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ABSTRACT

Is Partial Tax Harmonization Desirable?*

We consider a setting in which capital taxation is characterized by two distortions working in opposite directions. On one hand, governments engage in tax competition and are tempted to lower capital tax rates. On the other hand, they are unable to commit to future policies and, once capital has been installed, have incentives to increase taxes. In this setting, there exists a tax that optimally trades off the two distortions. We compare three possible tax harmonization scenarios: no tax harmonization (all countries set taxes unilaterally), global tax harmonization (all countries coordinate their capital taxes), and partial tax harmonization (only a subset of all countries coordinate capital taxes). We show that, if capital is sufficiently mobile, partial tax harmonization benefits all countries compared to both global and no harmonization. Our analysis provides a rationale for the proposed creation of an Enhanced Cooperation Agreement on capital taxes within the European Union.

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1 Introduction

This paper is motivated by the recent debate about corporate tax harmonization in Europe. It is often argued that the increasing integration of economic activity within the European Union (EU) generates a “race to the bottom” in capital income taxation, a view that is supported by the broad literature on tax competition (see Wilson (2003) for a review of this literature). The general concern is that tax competition will result in a shift away from taxes on mobile capital toward taxes on labor and thus undermine the foundations of Europe’s welfare state (see, for example, EU Commission, 1998 and 2001). In particular, fears of harmful tax competition have been increasing since the accession of new member states, as old member states struggle to come to terms with lower corporate taxes in Eastern Europe.¹

At the same time, it is well known that potential time consistency problems can generate an upward bias in capital taxation (see Fischer (1980), Rogers (1987), Chari *et al.* (1989), Benhabib and Rustichini (1997), among others): when investment decisions have yet to be made, optimizing governments recognize that capital taxes discourage investment; hence, if they could commit to policy plans, they would wish to minimize the taxation of capital in the long run; however, once investment has taken place, they have incentives to raise capital taxes, since the taxation of capital is weakly distortionary in the short run. Hence, in the absence of credible commitment mechanisms, a policy of low capital taxation is time inconsistent. In some European countries, commitment problems in capital taxation may be linked to political considerations. Governments may announce low capital taxes to encourage investment; however, once factories have been built, they may find it politically tempting to meet their budget requirements by increasing capital taxation and lowering labor taxation.² Indeed, though much of the optimal tax literature recommends capital income tax rates close to zero (see Stiglitz (1987) and Lucas (1990), among others), actual

¹For example, “The competitive threat from the new EU members, almost all with significantly lower corporate taxes, last year forced Austria to act. From January 2005, company tax was slashed to 25 per cent from 34 per cent in response” (*Financial Times*, November 24, 2005).

²For example, in Denmark it is much harder to lower capital taxes than labor taxes, since it is “completely impossible to get popular support for a tax-cutting policy that gives the impression it was designed to ease the burden for a small group of high earners and would be funded by cutting welfare programmes for low earners” (*Financial Times*, November 24, 2005).

rates are often very high.³

The objective of this paper is to examine the implications of European tax harmonization, in a setting in which capital taxation suffers from the above two distortions working in the opposite direction. On one hand, governments compete with each other for mobile capital and are thus tempted to lower corporate taxes; on the other hand, they are unable to commit to future policies and have incentives, once capital has been installed, to raise corporate tax rates.

There have already been various attempts to coordinate some aspects of business taxation within the EU. In particular, in 2003 the EU Council adopted a Code of Conduct, requiring member states to amend any laws or practices deemed to be harmful and to refrain from introducing any new harmful tax measures.⁴ More ambitious proposals for corporate tax harmonization, including the idea of a single EU corporate tax, have been under discussion (see Bond *et al.*, 2000), but only “20 of the EU’s 25 members are supportive of the idea: Britain, Ireland, the Czech Republic, Slovakia and Estonia are opposed” (*Financial Times*, November 24, 2005).

In a federation like the EU, most policy issues are either decided at the central level or are decentralized and left to the member states. There is, however, a possible alternative: only a *subset* of states may decide to coordinate their policies on a particular issue—forming an Enhanced Cooperation Agreement (ECA)—while the remaining states continue to decide autonomously. Traditionally, the EU has allowed some of the members to go on with further integration and others to opt out, at least temporarily. The European Monetary Union and the Shengen Treaty are the best known examples of this strategy. Since EU member states are divided about whether or not to harmonize corporate taxes, the idea of an ECA is currently being debated.

³For example, the statutory rates of corporate taxes average around 35 percent in all major industrial countries (see Devereax *et al.*, 2005).

⁴The Code of Conduct covers tax measures (legislative, regulatory and administrative) which have, or may have, a significant impact on the location of business in the Union. The criteria for identifying potentially harmful measures include: (i) an effective level of taxation which is significantly lower than the general level of taxation in the country concerned; (ii) tax benefits reserved for non-residents; (iii) tax incentives for activities which are isolated from the domestic economy and therefore have no impact on the national tax base; (iv) granting of tax advantages even in the absence of any real economic activity; the basis of profit determination for companies in a multinational group departs from internationally accepted rules, in particular those approved by the OECD; (v) lack of transparency.

To examine the welfare implications of the creation of an ECA on corporate taxes, we compare three alternative policy scenarios: no tax harmonization (governments choose taxes unilaterally), global tax harmonization (all governments coordinate their policy choices), and partial tax harmonization (only a subset of countries coordinate their tax choices). Our analysis shows that, when capital taxation suffers from a commitment problem, the creation of a partial tax agreement can benefit all countries compared to both no tax coordination and global coordination. The intuition behind this result is that partial harmonization reduces harmful tax competition, while maintaining some discipline on policymakers, who would otherwise be tempted to charge higher-than-optimal capital tax rates.

Previous studies have mostly focused on the interaction between tax competition and other distortions. For example, Edwards and Keen (1996), following the spirit of Brennan and Buchanan (1980), have argued that tax competition can help to restrain the rent-seeking activities of politicians, bureaucrats and special interest groups. The interaction between tax competition and time inconsistency problems has been considered by Kehoe (1989), who has provided an example of counterproductive fiscal coordination in a two-country model of tax competition. However, Kehoe (1989)'s analysis cannot be applied to the current debate on European tax harmonization, since it focuses only on the extreme cases of no tax harmonization and global tax harmonization, without considering the scenario in which only a subset of countries coordinate their policy choices.

After examining the welfare implications of the alternative tax arrangements, we discuss the issue of their sustainability. The existing literature on tax competition shows that, when governments can credibly commit to future policies, global tax coordination is the outcome that maximizes world welfare; however, such an agreement is not sustainable due to the incentive of countries to violate the agreement by lowering their taxes. By taking into account the inability of governments to commit vis-à-vis investors, we reach the more optimistic conclusion that the most desirable tax arrangement from the point of view of world welfare will also be sustainable.

Our analysis has important implications for the current debate about the possible creation of an ECA on corporate taxes. Our results suggest that such an ECA might be desirable not *despite* but rather *because of* its partial nature. A tax ECA put forward by some EU members should be allowed on the grounds that it would benefit both signatories and outsiders, thus not posing a conflict for the EU as a whole.

The remainder of the paper is organized as follows. Section 2 describes the basic model in a two-country framework. Sections 3 and 4 focus on the scenarios of no tax harmonization

and global tax harmonization. Section 5 extends the analysis to a three-country setting and considers partial tax harmonization. Section 6 examines the question of the stability of tax coordination agreements. Section 7 concludes.

2 The Model

Consider two symmetric countries, denoted by home (h) and foreign (f), each populated by a large number of identical consumers. For simplicity, we analyze a two-period economy. Consumers are assumed to take consumption-savings-investment decisions in the first period and consumption-labor decisions in the second. In the first period, the representative consumer in each country receives an exogenous disposable income Y , which can be consumed or saved. Savings, S , can be invested and result in an equal amount of capital, K . In the second period, the consumer has a time endowment equal to unity, which she can use for labor (L) or leisure ($1 - L$).

Capital and labor are inputs in production. For simplicity, production in both countries is represented by a separable, linear production function, $f(L, K) = rK + wL$. In a competitive equilibrium, the wage rate must equal the marginal product of labor, w , and the gross-of-tax rate of return to savings must equal the marginal product of capital, r .

Consumer preferences can be represented by a quasilinear, inter-temporal utility function, $U(C_1, C_2, L) = C_1 + \delta(C_2 + v(1 - L))$, where C_1 and C_2 are respectively first- and second-period consumption and v is assumed to be increasing and concave. For simplicity, in the analysis that follows we shall set the discount rate to unity, implying that the socially efficient level of savings is $S = Y$.⁵

We assume that labor is completely immobile, while capital is partially mobile across countries. We use superscripts (subscripts) to refer to the country of origin (destination), so K_h^i and K_f^i denote, respectively, the capital invested domestically and abroad by a representative consumer in country i . It is widely acknowledged that foreign investment involves extra costs compared to domestic investment—to gather extra information, overcome market-specific regulations, hire foreign employers, etc. As in Persson and Tabellini (1992), Bacchetta and Espinosa (1995) and Slemrod *et al.* (1997), we assume convex costs

⁵Our analysis carries through for lower discount rates, as long as δ exceeds $1/r$ and it is thus socially efficient to save all initial income.

of investing abroad: specifically, when investing K_f^h abroad, a home consumer incurs costs

$$\Omega(K_f^h) = \frac{\alpha}{2} (K_f^h)^2. \quad (1)$$

The parameter α will play a crucial role in the analysis that follows, since it captures the degree of capital mobility and hence the severity of tax competition between countries.

Governments are unable to commit to future policies and face the problem of optimally financing an exogenous stream of public spending G by levying a combination of proportional capital and labor income taxes, denoted by t_K and t_L , respectively. Capital taxes are levied according to the source principle, e.g. the home country's government levies a tax t_K^h on each unit of capital invested in its jurisdiction.⁶

Consider the problems faced by the representative consumer and the policymaker of the home country (the problems faced by the agents of the foreign country can be described symmetrically). Given an initial income Y , a representative consumer in the home country chooses C_1^h , S^h , K_h^h , K_f^h , C_2^h and L^h to maximize

$$C_1^h + C_2^h + v(1 - L^h) \quad (2)$$

subject to

$$C_1^h \leq Y - S^h, \quad (3)$$

$$K_h^h + K_f^h \leq S^h, \quad (4)$$

$$C_2^h \leq (1 - t_K^h)rK_h^h + (1 - t_K^f)rK_f^h + (1 - t_L^h)wL^h. \quad (5)$$

The objective of the home government is to maximize the welfare of its representative consumer (equation (2) above) subject to an exogenous revenue requirement G in the second period:

$$G \leq t_K^h r(K_h^h + K_f^h) + t_L^h wL^h. \quad (6)$$

The timing of the events is as follows: in the first period, consumers decide how much to consume and how much to save, then governments set tax rates, and finally consumers

⁶Most models of tax competition adopt the source principle as a tax rule, according to which all incomes originating in a country are taxed in this country regardless of the country of residence of the taxpayers. An alternative taxation rule is the residence (of the taxpayer) principle, according to which residents are taxed on their whole income regardless of its origin.

decide where to invest. This timing implies that capital will locate in response to tax rates. Capital is footloose in the sense that if it is taxed too heavily in one country, it can flee to countries with lower tax rates. In the second period, consumers choose to work up to the point at which the net-of-tax labor income equals the marginal utility of leisure, i.e. $(1 - t_L)w = v'$, where we use primes to denote derivatives. This identifies an implicit function for labor supply $L(t_L)$.

We assume $G > rY$, i.e. the required revenues cannot be raised by capital taxation only. Notice that, if policymakers could avoid taxing labor income, no commitment problem would arise in our model, since there would be no ex-post incentives to raise capital income taxes.

2.1 Optimal Policies

We first solve for optimal policies in the absence of the commitment and tax competition distortions. Since it is socially efficient to invest all initial income, if policymakers could commit to future policies and did not engage in tax competition, they would set capital taxes at the maximum rate which supports an investment choice of $S = Y$:

$$t_K^* = \frac{r - 1}{r}; \tag{7}$$

this would allow them to maximize capital tax revenues and to minimize the labor tax rate necessary to raise the rest of their budget requirement:

$$t_L^* = \frac{G - Y(r - 1)}{wL(t_L^*)}. \tag{8}$$

This optimal policy combination⁷ yields a payoff of

$$\Pi^* = (1 - t_K^*)rY + (1 - t_L^*)wL(t_L^*) + v(1 - L(t_L^*)). \tag{9}$$

In Sections 3-5, we shall compare this benchmark case with scenarios in which policymakers are unable to commit vis-à-vis their investors and might also engage in tax competition.

2.2 Investment Choices

In the absence of a commitment mechanism, policy choices will occur after consumption-savings decisions. Recall that in the first period, the representative consumer decides how

⁷It should be stressed that the policy combination (t_K^*, t_L^*) is only a constrained optimum, since the first-best policy would involve financing the revenue requirement by a lump-sum tax.

much to consume and how much to save, then governments sets capital and labor taxes, and finally consumers decide where to invest.

Let us then consider the consumption-savings decision of a representative home consumer and define R^h as her expected best return to investment.⁸ How much she will save will depend on how R^h compares with the return to first-period consumption (equal to unity): if $R^h < 1$ for any $S^h \leq Y$, all initial income will be consumed and there will be no investment ($C_1^h = Y$ and $S^h = 0$); if $R^h > 1$ for any $S^h \leq Y$, all initial income will be saved ($C_1^h = 0$ and $S^h = Y$); if $R^h = 1$ for some $S^h < Y$, consumers will save some of their initial income and consume the rest ($C_1^h > 0$ and $S^h > 0$); finally, if $R^h = 1$ for any $S^h \leq Y$, any combination of first-period consumption/saving will be rational.

In the second period, given a certain amount of savings S^h , governments will select capital and labor taxes, and capital will move until it earns the same return in each state, taking into account taxes and mobility costs, i.e. until $(1 - t_K^h)r = (1 - t_K^f)r - \alpha K_f^h$. The amount of capital invested domestically and abroad will thus be as follows:

$$t_K^h \leq t_K^*:$$

$$K_h^h = \min \left\{ S^h, S^h - \left(\frac{r}{\alpha} (t_K^h - t_K^f) \right) \right\}, \quad (10)$$

$$K_f^h = \max \left\{ 0, \frac{r}{\alpha} (t_K^h - t_K^f) \right\}. \quad (11)$$

$$t_K^h > t_K^*:$$

$$K_h^h = 0, \quad (12)$$

$$K_f^h = \max \left\{ 0, \frac{r(1 - t_K^f) - 1}{\alpha} \right\}. \quad (13)$$

In the next three sections, we shall consider the policy choices made by the governments, based on the above consumption-saving-investment decisions by the representative consumers of their countries.

⁸Defining domestic and foreign expected capital taxes as \hat{t}_K^h and \hat{t}_K^f , this is equal to

$$R^h \equiv \max\{(1 - \hat{t}_K^h)r, (1 - \hat{t}_K^f)r - \alpha S^h\}.$$

3 No Tax Harmonization

Let us consider first the case in which governments select policies unilaterally. In the Appendix, we derive the following expression for capital income taxes in a symmetric two-country non-cooperative regime:

$$t_K = \frac{\alpha S(\Lambda - 1)}{\Lambda r}, \quad (14)$$

where $\Lambda = \frac{1}{1+\mu}$, with μ denoting the elasticity of labor supply with respect to labor income taxation. As expected, non-cooperative capital taxes decrease with the degree of capital mobility, i.e. higher capital mobility (lower α) exacerbates fiscal competition.⁹

In a perfect-foresight equilibrium, investors will correctly anticipate the ex-post optimal choice of the government. This implies that they will save an amount $S = Y$ only if $t_K^N \leq t_K^*$. Comparing (7) and (14), we can see that this is only true as long as α does not exceed

$$\alpha^* = \frac{\Lambda(r - 1)}{Y(\Lambda - 1)}. \quad (15)$$

If instead mobility costs are above this critical threshold, consumers will choose a level of S for which the return to investment equals the return to first period consumption, i.e. $(1 - t_K)r = 1$. We can thus distinguish two regimes:

(1) $0 \leq \alpha \leq \alpha^*$: in this case, savings are equal to $S^N = Y$, non-cooperative capital and labor taxes are given by

$$t_K^N = \frac{\alpha Y(\Lambda - 1)}{\Lambda r} \leq t_K^*, \quad (16)$$

$$t_L^N = \frac{G - rS^N t_K^N}{wL(t_L^N)} \geq t_L^*, \quad (17)$$

and countries' payoffs are equal to

$$\Pi^N = (1 - t_K^N)rS^N + (1 - t_L^N)wL(t_L^N) + v(1 - L(t_L^N)) \leq \Pi^*. \quad (18)$$

⁹Our prediction of positive non-cooperative capital taxes is in contrast with Kehoe (1989)'s prediction of a race to the bottom in capital taxes; this is because Kehoe assumes that capital is costlessly mobile across countries ($\alpha = 0$), so governments have always incentives to undercut each other; if instead there are frictions to international capital movements, as we assumed in our analysis ($\alpha > 0$), governments are somewhat sheltered from such cutthroat tax competition.

Notice that in this regime countries' payoffs increase monotonically with α . This is because higher mobility costs imply higher capital income taxes; in turn, for a given amount of savings $S^N = Y$, this leads to higher capital tax revenues and lower labor taxation. At the limit of this regime, for $\alpha = \alpha^*$, non cooperative payoffs Π^N coincide with Π^* as defined by (9) above;

(2) $\alpha^* < \alpha \leq \infty$: in this regime, savings are given by

$$S^N = \frac{\Lambda r}{\alpha(\Lambda - 1)}, \quad (19)$$

implying that the amount of capital installed decreases with the mobility costs α . Non-cooperative capital and labor taxes are equal to

$$t_K^N = t_K^*, \quad (20)$$

$$t_L^N = \frac{G - rt_K^N S^N}{wL(t_L^N)} > t_L^* \quad (21)$$

and countries obtain a payoff equal to

$$\Pi^N = Y - S^N + (1 - t_K^N)rS^N + (1 - t_L^N)wL(t_L^N) + v(1 - L(t_L^N)) < \Pi^*. \quad (22)$$

In this regime, countries' payoffs decrease with α , since higher mobility costs imply lower levels of investment and higher labor taxation.

Notice that, although we cannot directly compare countries' payoffs across the two regimes,¹⁰ we can compare welfare levels within each of the regimes: below α^* , payoffs increase in the capital mobility costs, reaching a maximum of Π^* at $\alpha = \alpha^*$; after this critical level, payoffs decrease in the extent of the capital mobility costs. We can thus argue that, while regime 1 there is *too much* tax competition, in regime 2 there is *too little* tax competition.

¹⁰The only direct welfare comparison is between the extremes of the two regimes, $\alpha = 0$ and $\alpha = \infty$: in both cases, there are no capital tax revenues and labor income taxes are equal to $t_L = G/(wL(t_L))$; however, countries' payoffs are higher when there are no mobility costs ($\alpha = 0$) and investment is high ($S^N = Y$) than when mobility costs are prohibitive ($\alpha = \infty$) and no investment occurs ($S^N = 0$).

4 Global Tax Harmonization

When taxes are selected non-cooperatively, as in the case considered in the previous section, competition to attract mobile capital reduces the ex-post incentives to raise taxes. This has a disciplining effect on policymakers. In this section, we show that such an effect is completely eliminated when taxes are selected cooperatively by *all* countries.

Suppose policymakers of the home and foreign countries coordinate the selection of capital and labor taxes. We assume that the objective of the centralized government is to maximize the joint welfare of the representative consumers of the two countries, subject to raising a revenue requirement equal to $2G$.

Absent any fear of capital flight, once capital has been installed, the centralized government will have incentives to set capital taxes to the maximum rate of

$$t_K^G = 1 > t_K^*. \quad (23)$$

Anticipating this, consumers will consume all their initial income, there will be no investment ($S^G = 0$), and all revenues will have to be raised by labor taxation:

$$t_L^G = \frac{G}{wL(t_L^G)} > t_L^*, \quad (24)$$

resulting in a payoff equal to

$$\Pi^G = Y + (1 - t_L^G)wL(t_L^G) + v(1 - L(t_L^G)) < \Pi^* \quad (25)$$

We can thus state the following result:

Proposition 1 *When policymakers cannot credibly commit to future taxes, global tax harmonization is never beneficial compared to no tax harmonization.*

PROOF: For $0 \leq \alpha < \infty$, global tax harmonization leads to lower levels of investment and higher labor taxation—and hence lower countries' payoffs—than no tax harmonization, i.e. $S^G < S^N$, $t_L^G > t_L^N$, and $\Pi^G < \Pi^N$. Only in the extreme case in which $\alpha = \infty$, no harmonization and full harmonization would yield the same levels of investment and welfare. \square

Therefore, under full fiscal coordination—when capital cannot escape domestic taxation by relocating to a neighboring country—the time-consistent tax rate on capital will be

prohibitively high and no investment will occur. Hence the complete elimination of the disciplining effect of tax competition can never be desirable.¹¹

5 Partial Tax Harmonization

The analysis presented in the previous sections shows that, if policymakers cannot credibly commit to future policies, no tax harmonization is always preferable to full tax harmonization, since it leads to higher levels of investment and welfare. In this section, we consider the effects of partial tax harmonization, in which only a *subset* of countries coordinate their tax choices, and examine under what conditions it can be more desirable than no tax harmonization. To do so, we extend the simple model of tax competition described in Section 2 to the case of three ex-ante symmetric countries and examine the consequences of the formation of a tax union between two of them. As before, we assume convex costs of investing abroad.¹²

To be able to examine the implications of partial tax harmonization, we first derive non-cooperative taxes in a three-country setting (see the Appendix for the derivation):

$$t_K = \frac{\alpha S(\Lambda - 1)}{2\Lambda r}. \quad (26)$$

Comparing (26) with (14), we can see that increasing the number of countries from two to three generates an increase in the degree of competition for mobile capital, which in turn leads to lower non-cooperative capital taxes. From (26) we can derive the critical degree of mobility costs below which it will be optimal for consumers to save all their initial income:

$$\alpha^* = \frac{2\Lambda(r - 1)}{Y(\Lambda - 1)}. \quad (27)$$

As in the two-country case, we can distinguish two regimes, depending on the size of the mobility costs:¹³

¹¹This result is in line with the findings of Kehoe (1989). However, while Kehoe's analysis is limited to the case of perfect capital mobility ($\alpha = 0$), we consider the more general setup in which exporting capital can be costly ($\alpha \geq 0$).

¹²Crucially, we assume that the tax union implies policy coordination among union members, but does not alter the cost of moving capital within the union.

¹³Comparing (15) and (27), we can see that the critical level of capital mobility costs α^* is higher in the three-country case. This implies that, increasing the number of countries competing for capital, increases the range of mobility costs for which all initial income will be invested.

(1) $0 \leq \alpha \leq \alpha^*$: in this case, savings will be equal to $S^N = Y$, non-cooperative capital and labor taxes will be given by

$$t_K^N = \frac{\alpha Y(\Lambda - 1)}{2\Lambda r} \leq t_K^*, \quad (28)$$

$$t_L^N = \frac{G - rt_K^N S^N}{wL(t_L^N)} \geq t_L^*, \quad (29)$$

and countries will obtain a payoff of

$$\Pi^N = (1 - t_K^N)rS^N + (1 - t_L^N)wL(t_L^N) + v(1 - L(t_L^N)) \leq \Pi^*; \quad (30)$$

(2) $\alpha^* < \alpha \leq \infty$: in this case, savings will be equal to

$$S^N = \frac{2\Lambda r}{\alpha(\Lambda - 1)}, \quad (31)$$

non cooperative capital and labor taxes will be given by

$$t_K^N = t_K^*, \quad (32)$$

$$t_L^N = \frac{G - rt_K^N S^N}{wL(t_L^N)} > t_L^* \quad (33)$$

and countries will obtain a payoff equal to

$$\Pi^N = Y - S^N + (1 - t_K^N)rS^N + (1 - t_L^N)wL(t_L^N) + v(1 - L(t_L^N)) < \Pi^*. \quad (34)$$

Notice that the main difference between the two-country case analyzed in Section 3 and the three-country case considered in this section is that here the switch from regime 1—in which there is excessive tax competition—to regime 2—in which there is too little tax competition—occurs at a higher level of mobility costs.

The model described in this paper is characterized by the presence of a coordination problem between governments (international tax competition) as well as a coordination problem between each government and the investors in its jurisdiction (the lack of domestic policy commitment).¹⁴ As discussed in Section 4, when policymakers cannot commit to future policies, global tax harmonization completely eliminates the competition between

¹⁴For a more general analysis of the interaction between international coordination and domestic policy commitment, see Conconi and Perroni (2005).

countries to attract mobile capital, leading to the lowest possible level of investment and welfare. Notice that Proposition 1 also holds in the three-country setting considered here: global tax harmonization can never be desirable compared to no tax harmonization.

We can finally turn to the analysis of partial tax coordination, considering a scenario in which two of the three countries form a tax union (denoted by U) to coordinate their policy choices, while the third country (denoted by j) chooses its taxes unilaterally. This situation is equivalent to tax competition between a large country (the union) and a small country (the excluded country).

It can easily be shown that for the excluded country j it would never be optimal to set capital income taxes above the rate set by the union; hence the asymmetric Nash equilibrium will always be characterized by $t_K^U \geq t_K^j$, with the larger country (the tax union) exporting capital to the smaller country. The intuition behind this result is that countries with a relatively large domestic tax base have less incentives to undercut taxes compared to countries with a relatively small tax base, which can benefit more from setting lower tax rates to attract foreign capital (see also Kanbur and Keen, 1993).

In the Appendix, we show that, if mobility costs are low enough ($\alpha \leq \alpha^U$), there will be an equilibrium in which all initial income Y will be saved in both the union members and the excluded country j and capital income taxes will be given by

$$t_K^U = \frac{5\alpha Y(\Lambda - 1)}{6\Lambda r} > t_K^j = \frac{4\alpha Y(\Lambda - 1)}{6\Lambda r}. \quad (35)$$

Comparing (26) with (35), it is straightforward to verify that the creation of a tax union leads to an increase in capital tax rates relative to the scenario of no tax harmonization. This implies that, for a given level of savings, tax harmonization entails higher capital tax revenues, lower labor taxes and higher welfare for both the union members and the excluded country. Hence, when $\alpha \leq \alpha^U$, the creation of a tax union reduces *harmful* tax competition between countries, unambiguously benefiting all countries.¹⁵

What if mobility costs are high ($\alpha > \alpha^*$)? Then, investment in the no harmonization equilibrium will be suboptimal. In this case, the creation of a tax union leads to a further reduction in the level of investment and to lower payoffs in both the union members and the excluded country. Hence, when mobility costs are so high that only some of the initial

¹⁵Notice, however, that the excluded country j will be able to “free ride” and benefit more from partial the creation of the tax union than the member countries

income is saved, partial tax harmonization unambiguously hurts all countries. The intuition for this result is that, when mobility costs are very high, the creation of a tax union reduces *beneficial* tax competition between countries, leading to lower investment and welfare overall.

For intermediate levels of mobility costs ($\alpha^U < \alpha < \tilde{\alpha}$), savings will differ between union members and the excluded countries and the welfare implications of partial tax harmonization will be ambiguous.¹⁶

To summarize the above results, we have three cases:

- (i) Low capital mobility costs, $0 \leq \alpha \leq \alpha^U$: in this case, the creation of the tax union is beneficial to all countries, since it allows both union and non-union countries to maintain high levels of investment while reducing labor taxation;
- (ii) Intermediate capital mobility costs, $\alpha^U < \alpha < \alpha^*$: here the creation of a tax union has an ambiguous effect on the welfare of union members and of the non-member country;
- (iii) High capital mobility costs, $\alpha^* \leq \alpha \leq \infty$: in this case, the creation of the tax union hurts both member and nonmember countries, since it leads to lower levels of investment and higher labor taxation.

We can thus state the following:

Proposition 2 *For low enough capital mobility costs, partial tax harmonization will benefit all countries, compared to global and no tax harmonization.*

Proposition 2 shows that, if policymakers cannot credibly commit to capital taxes before investment decisions are made, partial tax coordination can only be beneficial if capital mobility costs are sufficiently low. The intuition for this result is that, when capital mobility costs are low enough, there remains enough capital tax competition after the creation of the tax union to discipline policymakers.¹⁷

¹⁶In some cases, all countries will loose or gain; in others, only the excluded country j will gain, while the union countries will lose.

¹⁷Other studies have examined the welfare implications of partial tax coordination, assuming that policymakers can credibly commit to capital taxes. Konrad and Schjelderup (1999) show that strategic com-

6 The Stability of Tax Agreements

We can now turn to the determination of which tax agreements will be formed in equilibrium. We have laid the groundwork for this analysis in the previous three sections where we have examined the welfare consequences of various types of tax agreements.

To determine which regimes may emerge in equilibrium, we can think of tax negotiations as a two-stage game, in which binding tax agreements are formed in the first stage and policies are selected in the second stage—cooperatively among countries participating in an agreement and non-cooperatively between countries belonging to separate agreements. Equilibrium coalition structures can then be identified by applying the concept of the Core—the set of agreement structures that are robust to objections by alternative coalitions.

Applying this equilibrium concept to the three-country model presented in the previous section, we obtain the following results concerning the stability of alternative tax agreements:

For very low levels of mobility costs ($0 \leq \alpha \leq \alpha^U$), partial tax harmonization will be the only stable outcome;

For intermediate mobility costs ($\alpha^U < \alpha < \alpha^*$), either no tax harmonization or partial tax harmonization will be the stable outcome;¹⁸

Finally, for very high mobility costs ($\alpha^* \leq \alpha \leq \infty$), no tax harmonization will be the only stable agreement structure.¹⁹

It follows that

plementarity of capital taxes implies that tax harmonization among a group of countries increases welfare for all countries (i.e. both within and outside the harmonizing coalition). Sørensen (2000) employs an applied general equilibrium model to analyze how European tax coordination affects the equilibrium tax rates when the rest of the world stays outside the coordination. His simulations indicate that strategic complementarity prevails for reasonable assumptions in a general equilibrium framework.

¹⁸Notice that in this range of mobility costs there will be scenarios in which the non-member j would be the only country to gain from the creation of a tax union; in this case, no tax harmonization will be the only stable outcome.

¹⁹Note, however, that such predictions can be rather fragile to changes in modeling assumptions (e.g., allowing inter-jurisdictional transfers) or to the introduction of equilibrium refinements (e.g., considering nested chains of objections and counter-objections, as in the concept of Stable Agreement Structure (SAS) developed by Conconi and Perroni, 2002).

Proposition 3 *When capital mobility is high enough, partial tax harmonization will be both desirable and sustainable.*

This result is in striking contrast to the traditional literature on tax competition—which assumes that governments can credibly commit to capital taxes. When governments can commit, then global tax coordination is the agreement structure which maximizes world welfare. However, the “grand tax coalition” is never a stable outcome because there is always an incentive for countries to defect from the agreement. Therefore, this literature reaches the rather pessimistic conclusion that the most desirable outcome is never sustainable. In our model, we are able to reach a much more optimistic conclusion: when governments cannot commit vis-à-vis investors not to raise capital taxes in the future, it turns out that whichever agreement structure is most desirable from the point of view of world welfare—no tax harmonization or partial tax harmonization, depending on the extent of the mobility costs—will also be sustainable.

7 Conclusions

We conclude by discussing the implications of our analysis for the ongoing debate on the possible creation of an ECA on corporate taxes among a subset of EU member countries.

Recently, EU members have agreed on the introduction of well defined procedures to allow some members to form sub-unions (e.g. a sub-union to harmonize corporate taxes), conditioning this possibility on the satisfaction of a number of detailed political constraints. The rules for forming ECAs in the EU were introduced in the Treaty of Amsterdam (1997). The Treaty of Nice (ratified in 2003) removed the veto power which the former treaty left to each country, thus making the implementation of ECAs much easier. Presently, to form an ECA at least 8 EU members must be involved and the ECA must be approved by a qualified majority in the Council of Ministers. Furthermore, the European Commission assesses the compatibility of the proposed ECA with the other institutions governing the Union.

Our results suggest that the creation of a tax ECA might be desirable not *despite* but *because of* its partial nature. Furthermore, if desirable, partial tax coordination should also be feasible, since it should not encounter any objection by any member or non-member countries. Therefore, if an ECA were to be proposed by a subset of European countries to coordinate the choice of their corporate taxes, it should be allowed on the grounds that it

would benefit members and nonmembers of the ECA alike, thus not posing a conflict for the EU as a whole.

Our analysis can also explain why the idea of partial tax harmonization has only recently gained support: when capital mobility costs were very high, the creation of a tax ECA was not debated because member countries would have been hurt by it; partial tax harmonization has only become appealing since the implementation of the Single Market programme and the consequent reduction in the barriers to factor mobility across Europe.

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Appendix

No Tax Harmonization

Two-country Case

In the absence of commitment mechanisms, governments will select taxes after consumption-savings decision have been made and will thus have incentives to raise capital taxes. However, policymakers will know that an increase in taxes will give rise to capital flight. This implies that (for $\alpha < \infty$), it will never be optimal to set capital taxes above the rate t_K^* , since this would lead to no capital being invested domestically. Therefore we can exclude scenarios in which the expected return to investment for the home consumer is $R^h < 1$ and there is no investment and focus on scenarios in which the expected return to investment is $R^h \leq 1$ and at least some of the initial income is invested.

To derive equilibrium taxes in a symmetric two-country Nash equilibrium, we derive first the best-response functions for an capital-exporting and capital-importing country. Consider a scenario in which $t_K^h \geq t_K^f$. Then h 's government must solve the following maximization problem:

$$\max \Pi^h(t_K^h, t_L^h, t_K^f) = C_1^h + (1-t_K^h)rK_h^h + (1-t_K^f)rK_f^h - \frac{\alpha}{2} (K_f^h)^2 + (1-t_L^h)wL(t_L^h) + v(1-L(t_L^h)), \quad (36)$$

subject to

$$G \leq t_K^h r K_h^h + t_L^h w L(t_L^h). \quad (37)$$

We totally differentiate (37) and set $dG = 0$ to obtain

$$\partial t_L^h / \partial t_K^h = - \frac{r(S^h - \frac{r}{\alpha}(2t_K^h - t_K^f))}{(1 + \mu)wL}, \quad (38)$$

where $\mu < 0$ denotes the elasticity of labor supply with respect to labor income taxation. The first-order condition for the maximization of h 's welfare can be written as

$$\frac{\partial \Pi^h(t_K^h, t_L^h, t_K^f)}{\partial t_K^h} = -rS^h + \frac{r^2}{\alpha}(t_K^h - t_K^f) - [wL - (1-t_L^h)wL' + v'L'](\partial t_L^h / \partial t_K^h) = 0. \quad (39)$$

Substituting (38) into (39) and making use of the fact that optimum labor supply decisions imply $(1-t_L^h)w = v'(1-L)$, we can rewrite the first-order condition as

$$-rS^h + \frac{r^2}{\alpha}(t_K^h - t_K^f) + \Lambda(r(S^h - \frac{r}{\alpha}(2t_K^h - t_K^f))) = 0, \quad (40)$$

where $\Lambda = \frac{1}{1+\mu} > 1$. From (40), we obtain the best-response function of the capital-exporting country:

$$t_K^h = \frac{(rt_K^f + \alpha S^h)(\Lambda - 1)}{r(2\Lambda - 1)}. \quad (41)$$

Next, consider the incentives of the foreign country. Its government faces the following problem:

$$\max \Pi^f(t_K^f, t_L^f, t_K^h) = C_1^f + (1 - t_K^f)rK_j^f + (1 - t_L^f)wL(t_L^f) + v(1 - L(t_L^f)), \quad (42)$$

subject to

$$G \leq t_K^f r(K_j^f + K_j^h) + t_L^f wL(t_L^f). \quad (43)$$

Using the same methodology as above, we derive f 's best-response function:

$$t_K^f = \frac{\alpha S^f(\Lambda - 1) + \Lambda r t_K^h}{2\Lambda r}. \quad (44)$$

We can finally combine (41) and (44), imposing $S^h = S^f$, to obtain capital income taxes in a symmetric two-country Nash equilibrium:

$$t_K = \frac{\alpha S(\Lambda - 1)}{\Lambda r}. \quad (45)$$

Three-country Case

Consider first a capital-exporting country i , whose taxes are at least as high as those prevailing in the other two countries, indexed by j and h (i.e. $t_K^i \geq t_K^j$, $t_K^i \geq t_K^h$). Its government will choose t_K^i so as to maximize

$$\begin{aligned} \Pi^i(t_K^i, t_L^i, t_K^j) &= C_1^i + (1 - t_K^i)rK_i^i + (1 - t_K^j)rK_j^i + (1 - t_K^h)rK_h^i - \frac{\alpha}{2}(K_j^i)^2 - \frac{\alpha}{2}(K_h^i)^2 \\ &\quad + (1 - t_L^i)wL(t_L^i) + v(1 - L(t_L^i)), \end{aligned} \quad (46)$$

subject to

$$G \leq t_K^i rK_i^i + t_L^i wL(t_L^i), \quad (47)$$

where

$$K_j^i = \frac{r}{\alpha}(t_K^i - t_K^j), \quad (48)$$

$$K_h^i = \frac{r}{\alpha}(t_K^i - t_K^h), \quad (49)$$

$$K_i^i = S^i - K_j^i - K_h^i. \quad (50)$$

The first-order condition for the maximization of i 's payoff can be written as

$$-rS^i + \frac{r^2}{\alpha}(2t_K^i - t_K^j - t_K^h) + \Lambda r(S^i - \frac{r}{\alpha}(4t_K^i - t_K^j - t_K^h)) = 0, \quad (51)$$

which we solve to derive the best-response function of country i :

$$t_K^i = \frac{(1 - \Lambda)(r(t_K^j + t_K^h) + \alpha S^i)}{2r(1 - 2\Lambda)}. \quad (52)$$

We can now look at the incentives of a capital-importing country. Consider, for example, the case in which country j 's capital tax does not exceed the taxes prevailing in the other two countries ($t_K^j \leq t_K^i$, $t_K^j \leq t_K^h$). Then, we can derive the following first-order condition for the maximization of j 's payoff:

$$-rS^j + \Lambda r(S^j - \frac{r}{\alpha}(4t_K^j - t_K^i - t_K^h)) = 0, \quad (53)$$

which yields the best-response function

$$t_K^j = \frac{\Lambda(r(t_K^i + t_K^h) + \alpha S^j) - \alpha S^j}{4\Lambda r}. \quad (54)$$

We can now use (52) and (54)—assuming that the third country's is either an importer or an exporter and imposing symmetry of savings—to solve for capital income taxes in this three-country non-cooperative equilibrium:

$$t_K = \frac{\alpha S(\Lambda - 1)}{2\Lambda r}. \quad (55)$$

Partial Tax Harmonization

Consider a scenario in which there are three ex-ante symmetric countries and two of them form a tax union (denoted by U) to coordinate their policy choices, while the third (denoted by j) chooses its taxes unilaterally.

It can be shown that it can never be optimal for the government of the country with the smallest tax base, j , to set capital taxes above t_K^U . Therefore, we need only consider scenarios in which $t_K^j \leq t_K^U$.

Suppose that expected returns are such that all initial income Y is saved in all countries. In this case, investment levels will be given by $K_j^U = r/\alpha(t_K^U - t_K^j)$, $K_U^U = Y - K_j^U$, and $K_j^j = Y$; the tax union will choose t_K^U so as to maximize

$$2\Pi^U(t_K^U, t_L^U, t_K^j) = 2(1-t_K^U)rK_U^U + 2(1-t_K^j)rK_j^U - \frac{\alpha}{2}(2K_j^U)^2 + 2\left((1-t_L^U)wL(t_L^U) + v(1-L(t_L^U))\right), \quad (56)$$

subject to

$$2G \leq 2\left(rt_K^U K_U^U + t_L^U wL(t_L^U)\right), \quad (57)$$

The first-order condition for maximization of the union's payoff can thus be written as

$$-2rY + \Lambda 2r\left(Y - \frac{r}{\alpha}(2t_K^U - t_K^j)\right) = 0, \quad (58)$$

which we can solve to get U 's reaction function:

$$t_K^U = \frac{\alpha Y(\Lambda - 1) + \Lambda r t_K^j}{2\Lambda r}. \quad (59)$$

We now turn to the derivation of the best-response function of the country excluded from the tax union. Its government will choose t_K^j so as to maximize

$$\Pi^j(t_K^j, t_L^j, t_K^U) = (1 - t_K^j)rK_{jj} + (1 - t_L^j)wL(t_L^j) + v(1 - L(t_L^j)), \quad (60)$$

subject to

$$G \leq r t_K^j (K_j^j + 2K_U^j) + t_L^j wL(t_L^j). \quad (61)$$

The first-order condition for maximization of the union's payoff can be written as

$$-rY + \Lambda r\left(Y - \frac{r}{\alpha}(4t_K^j - 2t_K^U)\right) = 0, \quad (62)$$

which yields the following reaction function for the capital-importing country:

$$t_K^j = \frac{\alpha Y(\Lambda - 1) + 2\Lambda r t_K^U}{4\Lambda r}. \quad (63)$$

Combining (59) and (63), we obtain capital tax rates in the asymmetric Nash equilibrium:

$$t_K^U = \frac{5\alpha Y(\Lambda - 1)}{6\Lambda r} > t_K^j = \frac{4\alpha Y(\Lambda - 1)}{6\Lambda r}. \quad (64)$$

From the above expression of t_K^U we can derive the critical level of mobility costs below which all initial income will be invested in all countries:

$$\alpha^U = \frac{6\Lambda(r-1)}{5Y(\Lambda-1)}. \quad (65)$$

Notice that α^U is smaller than α^* , the critical level of mobility costs below which all initial income is saved in the case of no tax harmonization (see equation (27) above).

The creation of a tax union reduces the degree of tax competition between the three countries. The welfare implications of this depend crucially on the extent of the mobility costs. In a regime in which capital mobility costs are below α^U , partial tax harmonization will benefit all countries compared to no tax harmonization, leading to lower labor taxation and higher welfare in both the union members and the excluded country.

If instead mobility costs are above α^U , savings will differ between the union members and the excluded country and the welfare implications of the creation of a tax union will become ambiguous. However, if the mobility costs are above the critical level α^* , the creation of a tax union will unambiguously hurt both the member countries and the outsider, leading to a reduction in the level of investment and to an increase in labor taxation in all countries.