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▶ **To cite this version:**

Fabien Candau, Jacques Le Cacheux. Corporate Income Tax as a Genuine own Resource. 2017. hal-01847937

HAL Id: hal-01847937
https://hal.science/hal-01847937

Preprint submitted on 24 Jul 2018

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Working Papers Series

Centre d'Analyse Théorique et de Traitement des données économiques

CATT WP No. 6
March 2017

CORPORATE INCOME TAX AS A GENUINE OWN RESOURCE

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Corporate Income Tax as a Genuine Own Resource

By Fabien Candau et Jacques Le Cacheux

This article proposes an original review of the literature on tax competition, providing new evidence on tax competition concerning different types of capital (intangibles, industrial building, etc). We also present fiscal optimization of Multi-National Firms (MNFs) and document some case studies regarding the foregone tax revenue due to evasion. Amounts saved by firms are comparable to the contributions to the EU budget by countries like the UK, Ireland, the Netherlands or Luxembourg. We estimate the revenue losses for the national governments of EU15 due to corporate tax avoidance through profit shifting under three scenarios considering different levels of 'CIT efficiency' to raise revenue for the year 2015. The 'intermediate' scenario predicts that the revenue losses for the EU governments due to corporate tax avoidance amount to approximately 98 billion €. After this description of the failure of the current system of taxation, the defense of corporate income tax at the European level as a genuine own resource for the EU budget, this article analyzes alternative schemes such as the Common Consolidated Corporate Tax Base (CCCTB).
JEL: F23, H26, H61

I. Introduction

Slow economic growth, high unemployment rate and significant public debt burdens characterize the economy of many European countries. Since the financial crisis of 2007-2008 and the 2009 Great Recession, this situation has raised concerns about the possibility to tax multinational firms. According to the OECD (2013a, b; 2015) and IMF (2014) the fact that multinational companies manipulate and shift their profits to low tax countries generates a serious erosion of the tax base. Due to the increasing mobility of capital, tax rates on profits of corporations are continously under downward pressure in Europe. Low-tax jurisdictions such as Ireland, Luxembourg, the UK and Eastern European Member States have pursued competitive strategies, compelling all the European members to follow suit and to increasingly rely on tax revenues from less-mobile sources such as real property, consumption and labor. Immobile agents (domestic firms, workers) are asked to contribute more while multinational firms exploit tax loopholes at the expense of high-tax countries in which these firms operate and sell most of their products. Tax competition has been the rule, leading to a 'race to the bottom' on statutory tax rates and discriminatory tax treatments.

In this article, we survey the literature on tax competition, we show how, whitout coordination, trade integration is welfare improving when capital is taxed at

the federal level and detrimental when taxed at the national one. We also provide new evidence on tax competition concerning different types of capital and we discuss how the increasing mobility of capital between the Members States but its relative immobility between Europe and the rest of the world can legitimate a European tax on multinational firms. Such a tax can be a good candidate to finance the European budget by genuine own resources. Instead of losing their fiscal sovereignty without compensation, Members States can decide to transfer or delegate their weak power to tax capital to the upper, EU level. Such a decision would improve the fairness and the efficiency of the European market but also the ability to launch European policies.

This article also documents the failure of the current system of taxation characterized by tax shopping, transfer pricing and tax competition leading to tax base erosion in many European countries. Case studies estmating the lost tax revenue due to evasion by a handful of firms (Apple, Amazon, Fiat, etc.) report significant amounts of revenue losses. By estimating these revenue losses for the EU15 in a more general way, we find an amount of approximately 98 billion euro.

After this description of the failure of the current system of taxation, this article analyzes alternative schemes such as the Common Consolidated Corporate Tax Base (CCCTB) proposed by the EU Commission. We emphasize the political difficulties of this reform and its consequences on competition between members.

II. Genuine own resources and a European tax on multinational enterprises

A. Why a guenine own resource?

The Rome Treaty and all European treaties since then, stipulated that the European Economic Community would have its own budget and that it would be financed by "own resources". Initially financed by the revenues from customs duties and levies on agricultural imports, the European budget progressively drifted away from "genuine" own resources towards a mode of financing essentially based on national contributions, first with the "VAT own resource", then with the currently dominant "GNI-based own resource". The immediate cause of this progressive change in the nature of financing was the insufficiency of revenue from the initial instruments due to both the increasing size of the budget, during the 1970s and 1980s, and to the decline in the yields of custom tariffs and agricultural levies. Figure (1) illustrates how the budget has moved from genuine own resources to national contributions.

The pros and cons of "genuine" own resources vs GNI-based national contributions have been discussed at length in the literature[1], and in various reports of the Commission and the European Parliament (in particular, Núñez Ferrer et al, 2016).

[1]Summarized in e.g. Cattoir, 2006; Le Cacheux, 2007; Begg, Enderlein, Le Cacheux and Mrak, 2008; Haug et. al, 2011; Núñez Ferrer et al, 2007 and 2008; Cipriani, 2007, 2010 and 2014

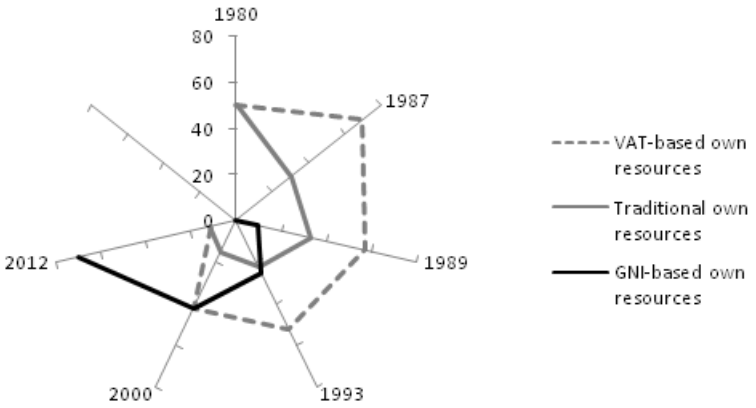

FIGURE 1. RESOURCES OF THE EUROPEAN BUDGET.

The most damaging problem of GNI-based national contributions is that it introduces a perverse institutional framework in which net contributors minimize the overall size of the budget (or claim fair return) in order to minimize their net contributions while net beneficiaries try to maximize transfers. With unanimity rule for adoption in the Council, this budget based on national contributions has hindered the collective decision-making and has handicapped the provision of common policies with a high European value added.

By establishing a real genuine own resource, a European corporate tax can help the Union to gain independence and to get out of the current political trap in order to lead ambitious policies which by reason of their scale and effects cannot be successfully implemented by the Member States. To illustrate this we propose a simple model of footloose capital and tax competition.

B. A simple model of the detrimental effect of tax competition in the single market

A robust conclusion of the literature on horizontal tax competition is that, with a limited number of governments competing from a mobile tax base, the equilibrium outcome will be sub-optimal in the provision of public goods –insufficient, in volume and quality, compared to an equilibrium with centralized taxation–, due to the existence of horizontal tax externalities.[2]This under-provision of public goods has been analyzed mainly by considering that the economical environment is fixed, i.e. whithout taking into account integration in the market of goods and services. Here we follow the economic geography literature[3] which provides useful

[2]See Wilson, 1986; Zodrow and Mieszkowski, 1986; Wilson and Wildasin, 2004; and for a survey of theory and evidence in the EU, Saint-Etienne and Le Cacheux, 2005

[3]See Andersson and Forslid (2003), Baldwin and Krugman (2004), Baldwin, Forslid, Martin, Ottaviano and Robert-Nicoud (2004), Ottaviano and van Ypersele (2005), Borck and Pfluger (2006) and Candau (2008.a) for theoretical models linking trade integration and tax competition. Candau (2008.b)

tools to better understand how tax competition evolves with trade integration in a single market.

We consider two countries, respectively denoted A and B, and two sectors, a Constant Returns to Scale (CRS) activity, agriculture, that produces a homogeneous good under perfect competition and an Increasing Returns to Scale (IRS) activity that produces differentiated services (or manufacturing goods, what matters is not the nature of goods but the process of production and the competition in this market). There are two factors of production, labour and capital. Each country is endowed with K and L units of factors. Workers are employed in the CRS activity as well as in the IRS and are immobile geographically. In contrast capital is footloose. The preference of the representative consumer is represented by the following quasi-linear utility function:

$$U = F + \ln\left[S^{\mu}(1+G)^{\alpha}\right], \text{ with } S = \left[\int_0^n c_i^{\frac{\rho-1}{\rho}} di\right]^{\frac{\rho}{\rho-1}},$$

where F is the food consumption, G the public goods consumption, and S is the consumption of a 'basket' of services, n the number of services, c_i, in this basket, and $\rho > 1$ the elasticity of substitution between these products. The budget constraint is given by $PS + p_F F = Y$, where p_F is the food price and $P = (\int_0^n p_i^{1-\rho} di)^{\frac{1}{1-\rho}}$ the price index of the different kinds of services with p_i the price of a typical service i.

Concerning the cost function in the IRS sector, the fixed cost involves f_i units of capital and the variable cost requires v_i units of workers. Thus the total cost of producing q services in country i is $TC_i = fr_i + vwq_i$ where r denotes capital owners' rent and w workers' wage. Each firm is a monopolist on the production of its variety and by maximizing its profit (under the Dixit-Stiglitz monopolistic competition assumptions) sets $p_i = vw\rho/(\rho - 1)$. Because there is free entry and exit, profits are always equal to zero, which gives the level of output $q_i = (\rho - 1)fr_i/vw$.

By denoting s_i the share of domestic firms in i, the supply of capital there is given by $s_i K$ (capital endowment is K in each country). In equilibrium, a typical firm employs f units of capital, so that the total demand in i is fn_i. The equalization gives the number of services produced: $n_i = s_i K/f$. Trade costs (that can be time costs, transport costs and transaction costs) are assumed in the IRS sector, if a service produced in A is sold at price p on it, then the delivered price of that variety in B is going to be τp with $\tau > 1$.

Wage in the agricultural sector, w, is taken as the numeraire and we also set $K = 1$ and $f = 1$ to simplify expression. Considering total demand in A as the sum of the local and export demands and equating this demand to the supply gives (after rearrangement and by inserting price index) the following market

provides a survey of this literature.

clearing equation:

$$r_A = \frac{\mu}{\rho}\left(\frac{L_A}{\Delta_A} + \frac{L_B}{\Delta_B}\phi\right). \tag{1}$$

with Δ_i a measure of the aggregate price of services in i: $\Delta_A \equiv s_A + (1-s_A)\phi$ and $\Delta_B \equiv s_A\phi + 1 - s_A$, where ϕ measures trade "freeness": $\phi = \tau^{1-\rho}$. This degree of trade liberalization increases from $\phi = 0$ with infinite trade costs to $\phi = 1$ with zero trade costs. *Ceteris paribus*, an increase in s_A implies, as long as there are transaction costs ($\phi < 1$), a decrease in the price index in A, i.e. an increase in Δ_A:

$$\frac{\partial \Delta_A}{\partial s_A} = -\frac{\partial \Delta_B}{\partial s_B} = 1 - \phi > 0 \tag{2}$$

As a result more capital in A has two different effects, on the one hand it means more competition in this country and thus reduces the capital reward (1), on the other hand because services are cheaper, the purchasing power is increasing in A with the agglomeration of capital. By summing indirect utility of capital owners and workers we analyze the following utilitarian social welfare function in $i = A, B$:

$$V_i = (1 - t_i^L)L_i + (1 - t_i^K)s_i r_i + 2a\ln(1 + G_i) + 2b\ln\Delta_i \tag{3}$$

where $b \equiv \mu/(\rho - 1)$ and with t_i^L and t_i^K taxes on labour and capital such as $G_i = t_i^L L_i + t_i^K s_i r_i$.

The location choice of capital is defined by net returns and thus the spatial equilibrium is $(1-t_A^K)r_A = (1-t_B^K)r_B$. The sequence of the tax competition game is standard, each government maximizes its objective function by taking as given the tax rate of its competitor and of the federal state and then relocation occurs. The game is resolved by backward induction. Resolving the spatial equilibrium condition using the market clearing equation gives the share of capital at the equilibrium:

$$s_A = \frac{1}{2}\left(1 - \frac{t_A - t_B}{2 - t_A - t_B}z^2\right) \quad with\, z = \frac{1+\phi}{1-\phi}$$

This expression indicates that with identical level of taxes the symetrical equilibrium is always stable (Martin and Rogers, 1995). Indeed with $t_A = t_B$ the capital is equally distribuated between countries ($s_A = 1/2$).

Concerning the second step of the tax game, each government maximizes (3) taking as given other taxes. By the symetry of the nations, the Nash equilibrium is given by:

$$t_i^K = a + \frac{b\Phi}{2} - \frac{t_i^L}{2} - \frac{1}{2}\left[\Gamma - \frac{16a\phi}{(1+\phi^2)} + 4ab\Phi + (b\Phi)^2\right]^{1/2} \tag{4}$$

with $\Phi \equiv (1-\phi^2)/(1+\phi^2)$ and $\Gamma \equiv (2a-(2+t_i^L))^2 + 2(2+t_i^L)b\Phi$.

From this expression it can be prove easily that this tax rate is decreasing in trade costs ($\partial\Phi/\partial\phi < 0$ and $\partial t_i^K/\partial\Phi > 0$), which means that due to trade integration, tax competition leads to a race to the bottom in term of capital taxation.

We can now analyze the welfare of citizens under a centralized and decentralized system. To present this analysis, we consider a federal government that is the sole to tax capital (national governments only tax labour). Since countries are identical, this central government divides its budget equally between the two countries and thus the furniture of public good is given by$G_i = t_i^L L_i + t_c^K(s_A r_A + s_B r_B)/2$. This government set its tax rate t_c^K by maximizing the utilitarian utility function presented in (3):

$$t_c^K = \frac{2a - 1 - Lt_i^L}{L} \tag{5}$$

This tax rate is not a function of trade integration and decreases with respect to the taxation on labour. By inserting this tax rate (5) in the social welfare function (3) we can analyze how trade integration affect welfare. Figure (2) reports this national welfare and compares it with the welfare obtained under tax competition (inserting (4) in (3)).

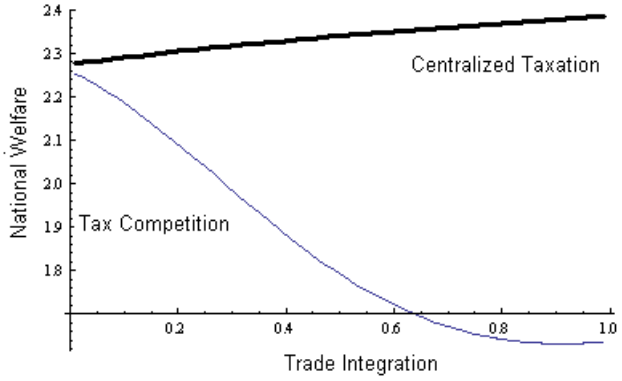

Figure 2. Tax Competition and Integration.

Note: Numerical simulations done with $\rho = 6$, $\mu = 0.4$, $t_A^L = t_B^L = 0.3$, $a = 1$, $L = 1$.

RESULT 1: *Trade integration is welfare improving when capital is taxed at the federal level and detrimental when taxed at the national level.*

There is an under-provision of the public good under tax competition that is exacerbated by trade integration, only a central government can restore the fair provision of public goods. In that last case, trade integration has a positive effect on welfare by reducing the cost of living (see (2) and (3)).

The most compelling argument in favor of a European tax on multinational firms is that the current system allows (and even encourages) Members States to compete with one another in a way that destabilizes the system itself. When trade costs decrease, mobile firms have strong incentives to avoid taxation by playing on national tax systems differences and loopholes. Restoring the ability to tax mobile capital (which is progressively lost by national governments) and reducing the numerous compliance costs encountered by MNFs would allow the European Union to improve both the fairness and the efficiency of the European market.

C. Discussions

Vertical tax competition

The previous model provides a radical view considering that only the central government sets a tax on capital in the federal system. When tax bases are shared amongst governments at different levels in a multitier government structure, a vertical tax externality also exists, in the sense that decisions to tax at one level will have an incidence on the size of the tax base for governments at other levels. This creates a strategic interdependence, whose effects in general counteract those of horizontal tax competition:

RESULT 2: *Vertical tax competition tends to mitigate the 'race to the bottom' induced by horizontal tax competition and may partially restore optimality in the provision of public goods (Keen and Kotsogiannis, 2002).*

The literature on vertical tax competition is more recent and less abundant than that on horizontal competition; the conclusions are less clear-cut and it suggests that outcomes depend to a large extent on institutional design and informational structure (Lachet-Touya, 2016). But the general conclusion that, introducing a more centralized power of taxation mitigates the inefficiency in public good provision, is generally valid (see the survey in Núñez Ferrer et al, 2016).

On the benefit of tax competition?

Of course, tax competition is not necessarily bad from an economic efficiency viewpoint. It undoubtedly has beneficial effects: by pushing rates down and raising the tax base, it reduces the distortions on market price signals, and hence

the deadweight loss generated by taxation, and may force governments to be more efficient in the provision of public goods and better cater to the preferences of their citizens. If we consider for instance a Leviathan government that maximizes its budget then the level of taxation can be excessive and tax competition can tame this bad behavior (Brennan and Buchanan, 1980; Edwards and Keen, 1996).[4]

However, in the presence of discriminatory tax treatments, there are, often large, efficiency losses due to distortions in firms' location decisions and other costs related to efforts by firms to 'optimize' their tax burdens, as exemplified by the recent cases of tax-motivated mega-mergers.

About incidence

While public opinion clearly supports the taxation of corporate firms, economists are less prone to recommend this instrument for at least two reasons. The first one is that such a tax introduces distortions and induces unproductive behaviors in order to evade taxation affecting investment, location decisions, international trade and economic growth. But insofar as firms are taxed at the national level, this distortion already exists, and the unproductive strategies they deploy to evade taxation are, as will be shown below, even more damaging in a single market with decentralized taxation than with a single tax authority.

The second one concerns incidence, i.e. the shifting of the corporate tax to some other units in the economics system. Many empirical papers since Harberger (1962) have tried to analyze who ultimately bears the economic burden of the tax. Multinational firms have the power to absorb the taxation by forward shifting onto consumers by rising prices and/or by backward shifting onto employees (and onto raw material and intermediate suppliers) by reducing wages (or the prices of raw and intermediate goods). Bradford (1978) and Kotlikoff and Summers (1987) show that a tax on corporate income leads to a flight of capital that reduces the return to labor, and thus domestic workers bear the entire burden of the tax. In Randolph (2006) the incidence depends on the proportion of capital in factor income and the author finds that labor bears between 45% and 75% of the tax burden. Arulampalam, Devereux and Maffini (2012) by using a sample of European firms find that a 1$ increase in the tax bill reduces real wages by around 50 cents. Hassett and Mathur (2006) by working with a panel of 72 countries over twenty years (1981-2002) find that wages are very responsive to corporate taxation when countries are small.

The question of the country size is indeed crucial in all this literature on distortion and incidence. As argued by Gordon (1986) a small country may be better off by taxing directly the immobile factors since due to the high mobility of capital in these countries, the tax burden inevitably falls on these factors and in addition distorts the allocation of capital. This was also in some sense the result

[4]These two different idea of governance (Leviathan versus Benevolent) however share the same conclusion, tax competition lowers the size of governments.

of Harberger (1962): in a closed economy, capital owners pay the tax. Needless to say, Europe is not a closed economy; however the mobility of capital is much weaker between Europe and the rest of the world than between Member States. The agglomeration of consumers and infrastructures and the local preferences of consumers reduce the mobility of capital at the European scale (as we will show in the next section) and as a result the extent to which owners of capital bear the tax burden increases at this level of governance. Thus according to incidence analysis, a corporate tax would be much more efficient if capital were taxed at the European scale than at the national level.

III. On the declining power to tax multinational firms at the national level

A. Globalization: Change in the Playing Field of Footloose Multinational firms

For most of the 20th century, globalization was mainly characterized by a spectacular decrease in trade costs. This stark change in the cost of moving goods has led multinational firms to fragment their supply chain in order to benefit of countries' comparative advantages. Factories have been located in low wage countries and headquarters, R&D or services in countries in which rich customers are agglomerated. The limit of this process resided in the fact that structuring the supply chain involves a continuous investment in communication to coordinate different tasks and thus when information on know-how was hard to transmit on long distances, the production of goods and services were clustered in some limited locations across the world. The new radical change at the end of the twentieth century has been the sharp decrease in the cost of moving information and ideas.

Both horizontally and vertically organized MNFs have grown in reason of economic fundamentals related to market size and access to low-cost local inputs (Markusen, 2002; Navaretti and Venables, 2006), but a growing part of affiliate creations, mergers and acquisitions are now driven by tax determinants. Working with 33,577 European foreign- and domestically-owned manufacturing plants, Egger, Eggert and Winter (2010) find that on average foreign ownership reduces the tax burden by about 56%. To sum up, while the transport costs revolution has mainly affected the location choice of physical capital, the Information and Communication Technology revolution (ICT) revolution made it easy to shift profits to low-tax countries.

The financial liberalization of the 1980s has been the first determinant allowing to move capital worldwide at a lower cost. Internet and the digitalization of the economy has been the second one making possible a deeper fragmentation of the international supply chain. The ICT connected to the computing power has totally modified the transmission capacities of information. Tacit information became codified and easily exchangeable opening up the possibility for firms to increasingly operate on a multinational scale (Baldwin, 2006, 2017). The world FDI flows, that used to represent only 2% of the gross domestic capital formation

in 1980, have risen to 15% in the early 2000s. FDI in Europe have increased at a tremendous rate as illustrated by Figure (3). Both the number and the value of mergers and acquisitions have skyrocketed.[5]

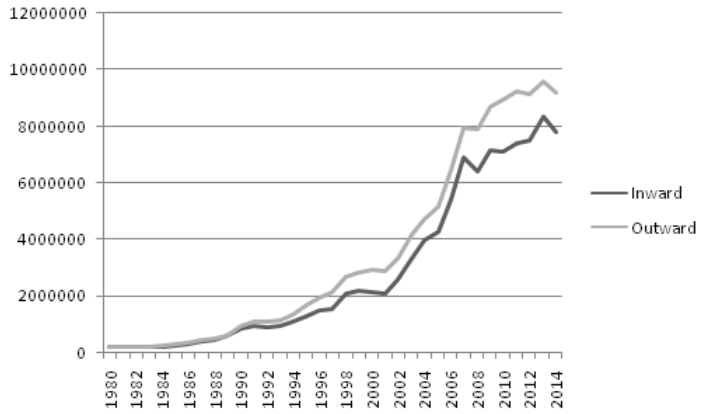

FIGURE 3. FOREIGN DIRECT INVESTMENT IN EU-28: INWARD AND OUTWARD STOCK, ANNUAL, 1980-2014.

Source: Based on UNCTAD (2015), US Dollars at current prices and current exchange rates in millions.

Furthermore, intangible assets related to innovation, such patents, trademarks and copyrights or marketing services, are now major factors of profits and these intangibles are much more mobile than physical capital and can thus be geographically separated from other production units at small costs. Standard examples are found in the ICT sector where the value of the firm is often linked to its innovative technology while the marginal cost of production is low. This process is however not limited to this sector, for instance firms in the pharmaceutical sector typically earn profit from their innovative patents and not from the manufacturing of the drugs which yields only low returns. And firms with valuable trademarks earn profits from their brands and image.

From the AMADEUS database, working on the EU-25 over years 1995-2005, Dischinger and Riedel (2011) observe the growing importance of intangible property in their sample of MNFs, they show that that the mean value of intangible property steeply rises both for the average parent firm and the average subsidiary.

B. Regionalization: Home bias and the European Supply Chain

Globalization has changed the scale at which multinational firms operate. This globalization is however a complex mix of global and regional exchanges. While

[5]According to the OECD (2002) approximately 80% of all FDI in the OECD countries were due to mergers and acquisitions in 2000.

MNFs move from countries to countries, for a vast majority of these firms many exchanges are organized around three continents, leading Baldwin and Lopez-Gonzalez (2015) to speak about Asian, American and European factories. Actually, it would be wrong to consider that we live in a world where distance does not matter.[6] For instance, Portes and Rey (2005) find that physical distance strongly affects international equity flows and holdings: doubling the distance reduces cross-border equity flows by half. Home bias on international markets, which explained "the desinclination of capital to migrate" (Flandreau, 2006) is still a real phenomenon. Despite financial globalization, US investors still held more than 80 percent of domestic equities in 2007 and similar numbers could be observed in Europe. European investors hold 57% of domestic equities which is a much higher proportion than the share of European equities in the world market (only 13.5%). Coeurdacier and Rey (2011) provides a survey documenting this Home Bias in equity.

Informational, institutional, transaction costs but also behavioral bias can explain these results. For instance, it has been known for decades that investors suffer of overconfidence concerning the detention of local assets (French and Poterba, 1991). The recent European debt crisis has also revealed that during the period of growth some European investors have been overconfident on the performance of some European peripheral countries. In many cases, one can observe that investors have a preference for 'familiar' assets and ignore standard portfolio theory on diversification including the geographical one (see Barberis and Thaler, 2003, for a review).

Since European borders still matter for equities, it is not surprising to observe that they also matter for less mobile factors. Physical capital for instance is obviously mobile and relocations towards China or to other emergent or developed countries have been numerous. However the vast majority of exchanges, both in terms of FDI and imports/exports, are between Members States. There is a clear hub-and-spoke offshoring system around high-wage countries such as Germany, France and the UK. Germany is obviously the leader of this so-called "bazaar" economy (Sinn, 2003) by selling goods that are partially produced elsewhere in Europe. Baldwin and Lopez-Gonzalez (2015) describes this "Factory Europe" where a vast majority of goods move inside the European Union.

All these results may lead to consider that if the revenues of capital taxation are harder to collect for the Members States, taxing them would be easier at the European scale.

C. Mechanisms for cross-border profit shifting

Facing these waves of globalization, the European and international rules of taxation seem archaic. In the current system, profits are generally taxed according

[6] To give one example, the distance elasticity of trade is remarkably high and stable, estimated around -1 over a century and a half of data on average at the world level (see Head and Mayer (2014) and Candau and Dienesch (2011) for surveys).

to the source based principle, i.e. where profits have been reported, while interest and royalty payments are deductible at source and taxed in the residence country of the recipient. Initially designed in the 1920s, under the auspices of the League of Nations, such a system was mostly geared at avoiding double taxation.

The problem is particularly serious when firms import and distribute at home, goods produced abroad by subsidiaries. In that case, each entity has to compute its profit by using "transfer prices", in principle set on comparable transactions between unconnected parties. This is the "arm's length pricing" principle. This principle defines how the profits of MNFs are allocated between countries. The main problem is that the manipulation of this principle is widespread in practice. Corporations in high-tax countries tend to sell intermediate goods at low price to their low-tax subsidiaries while these entities export to them at high price. For instance, Hanson, Mataloni and Slaughter (2005) find that the demand of American multinational enterprises for imported inputs is higher when affiliates face lower corporate income tax rates. Vicard (2014) finds that the manipulation of transfer prices in France led multinationals firms to decrease the value of exports by 0.8% and to increase imports value by 0.5% in 2008. This strategy enabled multinational groups to reduce the corporate tax bill they paid in France by 10% on average, saving approximately 8 bn USD in 2008. Davies, Martin, Parenti, and Toubal (2014) confirm the existence of tax avoidance through transfer pricing in France, but observe that this strategy is concentrated on a small subset of firms (driven by the exports of 450 firms to ten tax havens), which leads them to conclude that significant revenue increases can be obtained by authorities with minimal cost by targeting enforcement.

These analyses naturally underestimate tax avoidance since comparable transactions between unconnected parties to set the transfer prices are not always available to detect the fraud. In developed tertiary economies, such a problem is particularly acute since many incomes are derived from intangible assets related to intellectual property (patents, trademarks, brands and copyrights). For instance when Google transferred its technology in 2003 to its Bermuda subsidiary (just before being listed as a public company), no comparable transaction was available and the fair transfer price (in the arm's length pricing spirit) seems hard, not to say impossible to set.

A common tax planning strategy is to locate intangible property in a group subsidiary resident in a low-tax country and license it to other group subsidiaries residing in high-tax countries. The most recent and famous practice of this kind is the "Double Irish Dutch sandwich" used by Google. In this evasion scheme, revenues are shuttling back and forth in four "shops": the US, Bermuda, Ireland and the Netherlands.

The historical collective failure to lead tax discussion on a multilateral basis and thus by default the necessity to rely on bilateral agreements is at the origin of treaty shopping. Multinational firms with stateless income tax planning[7] exploit

[7]See Kleinbard (2011) for an analysis of the concept "Stateless Income".

tax loopholes at the detriment of high-tax countries where these firms operate and sell most of their products.[8]

Transfer pricing (including the location choice of intangible property that benefits of preferential tax treatment in many countries) automatically leads to tax evasion which could explain 70% of profit-shifting (European Commission, 2015).

Debt shifting is also a common practice to evade taxation. MNFs easily shift profits by financing group companies in high-tax countries offering interest deductibility with intra-group debt from affiliates residing in low-tax countries. Adopted in 1990 and amended in 2003, the European directive on Parent-subsidiary taxation failed to properly address this issue.

D. Some Examples of Tax Optimization

The Google treaty shopping is maybe one of the most famous; it started in 2003 when Google US sold a part of its business to Google Ireland Holdings which is a subsidiary incorporated in Ireland but that resides in Bermuda. Then, this subsidiary has sold the rights to use its technologies in Europe to a Dutch company, which in turn has licensed the rights to a lower-tier subsidiary, Google Ireland Limited. To avoid paying the 12.5 percent corporate income tax imposed by Ireland, Google Ireland Limited makes deductible royalty payments to its Dutch subsidiary which makes the same royalty payments to Ireland Holdings. This subsidiary is considered as a Bermuda company by Ireland, so no taxation is levied there. Furthermore, this company is Irish from the U.S. and Dutch perspectives, allowing Google to pay an effective tax rate of only 2.4% and to reduce its tax bill by $3.1 billion.[9]

This is the kind of inconsistencies coming from bilateral agreements that allows firms to legally evade taxation. Figure (A1) in Appendix A summarizes the main characteristic of this treaty shopping.

One may notice that this scheme of evasion widely used by multinational firms is only one example among many.[10] Here we provide a non exhaustive list of some affairs reported recently by different kind of investigations.

Apple Inc. has used different strategies to evade about $44 billion taxes from the US and from source countries (see Ting, 2015 for details). The European Commission has considered that Ireland had provided undue tax benefits of €13 billion. In 2011 Apple recorded profits of €16 billion but paid only €10 million of taxes. This effective rate of 0.05% has even been divided by 10 in the following years (0.005% in 2014).

The EU commission has also launched an investigation on Amazon which has used a tax arrangement in Luxembourg since 2003 to pay no taxes on profits.

[8] Recently, progress has been made thanks to the OCDE "Base Erosion and Profit Shifting" (BEPS) initiative, leading to the adoption of a new set of rules for international tax treaties, including country-by-country reporting, etc. See: http://www.oecd.org/tax/beps/.

[9] First revealed by Drucker (2010).

[10] The "double Irish" system has been closed in 2015 for new firms and is going to be close in 2020 for past location choices.

Starbucks has also used transfer pricing methods between Switzerland, the Netherlands and the UK to pay in the Netherlands only €2.6 million in corporate tax on a pretax profit of €407 million (i.e. an effective tax rate of less than 1%) which has unfairly reduced its tax burden by €20-30 million (Commission Decision, 2015). Figure (A2) in Appendix A illustrates how Starbucks pays substantial royalty to its company in UK and high price for green coffee beans from Switzerland.

The European Commission has also found a similar amount of €20-30 million saved by Fiat Finance and Trade in 2012. The taxable profits declared in Luxembourg were 20 times smaller than total profits thanks to a selective tax advantage provided by the domestic tax authorities, i.e. Fiat paid taxes on a small portion of its actual accounting capital.

Playing on tax treaties concerning royalty payments between the US and Luxembourg, McDonald's has succeeded to pay no tax in either country. These untaxed profits amounted to more than €250 million in 2013 alone according to the EU Commission. The French tax authority has also considered that the company had reduced its French tax bill on profits by €300 million thanks to transfer pricing with McDonald's Inc. Luxembourg and Switzerland.

According to Auerbach (2016), IKEA has also used various schemes such as intra-company loans and tax on royalty to alleviate its tax burden. The tax bill has been reduced by €24 million in France, €5 billion in Germany, €11.6 million in the U.K., etc. IKEA has also exploited Belgian notional interest deduction and sweetheart deals with Luxembourg. Lastly Ikea's corporate groups have used financial arrangements to shift profits from Luxembourg to Lichtenstein. While the total net income declared in Luxembourg was about €15.6 billion, the company has paid only €477.9 million (3%). According to this report, IKEA has avoided at least €1 billion taxes between 2009 and 2014.

The retailer Gap has also succeeded to pay almost no tax in the UK by buying royalty fees from its Dutch subsidiary despite its £1 billion of sales.

More recently, Auerbach (2016) finds that BASF has avoided €923 million in taxes over the period 2010-2015. The number of techniques used is significant. BASF has evaded the German income tax on foreign-source dividends by using Dutch holding companies, has used the Netherlands participation exemption to avoid taxes on intra-group loans, and has also used the Dutch innovation box to reduce the tax burden on intellectual property income. Lastly the group has used intra-group activities to shift profits to Puerto Rico and Switzerland.

To make these numbers meaningful, Figure (4) and Figure (5) summarize these amounts of tax revenue losses due to tax evasion and compare them to the EU-budget contributions of four countries that have been particularly active in providing tax loopholes: the UK, Ireland, the Netherlands and Luxembourg. Since many investigations have been led around the year 2010, we take that year for the contribution of these countries to the EU budget.

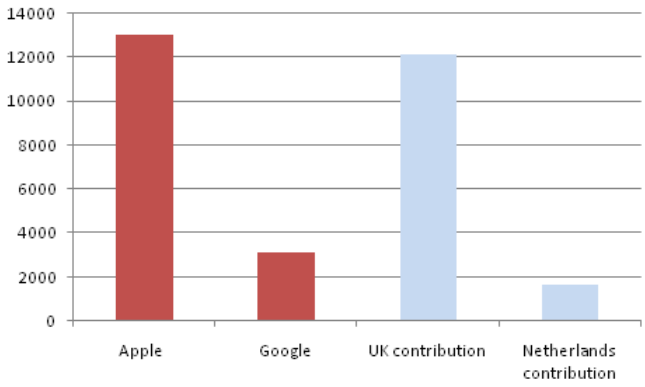

Figure 4. Tax evasion and Members Contribution to the EU-budget.

It is striking to observe that the contribution of the UK is equivalent to the tax saved by Apple, and that the Google tax gain is larger than the Netherlands' contribution.

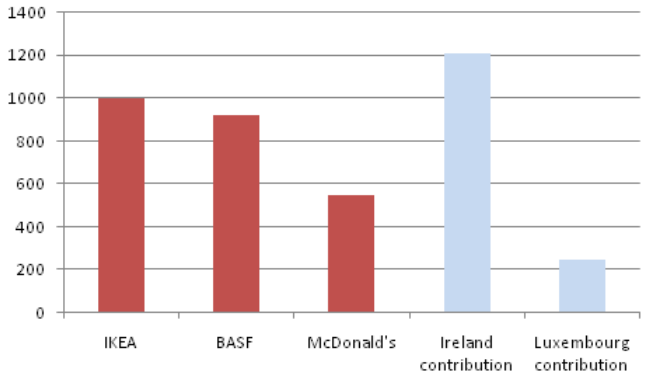

Figure 5. Tax evasion and Members Contribution to the EU-budget.

The sum of taxes saved by IKEA, BASF and McDonald's alone is higher than the Ireland and Luxembourg contributions.

IV. Tax competition

A. Stylized facts

Corporate Income Tax

The wind of change born in the beginning of the 80s has not only changed the mobility of profit, it has also changed the way profits are treated by countries.

Once profit became more mobile, competition between countries to attract capital has become fiercer. Tax competition in Europe is however not a new phenomenon. Ever since the completion of the European Single market, tax competition has been on the rise. In the late 1980s, after the adoption of the single European Act, the Commission had expressed concern that tax harmonization might be needed, at least on some of the tax instruments most directly impacted by increased mobility of tax bases. Later on, in the late 1990s, renewed concern was expressed about 'harmful tax competition' in the fields of corporate taxation and the taxation of incomes from personal financial investments (Primarolo Report, 1999). As a response, two measures were adopted: the 'Code of conduct', prohibiting 'damaging' or 'harmful' tax competition –essentially discriminatory tax treatment of foreign firms-- on corporate taxation, and the Savings Directive, that introduced mandatory information exchange on incomes from interest-bearing assets held by non-resident EU citizens.

However these measures have not stopped tax competition, which seems to have been exacerbated by successive enlargements (Davies and Voget, 2011). Exbrayat (2016) reveals that bilateral trade integration gives rise to significant interactions with respect to effective average tax rates in Europe. To illustrate this, Figure (6) reports the mean of corporate income tax rates in the EU (including countries only after each enlargement) and eleven OECD members with European countries before they join the EU.

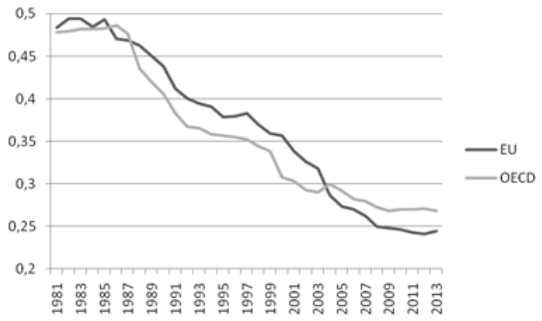

Figure 6. Statutory Corporate Income Tax Rates, 1981-2013.

Source: Calculation based on the OECD Tax Database.

The decrease in the level of average CIT rates does not represent only a mechanical decline due to the integration of poor countries with historical low level of taxation. Crabbé and Vanderbussche (2013) and Cassette and Patty (2008) show that EU-15 countries in the neighborhood of Central and Eastern Europe have been more engaged in CIT tax competition.

An indirect measure of the extent of profit shifting by firms in response to the various tax loopholes and incentives may be gathered from comparing the

composition of GDP in various EU countries: it confirms that small countries tend to have a larger share of profits in GDP than larger ones, the most extreme case being Ireland, especially in recent years as shown in Figure (7).

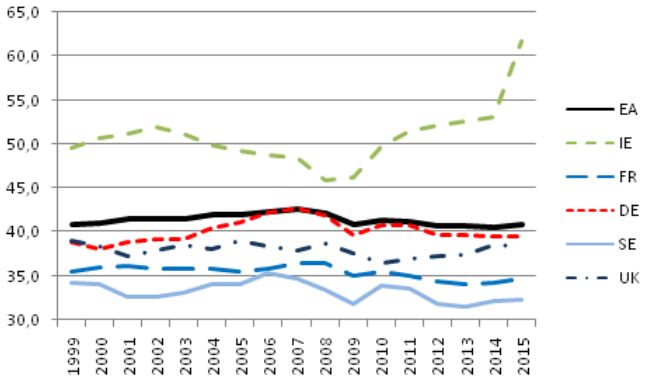

Figure 7. Gross operating surplus, as a percent of GDP, in selected EU countries, 1999-2015.

Source: Eurostat.

More recently some other small countries, like Luxembourg, or larger ones like the UK, have taken the leadership of this tax competition game. This competition has been more or less intense depending on the sector considered. For instance, firms in the financial sector have been much more prone to relocation with an estimated marginal effect of taxes that is twice larger in this sector than in manufacturing (Lawless et al., 2014)). The recent multiplication of IP box regimes to attract intangible assets certainly also reflects a new field of tax competition.

IP Box Regimes

As previously described, intangible assets are highly mobile and thus are very sensitive to corporate income taxation as shown by Griffith et al. (2014) concerning the location of patents. In response, many European countries have introduced "Intellectual Property (IP) Box regimes" reducing the rate of corporate tax levied on the income derived from patents and intellectual property (Evers et al. 2015). Table (8) below reports the numerous IP box implemented over the past decade.

These preferential tax regimes have been clearly identified as harmful tax practices by the OECD (2013a) and by the European Commission (2013). And very recently (2017), the OCDE has asked the French government to repeal the French Patent box regime.

	Date of implementation	IP Box rate (%)	Main rate (%)
Belgium	2007	6.8	33.99
Cyprus	2012	2.5	12.5
France	2000	16.76	35.41
Hungary	2003	9.5	19
Liechtenstein	2011	2.5	12.5
Luxembourg	2008	5.84	29.22
Malta	2010	0	35
Netherlands	2007	5	25
Portugal	2014	15	30
Spain	2008	12	30
Nidwalden, Switzerland	2011	8.8	12.66
United Kingdom	2013	10	21

FIGURE 8. IP BOX REGIMES IN PLACE IN EUROPE IN 2014.

Source: Evers, Miller, Spengel (2015).

EFFECTIVE AVERAGE AND MARGINAL TAX RATES

Statutory tax rates analyzed until now matter regarding profit shifting, but to observe the competition of governments to attract investments, the analysis of the Effective Average Tax Rates (EATR) is more adequate. This tax rate measures the wedge between the pre- and post-tax return on a typical investment project. Discrete choices of investment made by multinational firms between alternative locations depend on EATR.[11]

There is significant difference between the levels of EATR in Europe as shown in Figure (9). In France for instance the EATR on financial assets was equal to 40% in 2014, while this tax rate was nearly 20% in UK and 16% in Estonia.

Another striking result of this figure is that the gap between countries varies with the nature of the capital considered. Industrial building which are among the least mobile base, support the highest level of taxation in many countries. Furthermore, Figure (10)[12] reports a clear downward trend over the past decades in EATR of the EU28. Not reported here, a similar result has been found for the Effective Marginal Tax Rate (EMTR) which measures the impact of tax on the cost of capital (including financial costs and depreciation).

[11] See among many studies European Commission (2013) and Devereux and Sorensen (2006).
[12] Source: Based on data from the European Commission (2013)

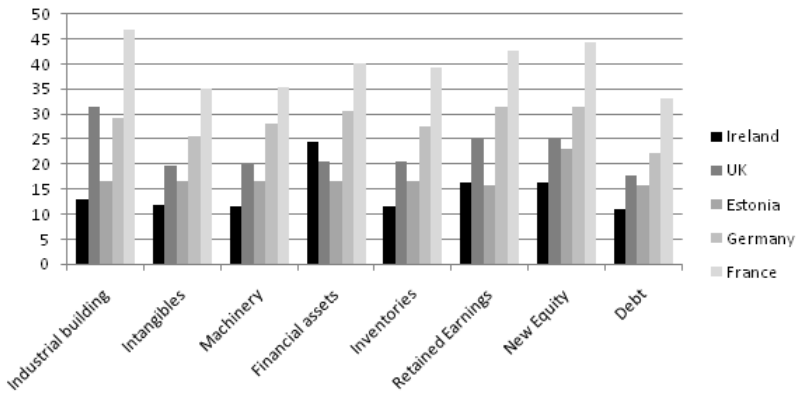

Figure 9. Effective average tax rate by asset and source of finance.

Source: Based on data from Spengel, Endres, Finke, Heckemeyer (2014).

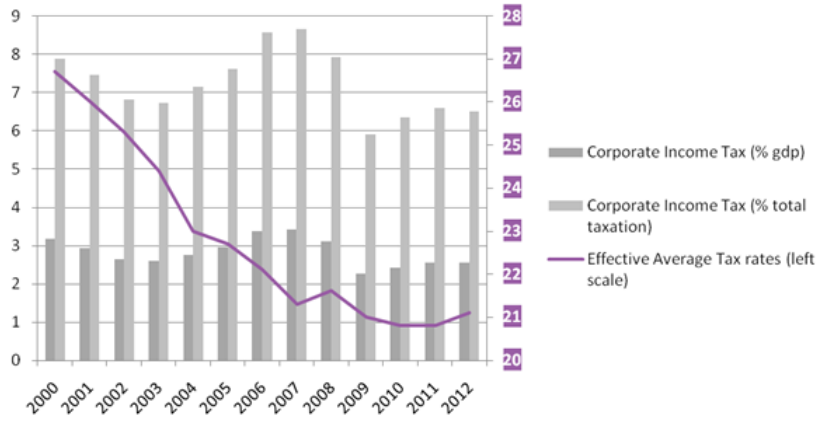

Figure 10. Corporate Income Tax and Effective Average Tax (EU28).

Source: Based on Eurostat.

Comparing the different tax rates, the drop in the Statutory tax rate has been more pronounced than the EATR (and EMTR), indicating that taxes are set to attract the most mobile base, while maintaining a relative higher tax on less mobile firms. We analyze this last point in more details in the next section devoted to the consequences of tax competition.

B. *Empirical Analysis*

The contribution of this section is to analyze tax competition on different type of capital which remains a difficult exercice due to data limitation. More precisely from Spengel, Elschner, Endres (2012) we collected EATRs on industrial building, intangibles, machinery and inventory assets (briefly presented in Figure (9)) for 25 European countries[13] over the period 1998-2012. We also lead a more classical regression by using CIT rates (from Eurostat) for the same sample of European countries but for a longer period of time (1996-2013).

To evaluate tax competition in a framework where common shocks, country-specific effects, time and spatial correlation are considered we estimate the following equation:

$$t_{i,t} = \alpha t_{i,t-3} + \beta \hat{t}_{i,t} + \gamma X_{i,t} + c_t + f_i + \varepsilon_{it} \tag{6}$$

where $t_{i,t}$ is the tax rate sets on a particular capital, $t_{i,t-1}$ is the lagged dependent variable,[14] $\hat{t}_{i,t}$ is an exogeneous proxy of the average tax rate of other countries, $X_{i,t}$ represents different controls, c_t is a common period effect and f_i are individual fixed effects. The common period effect aims to control for the recent crisis in Europe by using a dummy that takes one for years 2007, 2008, 2011 and 2012 and zero otherwise.[15] Considering controls we use the share the share of old and young people[16], hereafter deoted $Old_{i,t}$ and $Young_{i,t}$, which are socio-demographic variables often used for their exogeneity.

The average tax rate of other countries is calculated using a weighted scheme ω_{ij} based on physical distance, d_{ij}:[17]

$$\bar{t}_{i,t} = \sum_{j \neq i} \omega_{ijt} t_{jt} \;\; \omega_{ijt} \equiv \frac{1/d_{ij}}{\sum_{j \neq i}(1/d_{ij})}$$

However, this average tax of partners presents a major drawback: in the presence of strategic interactions on tax rates, this explanatory variable can be a function of the dependent variable $t_{i,t}$ leading to a biased estimation of tax competition. To deal with this endogeneity bias, we adopt an intrumental approach in two-steps, where in the first one the following regression is performed:

$$\bar{t}_{i,t} = \beta_1 \sum_{j \neq i} \omega_{ijt} Old_{i,t} + \beta_2 \sum_{j \neq i} \omega_{ijt} Young_{i,t} + f_i + \upsilon_{i,t}.$$

[13] Herer the 3 letters code (to save space) of these countries AUT, BEL, BGR, CYP, CZE, DEU, DNK, ESP, EST, FRA, GBR, GRC, HRV, HUN, IRL, ITA, LTU, LUX, LVA, MLT, NLD, POL, PRT, SVK and SWE.

[14] Here one year, but we have verified that the results are still verified with longer lag (three years).

[15] We have also used a time trend and we obtain similar result.

[16] More precisely these variable are the share of population older than 65 years old and younger than 14 years old. These data comes from the World Development Indicators.

[17] We have also used a distance weighted by population with the same results.

We adopt here the same instrument used in the literature, i;e. the shares of old and young people, which have a good explanatory power of tax rates without influencing population pyramid. Then in a second step the predicted value of $\bar{t}_{i,t}$, denoted $\hat{t}_{i,t}$ is used in Equation (6).

This system is identified if and only if:

$$\beta_1 \neq 0,\ \beta_2 \neq 0,$$

$$Cov(\sum_{j \neq i} \omega_{ijt} Old_{i,t}, \upsilon_{i,t}) = 0,\ Cov(\sum_{j \neq i} \omega_{ijt} Young_{i,t}, \upsilon_{i,t}) = 0,$$

$$Cov(\hat{t}_{i,t}, \varepsilon_{it}) = 0.$$

The first condition is about relevance requiring that conditional on controls, i.e. individual fixed effects f_i, the instrument predicts the endogenous dependent variable. The other two require that the instrument affects the dependent variables only through their impact on the average tax rate of other countries, i.e. the so-called exogeneity conditions or exclusion restrictions.

Table (1) provides the result of these two steps.

Beside Hansen test indicating that the selected instruments are strong, we can verify their validy in all column of Table (1), the proportion of old and young people significantly explained CIT rates and EATR in Europe.

Concerning the second step, we confirm the results of Overesch and Rincke (2011) concerning the dynamics adjustment of taxes, all our dependent variables depend significantly on past levels. More importantly the instrumented distance-weighted measures of neighbors' taxes are always significant. This result contrasts with Overesch and Rincke (2011) who do not find serious evidence of tax competition on EATR (only on CIT rates).

Lastly, even if our dummy "crisis" is simplistic and can be critized on various grounds, it is interesting to observe that this variable does not explain tax rates on capital. Tax competition on this factor is not a temporary phenomenom due to the recent crisis.

Table 1—CIT and EATR Competition.

	CIT	Effective Average Tax Rate				
		Intangibles	Machinery	Indus Build	Financial	Inv Assets
Second step						
Lagged tax	0.778	0.730	0.745	0.760	0.754	0.590
	0.025^a	0.034^a	0.035^a	0.033^a	0.032^a	0.030^a
Average Tax	0.447	0.262	0.307	0.160	0.253	0.397
	0.098^a	0.098^a	0.097^a	0.090^c	0.101^b	0.105^a
Crisis	0.094	-0.05	0.195	-0.055	-0.098	-0.126
	0.279	0.823	0.265	0.239	0.224	0.285
R^2	0.94	0.94	0.95	0.96	0.94	0.94
F-value	240	199	220	292	169	179
Observations	450	343	343	343	343	343
First step						
Young	1.037	1.604	1.501	1.625	2.084	2.025
	0.158^a	0.096^a	0.048^a	0.084^a	0.097^a	0.093^a
Old	2.783	-1.391	-1.433	-1.058	-1.319	-1.163
	0.310^a	0.053^a	0.087^a	0.046^a	0.053^a	0.051^a
R^2	0.98	0.94	0.96	0.96	0.95	0.95
Observations	509	398	398	398	398	398

Note: ^{abc}denote significance at the 1, 5 and 10 level respectively. Robust standard errors are reported under each coefficient. Indivdual fixed effects have been introduced in all regressions. The share of young and old people in the second step are rarely significant with individual fixed effects and thus not reported here.

V. Consequences of capital tax competition on immobile factors

Theory

The consequences of tax competition on the most mobile source are well known, they lead governments to transfer the tax burden on the less mobile bases. To illustrate this simply, and to show in addition the role of trade integration which is often neglected in the traditional literature on tax competition, we use the theoretical model presented in the previous section. In both countries, taxation on capital and labor is chosen to raise a given amount of revenue, previously denoted G. Without loss of generality we follow Ottaviano and van Ypersele (2005, Section 5.2) by imposing $G_i = 0$, this implies that the tax rate on capital automatically determines the tax rate on labor to balance the budget, indeed the budget constraint is now $t_i^L L_i + t_i^K s_i r_i = 0$. By inserting the tax rate set on capital under the simultaneous Nash game in this constraint and by resolving for t_i^L we obtain the tax levied on labour when this factor is the adjustment variable

in the budget function:

$$t_i^L = \frac{\mu - \mu\phi^2 - L(1-\rho)(1-2a(\phi-1)^2+\phi^2)}{(2a-1)L(\rho-1)(1+\phi^2)}$$

Figure (11) reports how this tax rate is affected by the economic integration of countries in this situation of tax competition on the mobile base.

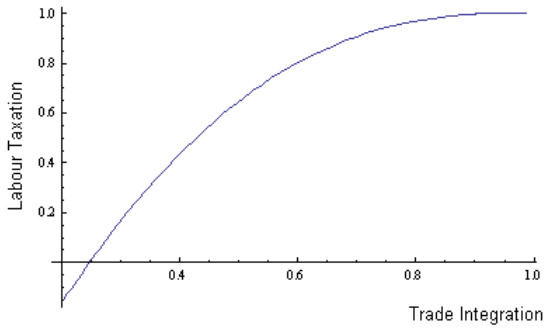

Figure 11. Labour Taxation under Tax Competition on Capital and Trade Integration.

Note: Numerical simulations done with $\rho = 6$, $\mu = 0.4$, $a = 1$, $L = 1$.

This gives the following result.

RESULT 3: *Due to tax competition, trade integration raises the burden of taxation on the immobile factor.*

Trade integration leads to a race to the bottom regarding taxes on capital (see the discussion below Equation (4)) which, for a given budget, inevitably leads to raise the labour taxation.

Facts

Since the 2009 Great Recession tax competition has tended to exacerbate, with the tendency of Eurozone countries caught in severe recessions and having to consolidate their public finances to resort to 'internal devaluations', usually a mix of wage moderation, reductions in social contributions, and consumption tax hikes. For instance a 'race to the top' on VAT rates has indeed been observed since 2010 (Le Cacheux and Laurent, 2015). The level of the average VAT rate in the EU-28 seems however to have reached its apex in the recent years (Figure (12)).

Labor also pays an increasing share of the tax burden. If one considers labor taxes targeted at the bottom end of the wage scale, usually reduced to boost

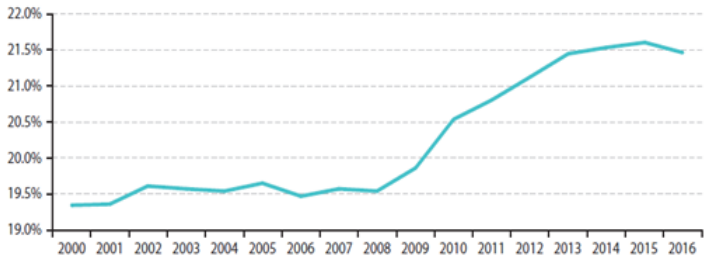

FIGURE 12. AVERAGE VAT RATE IN THE EU-28.

Source: DG Taxation and Customs Union.

employability of low-skilled workers, the crisis has provoked a radical change. To illustrate this Figure (13) presents the difference between labor costs to the employer and the corresponding net take-home pay of the employee, called the tax wedge on low wage workers (single worker without children at two thirds of average earnings and its developments since 2002). Whereas this tax wedge had been falling before the crisis, one can observe a rising trend up since 2008-2009. The implicit tax rate on labor (which is the ratio of taxes and social security contributions on employed labor income to total compensation of employees and payroll taxes) has followed the same evolution.

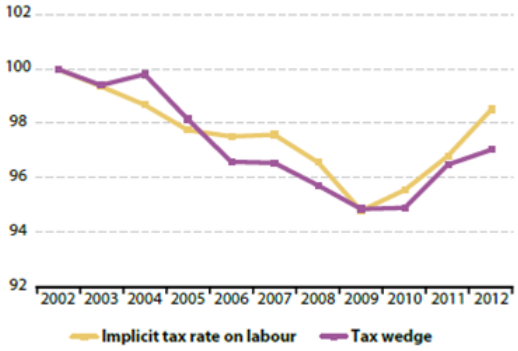

FIGURE 13. INDICATORS OF TAX BURDEN ON LABOUR, EU-27, 2002-2012.

Source: Commission services and OECD.

The dramatic decrease in tax rates on mobile firms has also led governments to revisit the definition of their tax bases. To show this the Corporate Income Tax (CIT hereafter) as a % of GDP and as a % of total taxation were presented in Figure (10). The relative stagnation of CIT as a % of GDP or as a % of total taxation contrasts with the constant decrease of the CIT rate. Actually, this ap-

parent rate-revenue paradox may be partly explained by base broadening.[18] The difficulty to tax multinational firms seems to have led governments to implement policies that broaden the corporate tax base. Devereux and Sorensen (2006) observe that on the 19 OECD countries of their sample, 11 cut their allowance rates for investment in plant and machinery between 1982 and 2004 in order to broaden their tax bases. In particular, the UK and Ireland decreased strongly their allowances from 100% to 73%, and to 71% for investment in plant and machinery. The decrease in the allowance for industrial buildings has even been more dramatic, close to 90% in the 1980s, it is now equal to zero since 2012. Kawano and Slemrod (2015) also find evidence that countries lowering their corporate tax rate, broaden their tax base. Figure (14) documents that many countries that have cut their tax rate have also decreased the Present Value (PV) of their depreciation allowances.

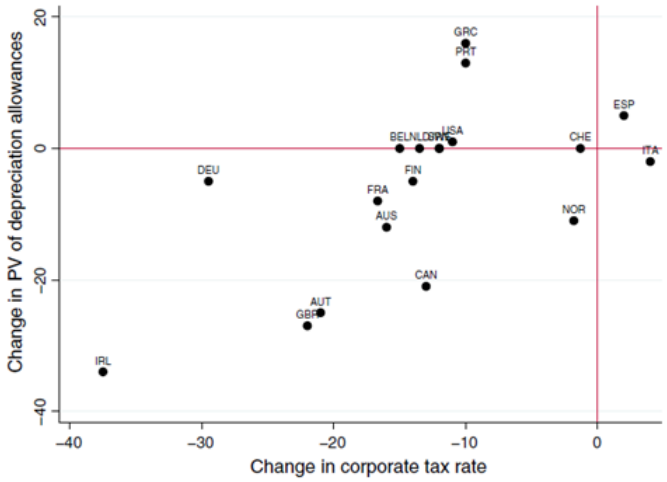

Figure 14. Change in corporate tax rates and change in depreciation allowances, 1980–2008.

Source: Kawano and Slemrod (2015).

The relationship is obviously not universal, some countries have reduced their tax rate without modifying their depreciation allowances on capital (e.g. Belgium, the USA), some others have even increased them (Spain, Portugal); but the majority of countries represented in Figure (14) are in the negative quadrant due to cuts in both their tax rate and capital allowances.

This tendency of countries to implement policies that broaden the corporate

[18] Another explanation lies in the increase in the share of corporate profits in GDP coming from: a) an increase in the size of the corporate sector (e.g. less personal income tax base and more corporate legal form), b) an increase in the profitability of the corporate sector (see Sorensen, 2006; de Mooij and Nicomède, 2007).

tax base in reaction of the competition on tax rates may have some adverse consequences on competitiveness and growth. This is typically the case with the reduction of capital consumption allowances described in the previous section: when businesses are not allowed to fully deduct capital expenditures, there is a risk that they invest less (Pomerleau, 2013).[19] Exploiting a change in the UK policy concerning the first-year depreciation allowances, Maffini et al. (2015) find that when firms become qualified to this policy, there is an increase in investment rate of 11% at the mean. Similar results have been found for the US (Zwick and Mahon, 2015).

VI. Assessment: the current source-based taxation

Previously in the text, we have presented some results regarding the lost tax revenue due to evasion, but our analysis was mainly based on anecdotal evidence, in particular on case studies reporting estimates of evasion at the firms level (Apple, Amazon etc). While we have shown that these amounts should not be minimized since they already represent a significant level of evasion (comparable to contributions of the EU of some members), they inevitably greatly under-estimate actual revenue losses. We thus follow the more general methodology recently presented by IMF (2014) to assess the efficiency of the CIT and to approximate the revenue losses. The IMF (2014) study works on OECD countries over the period 2000-2012. This analysis has been applied to the EU28 by Dover et al. (2015), who stopped their assessment in the year 2014. Our analysis differs in two ways: we do not use the same variables as the IMF and we do not work with the same sample as Dover et al. (2015). In particular we focus our attention on the EU15, which includes the main losers of tax avoidance. The focus on these countries allows not to bias the analysis by not taking into account the low tax rates of newly integrated countries that only affect marginally revenue losses. In comparison with other studies, we also focus our attention on the year 2015 which to our knowledge had not been evaluated yet. More precisely, we compute the following indicator of tax avoidance (including, but not only, profit shifting), also called 'CIT-efficiency' (E_{it}):

$$E_{it} = \frac{R_{it}}{t_{it}\pi_{it}}$$

where R_{it} is the CIT revenue, t_{it} is the tax rate, π_{it} is the reference tax base. When the CIT revenue is smaller than the reference, the efficiency of the CIT is below unity and thus taxation is less effective in raising revenue. Data on CIT revenue and tax rates comes from the DG Taxation and Customs Union, the approximation of the reference tax base is the "Net operating surplus: Adjusted for imputed compensation of self-employed" from AMECO, hereafter denoted NOS-adj. This contrasts with the IMF (2014) study that use Gross operating surplus

[19] In order to stimulate investment, in July 2015 the French government has enacted a temporary accelerated depreciation allowance.

(GOS). Since consumption of fixed capital might be biased by tax deduction for depreciations or by 'creative' accounting, it seems more adequate to use data on NOS that subtract these depreciation charges from the GOS in order to obtain a variable that is closer to the 'true' CIT base. Furthermore, we use the NOS-adj because the surplus above costs of self-employed individuals is taxed as personal income (and not as corporate income) and is thus not subject to CIT (see also Dover et al. 2015).

We compute this indicator for the EU-15 in 2015. The average CIT efficiency is equal to 69%. This contrast with the 75% obtained by Dover et al. (2015) for the EU-28 in 2013 and with the 86% obtained by the IMF. We find that all the countries in EU-15 have a CIT-efficiency below the unity. This means that even countries like the UK, Ireland or Luxembourg fail to raise the amount of revenue that would be obtained by taxing the NOS-adj at the statutory CIT rate. To better quantify this CIT-efficiency, we rewrite the previous expression as the difference between the numerator and the denominator, which represents the losses of governments due to the fact that they do not tax the NOS-adj at the CIT, the formula is the following:

$$L_{it} = R_{it} - t_{it}\pi_{it}.$$

This difference provides a crude measure of the loss due to tax optimization. Countries that lose the most are mainly larger countries such as Germany, France, Italy, and to a lesser extent the UK. Small or middle size countries like Greece or Spain are also subject to substantial losses (see Figure 15). Computing the sum of these amounts, we find that in 2015, the revenue losses for the EU15 Member States governments due to the inefficiency of the CIT system amounts to €198.599 billion.[20] In other words, if 100% of the tax base (NOS-adj) were taxed at the current CIT, the total gain would be equal to €198.599 billion which is higher than the current budget of the European Union. A genuine own resource can thus be financed without affecting CIT rates.

[20]This figure is (not much) higher than the €150 billion obtained by Murphy (2012) or the €160-190 billion of Dover et al. (2015). Differences in these estimations come from the different methodologies used but may also reflect an increase in the CIT-inefficiency in the recent period.

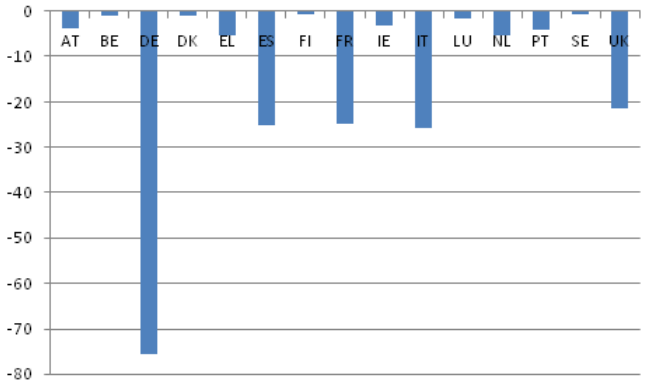

FIGURE 15. REVENUE LOSSES FOR THE EU15 DUE TO CORPORATE TAX AVOIDANCE IN 2015.

Source: Authors' calculations. CIT revenue and tax rate comes from the DG Taxation and Customs Union, the approximation of the reference tax base is the "Net operating surplus: Adjusted for imputed compensation of self-employed" from AMECO.

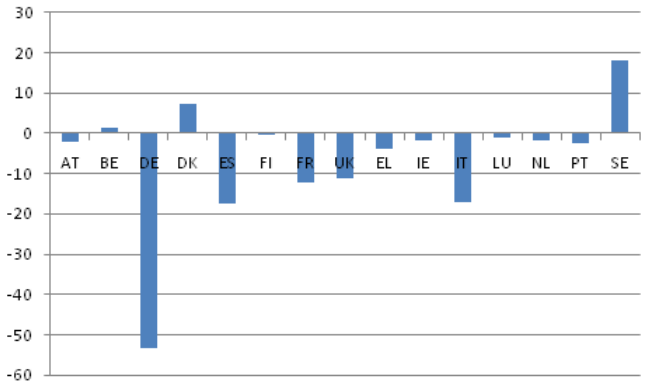

FIGURE 17. REVENUE LOSSES FOR THE EU15 DUE TO CORPORATE TAX AVOIDANCE IN 2015.

Source: Authors' calculations. CIT revenue and tax rate comes from the DG Taxation and Customs Union, the approximation of the reference tax base is the "Net operating surplus: Adjusted for imputed compensation of self-employed" from AMECO.

The previous result is based on the assumption that profit shifting is the only reason of a difference between the potential and the real revenue collected by the CIT. But this difference can come from (a) differences between compliance and enforcement, and (b) differences between the tax base assumed here (NOS-adj) and the actual one. Thus whereas the previous result is extreme by considering that 100% of the difference comes from profit shifting, we make here another extreme assumption by considering that only a share s_{it} of the CIT on NOS-adj

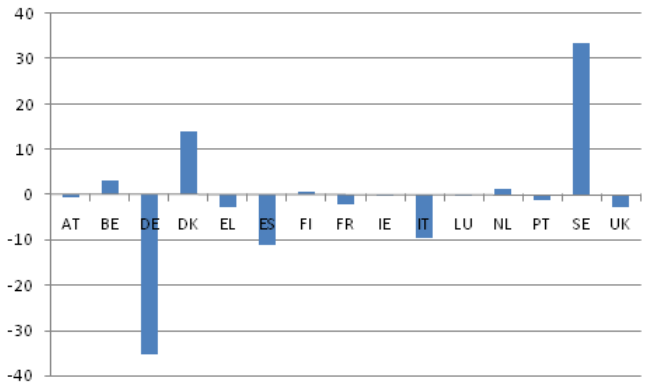

FIGURE 16. REVENUE LOSSES FOR THE EU15 DUE TO CORPORATE TAX AVOIDANCE IN 2015.

Source: Authors' calculations. CIT revenue and tax rate comes from the DG Taxation and Customs Union, the approximation of the reference tax base is the "Net operating surplus: Adjusted for imputed compensation of self-employed" from AMECO.

represents a revenue for each nation:

$$L_{it} = L_{it} = R_{it} - s_t t_{it} \pi_{it}.$$

Concerning s_t we follow the IMF (2014) as follow:

$$s_t = \sum_{EU15} \frac{\pi_{it}}{\sum_{EU15} \pi_{it}} E_{it}$$

where the efficiency of the CIT defined previously is weighted by the average tax base of NOS-adj. Concerning the weighted average of CIT-efficiency we find $s_t = 0.72$ which is not too far from the simple average of CIT-efficiency obtained previously (*0.69*) and to the weight adopted elsewhere (e.g. *0.75* in Dover et al., 2015). The aim of this weighting scheme is to eliminate the base effects from sources not coming from profit shifting, by considering that only 72% of the NOS-adj base is taxed at the CIT rate, this computation gives our lower estimates of profit shifting: €14.3652 billion. Figure 16 reports losses and gains by countries. One can first observe some differences such as the fact that there are now winners of the tax shifting game, such as Belgium and the Netherlands. The large gains of Sweden or Denmark, not known to be a tax haven, probably simply reveals the good efficiency of their tax system and the fact that these countries have a system that rely heavily on personal income tax. One can also observe that the losses of Luxembourg and of the U.K. have shrunk in comparison with the previous results. Lastly, tax shifting is still strongly detrimental to Germany, Spain, Italy and Greece (the amount of losses is small in absolute terms, see Figure 16, but not in relative terms, i.e. considering the size of the country) and still problematic

for France (€2.2 billion).

These results illustrate the sensitivity of the measure of losses to the parameter defining the potential/theoretical tax base. Choosing $s_t = 0.72$ or $s_t = 1$ as previously gives extreme values of losses, approximately equal to €15 billion in the first case and €198 billion in the second one. Now if we take an intermediate value, $s_t = 0.85$, which is the one used by the IMF in its study over the period 2000-2012 (to be precise $s_t = 0.86$) we find that losses are still quite high, i.e. equal to €97.4576 billion in the EU15 for the year 2015.

The distribution of losses and gains are similar to the one obtained in the previous scenario.

VII. European taxation on a Common Consolidated Corporate Tax Base

A. The EU commission proposal

In order to reduce compliance costs and to end profit-shifting within the European single market, the EU Commission has proposed to modify in depth the current system by promoting a Common Consolidated Corporate Tax Base (CCCTB). This proposal contains a revenue-sharing mechanism i.e. a formula apportionment defining how the consolidated tax base is shared among countries. This is a radical change leading to replace the current separate accounting systems by a system whereby multinational firms should consolidate the incomes of their affiliates into a single measure of taxable income in the country of residence of their headquarters, and the taxable base then be distributed among the governments of the various countries in which they operate based on a firm's geographic distribution of different factors (e.g. payroll, property, and sales).

To illustrate this system one can take a very simple example. Consider a multinational firm located in Germany with a single subsidiary in France with the following characteristics: 60% of the capital, 30% of the payroll and 9% of the sales are located in Germany. With a formula apportionment and an equal weight (i.e. 1/3) on these factors, the multinational firm presents a consolidate income of 43% in Germany (60/3+30/3+9/3=43) and the remainder in France.

The formula apportionment proposed by the EC relies on three factors i.e. sales, labor and assets. Sales to take into account where income is generated (demand side), and labor and capital to represent how income is generated (supply side). The Commission also proposes to decompose the labor factor into two equally weighted factors, payroll and the number of employees. Regarding assets, only fixed tangible assets are considered, which is a limitation since intangible asset are highly mobile. The EC has however proposed to include R&D and marketing in the future.[21]

[21] The EC Commission (2011, p.51) proposes to include progressively intangible assets as follows: "in the five years that follow a taxpayer's entry into an existing or new group, its asset factor shall also include the total amount of costs incurred for research, development, marketing and advertising by the taxpayer over the six years that preceded its entry into the group".

This proposal has been approved with amendments by the European Parliament in April 2012 (68% votes in favor) with opponents coming from Bulgaria, the Czech Republic, Hungary, Ireland, Malta, Poland and Great Britain. In 2016, the Commission has proposed to re-launch the CCCTB with a new proposition that foresees an intermediate step in which the tax base would not be consolidated (CCTB) and only firms with annual turnover exceeding €750 million would be subject to the CCTB. Before analyzing the effects of this proposal, it is interesting to present the US situation and its apportionment formula that has inspired and can still inspire the implementation of a CCCTB in Europe.

B. The Massachusetts formula and the question of uniformity

Like the European Member States, the US states have lost part of their fiscal sovereignty due to the mobility of their tax base. In the early 20th century, many states started to set corporate income taxes and a federal corporate income tax was first instituted in 1909; however at the same time, firms began to grow beyond their regional boundary. For instance the Ford Motor Company founded in 1903, started to locate its factories all around the US in different large cities in the 1910s and in Europe in the 1920s. By the end of the 1930s many states adopted an apportionment formula which has progressively converged towards the "Massachusetts formula".

Like the EC proposal, this formula gives an equal weight to three factors, property, payroll and sales. However contrary to the European proposal, there is no uniformity in the implementation, and the weighting scheme has evolved over time. For instance, Clausing (2014) shows that the percentage of states using this formula has decreased from 80% in 1986 to 17% in 2012. An increasing number of states have adopted a single-sales formula where the entire weight is on sales (see Figure 18).

The fact that the formula apportionment rule is not harmonized between states represents a particular problem already emphasized by McClure (1980). This author demonstrates that the apportionment formula modifies the nature of the corporate income tax that becomes a direct tax on the factors in the formula. As a result, governments strategically chose the weights of the formula to attract activities.

These externalities have been detected empirically by Goosbee and Maydew (2000), showing that the U.S. system turns partially the corporate income taxes among states into a payroll tax leading firms to optimize their tax payment by shifting the location of their production. Using a panel dataset over more than twenty years (1978-94), they find that employment increases in states where the payroll weight is reduced and decreases in other states. Reducing the payroll weight from one-third to one-quarter increases manufacturing employment around 1.1%. Adding two decades to this database, Clausing (2014) minimizes these results for the recent period, but however underlines the possibility of harmful competition among American states.

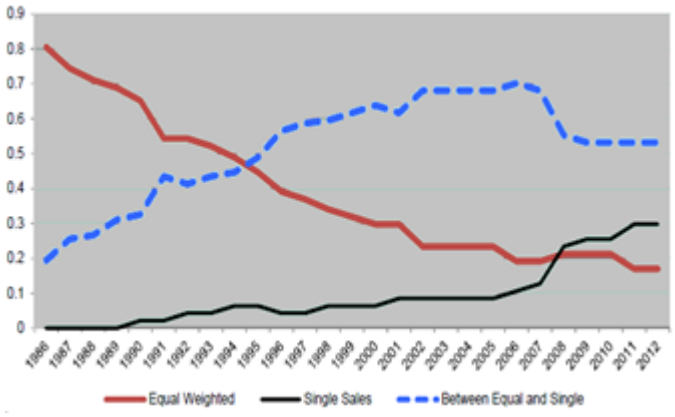

FIGURE 18. THE DECREASING IMPORTANCE OF EQUAL WEIGHTS IN THE AMERICAN FORMULA.

Source: Clausing (2014).

C. Assessment on the CCCTB

The key word of the CCCTB proposal is uniformity, uniformity of the tax base, uniformity in the rules of consolidation and the adoption of a uniform formula apportionment, but the consensus on this topic is hard to reach.

The advantage to increase the attractiveness of the European Single market by removing compliance costs and obstacles to cross-border activity may be too small and the divergent points of view of Member States on the different technical questions raised by the CCCTB are numerous. A more realistic solution may be to relax the requirement of uniformity on base, consolidation and apportionment. Such a system would obviously be less optimal and ambitious, but can nonetheless represent an improvement.

The Commission has proposed to re-launch in 2016 the CCCTB with a new proposition postponing consolidation until after the common base has been implemented, i.e. the first step of this reform would be to find an agreement on a Common Corporate Tax Base (CCTB). A number of studies offers evaluations of the potential impact on total revenue and cross-country distribution of introducing the C(C)CTB while keeping the national statutory rates at their pre-reform level (Spengel, 2008; Spengel et al., 2012; PWC, 2008; Ernst & Young, 2011).

In most cases, the reform is shown to have a minor impact on corporate effective tax rates and on overall CIT revenue. Figure 19 presents the findings of Spengel et al. (2012) computing the current effective tax burdens (in black) and the effective tax burden in case of a Common Corporate Tax Base (CCTB) without consolidation (in grey) based on a dataset of European multinational firms (Ernest & Young database). Clearly, differences in the effective tax burden with and without a CCTB are small.

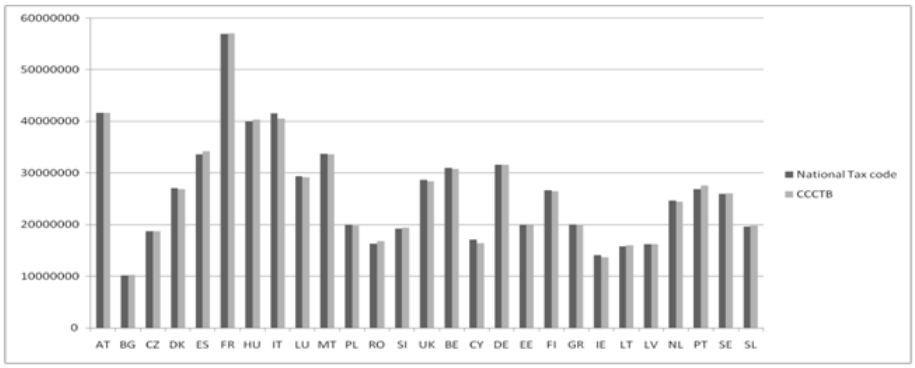

Figure 19. Common Corporate Tax Base.

Source: Spengel et al. (2012).

These results are obviously highly dependent on the selected apportionment formula, the total revenue from a CCTB should be higher than the sum of current national revenues from CIT since a number of multinational corporations has been benefiting from specific – and sometimes extremely favorable tax treatments in some countries. Such a reform may be regarded as necessary in terms of efficiency (to reduce compliance costs, double taxation and double non-taxation) and in terms of fairness and growth.

The move to the CCTB may reduce opportunities for 'aggressive' tax optimization and likely increase the total yield of CIT in the EU. But it would still offer MNFs possibilities for shifting taxable profit to low tax rate jurisdictions. Only base consolidation would close loopholes and severely limit tax planning; but it has to be accompanied by formula apportionment. Obviously, as illustrated by the U.S. experience, such a system should not be idealized. The current proposal takes the risk to bring complexity without resolving the tragedy of the harmful competition between members.

VIII. Concluding remark

It is proverbial that 'Two things are unavoidable: taxes and death', but taxes are increasingly avoidable by multinational firms in Europe. In this article we have presented the reasons of this avoidance. Trade integration, financial liberalization and technological revolutions have both facilitate tax evasion and tax competition. Many economists have proposed to reform the current system by an allocation of the tax base based on the location of sales to third parties. Such a mechanism would lead to tax profits on the least mobile elements i.e. shareholders, the companies composing the group and consumers. Auerbach and Devereux (2012) argued that this destination-based tax could operate like a Value Added Tax (VAT) but levied profits (with a deduction for labor costs). Under this system, a

firm would be taxed in its place of residence by the EU if this firm sells products or earns revenue in the European Single market. The incidence of this tax would certainly fall partially on consumers (this is already the case with the current system) but the advantage is that tax avoidance would be much harder. As we have argued in this article, instead of this destination-based solution, a CIT at the European level on a specific base can be another solution to finance the EU budget as a genuine own resource. CCTB may be step in the proposed direction, but other routes are possible. And the full benefits from a European corporate tax rate cannot be reaped unless consolidation of the tax base is achieved.

REFERENCES

Andersson, F. and R. Forslid (2003). Tax competition and economic geography. Journal of Public Economic Theory 5, 279–303.

Arulampalam W, Devereux M and Maffini G. (2012), The Direct Incidence of Corporate Income Tax on Wages. European Economic Review. Volume 56, Issue 6, Pages 1038–1054.

Auerbach, M., (2016), Toxic Tax Deals, report Greens/EFA.

Auerbach, A. and Devereux, M. P. (2012), Consumption and Cash-Flow Taxes in an International Setting, Oxford University Centre for Business Taxation Working Paper 12/14.

Baldwin, R (2006). Globalisation: the great unbundling(s), Chapter 1, in Globalisation challenges for Europe, Secretariat of the Economic Council, Finnish Prime Minister's Office, Helsinki, 2006.

Baldwin, R (2016). The Great Convergence, Information Technology and the New Globalization. Harvard U Press.

Baldwin, Forslid, Martin, Ottaviano and Robert-Nicoud (2004). Economic Geography and Public Policy. Princeton U Press.

Baldwin, R. E. and P. Krugman (2004), Agglomeration, Integration and Tax Harmonisation, European Economic Review, 48, 1, 1–23.

Baldwin R, J Lopez-Gonzalez (2015), Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses. The World Economy. Volume 38, Issue 11, pages 1682–1721.

Barberis, N., Thaler, R., (2004), A Survey of Behavioral Finance. in Handbook of the Economics of Finance, chap. 18, 1051-1121, in Constantinides G, M. Harris and R.M. Stulz eds., Elsevier North-Holland.

Begg, I., Enderlein H, Le Cacheux J, Mrak M. (2008), Financing the European Union Budget.

Borck, Rainald & Pfluger, Michael, 2006. "Agglomeration and tax competition," European Economic Review, Elsevier, vol. 50(3), pages 647-668

Brennan, G., Buchanan, J., 1980. The Power to Tax: Analytical Foundations of a Fiscal Constitution. Cambridge University Press, New York.

Bradford, David F., (1978), Factor Prices may be Constant, but Factor Returns are not. Economics Letters, 199–203.

Candau, F. (2008), Urban Costs, Trade Costs and Tax Competition. Revue d'Economie Politique, Vol 118, 5, 625-661.

Candau, F. (2008), Entrepreneurs' Location Choice and Public Policies, a Survey of the New Economic Geography. Journal of Economic Surveys. Vol. 22, Issue 5, pp. 909-952.

Candau, F and Dienesch, E, (2011) A Survey on the Micro-Foundations of the Trade Gravity Equation. Available at SSRN: https://ssrn.com/abstract=1859602

Cassette, A. and Paty, S. (2008), Tax competition among Eastern and Western European countries: With whom do countries compete?, Economic Systems 32, No. 4, 307-325

Cattoir P, (2006), A history of the "tax package". The principles and issues underlying the community approach.

Cipriani, G. (2007), Rethinking the EU Budget: Three Unavoidable Reforms, CEPS Paperback, CEPS, Brussels, November.

Cipriani, G. (2010), The EU Budget: Responsibility without accountability?, CEPS Paperback, CEPS, Brussels, November.

Cipriani, G. (2014), Financing the EU Budget, Moving Forward or Backwards?

Clausing, K A. (2003), Tax-motivated Transfer Pricing and US Intrafirm Trade Prices. Journal of Public Economics 87(9–10): 2207–23.

Clausing, K A. (2014), Lessons for International Tax Reform from the US State Experience under Formulary Apportionment. ICTD Research Report 2.

Cline R. and al. (2008), Study on the Economic and Budgetary Impact of the Introduction of a Common Consolidated Corporate Tax Base in the European Union, Commissioned by the Irish Department of Finance.

Coeurdacier N, and H. Rey (2013), Home Bias in Open Economy Financial Macroeconomics. Journal of Economic Literature, 51(1): 63-115.

Crabbé K. and Vandenbussche, H. (2013), Are Your Firm's Taxes Set in Warsaw? Spatial Tax Competition in Europe, FinanzArchiv: Public Finance Analysis, Volume 69, Number 3, pp. 317-337(21)

Davies, R, Martin J, M Parenti and F Toubal, (2014), Knocking on Tax Haven's Door: Multinational Firms and Transfer Pricing. CEPR Discussion Papers 10844.

Davies, R. B. and J. Voget (2011), Tax Competition in an Expanding European Union, GEE Papers, 0033.

de Mooij R. A., G. Nicodème (2007), Corporate tax policy and incorporation in the EU. CEB Working Paper N° 07/016

Devereux M and S. Loretz (2008), CCCTB and Economic Efficiency, Centre for Business Taxation, Oxford.

Devereux M, P B Sørensen, (2006), The Corporate Income Tax: International Trends and Options for Fundamental Reform Working Party No. 2 of the Committee on Fiscal Affairs of the OECD.

Dischinger, M., & Riedel, N. (2011), Corporate taxes and the location of intangible assets within multinational firms. Journal of Public Economics, 95(7–8), 691–707.

Dover R, B Ferrett, D Gravino, E Jones and S Merler (2015), Bringing transparency, coordination and convergence to corporate tax policies in the European Union

Drucker, J., (2010), Google 2.4% Rate Shows How $60 Billion Is Lost to Tax Loopholes. Bloomberg, October 21, 2010. http://www.bloomberg.com/news/2010-10-21/google-2-4-rate-shows-how-60-billion-u-s-revenue-lost-to-tax-loopholes.html.

Edwards, J., Keen, M., 1996. Tax competition and Leviathan. European Economic Review 40, 113-134.

Ernst & Young (2011) : Common Consolidated Corporate Tax Base : A study on the impact of the Common Consolidated Corporate Tax Base proposals on European business taxpayers.

European Commission (2013), Room Document No. 2 prepared for the Code of Conduct Group (Business Taxation), 22 October 2013, Tax Notes International, Doc. 2013–24148.

European Commission (2015) Corporate Income Taxation in the European Union. Commission Staff Working Document.

Evers L, Miller H, C Spengel (2015), Intellectual property box regimes: effective tax rates and tax policy considerations. Int Tax Public Finance, 22:502–530.

Egger, P H., W Eggert, and H Winner (2010), Saving taxes through foreign plant ownership, Journal of International Economics 81 (1), pp. 99-108.

Exbrayat, N, (2016), Does Trade Liberalisation Trigger Tax Competition? Theory and Evidence from OECD Countries. Forthcoming in The World Economy, doi: 10.1111/twec.12405

Flandreau, M., (2006), Home Biases, Nineteenth Century Style, Journal of the European Economic Association 4(2-3):634-643.

Fuest C, Spengel, C Finke, K Heckemeyer, J H. Nusser (2013), Profit shifting and 'aggressive' tax planning by multinational firms: Issues and options for reform, ZEW Discussion Papers, No. 13-078.

Goolsbee, A. and Maydew, E. (2000) Coveting thy neighbor's manufacturing: the dilemma of state income apportionment', Journal of Public Economics 75: 125-143

Gordon, RH. (1986) Taxation of Investment and Savings in the World Economy. American Economic Review vol.76(5), pp.1086–1102.

Griffith, R., Miller, H., & O'Connell, M. (2014). Ownership of intellectual property and corporate taxation. Journal of Public Economics, 112(1), 12–23

Hassett, Kevin A, Mathur., Aparna (2006) Taxes and wages. American Enterprise Institute Working Paper, 128.

Hanson G H., Raymond J. Mataloni, Jr., and M J. Slaughter (2005) Vertical Production Networks in Multinational Firms. The Review of Economics and Statistics, Vol. 87, No. 4, pp. 664-678.

Harberger, A. (1962), The Incidence of the Corporation Income Tax, Journal of Political Economy, 70, 215–40.

International Monetary Fund (2014), Spillovers in International Corporate Taxation, IMF Policy Paper, May 9.

Kawano L, J Slemrod, (2015), How do corporate tax bases change when corporate tax rates change? With implications for the tax rate elasticity of corporate tax revenues. WP Michigan U.

Keen, M., and C. Kotsogiannis, 2002. Does Federalism Lead to Excessively High Taxes ? American Economic Review 92, 363-370.

Kleinbard, Edward D. (2011), Stateless Income. Florida Tax Review 11(9): 699–774.

Kotlikoff, Laurence J., Summers, L H., (1987), Tax Incidence, in Auerbach, Alan J., Feldstein, Martin (Eds.) Handbook of Public Economics, 2., Amsterdam: Elsevier Science, North-Holland, pp.1043–1092.

Lachet-Touya, F., 2016. Horizontal and Vertical Tax Interactions in a Common Agency Game. CATT Working Paper 12.

Lawless M, D McCoy, E Morgenroth, C O'Toole, (2014), The Importance of Corporation Tax Policy in the Location Choices of Multinational Firms

Le Cacheux, J., and E. Laurent (2015), Report on the State of the European Union, vol.4, Is Europe Sustainable?, Palgrave MacMillan

McLure, C. (1980), The state corporate income tax: Lambs in wolves' clothing. In The Economics of Taxation, edited by H. Aaron, and M. Boskin. Washington, D.C.: Brookings Institution.

McLure C. E. & J. M. Weiner (2000), Deciding whether the European Union should adopt formula apportionment of company income, in S. Cnossen (ed.), Taxing Capital Income in the European Union, p. 243, 285: "chaos to be avoided".

Maffini, G, J Xing, M Devereux, (2015), The impact of investment incentives: evidence from UK corporation tax returns.

Markusen, James R. (2002), Multinational Firms and the Theory of International Trade, MIT Press.

Monti, Mario (2017), Future Financing of the EU, Final Report and Recommendations of the High Level Group on Own Resources, January, http://ec.europa.eu/budget/mff/hlgor/library/reports-communication/hlgor-

report_20170104.pdf .

Murphy, R. (2012), Closing the European Tax Gap, a report for the Progressive Alliance of Socialists and Democrats in the European Parliament.

Navaretti, G Barba, and A J. Venables (2006), Multinational Firms in the World Economy. Princeton, N.J: Princeton University Press.

Núñez Ferrer, J. (2007), The EU Budget, the UK rebate and the CAP: Phasing them both out?, CEPS Task Force Report, CEPS, Brussels, pp. 108. Núñez Ferrer, J. (2008), "Can reforming own resources foster policy quality?", SIEPS, Working Document No. 3, SIEPS, Stockholm.

Núñez Ferrer J, Le Cacheux J, G Benedetto, M Saunier, F Candau, C Emonnot, F Lachet-Touya, J Mortensen, A Potteau, I Taranic (2016), Study on the potential and limitations of reforming the financing of the EU budget, Report for the HLGOR, June, http://ec.europa.eu/budget/mff/hlgor/library/highlights/hlgor-studies-external-studyonfinancingofeu-budget-june-2016_en.pdf .

OECD (2002), Foreign Direct Investment for Development, Maximising Benefits, Minimising Costs, Paris.

OECD (2013a), Addressing Base Erosion and Profit Shifting, Paris.

OECD (2013b), Action Plan on Base Erosion and Profit Shifting, Paris.

OECD (2015), BEPS Action 11: Improving the analysis of BEPS, Public discussion Draft, Paris.

Ottaviano, G. and T. Van Ypersele (2005), Market Access and Tax Competition, Journal of International Economics, 67, 1, 25–46.

Overesch, M. and J. Rincke (2011), What Drives Corporate Taxes Down? A Reassessment of Globalization, Tax Competition and Dynamic Adjustment to Shocks, Scandinavian Journal of Economics, 113, 3,579–602.

Pomerleau K, (2013), Capital Cost Recovery across the OECD. Fiscal Fact 402.

Portes, R. & Rey, H. (2005), The Determinants of Cross Border Equity Flows. Journal of International Economics, Volume 65, Issue 2, pp. 269-296.

PwC (2008) : "Impact of corporate income tax reforms at the EU level on European business taxpayers; Report on the impact on taxable profits".

Randolph, W G., (2006), International burdens of the corporate income tax. Congressional Budget Office WP09.

Saint-Etienne, Ch., and J. Le Cacheux (2005), Croissance équitable et concurrence fiscale, Rapport du Conseil d'analyse économique (CAE), n°56, October.

Sinn H.W. (2003). Bazaar Economy, Ifo-Viewpoint, 50.

Sorensen PB, (2006), Can income taxes survive? And Should They? CESifo wp 1793.

Spengel C, C Elschner, D Endres, K Finke, J Heckemeyer, (2012), Effective Tax Levels. TAXUD, Project for the EU Commission

Spengel C , D Endres, K Finke, J Heckemeyer, (2014), Effective Tax Levels. TAXUD, Project for the EU Commission

Spengel C., A. Oestreicher, C. Elschner, T. Reister, C. Ernst, M. Grünewald, K. Finke, J. Prassel, and L. Cui (2008), Study on the impact of reforms of corporate income taxation systems at the EU level on the size of the tax bases of the EU companies, using the model "European Tax Analyzer", Project for the EU Commission, TAXUD/2007/DE/325, FINAL REPORT, Centre for European Economic Research (ZEW).

Spengel C., M. Ortmann-Babel, B. Zinn and S. Matenaer (2012), A Common Corporate Tax Base for Europe: An Impact Assessment of the Draft Council Directive on a CC(C)TB, ZEW Discussion Paper No. 12-039.

UNCTAD (2015), Handbook of Statistics.

Vicard, V. (2014), Transfer pricing of multinational companies and aggregate trade. WP Banque de France N555.

Wilson, J.D. (1986), A Theory of Interregional Tax Competition, Journal of Urban Economics, 193, 296-315.

Wilson JD, Wildasin D, (2004). Capital Tax Competition: bane or boon. Journal of Public Economics 88 1065– 1091.

Zodrow, G. and P. Mieszkowski (1986), Pigou, Tiebout, Property Taxation and the Underprovision of Local Public Goods, Journal of Urban Economics, 19, 3, 356–70.

Zwick E and J Mahon, (2014). Do Financial Frictions Amplify Fiscal Policy? Evidence from Business Investment Stimulus.

Tax shopping

Figures (A1) and (A2) summurize tax optimization described in the text for Google and Starbucks

Various Formulas in the USA

As emphasized by Hey (2008) not only the components of the formula varies but also the factors included in this formula. For instance some states take into account intangible assets, such as computer software, while other not and the variety of consolidation scheme is also significant among states. Table (B1) reports the different scheme adopted in 2007. Due to the lack of harmonization, some American scholars consider the US states' taxation systems as a "chaos" and recommend to the EU to not follow this path (McLure and Weiner, 2000).

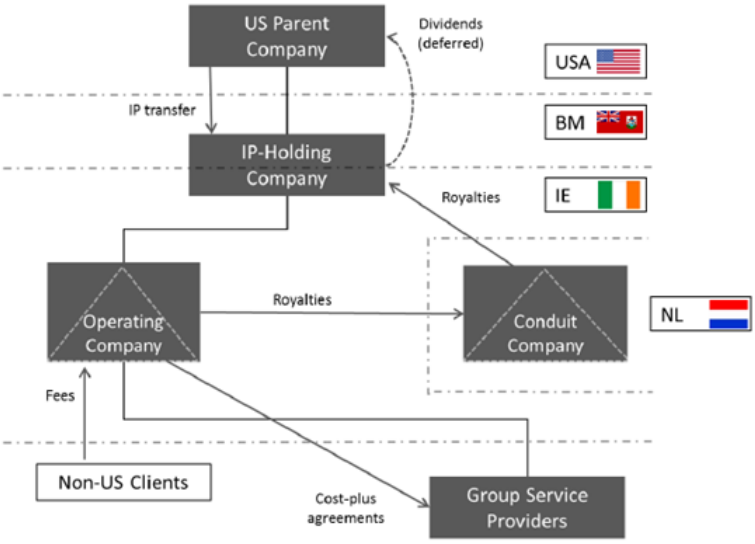

FIGURE A1. DOUBLE IRISH DUTCH SANDWICH.

Source: Fuest, Spengel, Finke, Heckemeyer and Nusser (2013).

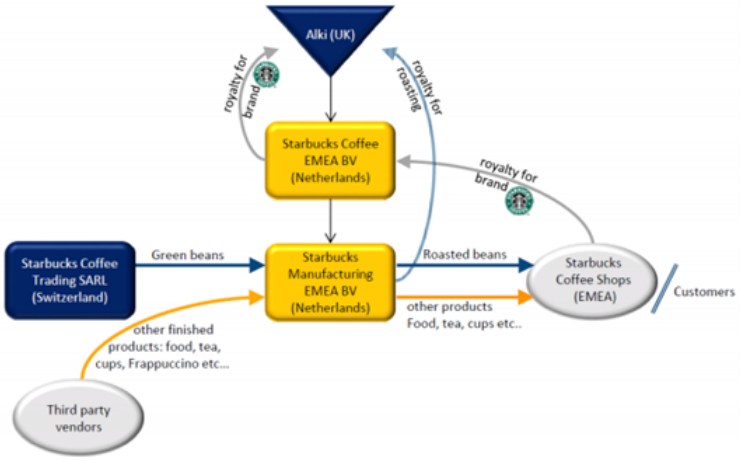

FIGURE A2. STARBUCKS.

Source: Commission Decision (2015, http://ec.europa.eu/competition/state_aid/cases/253201/253201_1762441_575_2.pdf).

(Formulas for tax year 2007 -- as of January 1, 2007)

ALABAMA	3 Factor	NEBRASKA	Sales
ALASKA	3 Factor	NEVADA	No State Income Tax
ARIZONA	60% Sales, 20% Property & Payroll	NEW HAMPSHIRE	Double wtd. Sales
		NEW JERSEY	Double wtd. Sales
ARKANSAS	Double wtd. Sales	NEW MEXICO *	Double wtd. sales
CALIFORNIA	Double wtd. Sales	NEW YORK	80% Sales, 10% Property & Payroll
COLORADO	3 Factor/Sales & Property		
CONNECTICUT	Double wtd. sales/Sales	NORTH CAROLINA *	Double wtd. sales
DELAWARE	3 Factor	NORTH DAKOTA *	3 Factor
FLORIDA	Double wtd. Sales	OHIO *	60% Sales, 20% Property & Payroll
GEORGIA	90% Sales, 5% Property & Payroll		
		OKLAHOMA	3 Factor
HAWAII *	3 Factor	OREGON *	Sales
IDAHO *	Double wtd. Sales	PENNSYLVANIA *	Triple wtd. sales
ILLINOIS *	Sales	RHODE ISLAND	Double wtd sales
INDIANA	60% Sales, 20% Property & Payroll	SOUTH CAROLINA	Double wtd. sales/Sales
		SOUTH DAKOTA	No State Income Tax
IOWA	Sales	TENNESSEE *	Double wtd. sales
KANSAS *	3 Factor	TEXAS	Sales
KENTUCKY *	Sales	UTAH *	3 Factor/Double wtd. sales
LOUISIANA	Double wtd. Sales	VERMONT	Double wtd. sales
MAINE *	Double wtd. Sales	VIRGINIA	Double wtd. sales
MARYLAND	Double wtd. sales/Sales	WASHINGTON	No State Income Tax
MASSACHUSETTS	Double wtd. sales/Sales	WEST VIRGINIA *	Double wtd. sales
MICHIGAN	92.5% Sales, 3.75% Property & Payroll	WISCONSIN	80% Sales, 10% Property & Payroll
		WYOMING	No State Income Tax
MINNESOTA	78% Sales,11% Property & Payroll	DIST. OF COLUMBIA	13 Factor
MISSISSIPPI	Accounting/3 Factor		
MISSOURI *	3 Factor/sales		
MONTANA *	3 Factor		

Figure B1. State Apportionment of Corporate Income.

Source: Hey (2008).

List of working papers released by CATT

2016-2017

- Lionel **de BOISDEFFRE**, Document de travail CATT n°5, février 2017,"Sequential equilibrium without rational expectations of prices: an existence proof"

- Serge **REY**, Catherine RIS, Document de travail CATT n°4, décembre 2016,"Productivité sectorielle du travail et compétitivité de l'économie de la Nouvelle-Calédonie"

- Jamal **BOUOIYOUR**, Refk SELMI, Document de travail CATT n°3, octobre 2016, "Are UK industries resilient in dealing with uncertainty? The case of Brexit"

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