CEPII

CENTRE
D'ÉTUDES PROSPECTIVES
ET D'INFORMATIONS
INTERNATIONALES

No 2006 – 11
June

Who's afraid of tax competition ?

Harmless tax competition from the New European Member States

Amina Lahrèche-Révil

Who's Afraid of Tax Competition?

Harmless Tax Competition from the New European Member States

Amina Lahrèche-Révil

No 2006 – 11
June

Support from the CIREM is gratefully acknowledged

Contents

WHO'S AFRAID OF TAX COMPETITION? HARMLESS TAX COMPETITION FROM THE NEW MEMBER STATES [1]

SUMMARY

The tax competition literature has long been stating that increasing international integration might impose a growing pressure on tax policies, as raising taxes creates an incentive for mobile tax payers to relocate abroad. Because tax base relocation is proportionally more important in small countries than in large ones, this literature further shows that small countries have stronger incentives than large ones to cut taxes, which could eventually lead tax rates on mobile income converge toward zero. Such a conclusion however has been challenged by a number of alternative approaches, pointing for instance to the fact that higher taxes can be the counterpart of higher attractiveness, or to the fact that taxation is a second order determinant of location decisions, well behind e.g. proximity to the market.

As far as corporate taxation is concerned, most existing empirical studies focus on the sensitiveness of foreign direct investment or firms location decision to taxation. These show that multinational entreprises (MNEs thereafter) do react to tax incentives, be they embedded in tax rules (which avoid double taxation problems through credit or exemption schemes) or tax rates, but to a limited extent (estimated elasticities are usually low).

While most existing studies focus on the OECD, the recent EU enlargement raises issues about the impact of tax differentials on FDI location in new member states. Indeed, since the beginning of the transition process, Central and Eastern European countries have engaged in a high-speed opening-up process, which has resulted, among other phenomena, in increasing opening to capital flows. This has come along with large corporate tax reforms is most countries, consisting in both lowering statutory rates and broadening the definition of the taxable income. But it remains to determine whether these reforms reflect pure tax competition (i.e. whether they are directly aiming at attracting FDI) or whether they primarily reflect the transformation of these former socialist countries into infant market economies.

This paper seeks to investigate the impact of tax incentives on FDI within the enlarged EU, using bilateral FDI flows from the EU15 countries to 18 to 22 EU25 countries (depending on tax measures), from 1990 to 2002. The empirical investigation relies on two alternative specifications of a gravitational model of FDI flows, where the impact of various definitions of corporate taxation (namely, implicit tax rates, statutory tax rates and effective average tax rates) is investigated, together with the impact of unit labor costs.

It is shown that, over the period of analysis, only implicit taxation has had a significant impact on FDI flows within the enlarged EU, when tax developments through time are essentially considered. When information on the (bilateral) cross-sectional dimension of the FDI equation is used, statutory taxation is found to have a significant and quite robust impact. In most cases, the impact of taxation is shown to have been asymmetric: while higher taxes have tended to reduce inward FDI flowing to EU15 countries, the impact of taxation on FDI flowing to the NMS is shown to have been much less significant, whatever the gravity specification used. Other factors, such as the real exchange rate and unit labor costs, also fail to significantly explain FDI inflows into the NMS.

[1] This is a part of the project "Tax/benefit systems and growth potential of the EU" (TAXBEN, Project no. SCS8-CT-2004-502639), financed by the European Commission under FP 6 of Research. The author gratefully acknowledges the comments and discussion made by the participants of the following conferences: the TAXBEN conference on tax competition in Prag, December 2004, the Euroframe conference, held in Vienna in June 2005, and the TAXBEN workshop held in Helsinki in September 2005. Agnès Bénassy-Quéré has devoted careful and rigorous attention to previous versions of this paper.

The results on statutory taxation are used to simulate the impact of various harmonization/competition scenarios, assuming that the tax-sensitivity of FDI flows in the NMS should converge in the long run to that of the EU15 countries. The impact on FDI flows of a EU-wide coordination on statutory taxation is shown to be of limited magnitude: in 2002, it would have produced, at most, a 5% change in FDI flows for the most affected countries. Harmonisation within a range of maximum/minimum tax rate would trivially have had a much more limited impact than total harmonization (alternatively, competition leading to a convergence of tax rates to the same level).

ABSTRACT

This paper investigates the tax sensitivity of foreign direct investment (FDI) in the context of EU enlargement to Eastern European countries. Using two alternative specifications of a gravity equation, it shows that the E25 is heterogeneous as far as FDI location determinants are concerned. However, the results are at odds with usual consensus:while tax differentials do impact on FDI in the EU15, they are shown to have had no impact on the new member states during the period of analysis (1990-2002). Similarly, other factors such as unit labor costs and price-competitiveness fail to explain FDI inflows to the new EU member states. Simulation exercises run on statutory taxation attend to assess empirically the impact of various tax convergence scenarios. They are shown to imply limited changes in FDI inflows, on the basis of FDI flows and tax differentials observed in 2002.

JEL classification: F21, F36, H25, H87
Keywords: tax competition, FDI, EU enlargement.

QUI A PEUR DE LA CONCURRENCE FISCALE ? L'ÉLARGISSEMENT ET LA CONCURRENCE FISCALE DES NOUVEAUX ÉTATS MEMBRES

RÉSUMÉ

La littérature sur la concurrence fiscale a depuis longtemps mis en évidence le fait que l'intégration économique pouvait imposer une pression de plus en plus forte sur les politiques fiscales, puisqu'une augmentation des taxes incite alors les détenteurs de revenus mobile à se localiser à l'étranger. Dans la mesure où la relocalisation des bases imposables est proportionnellement plus importante dans les petits pays que dans les grands, cette littérature suggère en outre que les petits pays ont des incitations plus importantes que les grands à réduire les taux d'imposition, ce qui peut aboutir à une convergence des taux de fiscalité sur les revenus mobiles vers zéro. Toutefois, de nombreux travaux ont remis en cause une telle conclusion, en mettant par exemple en évidence le fait que des taux de fiscalité plus élevés pouvaient être la contrepartie d'une meilleure attractivité, ou le fait que la fiscalité est un déterminant de second ordre des décisions de localisation, loin derrière la proximité au marché par exemple.

Pour ce qui concerne la fiscalité des entreprises, la plupart des analyses empiriques existantes se concentrent sur la sensibilité de l'investissement direct étranger (IDE) - ou des décisions de localisation des firmes - aux taxes. Ces travaux montrent que les firmes multinationales (FMN) réagissent bel et bien aux incitations fiscales, que celles-ci soient incluses dans les législations fiscales (qui limitent les problèmes de double taxation par le biais des systèmes de crédit ou d'exemption) ou dans les taux d'imposition. Mais leur réactivité est limitée, puisque les élasticités estimées sont généralement faibles.

Tandis que la plupart des études existantes se concentrent sur l'OCDE, l'élargissement récent de l'UE pose la question de l'impact des écarts de taux sur la localisation de l'IDE dans les nouveaux États membres (NEM). En effet, depuis le début du processus de transition, les pays d'Europe centrale et orientales se sont engagés dans un processus d'ouverture rapide, qui a conduit, entre autres, à une ouverture croissante aux flux de capitaux. Ce mouvement s'est accompagné d'importantes réformes de la fiscalité des entreprises dans la plupart des pays, consistant à la fois à en une diminution des taux statutaire, et en un élargissement des revenus imposables. Il reste cependant à determiner si ces réformes reflètent une véritable concurrence fiscale (c-à-d si elles sont directement orientées sur l'attraction de l'IDE) ou si elles reflètent la transformation de ces anciennes économies socialistes en jeunes économies de marché.

Cet article analyse l'impact des incitations fiscales sur l'IDE dans l'UE élargie, à partir de données de flux d'IDE bilatéraux de l'UE15 vers 18 à 22 pays de l'UE25 (en fonction des mesures de fiscalité), de 1990 à 2002. Les IDE sont expliqués dans le cadre d'un modèle de gravité, dont on examine deux spécifications alternatives, où l'on étudie l'impact de différentes définitions de l'impôt sur les sociétés (précisément, le taux d'imposition implicit, le taux statutaire et le taux effective *ex-ante*), ainsi que des coûts salariaux unitaires.

On montre que, au cours de la période d'analyse, les NEM ont présenté un comportement asymétrique pour ce qui concerne la réaction des entrées d'IDE aux écarts de fiscalité. Lorsque l'on exploite l'information statistique temporelle, seuls les écarts de fiscalité implicite permettent d'expliquer l'IDE. Lorsque l'on utilise prioritairement l'information disponible dans la dimension géographique (bilatérale), les écarts de fiscalité statutaire également ont un impact significatif et robuste. Dans les deux cas, alors que des taxes plus élevées tendent à réduire l'IDE entrant dans les pays de l'UE15, on ne trouve pas impact significatif pour les NEM. On ne peut pas non plus expliquer les IDE entrants dans les NEM par des facteurs tels que le taux de change réel et les coûts salariaux unitaires, qui expliquent l'IDE

dans les pays de l'UE15.
On utilise les résultats obtenus sur le taux d'imposition statutaire pour simuler l'impact de différents scénarios d'harmonisation/concurrence fiscale, en faisant l'hypothèse que la sensibilité des flux d'IDE aux écarts de fiscalité se rapprochera à terme entre les pays de l'UE15 et les nouveaux Etats membres. L'impact sur les flux d'IDE d'une coordination à l'échelle de l'UE élargie des taux de fiscalité statutaire est d'ampleur limitée : en 2002, elle aurait provoqué une variation des flux d'IDE au plus égale à 5% pour les pays les plus affectée. Une harmonisation des taux dans une fourchette aurait eu un impact bien plus limité qu'une harmonisation complète (ou qu'une concurrence produisant une convergence des taux de fiscalité sur le même niveau).

RÉSUMÉ COURT

Cet article analyse la sensibilité de l'investissement direct étranger (IDE) à la fiscalité dans le cadre de l'élargissement de l'Union européenne. A partir de différentes spécifications d'une équation de gravité, on montre que l'UE25 est une zone hétérogène pour ce qui concerne les déterminants de la localisation des IDE. Cependant, les résultats sont différents de ce qui constitue le consensus habituel. En effet, les écarts de fiscalité expliquent bien les IDE dans l'UE15 ; mais on montre qu'ils n'ont eu aucun impact sur les nouveaux états membres au cours de la période étudiée. De la même manière, les entrées d'IDE ne sont pas déterminées significativement par des facteurs comme les coûts du travail ou la compétitivité-prix.
On simule l'impact de différents scénarios d'harmonisation/concurrence sur la fiscalité statutaire, et l'on montre qu'ils ont des implications limitées pour les flux d'IDE entrants, sur la base des flux d'IDE et des écarts de taux observés en 2002.

Classification *JEL* : F21, F36, H25, H87
Mots clés : concurrence fiscale, investissement direct, élargissement de l'UE.

WHO'S AFRAID OF TAX COMPETITION? HARMLESS TAX COMPETITION FROM THE NEW MEMBER STATES

Amina LAHRÈCHE-RÉVIL[2]

1 Introduction

The tax competition literature has long been stating that increasing international integration might impose a growing pressure on tax policies, as raising taxes creates an incentive for mobile tax payers to relocate abroad. Because tax base relocation is proportionally more important in small countries than in large ones, this literature further shows that small countries have stronger incentives than large ones to cut taxes, which could eventually lead tax rates on mobile income converge toward zero (see Diamond & Mirrlees (1971), Gordon (1986), Razin & Sadka (1991), and Wilson (1999) for a survey).

This theoretical conclusion has given rise to a number of papers dealing with tax competition, which emphasize, both on the theoretical and empirical level, that tax competition is unlikely to lead to zero taxation. On the theoretical level, the literature has highlighted the impact of various factors that impede the convergence of tax rates to zero: (*i*) when taxation allows for the provision of public goods, tax rates can be higher (Tiebout (1956)), (*ii*) tax differentials are second-order determinants compared to the proximity to final markets or the characteristics of competition on the labor and goods markets for instance (Markusen (1995)), (*iii*) a higher tax rate can result in a higher pre-tax return in a general equilibrium framework (because of lower capital stock), with no measurable impact on post-tax returns (Scholes & Wolfson (1990)), (*iv*) tax differentials can be an equilibrium outcome in an imperfect competition setting combining economies of scale with trade costs and/or agglomeration forces (Haufler & Wooton (1999), Andersson & Forslid (2003), Baldwin & Krugman (2004), Ludema & Wooton (2000)). Moreover, on the practical side, firms have a number of possibilities to exploit tax differentials without having to resort to relocation. For instance, the use of transfer pricing and intra-firm debt contracting allows them to shift profits where taxation is the lowest, therefore disconnecting the location of profit and production.

As far as corporate taxation is concerned, most existing empirical studies focus on one particular aspect of tax competition, which is the sensitiveness of foreign direct investment or firms location decision to taxation. These show that MNEs do react to tax incentives, be they embedded in tax rules (which avoid double taxation problems through credit or exemption schemes) or tax rates (for reviews of the literature, see Hines (1999) and Gordon & Hines (2002)). The estimated impact however is rather limited: according to the meta-analysis by De Mooij & Ederveen (2005)[3], the semi-elasticity of FDI to tax rates varies from -22.7 to +13.2, with a mean of -3.3 or -4.0, depending on whether non significant estimates are included in the sample. As for the elasticity of FDI to tax rates, it ranges from -0.6 to -2.8, depending on the estimation method (Desai & Hines (2001)).

Most existing studies focus on FDI within the OECD (see for instance Bénassy-Quéré, Fontagné & Lahrèche-Révil (2005)), while existing studies on FDI flowing to emerging or

[2]CEPII (amina.lahreche@cepii.fr).

[3]This work is an update of De Mooij & Ederveen (2003).

transition countries usually ignore tax issues (Carstensen & Toubal (2005), Beyer (2002), Edmiston, Mudd & Valev (2003) are recent exceptions).
Since the beginning of the transition process, Central and Eastern European countries have engaged in a high-speed opening-up process, which has resulted, among other phenomena, in increasing opening to capital flows. This has come along with large corporate tax reforms is most countries, consisting in both lowering statutory rates and broadening the definition of the taxable income. It is however difficult to determine whether these reforms reflect pure tax competition (i.e. whether they are directly aiming at attracting FDI) or the necessary transition path of former socialist countries, marked by a high implication of the State in the economy.
Given the peculiarities of the NMS, there is some ground for suspecting that the empirical conclusions of the studies based on OECD countries could be inappropriate for transition countries, both because of the transition process they have been experiencing and because of the catching-up process in progress. Still, working only on FDI flowing to the NMS might also be restrictive. First, past inflows of FDI in the NMS where probably determined by a mixture of transition-related and more long-run factors (transition-related factors include privatization, fast and deep opening-up, while more structural factors would include market access by investing firms or cost-related factors). Therefore, estimating the determinants of FDI flowing only to NMS does not allow to disentangle between both kinds of determinants. From this point of view, investigating the behavior of FDI within a larger sample including the NMS and more advanced countries allows for a more general assessment of its determinants. In this paper, the determinants of FDI are investigated within the enlarged EU. This allows to investigate whether FDI flowing to the NMS and FDI flowing to the EU15 behaves similarly, or whether some asymmetries can be found between both country groupes. Compared to the existing literature, this is an improvement, as the determinants of FDI to the NMS are estimated simultaneously for the EU15 and the NMS. In addition, the analysis is run on *bilateral* FDI data, which allows to identify the impact of tax incentives more accurately, since tax incentives can be computed for each pair of investing/recipient country. More precisely, this paper investigates the impact of tax incentives on FDI within the enlarged EU, using bilateral FDI flows from the EU15 countries to 18 to 22 EU25 countries (depending on taxes measures)[4], from 1990 to 2002. The empirical investigation relies on a gravitational setting for FDI.
The paper is organized as follows: Section 2 recalls the theoretical and empirical issues underlying the use of the gravity equation in modeling FDI flows, with a special focus on FDI within the EU25. In Section 3, the results of the "simple" - i.e. not taking account of interaction with third countries - gravity equation are displayed and analyzed. Section 4 further investigates the impact of taxation when these interactions are taken into account. In Section 5, the impact of various scenarios of harmonization/competition on statutory taxation is assessed. Finally, Section 6 concludes.

[4]Host countries are the EU15 countries, to which Cyprus, the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia and Slovenia are added.

2 Modeling the impact of corporate taxation on FDI flows

2.1 The gravity equation and FDI flows

The gravity equation was first developed for trade analysis, but it has become increasingly used for capital flows analysis (see Portes, Rey & Oh (2001) or Mody, Razin & Sadka (2002) for instance), and more specially for FDI analysis. Its use has expanded in a number of areas. For instance, Mutti & Grubert (2004) use a gravity framework for analyzing US outward FDI at the firm level. Bénassy-Quéré et al. (2005) also used the same tool to investigate FDI in 11 advanced OECD countries. Brenton, Di Mauro & Lücke (2000) or Campos & Kinoshita (2003) use the same setting to investigate inward FDI in transition economies. The gravity framework is also used by Walkenhorst (2004) on sectoral data for Poland, and on macroeconomic data for a set of transition countries by Carstensen & Toubal (2005).[5]
The gravity framework relates FDI flows to the size of the exporting and the importing country, and to the distance between them. It is therefore bilateral by nature, which allows to take into account both the features of the exporting (supply-side effect) and of the importing (cost/demand effect) country. In gravity models of trade, distance is a proxy for transportation costs and/or barriers to trade. When modeling FDI, the distance variable is less easy to interpret. On the one hand, when FDI is market seeking, a larger distance should act as an incentive for firms to locate in the target country instead of exporting to it. Alternatively, Mody et al. (2002) and Portes et al. (2001) interpret the distance variable in FDI gravitational models as a proxy for informational frictions, in which case remoteness should reduce FDI.[6]

2.2 The expected impact of tax differentials

According to Mutti & Grubert (2004), host country taxation may play a limited role in investment decisions when investment is horizontal (i.e. targeting market access).[7] In this case, foreign firms reach the market by foreign direct investment (trade costs make it more attractive to locate in the target country than to export products), and all producers and sellers are therefore subject to the same tax rules and tax rates (there is capital import neutrality). Consequently, tax competition from third countries should play little role in location decisions.[8] When foreign investment is undertaken by vertically-integrated firms targeting export markets, sellers from different countries compete in the destination market. Those sellers are

[5] Most papers on transition economies however investigate a limited number of countries, because the Central and Eastern European countries and the Baltic countries together receive the bulk of FDI flowing to transition economies. An exception is the paper by Garibaldi, Mora, Sahay & Zettelmeyer (2001), which does not however rely on a gravity setting, as FDI data are not available on a bilateral basis.

[6] As far as the impact of taxation on FDI is concerned, the use of aggregate - even though bilateral - data might introduce aggregation biases in the estimates, since taxation is likely to influence FDI unevenly, depending on the sectors under consideration. The use of sectoral data would obviously be preferable. However, bilateral, sectorally disaggregated data, when available from Eurostat, are highly truncated, which generate selection biases problems. Other sectoral data are available from the US, but do obviously not allow to address the issue of this paper. An exception is Shiells (2003), working on the CIS; notice however that FDI flowing to these countries is mostly natural-resources seeking.

[7] Multinational entreprises (MNEs) are horizontally integrated when they duplicate production operations abroad, in order to spare on transportation costs or trade barriers, and improve their market access.

[8] Such an approach however ignores the impact of taxation on repatriated profits. When this issue is taken into account, the double-taxation regime - either credit or exemption - can affect the way MNEs respond to tax differentials between the destination country and their country of origin. See

not subject to the same corporate taxes, and host country taxes should play a more important role. In the case of US affiliates, they show that taxes are a determinant of multinational entreprises location, but that the tax sensitivity is smaller when the affiliates primarily serve the host market. As a conclusion, export-oriented production should be more sensitive to host-country taxation, and the sensitiveness of FDI flows to tax differentials should be lower in high-income OECD countries, while tax elasticity should be increasing over time, as integration deepens.

Unfortunately, it is not possible to disentangle horizontal from vertical FDI, and one is left with one single elasticity estimate fitting all possible motives for foreign investment. Heterogeneity in the nature of FDI might therefore be one reason behind the fact that FDI seems to be little reactive to tax incentives.

2.3 Modeling strategy and data

When the cross-sectional and time dimensions are pooled together, the standard gravity equation has the following form:

$$FDI_{ijt} = Q_{it}^{\alpha} Q_{jt}^{\beta} D_{ij}^{\delta} \tag{1}$$

where FDI_{ijt} is bilateral FDI flowing from country i to country j at time t, Q_{it} and Q_{jt} refer to the respective mass of countries i and j, and D_{ij} refers to the distance between them. The estimates in the paper are run within the framework of a pseudo panel, where three dimensions are simultaneously present: the investing country, i, the recipient one, j, and time (t).

While estimating such an equation two alternative strategies are available. The first one consists in using as much information as possible from the times-series dimension of the panel. This is done by controlling for the cross-sectional dimensions of the panel through i and j, and possibly ij, fixed effects, which leaves mostly the variance in the time dimension for estimating the coefficients. This is the usual pseudo-panel specification used in Bénassy-Quéré et al. (2005) or Bellak, Leibrecht & Römisch (2005*b*) for instance.

Still, since there might is little time variance within the panel, there is ground for investigating the determinants of FDI by using the information available in the cross-country dimension of the panel. This can be done by controlling for all $i \times t$ and $j \times t$ possible shocks in the data through the use of it and jt fixed effects, which leaves mostly the bilateral dimension for estimating the coefficients of interest. This of course implies to modify the baseline equation, as Q_{it} Q_{jt} would be collinear with the fixed effects.

Because estimates of the impact of taxation of FDI are well known to be fragile, this paper investigates both dimensions of the panel, focusing first primarily on its time-series dimension, and then on its cross-section dimension. Hence, two alternative baseline specifications are used:

$$\begin{aligned} \ln FDI_{ijt} &= \alpha_1 \ln SIZE_{it} + \alpha_2 \ln SIZE_{jt} + \alpha_3 \ln DIST_{ij} \\ &\quad + \gamma X + \mu_i + \nu_j + \epsilon_{ijt} \qquad (2) \\ \ln FDI_{ijt} &= \beta_1 \ln DIST_{ij} + \delta X + \lambda_{it} + \kappa_{jt} + \varepsilon_{ijt} \qquad (3) \end{aligned}$$

Where X is a vector of control variables, and $SIZE_{it,jt}$ stands for the size of the investing/recipient country, while $DIST_{ij}$ is the bilateral distance between both partners. The

Bénassy-Quéré et al. (2005) for a discussion and an empirical analysis.

second equation is obviously less structural, but it still allows for a control of size variables through the country-and-time fixed effects; it is also more general, as it allows for a control of any shock in the time or individual country dimension, that could affect the recipient or the investor.

Selecting the relevant FDI data is quite a complicated issue. FDI flows should be the best suited within the framework of a gravity equation, which is precisely focusing on *flows*. However, FDI flows data are affected by a large number of missing data, which could bias estimates the same way as if there were selection bias. Moreover, there are instances of negative flows that cannot be tackled when models are specified in logs, and which lead to additional missing flows once the logarithmic transformation is imposed to data. Still, using FDI stocks is an imperfect solution to those problems, are these data are by definition highly auto-correlated, which might also affect panel estimations.
In order not to have estimates polluted by auto-correlation in the time dimension, and in order to make the baseline equation consistent with the gravity approach, the analysis is restricted to (positive) FDI flows. Because missing data might affect the results, a robustness analysis is undertaken on the preferred specification, through the use of tobit estimation procedures.
The source for FDI data is Eurostat, and the time coverage is 1990 to 2002, with an annual frequency. FDI flows are in euros at constant prices (the deflator being the gross capital formation price index of the recipient country).

Q_{it}, the size of the capital-exporting country, is proxied by the GDP in volume of country i, converted into international dollars using purchasing parity standards (World Bank data). Because large countries tend to export more capital, the GDP of the origin country should be capturing a supply effect. As far as the recipient country is concerned, size bears a somewhat different definition. In traditional models of trade, the size of the importing country should also be proxied by its GDP. However, if most of FDI is designed to serve the local market, highly concentrated markets should be more attractive than quite dispersed ones, as the density of demand allows the investor to serve markets more easily and at lower cost. In order to take this into account, the proxy for the importer's size is the market potential, which is defined as the (PPS converted) GDP, deflated by the internal distance. When internal distance is low, the market potential is higher for a given level of GDP, and the country should be more attractive because of more dense demand.[9]

Finally, distance is defined as the geodesic distance (in kilometers) between capitals. In addition to these traditional gravity variables, two standard gravity dummies are introduced, i.e. a dummy for common language and a dummy for common borders. Distance and gravity dummies are taken from the CEPII databases.[10]

The measurement of taxes is also a non-trivial issue, as existing measures are unevenly available, and unevenly representative for the tax burden. Statutory corporate taxes (thereafter STR) are available for all the countries of the sample (source : Eurostat). However, statutory taxation is a highly imperfect measure of the tax burden, as the rules that define taxable income can vary in a great extent across countries, and affect the magnitude of effective taxation. *Ex-post*, implicit tax rates (thereafter ITR) are not affected by this bias, as they reflect the total amount of tax revenues that is levied for a given year by a given country. Here, implicit taxation is defined as the total amount of corporate income tax rate normalized either

[9] Because internal distance is a constant, the estimated coefficient would not be changed if "simple" GDP were used. However, taking account of this geographical variable ensures that fixed effects for the destination country are not affected by the density of economic activity in the recipient country.

[10] Available at `http://www.cepii.fr/francgraph/bdd/distances.htm`

by GDP of by the total value added in the economy (source: OECD). This measure is not exempt from any drawbacks however. First of all, it can be affected by the economic cycle, which might lead implicit taxation to be endogenous to the amount of FDI flowing into the economy.[11] Secondly, data are available for a limited number of countries on a homogeneous basis (namely, the OECD ones), which restrains the sample of New Member States (thereafter, NMS) to the Czech Republic, Hungary, Poland and Slovakia. Finally, implicit tax rates can be affected by optimization strategies by firms, trying to locate profit where taxation is the lowest.[12]

Another drawback of this measure is its *ex-post* nature, which does not allow to take account of the *ex-ante* incentives provided by taxation. *Ex-ante* measures are useful in this respect. These measures, first developed by King & Fullerton (1984), and thereafter developed by Devereux & Griffith (1998), Devereux & Griffith (2002), Devereux (2003), allow to compare the level of taxation incurred by a firm that considers an investment of a given amount, for a given financing structure, for given macro-economic conditions, and for a given return.[13] They therefore allow for a perfect comparability of tax incentives across countries. However, by nature they ignore the fact that firms optimize their investment according to the legislation, and that investment financing - for instance - has no reason to be identical across recipient countries.[14]

Ex-ante tax measures (EATR, for effective average tax rates) are now available for a reasonable set of countries, if one considers the various existing databases. The Devereux & Griffith (2002) database covers 16 countries, from 1982 to 2001, of which 13 belong to the EU15. Recently, Bellak et al. (2005*b*) have built data for 5 NMS, from 1996 to 2004. These series are also used, in order to provide a complementary view on the impact of taxation on FDI.

In this paper, tax differentials are defined as the difference between the destination (j) and the origin (i) country, so that a positive tax differential points to higher taxes in the recipient country, and should induce a decrease in inward FDI; the expected sign of the estimated coefficient on tax differentials is therefore negative. Other variables are introduced step-by-step in the analysis: bilateral real exchange rates and unit labor cost differentials. All the data are detailed in the Appendix.

The impact of taxation is first estimated following Equation (2) (section 3). Time-and-country fixed effects are then introduced, and the impact of taxation on FDI is further investigated (section 4), following Equation (3).

[11] This issue is investigated in the following, through the use of two-stage least squares on the preferred specification.

[12] Stöwhase (2002) provides some evidence of tax planning using German data, showing that "*FDI in real activity (production) is correlated with effective tax rates while FDI that implies more opportunities for profit shifting activities (service, finance and R&D) is correlated with the statutory tax rate*".

[13] These measure can either describe the average tax rate incurred under a given set of conditions, or the marginal tax rate incurred on an additional investment.

[14] Actually, the financing structure of investment should depend on the relative cost of finance, which is affected by the tax system and varies across countries.

3 Tax differentials and FDI within a standard gravity equation

The graphs displayed in Figure 1 provide some insight about the behavior of taxation in the EU15 and in the NMS. Statutory taxation is strikingly decreasing in the EU15 countries, together with the dispersion of tax rates. These changes are feeding fears that tax competition might be at play in the enlarged EU. The fall in *ex-ante* taxation is striking in the NMS (notice that data run from 1996 to 2004), which is much less the case in the EU15, where ex-ante taxation is quite stable (except in Germany and Italy). The picture is less clear for both groups of countries as far as implicit tax rates are concerned, as implicit taxation is more cyclical.

3.1 The baseline gravity equation

The baseline gravitational equation for FDI is the following:

$$\begin{aligned} \ln FDI_{ijt} &= \beta + \alpha_1 \ln SIZE_{jt} + \alpha_2 \ln GDP_{it} + \alpha_3 \ln DIST_{ij} \\ &\quad + \alpha_4 CONTIG_{ij} + \alpha_5 COMLNG_{ij} + \mu_i + \nu_j + \epsilon_{ijt} \end{aligned} \tag{4}$$

where FDI_{ijt} denotes FDI flowing from country i to country j at time t, in volume[15]. $DIST_{ij}$ is the bilateral distance between countries i and j, $CONTIG_{ij}$ is a dummy that takes the value of 1 when countries i and j share a common border, μ_i and ν_j are country-specific fixed effects, that control for any unobserved, time invariant, characteristic of the investing and recipient country respectively, and ϵ_{ijt} is a residual. Notice that there are no fixed effect for time, as these are collinear with the GDP variables.

GDP_{it} is defined as the GDP of the investing (i) country, and can be interpreted as catching a supply effect. As to $SIZE_{jt}$, various definitions are experimented in order to catch the size-related attractiveness of the recipient country. In the baseline specification $SIZE_{jt}$ is defined as the market potential of the destination, $MPOT_{jt}$. Market potential is defined as the GDP of the recipient, weighted by the inverse of the internal distance (see *supra*). Therefore, it is a proxy for the density of the internal market, and according to the new economic geography literature, it should be representative of the demand factor leading firms' decisions to locate in the recipient country.

However, it could be argued that the density of the destination market is not the most important determinant of location decisions, especially as far as MNEs are involved in a process of international division of production processes, or more simply in re-export. Indeed, when production is aimed at reexporting, a potential recipient country should be all the more attractive to FDI that it is highly integrated with other countries also displaying a large market potential. In order to test this hypothesis, an alternative definition of the market potential is used, where the market potential of the host country is defined as the (inverse of distance weighted) sum of its own market potential and the market potential of its trade partners. Weighting by the inverse of distance allows to take into account the impediments to trade between the destination country and its neighbors, as a larger distance leads to less interaction between the recipient and its neighboring markets. The definition of the enlarged market potential is therefore the following:

[15] see the Appendix for a complete definition of data

$$EMPOT_{jt} = \frac{GDP_{jt}}{Dist_{jj}} + \sum_{k \neq j} \frac{GDP_{kt}}{DIST_{kk}} \times \frac{1}{DIST_{jk}} \tag{5}$$

where $DIST_{jj}$ and $DIST_{kk}$ are internal distances.

Finally, because there happens to be some correlation between the market potential proxies and the GDP of the investing country (due to the country composition of the sample), an alternative specification is used, where the coefficients on host and recipient GDPs are constrained to equality by summing them. The main advantage of this specification is that it allows for almost zero correlation (on average) between the sum of GDPs and the tax and cost variables, and therefore ensures that potential multicollinearity is minimized. However, it imposes parameter homogeneity on GDPs, which might be a constraining assumption. Consequently, this last specification should be viewed as a robustness check.

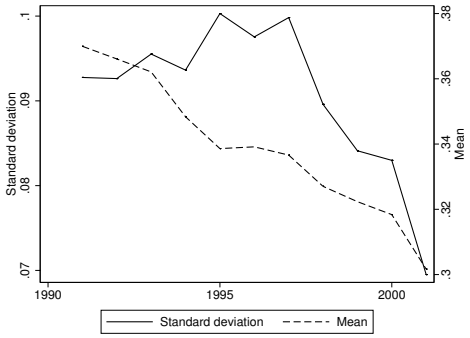
Because of the high heterogeneity between NMS and EU15 countries (both in terms of level of development and because the rather recent integration of NMS to world trade and financial flows), it can be suspected that the estimated coefficients on taxes or other cost variables might be different across country groupings. To investigate this issue, the estimated coefficients are then differentiated according to the geographical belonging of the destination country.
Indeed, the issue of heterogeneity in panel data estimates of gravitational equations has been widely discussed, but mostly on the ground of heterogeneity regarding the constant term (see for instance Cheng & Wall (2005), for a literature review and empirical investigation). However, this leaves aside the issue of potential heterogeneity in the parameter estimates. Because the enlarged EU sample is likely to be highly heterogeneous, this paper argues there is ground for checking the homogeneity across locations of - first - the gravity parameter estimates and - in a second step - of the other estimates.
To this end, the impact of the gravity variables on FDI is differentiated according to the geographical belonging of the destination countries - i.e. whether they belong to the EU15 or NMS countries sub-sample. Therefore, the gravity variables are interacted with a dummy (EU_j) that takes the value of 1 when the destination country belongs to the EU15, and zero when it belongs to the group of new member states.
Allowing for parameter heterogeneity across country groups implies the following changes to the baseline equation:

$$\begin{aligned} \ln FDI_{ijt} \quad = \quad & \beta + \alpha_1 EU_j \ln SIZE_{jt} + \alpha_2 (1 - EU_j) \ln SIZE_{jt} \\ & + \alpha_3 EU_j \ln GDP_{it} + \alpha_4 (1 - EU_j) \ln GDP_{it} \\ & + \alpha_5 EU_j \ln DIST_{ij} + \alpha_6 (1 - EU_j) \ln DIST_{ij} \\ & + \alpha_7 CONTIG_{ij} + \alpha_8 COMLNG_{ij} + \mu_i + \nu_j + \epsilon_{ijt} \end{aligned} \tag{6}$$

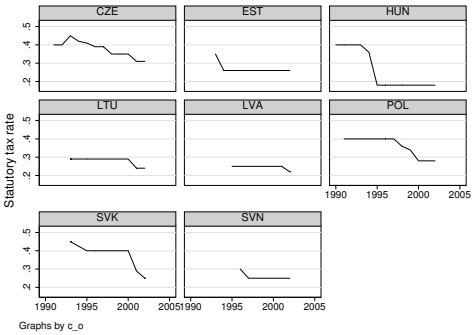
The whole set of results is displayed in Table 1.
The equality in estimated parameters for the EU15 countries and the NMS cannot be statistically rejected at conventional levels, meaning that the gravity equation for FDI uniformly fits the behavior of both regions. Interestingly, the estimated coefficient for the distance variable is close to (minus) one, as it is in trade estimates using the gravity setting (in other works on FDI, the coefficient on distance can be found to be very different. For instance, it is found to be non-significant in Bénassy-Quéré et al. (2005), for FDI within the OECD countries). The estimates also show that the common language dummy, which is never significant, can be dropped with no consequences for the quality and sign of the other estimates.

Figure 1: Taxation within the enlarged EU

EU15 statutory taxation

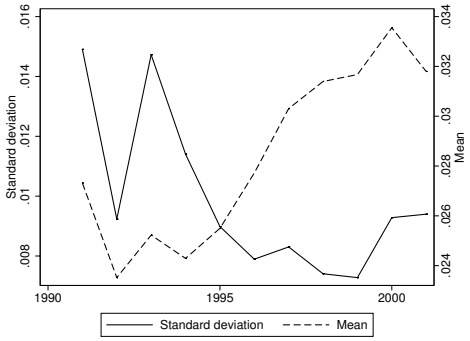


NMS statutory taxation

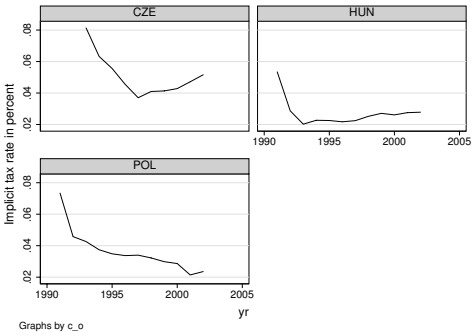


Source: Eurostat

EU15 implicit taxation

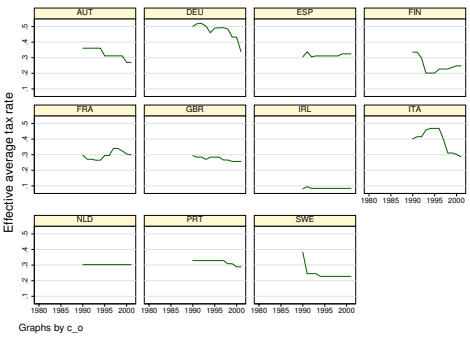


NMS implicit taxation

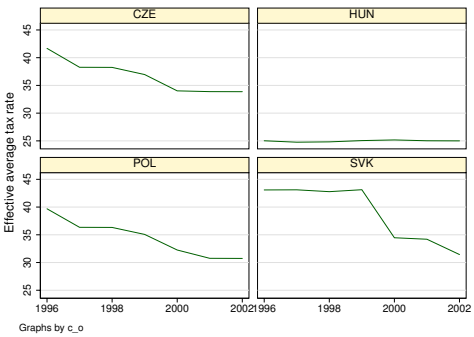


Source: OECD

EU15 EATR



NMS EATR[a]



[a] Effective average tax rate. Source: Devereux and Griffith database and Bellak, Leibrecht & Römisch (2005*a*)

Table 1: Parameter homogeneity for gravity variables

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-162.76^a	-168.35^a	-152.68^a	-162.52^a	-164.91^a	-171.04^a
	(11.12)	(11.03)	(8.88)	(11.12)	(11.05)	(10.49)
Market pot.,j	1.50^a					
	(0.51)					
GDP, i	5.37^a	6.02^a				
	(0.69)	(0.68)				
Distance	-1.01^a	-1.00^a	-1.02^a			
	(0.08)	(0.08)	(0.08)			
Contiguity	0.28^b	0.30^b	0.27^b	0.27^b	0.28^b	0.29^b
	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)	(0.12)
Common language	0.01	-0.01	0.02			
	(0.16)	(0.16)	(0.16)			
Enlarged market potential, j		0.94^c				
		(0.51)				
$GDP_{it} + GDP_{jt}$			3.13^a			
			(0.17)			
GDP, $i, j \in$ EU15				5.43^a	5.69^a	3.73^a
				(0.69)	(0.68)	(1.16)
GDP, $i, j \in$ NMS				5.32^a	5.57^a	3.88^a
				(0.71)	(0.70)	(1.34)
Market pot., $j \in$ EU15				1.42^a		
				(0.52)		
Market pot., $j \in$ NMS				1.82^a		
				(0.54)		
Distance, $j \in$ EU15				-1.03^a	-1.02^a	-1.00^a
				(0.09)	(0.09)	(0.09)
Distance, $j \in$ NMS				-0.86^a	-0.85^a	-0.86^a
				(0.14)	(0.14)	(0.14)
Enlar^d market pot., $j \in$ EU15					1.20^b	
					(0.52)	
Enlar^d market pot., $j \in$ NMS					1.75^a	
					(0.59)	
$GDP_{it} + GDP_{jt}, j \in$ EU15						1.58^a
						(0.53)
$GDP_{it} + GDP_{jt}, j \in$ NMS						1.19
						(0.90)
N	1658	1658	1658	1658	1658	1658
R^2	0.718	0.717	0.716	0.719	0.719	0.719
RMSE	1.256	1.258	1.26	1.254	1.255	1.255

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

The baseline gravity equation is therefore Equation (4), which estimation results are displayed in column (1) of Table 1. In the following, and consistently with the findings of this first set of estimates, the coefficients on the gravity variables are constrained to homogeneity across countries.
Notice that the estimated equation is robust to the alternative definition of market potential, and to the constraint of host and recipient GDPs coefficients to equality, although the enlarged market potential seems to provide slightly less accurate information. Because the results are quite similar, the analysis is restricted thereafter to the use of the simple market potential (i.e. that of GDP divided by internal distances). Results when the sum of GDPs are used are also displayed, as they seem to be clean from multicollinearity problems.

3.2 Adding tax and cost variables to the gravity setting

Taxation is defined using the tax differential between the host country (j) and the investing one (i), so that

$$dTAX_{ijt} = TAX_{jt} - TAX_{it}$$

Where $dTAX_{ijt}$ is either computed on statutory, *ex-ante* or implicit tax rates.
In addition to tax incentives, foreign direct investment might be motivated, at least in transition economies, by relatively low labor costs. Firms originating from countries where wages are relatively high compared to productivity should therefore feel an incentive to invest in countries where unit labor costs are lower. In line with Walkenhorst (2004), relative unit labor costs (denoted ULC) are therefore introduced in the analysis. They are defined as follows: $dULC_{ijt} = \ln ULC_{jt} - \ln ULC_{it}$, where i is the investing country and j is the host country. Both variables are converted into euros at current exchange rates (source: OECD).
However, unit labour costs might not be the only source of marginal costs. Cost competitiveness can also be more widely defined, using the real exchange rate. Therefore, the (log of the) real exchange rate ($\ln RER_{ijt}$) is also introduced in the equations, where RER_{ijt} decreases when the host country currency appreciates.
The following equations are estimated, where Z_{ijt} refers to the vector of gravitational variables. This vector includes the GDP of the capital-exporting country GDP_{it}, the (simple or enlarged) market potential of the recipient one, $MPOT_{jt}$, distance and the dummy for contiguity. GDP_{it}, $MPOT_{jt}$ and $DIST_{ij}$ are converted into logs. Alternatively, the sum of GDPs is introduced in the estimation.

$$\ln FDI_{ijt} = \beta + \varphi_1 dTAX_{ijt} + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \quad (7)$$

$$\ln FDI_{ijt} = \beta + \varphi_1 dTAX_{ijt} + \chi_1 \ln RER_{ijt} + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \quad (8)$$

$$\ln FDI_{ijt} = \beta + \varphi_1 dTAX_{ijt} + \chi_2 dULC_{ijt} + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \quad (9)$$

$$\ln FDI_{ijt} = \beta + \varphi_1 dTAX_{ijt} + \chi_1 \ln RER_{ijt} + \chi_2 dULC_{ijt} + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \quad (10)$$

The common language dummy fails to be significant in explaining FDI, a feature which remains when the contiguity variable is dropped out. For this reason, this dummy is dropped from all subsequent estimations. Moreover, because unit labor costs and the real exchange rate appear to be correlated, they are only introduced sequencially in most estimations.

3.2.1 Imposing parameter homogeneity to cost variables

As a first step, the impact of taxation is not differentiated according to the geographical belonging of the destination countries. The results are displayed in Tables 2, 3 and 4, for ITR, STR and EATR differentials respectively.
Looking first at gravitational variables, they are robust to the inclusion of other explanatory variables in the estimated equations. The only exception is when the real exchange rate and the market potential are included simultaneously, which might be the consequence of the correlation between both variables. The last two columns, where the sum of GDPs is used instead of the market potential and the GDP of the origin country, clears this potential multicollinearity problem, and allows for more robust estimates in this respect.

Table 2: ITR and FDI

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-163.58^a	-157.14^a	-164.37^a	-162.37^a	-153.28^a	-175.70^a
	(11.75)	(11.96)	(11.69)	(11.97)	(9.10)	(10.56)
ITR diff.	-4.31	-8.42^c	-2.56	-5.59	-7.78^c	-8.29^b
	(4.42)	(4.72)	(4.41)	(4.75)	(4.12)	(4.19)
Market pot., j	1.73^a	3.63^a	1.41^b	2.55^a		
	(0.56)	(0.94)	(0.56)	(0.97)		
GDP, i	5.24^a	3.52^a	5.51^a	4.56^a		
	(0.75)	(1.00)	(0.75)	(1.03)		
Distance	-1.05^a	-1.05^a	-1.04^a	-1.05^a	-1.05^a	-1.05^a
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Contiguity	0.25^b	0.25^b	0.26^b	0.25^b	0.26^b	0.25^b
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Real exchange rate		0.26		0.86^b		0.25
		(0.41)		(0.43)		(0.39)
ULC differential			1.76^a	1.91^a	1.61^a	
			(0.42)	(0.48)	(0.42)	
$GDP_{it} + GDP_{jt}$					3.15^a	3.57^a
					(0.17)	(0.20)
N	1560	1507	1560	1507	1560	1507
R^2	0.689	0.698	0.692	0.701	0.690	0.698
RMSE	1.256	1.247	1.249	1.24	1.253	1.246

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Table 3: CITR and FDI

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-166.30^a	-164.08^a	-166.20^a	-166.25^a	-151.62^a	-170.75^a
	(11.25)	(11.37)	(11.21)	(11.36)	(8.94)	(10.32)
STR diff.	1.28^b	1.18^c	1.07^c	0.95	0.44	0.83
	(0.63)	(0.65)	(0.63)	(0.65)	(0.61)	(0.61)
Market pot., j	1.21^b	2.09^b	1.14^b	1.78^b		
	(0.53)	(0.84)	(0.53)	(0.86)		
GDP, i	5.74^a	4.97^a	5.79^a	5.29^a		
	(0.71)	(0.90)	(0.71)	(0.92)		
Distance	-1.01^a	-1.01^a	-1.00^a	-1.01^a	-1.02^a	-1.02^a
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Contiguity	0.28^b	0.28^b	0.29^b	0.28^b	0.28^b	0.28^b
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Real exchange rate		0.14		0.62		0.31
		(0.39)		(0.43)		(0.38)
ULC differential			1.33^a	1.47^a	1.23^a	
			(0.39)	(0.44)	(0.39)	
$GDP_{it} + GDP_{jt}$					3.11^a	3.48^a
					(0.17)	(0.20)
N	1656	1603	1652	1599	1652	1603
R^2	0.717	0.725	0.718	0.726	0.715	0.724
RMSE	1.255	1.248	1.251	1.243	1.256	1.248

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Table 4: EATR and FDI

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-170.77^a	-166.77^a	-172.41^a	-170.34^a	-164.48^a	-187.61^a
	(13.52)	(13.57)	(13.44)	(13.53)	(10.73)	(12.61)
EATR diff.	-0.04	-0.04	-0.01	-0.02	-0.02	-0.04
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Market pot., j	1.93^a	3.96^a	1.81^a	3.23^a		
	(0.60)	(1.01)	(0.60)	(1.02)		
GDP, i	5.27^a	3.55^a	5.42^a	4.25^a		
	(0.81)	(1.06)	(0.81)	(1.07)		
Distance	-0.84^a	-0.83^a	-0.83^a	-0.83^a	-0.83^a	-0.83^a
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Contiguity	0.49^a	0.49^a	0.50^a	0.50^a	0.49^a	0.49^a
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Real exchange rate		0.16		0.66		0.14
		(0.47)		(0.49)		(0.46)
ULC differential			1.98^a	1.95^a	1.91^a	
			(0.48)	(0.52)	(0.48)	
$GDP_{it} + GDP_{jt}$					3.32^a	3.76^a
					(0.20)	(0.24)
N	1235	1186	1235	1186	1235	1186
R^2	0.702	0.71	0.706	0.714	0.704	0.71
RMSE	1.242	1.234	1.234	1.227	1.237	1.233

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

As to cost variables, the results are inconclusive. Turning first to tax variables, implicit taxation tends to have a weak and fragile impact on FDI (Table 2), which tends to be essentially significant in columns (7) and (8), where the sum of GDPs is used as a proxy for size variables.[16] Second, and contrary to usual expectations, statutory taxation has a positive impact on inward FDI in most cases (Table 3), meaning that an increase in statutory tax differentials in the recipient country compared to the exporting one would *increase* inward FDI. Such a result is further investigated in the following, as it departs from what is usually found in the literature (see for instance Bénassy-Quéré et al. (2005), or the meta-analysis by De Mooij & Ederveen (2005)). Finally, *ex-ante* tax differentials are never significant in explaining FDI (Table 4).

The real exchange rate is not significant when introduced independently in the regressions, although the estimates are correctly signed. Because the real exchange rate and unit labor cost differential are strongly correlated, they are not included simultaneously in the estimations (with the exception of Column (4) in Tables 2, 3 and 4.

Unit labor costs are always significant, but in an odd direction, since an increase in ULC in the recipient country tends to increase inward FDI. Such a result is not unusual however (see Bénassy-Quéré et al. (2005) for instance, and could be due to the fact that ULC data do not take correctly into account labor quality differences. However, using secondary school enrollment data in order to control for the quality of labor also fails to change the sign of the relative labor costs variable.[17]

Finally, because the geographic coverage of tax differential data varies, a last set of estimations is run on exactly the same panels, in order to check for the impact of potential selection biases. The results are displayed in Table 5, where the estimated equation is the following:

$$\ln FDI_{ijt} = \beta + \varphi_1 dTAX_{ijt} + \chi_2 dULC_{ijt} + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (11)$$

The results are mostly robust to selection biases: implicit taxation remains the only significant - though somehow weakly - tax determinant of FDI, while statutory taxation turns insignificant, though positively signed; *ex-ante* taxation once again fails to be significant in explaining inward FDI. This variable is therefore discarded in the remaining of the paper.

[16] ITR differentials are not robust to the inclusion of the enlarged market potential (columns (5) and (6).

[17] A higher secondary enrollment ratio in the destination country is associated to higher FDI; however, this does not allow to reverse the sign of the unit labor cost differential. The results are not displayed here.

Table 5: Controlling for selection biases

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-166.47^a	-174.05^a	-172.60^a	-165.10^a	-202.75^a	-164.18^a
	(13.80)	(13.42)	(13.45)	(10.69)	(17.13)	(10.76)
ITR diff.	-8.76^c			-12.40^a		
	(5.03)			(4.64)		
STR diff.		0.72			0.72	
		(0.91)			(0.91)	
EATR diff.			-0.01			-0.02
			(0.05)			(0.05)
ULC differential	2.12^a	2.09^a	2.11^a	2.09^a	2.09^a	2.03^a
	(0.49)	(0.49)	(0.50)	(0.49)	(0.49)	(0.50)
Market pot., j	2.19^a	1.67^a	1.77^a			
	(0.64)	(0.61)	(0.60)			
GDP, i	4.91^a	5.59^a	5.46^a			
	(0.87)	(0.82)	(0.81)			
Distance	-0.82^a	-0.82^a	-0.82^a	-0.82^a	-0.82^a	-0.83^a
	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)
Contiguity	0.51^a	0.51^a	0.51^a	0.51^a	0.51^a	0.50^a
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
$GDP_{it} + GDP_{jt}$				3.33^a	5.59^a	3.32^a
				(0.20)	(0.82)	(0.20)
N	1218	1218	1218	1218	1218	1218
R^2	0.699	0.698	0.698	0.698	0.698	0.696
RMSE	1.233	1.234	1.234	1.234	1.234	1.237

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

3.2.2 Allowing heterogeneity in cost variables estimates

Working on a sample of Central and Eastern European countries and CIS[18] countries (26 countries, over the 1990-1999 period), Garibaldi et al. (2001) highlight cross-country heterogeneity in the behavior of FDI and portfolio investment. In their paper, heterogeneity is caught through additive dummies, implying that heterogeneity affects only the constant term, not the parameters. However, working on the enlarged EMU might make the implicit assumption of parameter homogeneity quite audacious, due to the transition and catch-up episodes which might have made the NMS behave quite asymmetrically from the EU15 countries. Moreover, heterogeneity might be the reason for - at least part - of the deceiving results displayed *supra*. This issue is investigated here, by allowing estimated coefficients to vary according to the geographical belonging of the countries of the sample. Namely, the tax, real exchange rate and unit labor costs coefficients are interacted with the $EU15$ dummy, which describes the geographical belonging of the destination country, along the following lines:

$$\begin{aligned}
\ln FDI_{ijt} &= \beta + EU_j \cdot \varphi_1 dTAX_{ijt} + (1 - EU_j) \cdot \varphi_2 dTAX_{ijt} \\
&\quad + \chi_1 EU_j \cdot \ln RER_{ijt} + \chi_2 (1 - EU_j) \cdot \ln RER_{ijt} \\
&\quad + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (12) \\
\ln FDI_{ijt} &= \beta + EU_j \cdot \varphi_1 dTAX_{ijt} + (1 - EU_j) \varphi_2 dTAX_{ijt} \\
&\quad + \chi_3 EU_j \cdot dULC_{ijt} + \chi_4 (1 - EU_j) \cdot dULC_{ijt} \\
&\quad + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (13)
\end{aligned}$$

The results are displayed in Tables 6 and 7. Because the real exchange rate fails to significantly impact FDI flows, the results using this variable are not displayed, except in column (1) of Table 6. The estimated coefficients for the gravity variables remain quite robust to the inclusion of interacting dummies on cost variables, and therefore deserve no particular comments.

[18] Commonwealth of Independent States

Table 6: Differentiating tax and cost variables according to the region of destination: ITR

	Dependent Variable: Ln of FDI			
Model :	(1)	(2)	(3)	(4)
intcpt	-163.63^a	-156.43^a	-165.27^a	-157.31^a
	(11.76)	(11.98)	(11.69)	(9.24)
ITR diff., $j \in$ EU15	-5.03	-10.38^b	-4.82	-10.06^b
	(4.65)	(5.06)	(4.63)	(4.29)
ITR diff., $j \in$ NMS	-0.01	1.85	0.75	-1.79
	(9.68)	(11.25)	(10.77)	(10.76)
Market pot., j	1.78^a	3.89^a	1.62^a	
	(0.57)	(0.98)	(0.57)	
GDP, i	5.20^a	3.29^a	5.38^a	
	(0.75)	(1.03)	(0.75)	
Distance	-1.05^a	-1.05^a	-1.04^a	-1.05^a
	(0.09)	(0.09)	(0.09)	(0.09)
Contiguity	0.25^b	0.24^c	0.24^b	0.24^b
	(0.12)	(0.12)	(0.12)	(0.12)
RER, $j \in$ EU15		0.20		
		(0.45)		
RER, $j \in$ NMS		0.13		
		(0.93)		
ULC diff., $j \in$ EU15			2.22^a	2.15^a
			(0.47)	(0.47)
ULC diff., $j \in$ EU15			0.38	0.11
			(0.93)	(0.92)
$GDP_{it} + GDP_{jt}$				3.23^a
				(0.17)
N	1560	1507	1560	1560
R^2	0.689	0.698	0.693	0.691
RMSE	1.256	1.247	1.248	1.251

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Table 7: Differentiating tax and cost variables according to the region of destination: STR and EATR

	Dependent Variable: Ln of FDI			
Model :	(1)	(2)	(3)	(4)
intcpt	-168.01^a	-154.88^a	-175.90^a	-164.68^a
	(11.21)	(9.02)	(13.52)	(10.73)
STR diff., $j \in$ EU15	0.95	0.29		
	(0.65)	(0.63)		
STR diff., $j \in$ NMS	0.53	0.11		
	(1.11)	(1.11)		
EATR diff., $j \in$ EU15			1.18	0.59
			(0.80)	(0.78)
EATR diff., $j \in$ NMS			-0.07	-0.08
			(0.06)	(0.06)
ULC diff., $j \in$ EU15	2.03^a	1.98^a	2.23^a	2.20^a
	(0.47)	(0.47)	(0.51)	(0.51)
ULC diff., $j \in$ NMS	-0.18	-0.39	-1.33	-1.38
	(0.69)	(0.69)	(1.49)	(1.49)
Market pot., j	1.24^b		1.59^b	
	(0.54)		(0.62)	
GDP, i	5.77^a		5.73^a	
	(0.71)		(0.83)	
Distance	-1.01^a	-1.02^a	-0.83^a	-0.83^a
	(0.08)	(0.08)	(0.10)	(0.10)
Contiguity	0.28^b	0.27^b	0.49^a	0.49^a
	(0.12)	(0.12)	(0.13)	(0.14)
$GDP_{it} + GDP_{jt}$		3.18^a		3.33^a
		(0.17)		(0.20)
N	1652	1652	1235	1235
R^2	0.719	0.717	0.708	0.706
RMSE	1.249	1.254	1.231	1.235

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

As far as implicit taxation is concerned, Table 6 shows that, when significant, implicit taxation differentials only affect FDI flowing to the EU15, but never FDI flowing to the NMS. This is quite an interesting result, as it seems to be at odds with conventional tax competition theory, which states that smaller countries should feel an incentive to lower taxation of mobile income, and succeed in attracting a larger share of mobile factors. Here, even though taxation is on average lower in the NMS of the sample, this does not lead to significantly higher inflows of FDI[19].

The asymmetry between the NMS and the EU15 countries also shows up in the estimates for unit labor cost differential. Indeed, the theoretically unexpected positive impact of unit labor costs differentials is now restricted to the EU15 countries, while lower (alternatively, higher) ULC in NMS countries have no significant impact on inward FDI flowing to these countries (while the negative sign of estimated coefficient is more in line with expectations).

Turning to statutory taxation, some asymmetry is also noticeable, since statutory tax differentials are never significant in explaining FDI inflows to the NMS. They are (very) weakly influential on FDI flowing to the EU15, with the same odd direction, suggesting that most of the positive impact obtained on statutory tax differentials when the countries of destination are not differentiated might be the consequence of a composition effect, as EU15 dominate the sample. Finally, *ex-ante* taxation once again fails to have any significant impact on FDI, and differentiating between EU15 and NMS recipient countries does not change the picture at all. Therefore, this tax variable is not considered anymore in the following of this Section.

3.3 Non-linearities in the impact of tax differentials

3.3.1 Positive versus negative tax differentials

Previous estimations relied on the hypothesis of a symmetric impact of negative and positive tax differentials. However, this impact might be asymmetric. The major reason for this is due to the coexistence of different double taxation schemes in investing countries.

Head, Ries & Swenson (1999) do find such an asymmetry, and conclude that Japanese investments in the US are diverted by high tax rates, but not much attracted by low taxes, a result also established in Bénassy-Quéré et al. (2005) for OECD countries applying credit schemes.

In order to look for the existence of such asymmetries in the impact of tax and cost differentials, dummies are built to identify the sign of tax differential: POS_{ijt} takes the value of one when the tax differential is positive, and NEG_{ijt} takes the value of 1 when the tax differential is negative ($NEG_{ijt} = 1 - POS_{ijt}$). These dummies are interacted with the tax differential, in order to estimate the impact of positive and negative tax gaps separately. In a second step, the EU15 dummy is also interacted, in order to see whether there is additionally an asymmetry due to the geographical belonging of the country of destination.[20]

[19] In the time series dimension, the standard deviation of the market potential (in logs) is .05 in the EU15 sample. An increase in one standard-deviation of the market potential is equivalent to a .02 percentage points increase in the implicit taxation differential, a figure which is a little higher than the observed standard deviation in implicit taxation in the EU15 countries (0.012).

[20] Here also, only the results using unit labor cost differentials are displayed, as the real exchange rate turns out to be insignificant in explaining FDI inflows.

$$\begin{aligned}
\ln FDI_{ijt} &= \beta + \varphi_1 POS_{ijt} \cdot dTAX_{ijt} + \varphi_2 NEG_{ijt} \cdot dTAX_{ijt} \\
&\quad + \chi_3 EU_j \cdot dULC_{ijt} + \chi_4 (1 - EU_j) \cdot dULC_{ijt} \\
&\quad + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (14) \\
\ln FDI_{ijt} &= \beta + \varphi_1 EU_j \cdot POS_{ijt} \cdot dTAX_{ijt} + \varphi_2 (1 - EU_j) \cdot POS_{ijt} \cdot dTAX_{ijt} \\
&\quad + \varphi_3 EU_j \cdot NEG_{ijt} \cdot dTAX_{ijt} + \varphi_4 (1 - EU_j) \cdot NEG_{ijt} \cdot dTAX_{ijt} \\
&\quad + \chi_3 EU_j \cdot dULC_{ijt} + \chi_4 (1 - EU_j) \cdot dULC_{ijt} \\
&\quad + \alpha Z_{ijt} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (15)
\end{aligned}$$

The results are displayed in Table 8. Gravity variables bear significant and robust signs, and the ULC differential explains FDI only in the EU15 countries.

Table 8: Impact of positive versus negative tax differentials

	Dependent Variable: Ln of FDI							
Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intcpt	-165.27^a	-161.94^a	-156.95^a	-148.95^a	-164.79^a	-157.02^a	-161.57^a	-1.00^a
	(11.69)	(11.35)	(9.21)	(9.15)	(11.71)	(9.26)	(11.38)	(9.24)
ITR diff. > 0	0.26		-4.42					
	(6.58)		(6.41)					
ITR diff. < 0	-8.74		-14.09^b					
	(6.60)		(6.37)					
STR diff. > 0		-1.33		-2.02^b				
		(0.95)		(0.93)				
STR diff. < 0		2.57^a		2.05^b				
		(0.83)		(0.82)				
ITR diff. > 0, $j \in$ EU15					-1.62	-6.62		
					(6.96)	(6.77)		
ITR diff. > 0, $j \in$ NMS					11.69	9.94		
					(15.41)	(15.44)		
ITR diff. < 0, $j \in$ EU15					-8.08	-13.45^b		
					(6.86)	(6.62)		
ITR diff. < 0, $j \in$ NMS					-14.80	-18.41		
					(19.59)	(19.60)		
STR diff. > 0, $j \in$ EU15							-1.40	-2.09^b
							(0.95)	(0.94)
STR diff. > 0, $j \in$ NMS							-0.14	-1.12
							(3.45)	(3.45)
STR diff. < 0, $j \in$ EU15							2.95^a	2.35^a
							(0.88)	(0.87)
STR diff. < 0, $j \in$ NMS							1.09	0.83
							(1.40)	(1.40)
Market pot., j	1.60^a	1.21^b			1.63^a		1.15^b	
	(0.57)	(0.53)			(0.57)		(0.54)	
GDP, i	5.39^a	5.57^a			5.36^a		5.61^a	
	(0.75)	(0.71)			(0.75)		(0.71)	
ULC diff., $j \in$ EU15	2.22^a	2.07^a	2.15^a	2.02^a	2.21^a	2.14^a	2.03^a	1.99^a
	(0.47)	(0.46)	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)
ULC diff. , $j \in$ NMS	0.22	-0.34	-0.14	-0.52	0.45	0.19	-0.12	-0.35
	(0.84)	(0.68)	(0.84)	(0.68)	(0.93)	(0.93)	(0.70)	(0.70)
Distance	-1.04^a	-0.98^a	-1.04^a	-1.00^a	-1.05^a	-1.05^a	-1.00^a	-1.01^a
	(0.09)	(0.08)	(0.09)	(0.08)	(0.09)	(0.09)	(0.08)	(0.08)
Contiguity	0.25^b	0.28^b	0.26^b	0.27^b	0.24^b	0.24^c	0.27^b	0.27^b
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
$GDP_{it} + GDP_{jt}$			3.22^a	3.06^a		3.22^a		3.05^a
			(0.17)	(0.17)		(0.18)		(0.17)
N	1560	1652	1560	1652	1560	1560	1652	1652
R^2	0.693	0.721	0.692	0.719	0.693	0.692	0.721	0.719
RMSE	1.248	1.245	1.251	1.25	1.248	1.252	1.245	1.25

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

As to tax differentials, the distinction between positive and negative tax differentials fails to conclusively explain inward FDI in the sample. There is weak evidence that negative ITR differentials (i.e. lower taxes in the recipient) attract FDI, and possibly only in the EU15 recipient countries, but this effect is conditional on the size variable that is included in the estimation (column (1) versus column (3), and column (5) versus column (6)), which tends to weaken its conclusiveness. As to STR differentials, the results are quite difficult to use, as the coefficients change sign depending on the sign of the tax differential.

3.3.2 Small and large tax differentials

Non-linearities in the relation between FDI and tax differentials might also show up in the different reaction of FDI to small and large changes in tax differentials. A number of reasons could indeed explain non-linear response to taxes depending on the size of tax gaps.
First, tax codes are complex and highly instable, especially in Europe and even more in the NMS, where the compliance to the "*acquis communautaire*" for instance has forced a number of changes in tax codes and in the whole institutional environment. Second, and even though the enlarged EU is becoming an increasingly integrated area, relocating from one country to another is costly, and these relocation costs could give rise to an "arbitrage tunnel", where firms only relocate when tax changes become sizable enough. Finally, a number of tax deferrals and measures allow for partial avoidance of taxation, which is also a reason why tax differentials might impact non-linearly on FDI, as small tax differentials can be canceled out by such provisions. In such a framework, large tax differentials should matter more than small ones when investing abroad is under consideration, and a negative sign would be expected on both simple and cubic differentials. However, if tax differentials are compensating for some locational disadvantage, the outcome could be different, as lower taxes would be used as a subsidy for locating in an otherwise little attractive country, and the non-linear relation could even reverse.
Nonlinearities are investigated by including cubic tax differentials in the estimation.[21] The results are displayed in Table 9 for implicit tax rates[22].

[21] The cubic transformation keeps the sign in the tax differential.

[22] Estimates using statutory tax rates fail to provide significant and conclusive results. They are therefore not reported here.

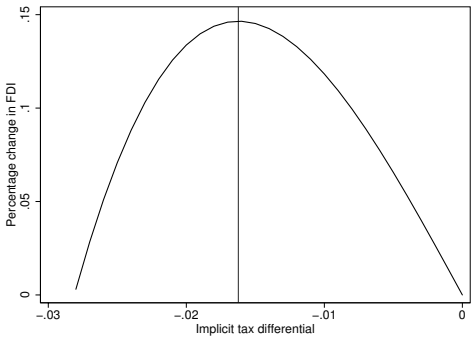
Table 9: Non-linearity of tax effects: ITR

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	-165.89^a	-165.88^a	-166.60^a	-156.60^a	-156.89^a	-157.67^a
	(11.67)	(11.67)	(11.66)	(9.19)	(9.22)	(9.22)
ITR diff.	-13.54^b			-18.33^a		
	(5.76)			(5.57)		
Cubic ITR diff.	17131.86^b	17009.02^b		16373.61^b	15972.41^b	
	(6698.82)	(6780.70)		(6713.55)	(6791.46)	
ULC diff., $j \in$ EU15	2.18^a	2.18^a	2.15^a	2.11^a	2.11^a	2.08^a
	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)	(0.47)
ULC diff. , $j \in$ NMS	0.35	0.39	0.36	-0.03	0.12	0.09
	(0.84)	(0.92)	(0.92)	(0.84)	(0.92)	(0.92)
Market pot., j	1.54^a	1.54^a	1.56^a			
	(0.56)	(0.57)	(0.57)			
GDP, i	5.47^a	5.47^a	5.48^a			
	(0.75)	(0.75)	(0.75)			
Distance	-1.05^a	-1.05^a	-1.04^a	-1.05^a	-1.05^a	-1.04^a
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
Contiguity	0.23^c	0.23^c	0.25^b	0.23^c	0.23^c	0.25^b
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
ITR diff., $j \in$ EU15		-13.61^b	-18.30^a		-18.52^a	-23.22^a
		(5.80)	(6.15)		(5.59)	(5.95)
ITR diff., $j \in$ NMS		-12.30	5.77		-14.14	3.93
		(11.94)	(14.32)		(11.96)	(14.35)
Cubic ITR diff., $j \in$ EU15			26401.09^a			25361.83^a
			(7926.31)			(7941.57)
Cubic ITR diff., $j \in$ NMS			-7323.26			-8353.53
			(12640.6)			(12671.9)
$GDP_{it} + GDP_{jt}$				3.21^a	3.22^a	3.23^a
				(0.17)	(0.17)	(0.17)
N	1560	1560	1560	1560	1560	1560
R^2	0.694	0.694	0.695	0.693	0.693	0.694
RMSE	1.246	1.246	1.244	1.249	1.249	1.248

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Because tax differentials are in levels (and not in percent), their magnitude is very limited (the minimum is -.068, with a .014 standard deviation). As a consequence, cubic tax differentials are very small, which explains the magnitude of the estimated coefficients.
Controlling for large tax differentials allows to improve the significance of the estimated coefficient on simple tax differentials, which becomes significant at the 1 to 5% level.
First,there appears to be a clear non-linear relation between tax differentials and FDI: higher (implicit) tax differential first tend to reduce inward FDI in the recipient, an effect that vanishes as tax differentials deepen, since the coefficient on the cubic tax differential is positive. Hence, when the tax differential is restricted to negative values (lower taxes in the recipient country than in the investing one), its impact on FDI appears to be bell-shaped. Table 9 also confirms the asymmetric behavior of FDI flowing to the EU15 and to the NMS, as tax differentials only affect FDI flowing to the EU15[23].
When is the impact of much lower tax rates (i.e. cubic tax differentials) fading out? This question is addressed through a simple simulation (Figure 2). The estimated coefficients in column (1) of Table 9 (no differentiation according to the geographic belonging of the destination country) are used to simulate the reaction of FDI flows (in %) to tax differentials, both natural and cubic. Since tax differentials are symmetric, only negative tax differentials are displayed here [24].

Figure 2: The non-linear impact of tax differentials



FDI does indeed react more to larger tax differentials, up to a certain threshold. Once this threshold is overtaken, the impact of larger tax discrepancies is reversed. According to the estimates in Table 9, the threshold is reached when the implicit tax differentials (in absolute value) is .0162, i.e. 1.62%. The bell-shaped curved displayed in Figure 2 therefore suggests that there are decreasing marginal returns in tax-cutting strategies, as far as these strategies aim at attracting FDI.
Within the whole sample, when only negative tax differentials are considered, 22% of implicit tax rate differentials are above this threshold in absolute value, meaning that for most recipient countries of the sample, lowering taxes would have a positive impact of inward

[23]Notice that using the sum of GDPs in the place of the GDP of the origin country and the market potential of the destination does not change the result, which is therefore robust to the specification of the gravitational determinants of FDI.

[24]99.55% of observed (negative) tax differentials lie within the $[-0.03, 0]$ range displayed in Figure 2. For those tax differentials, simulated FDI inflows are always positive.

FDI.
This might be an argument for the fear of tax competition within the EU, since the results suggests that most countries have not reached the point where lower tax rates displays decreasing marginal returns.
The results are broadly similar when the analysis is restricted to the EU15 countries (not plotted here).

3.4 Robustness checks

The estimation results displayed so far rely on two assumptions that call for further investigation. The first one is that the number of missing observations for FDI flows does not affect the results. Still, missing data might be responsible for a sample selection bias, an issue that needs to be tackled. The second one is that FDI and tax rates are exogenous, which might be questionable as far as implicit tax rates are concerned; indeed, implicit tax rates might be found to decrease when FDI enters a recipient country, if this leads to a boost in GDP[25]. There would then be reverse causality from FDI to the implicit tax rate.
The issue of missing observations is addressed through the use of a tobit estimation. In order not to inflate the number of control estimations, robustness analysis is run on the following preferred specifications:

$$\begin{aligned} \ln FDI_{ijt} &= \beta + \varphi_1 dITR_{ijt} + \chi_2 dULC_{ijt} + \alpha_1 \ln GDP_{it} + \alpha_2 \ln MPOT_{jt} \\ &\quad + \alpha_3 \ln DIST_{ij} + \alpha_4 CONTIG_{ij} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (16) \\ \ln FDI_{ijt} &= \beta + \varphi_1 dITR_{ijt} + \chi_2 dULC_{ijt} + \gamma_1 (\ln GDP_{it} + \ln GDP_{jt}) \\ &\quad + \gamma_2 \ln DIST_{ij} + \gamma_3 CONTIG_{ij} + \mu_i + \nu_j + \epsilon_{ijt} \qquad (17) \end{aligned}$$

The results for the tobit estimations are displayed in Table 10.

[25] Since there are delays in the collection of taxes, the denominator increases while the numerator is unaffected in the short run, leading to a apparent tax decrease, which in fact stems from a growth in GDP.

Table 10: Tobit estimations

	Dependent Variable: Ln of FDI			
Model :	(1)	(2)	(3)	(4)
intcpt	-117.70^a	-135.56^a	-118.44^a	-136.86^a
	(11.74)	(14.29)	(12.22)	(15.04)
ITR diff.	-8.49	-8.80^c		
	(5.66)	(5.63)		
ITR diff., $j \in$ EU15			-11.82^b	-12.32^c
			(6.56)	(6.49)
ITR diff., $j \in$ NMS			6.71	6.54
			(10.32)	(10.31)
ULC diff.	.81^c	.79^c		
	(.45)	(.45)		
ULC diff., $j \in$ EU15			.57	.56
			(.49)	(.49)
ULC diff. , $j \in$ NMS			2.24^a	2.18^a
			(.96)	(.95)
Market pot., j.	2.06^a		2.06^a	
	(.77)		(.79)	
GDP, i	2.82^a		2.86^a	
	(.74)		(.74)	
Distance	.36^a	.36^a	.37^a	.37^a
	(.08)	(.08)	(.08)	(.08)
Contiguity	2.92^a	2.92^a	2.90^a	2.90^a
	(.20)	(.20)	(.20)	(.20)
Sum of GDP		2.45^a		2.47^a
		(.25)		(.27)
N	3738	3738	3738	3738
LR χ^2	2076.78^a	2076.50^a	2080.35^a	2080.04^a
Log likelihood	-6553.69	-6553.83	-6551.91	-6552.06

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Using a tobit estimation procedure does not change the main message of the panel data estimates: although the magnitude of the coefficients associated to gravity variables are changed, the gravitational model remains significant and robust. ITR differentials tend to be more robustly associated to FDI flows, and the result that ITR differentials only affect FDI flowing to the EU15 is remains. ULC differentials still have an unexpected (though of less magnitude) impact on FDI flows, and the "anomaly" is now concentrated on the NMS, where higher ULC compared to the investing country tend to increase FDI.
The potential endogeneity of ITR and FDI is treated using instrumental variables, where ITR is instrumented using the (one period) lagged ITR. The results are displayed in Table 11.
Instrumenting the ITR yields non-significant results as far as ITR differentials are not interacted with a region-of-destination dummy. This suggests that there might indeed be reverse causality problems. Still, when the ITR differentials are interacted with the region-of-destination dummy, the results tend to confirm previous conclusions.

Table 11: Instrumentation of ITR differentials

	Dependent Variable: Ln of FDI	
Model :	(1)	(2)
intcpt	-168.30^a	-157.92^a
	(12.10)	(9.40)
ITR diff., $j \in$ EU15	-7.13	-15.49^a
	(7.51)	(6.48)
ITR diff., $j \in$ NMS	2.05	-2.29
	(14.21)	(14.08)
ULC diff., $j \in$ EU15	2.71^a	2.61^a
	(.57)	(.57)
ULC diff. , $j \in$ NMS	.46	.10
	(1.00)	(.99)
Market pot., j	1.43^b	
	(.66)	
GDP, i	5.82^a	
	(.86)	
Distance	-1.05^a	-1.06^a
	(.09)	(.09)
Contiguity	.20^c	.20^c
	(.12)	(.12)
Sum of GDP		3.32^a
		(.18)
N	1486	1486
R^2	.722	.720
RMSE	1.25	1.26

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Once again, the results are somehow conditional to the specification of the gravity equation - a feature that also showed up in previous estimations. The main conclusion seems however confirmed, that if ITR differentials ever affect FDI, they only did so over the past for EU15 countries. The unexpected and positive impact of ULC differentials on FDI is once again constrained to EU15 countries, while their impact is non-significant for FDI flowing to the NMS.

3.5 Interactions between EU25 countries

In the previous section, estimations were run as if bilateral FDI flows were the result of investors choosing to invest or not in a given location, regardless of the developments in the rest of the world. The underlying assumption is therefore that potential recipients are independent one from another. However, this might badly fit the enlarged EU, since the high and increasing trade integration of the area allows an investor to choose between a number of potential locations, given that products made in one country can easily be exported to the others. Consequently, FDI flowing into a country should not depend only on the national characteristics of the recipient country, but also on the characteristics of the "competing" countries. In the following, various aspects of the attractiveness of third countries are investigated.

The externality due to third countries taxation is measured as the difference between the tax level of potential alternative locations and the country of origin. The former variable is labeled $\overline{TAX_{jt}}$, and defined as:

$$\overline{TAX_{jt}} = \frac{1}{n} \sum_{c \neq j} TAX_{ct} \cdot \frac{MAX_c\left(DIST_{jc}\right)}{DIST_{jc}} \tag{18}$$

where c is a potential host. The weighting scheme is the relative distance between the destination country and each alternative location, on the ground that competition for attracting FDI is weaker between remote countries (because transaction costs then are overwhelming compared to tax differentials). The tax differential between the alternative locations to j and the country of origin i is then computed as follows: $\overline{TAX_{ijt}} = \overline{TAX_{jt}} - TAX_{it}$. This variable is then included in the estimation as an additional explanatory variable. We also try to discriminate the impact of competition stemming from EU15 and NMS countries, by computing the same series, and constraining the destination countries to belong to the EU15 ($\overline{EUTAX_{jt}}$) or the NMS ($\overline{NMSTAX_{jt}}$).

The results are displayed in Table 12, both for implicit (columns (1) and (2)) and statutory (columns (3) and (4)) taxation. In addition, the impact of ULC differentials with potential competitors is also investigated (column (7)), where ULC differentials with potential competitors are built in a symmetric way as ITR/STR differentials with alternative locations.

Table 12: Third country externalities

	Dependent Variable: Ln of FDI				
Model :	(1)	(2)	(3)	(4)	(5)
intcpt	-147.58^a	-137.70^a	-168.76^a	-173.69^a	-148.46^a
	(12.90)	(15.80)	(13.30)	(13.49)	(20.17)
ITR diff.	-7.99^c				
	(4.61)				
ITR diff. with alternative locs.	10.26^a				
	(3.20)				
ITR diff., $j \in$ EU15		-9.30^c			-7.76
		(5.04)			(5.11)
ITR diff., $j \in$ NMS		-3.79			-4.44
		(10.84)			(10.89)
ITR diff., alternative EU15 locs.		17.18^a			15.84^a
		(3.60)			(3.79)
ITR diff., alternative NMS locs.		2.73^a			2.62^b
		(1.02)			(1.02)
STR diff.			0.85		
			(0.64)		
STR diff. with alternative locs.			0.07		
			(0.32)		
STR diff., $j \in$ EU15				0.93	
				(0.67)	
STR diff., $j \in$ NMS				0.51	
				(1.12)	
STR diff., alternative EU15 locs.				-0.01	
				(0.57)	
STR diff., alternative NMS locs.				0.31^c	
				(0.17)	
ULC diff., $j \in$ EU15	2.45^a	3.27^a	2.11^a	2.10^a	2.68^a
	(0.47)	(0.57)	(0.50)	(0.47)	(0.67)
ULC diff. , $j \in$ NMS	-0.12	0.22	-0.34	-0.11	0.37
	(0.85)	(0.93)	(0.69)	(0.69)	(0.97)
Distance	-1.04^a	-1.05^a	-1.01^a	-1.00^a	-1.05^a
	(0.09)	(0.09)	(0.08)	(0.08)	(0.09)
Market pot., j	1.62^a	1.09^c	1.83^b	1.21^b	1.06^c
	(0.56)	(0.60)	(0.85)	(0.54)	(0.61)
GDP, i	4.70^a	4.74^a	5.34^a	6.00^a	5.18^a
	(0.78)	(0.86)	(0.95)	(0.75)	(0.95)
Contiguity	0.25^b	0.21^c	0.28^b	0.28^b	0.21^c
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
ULC diff., competitors in EU15					-1.10
					(0.96)
ULC diff., competitors in NMS					-0.70
					(0.71)
N	1560	1488	1599	1652	1488
R^2	0.695	0.701	0.727	0.72	0.701
RMSE	1.244	1.243	1.241	1.248	1.242

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Statutory taxation always fails to significantly account for FDI flows. This is not the case when implicit taxation is considered. Indeed, higher taxes in the recipient tend to deter inward FDI flows, while higher taxes in alternative potential locations tend to *increase* FDI flowing to the considered recipient country. There seem therefore to be significant tax externalities within the enlarged EU.

Further differentiating the impact of taxation in third countries show that these externalities are mostly concentrated within the EU15. Once again, higher taxes only divert FDI flowing to the EU15 countries; moreover, the externality of higher taxes in potential alternative locations is higher when the alternative locations are in the EU15, although there is some effect of higher taxation in potential NMS hosts.

This means that - at least over the past - FDI in the (enlarged) EU has been mostly affected by the competitive tax environment in other EU15 countries, and consequently that tax competition in the EU might have been circumscribed to the EU15 countries, since taxation in the NMS had no impact on FDI flowing to the EU15. Given the scarcity of data for NMS FDI, it was not possible however to isolate the determinants of FDI flowing to these countries.

Finally, as shown in Column (5), it is not possible to evidence similar externalities stemming from ULC differentials.

4 Taxation and FDI within a more general gravity setting

The standard gravity equation used so far relies on a structural equation, which imposes gravity variables to be identified to the respective sizes of partners. Including fixed effects for i and j allows to control for country-specific phenomena that could affect bilateral FDI flows independently from time. In the standard trade gravity framework, such fixed effects allow to control, *inter alia* for the impact of remoteness on relative prices (see the seminal contribution of Anderson & van Wincoop (2003)).

However, using a panel of partners through time can make the standard gravity setting less relevant, mostly because developments in the time dimension cannot be correctly controlled for. Indeed, because size variables are collinear with time, time fixed-effects could not be introduced in the analysis. As a consequence, potential bias arising from omitted variables that would affect FDI developments in the time dimension cannot be ruled out.

In order to tackle this issue, the standard gravity equation is generalized to allow for a larger control of shocks that may occur in the time and country dimension. Namely, and as stated in Section 2, FDI is regressed on a set of $i \times t$ and $j \times t$ fixed effects, that account for size effects (the GDP and market potential) and all possible development in the origin and destination country, at each period. The model is therefore more general.[26] The main drawback is of course that the model is less structural, as no estimate can be drawn for the size variables.

As a consequence of the controls for it and jt fixed effects, the model is estimated using the remaining source of variance, which is cross-pairs-of-countries (ij). Therefore, it complements the estimates provided in Section 3.

[26]This allows to overcome a number some problems that where affecting the estimations in Section 3, for instance, the fact that time fixed-effects could not be introduced in the estimates due to their collinearity with the size variables, or the (limited) collinearity between the GDP of the host and of the destination country.

4.1 Taxes and unit labor costs

Symmetrically to the estimations above, the impact of tax differentials on FDI is tested along the following lines, where unit labor cost differentials and the real exchange rate are included alternatively, and $dTAX_{ijt}$ refers respectively to ITR, STR and EATR differentials:

$$\begin{aligned} \ln FDI_{ijt} &= \beta + \alpha_1 dTAX_{ijt} + \alpha_2 dULC_{ijt} + \alpha_3 \ln RER_{ijt} + \alpha_4 \ln DIST_{ij} \\ &\quad + CONTIG_{ij} + \lambda_{it} + \kappa_{jt} + \epsilon_{ijt} \end{aligned} \tag{19}$$

The results are displayed in Table 13.[27]

[27] Because the real exchange rate is never significant, the results are not reported.

Table 13: Taxes and unit labor costs in an extended gravity framework

	Dependent Variable: Ln of FDI					
Model :	(1)	(2)	(3)	(4)	(5)	(6)
intcpt	7.40^a	7.90^a	7.42^a	12.98^a	5.60^a	4.96^a
	(1.82)	(1.82)	(1.74)	(1.63)	(1.74)	(1.81)
ITR diff.	-4.78	-22.18^b				
	(8.77)	(10.54)				
STR diff.			-5.15^a	-6.40^a		
			(1.22)	(1.29)		
EATR diff.					-0.05^a	-0.04^a
					(0.01)	(0.01)
ULC diff.		-6.85^a		-4.29^a		-2.29
		(2.31)		(1.44)		(1.74)
Distance	-1.15^a	-1.16^a	-1.10^a	-1.10^a	-1.04^a	-1.03^a
	(0.09)	(0.09)	(0.08)	(0.08)	(0.10)	(0.10)
Contiguity	0.17	0.16	0.24^b	0.24^b	0.39^a	0.40^a
	(0.13)	(0.13)	(0.012)	(0.12)	(0.14)	(0.14)
N	1560	1560	1656	1652	1235	1235
R^2	0.765	0.767	0.787	0.788	0.797	0.797
RMSE						

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Distance (the remaining observable gravity variable) remains significant and stable as far as the magnitude of the estimated coefficient is concerned, and the explanatory power of the regression is improved, due to the number of fixed effects. Beyond these observations, the striking result is now that statutory and effective average taxation turn out to significantly explain FDI inflows within the sample, while the explanatory power of implicit taxation remains - though once again with weaknesses. This suggests that the impact of taxation is magnified within the cross-section (i.e ij) dimension.
The estimated coefficient on statutory taxation lies within the usually estimated range (when significant), close to -5. Because the EATR is specified in percentage points, the estimated coefficients is a hundred times smaller. Therefore, the semi-elasticity is in fact comparable for both tax measures.[28]

4.2 Further analysis

The analysis is further developed by taking into account the geographic belonging of the countries of destination, according to the following specification:

$$\begin{aligned} \ln FDI_{ijt} &= \beta + \alpha_1 EU_j dTAX_{ijt} + \alpha_2 (1 - EU_j) dTAX_{ijt} \\ &\quad + \alpha_3 EU_j dULC_{ijt} + \alpha_4 (1 - EU_j) dULC_{ijt} \\ &\quad + \alpha_5 \ln DIST_{ij} + CONTIG_{ij} + \lambda_{it} + \kappa_{jt} + \epsilon_{ijt} \end{aligned}$$

The results are displayed in Table 14.

[28]Notice that, in the case of ITR differentials, the results are robust to the use of two-stage least squares for netting implicit taxation from potential reverse causality - namely, the tax differential is instrumented using its one-period lagged value. The results are not reported here but are available upon request from the author.

Table 14: Differentiating tax and cost variables according to the region of destination

	Dependent Variable: Ln of FDI							
Model :	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
intcpt	7.67^a	5.09^a	7.45^a	8.32^a	15.39^a	12.92^a	9.98^a	7.85^a
	(1.80)	(1.88)	(1.82)	(1.76)	(2.18)	(1.63)	(3.27)	(2.19)
ITR diff., $j \in$ EU15	12.55	15.35	-4.70					
	(9.39)	(9.38)	(11.18)					
ITR diff., $j \in$ NMS		-48.07^a	-33.52^a	-58.21^a				
		(12.39)	(12.86)	(13.39)				
Distance	-1.17^a	-1.17^a	-1.19^a	-1.07^a	-1.07^a	-1.10^a	-1.02^a	-1.02^a
	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)	(0.10)	(0.10)
Contiguity	0.22^c	0.23^c	0.20	0.27^b	0.29^b	0.25^b	0.40^a	0.41^a
	(0.13)	(0.13)	(0.13)	(0.12)	(0.12)	(0.12)	(0.14)	(0.14)
RER, $j \in$ EU15		12.31^a			9.12^a			-8.05
		(2.79)			(2.92)			(4.91)
RER, $j \in$ NMS		-0.37			-0.41			4.78
		(1.82)			(1.72)			(3.37)
ULC diff., $j \in$ EU15			-8.10^a			-6.17^a	2.18	
			(2.44)			(1.86)	(3.89)	
ULC diff., $j \in$ NMS			-3.01			-1.97	-3.37^c	
			(2.55)			(1.63)	(1.98)	
STR, $j \in$ EU15				-5.60^a	-2.96^b	-5.86^a		
				(1.23)	(1.44)	(1.32)		
STR, $j \in$ NMS				-1.86	0.00	-3.22^c		
				(1.66)	(1.73)	(1.80)		
EATR diff., $j \in$ EU15							0.80	-1.38
							(1.65)	(1.91)
EATR diff., $j \in$ NMS							-0.06^a	-0.07^a
							(0.02)	(0.01)
N	1560	1507	1560	1656	1603	1652	1235	1186
R^2	0.77	0.781	0.772	0.789	0.797	0.789	0.798	0.803
RMSE	1.277	1.258	1.271	1.276	1.264	1.273	1.232	1.227

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Distance remains a significant and stable determinant of FDI inflows. As far as the cost-related determinants are concerned, the conclusions of the estimates displayed in Table 14 are somehow different from the outcomes of a standard gravity specification. Indeed, the negative impact of higher implicit tax rates in the recipient country are now circumscribed to the NMS, while ITR differentials fail to significantly explain FDI flowing to the EU15 countries. But the reverse is obtained when using statutory tax rates, where STR differentials only affect FDI flowing to the EU15 (column (4) in Table 14), or affect mostly FDI flowing to the EU15 (the coefficients in column (6) are statistically different for EU15 countries and NMS, suggesting that the tax-elasticity of FDI is indeed larger for the countries of the EU15). Finally, using average effective tax rates yields mixed results (EATR differentials only affect FDI flowing to the NMS, as is the case for ITR, and the impact of ULC differential is limited to NMS recipients, a result which is the reverse of what is obtained when using the two alternative tax variables).[29]
Here, real exchange rates tend to affect FDI flowing to the EU15 - but not to the NMS - , in such a way that a real depreciation tends to increase inward FDI, while ULC differentials also have an asymmetric impact, restricted to the EU15 countries.[30]

Similarly to the estimates displayed in Table 8, positive and negative tax differentials are identified through an interactive dummy, as in Equations (20) and (21) below:

$$\begin{aligned}
\ln FDI_{ijt} &= \beta + \varphi_1 POS_{ijt} \cdot dTAX_{ijt} + \varphi_2 NEG_{ijt} \cdot dTAX_{ijt} \\
&\quad + \chi_1 EU_j \cdot dULC_{ijt} + \chi_2 (1 - EU_j) \cdot dULC_{ijt} \\
&\quad + \alpha_1 \ln DIST_{ij} + \alpha_2 CONTIG_{ij} + \mu_{it} + \nu_{jt} + \epsilon_{ijt} \qquad (20) \\
\ln FDI_{ijt} &= \beta + \varphi_1 EU_j \cdot POS_{ijt} \cdot dTAX_{ijt} + \varphi_2 (1 - EU_j) \cdot POS_{ijt} \cdot dTAX_{ijt} \\
&\quad + \varphi_3 EU_j \cdot NEG_{ijt} \cdot dTAX_{ijt} + \varphi_4 (1 - EU_j) \cdot NEG_{ijt} \cdot dTAX_{ijt} \\
&\quad + \chi_1 EU_j \cdot dULC_{ijt} + \chi_2 (1 - EU_j) \cdot dULC_{ijt} \\
&\quad + \alpha_1 \ln DIST_{ij} + \alpha_2 CONTIG_{ij} + \mu_{it} + \nu_{jt} + \epsilon_{ijt} \qquad (21)
\end{aligned}$$

The results are displayed in Table 15

[29]Notice that EATR data come from two different sources - Devereux et al. for the EU15, and Bellak et al. for the NMS; since the results are mostly dominated by the variance in the cross-country dimension, it could be the case that the heterogeneity of the data has an impact on the results.

[30]Hence, the non-significant impact of the real exchange in the estimation of equation (19) is not confirmed, and the results suggest that the strong heterogeneity in the enlarged EU sample might be responsible for this.

Table 15: Impact of positive versus negative tax differentials

	Dependent Variable: Ln of FDI			
Model :	(1)	(2)	(3)	(4)
intcpt	7.35^a	13.04^a	7.80^a	12.95^a
	(1.82)	(1.63)	(1.80)	(1.63)
ITR diff. > 0	-46.62^a			
	(11.66)			
ITR diff. < 0	11.62			
	(12.67)			
ULC diff., $j \in$ EU15	-8.75^a	-6.76^a	-4.31	-6.04^a
	(2.42)	(1.81)	(2.62)	(1.96)
ULC diff., $j \in$ NMS	-2.93	-2.24	-1.13	-1.82
	(2.55)	(1.61)	(2.58)	(1.64)
Distance	-1.19^a	-1.09^a	-1.18^a	-1.08^a
	(0.09)	(0.08)	(0.09)	(0.08)
Contiguity	0.12	0.23^c	0.20	0.25^b
	(0.13)	(0.12)	(0.12)	(0.12)
STR diff. > 0		-8.29^a		
		(1.63)		
STR diff. < 0		-4.01^a		
		(1.45)		
ITR diff. > 0, $j \in$ NMS			-100.15^a	
			(15.31)	
ITR diff. > 0, $j \in$ EU15			-15.05	
			(13.07)	
ITR diff. < 0, $j \in$ NMS			40.26	
			(26.02)	
ITR diff. < 0, $j \in$ EU15			31.83^b	
			(13.20)	
STR diff. > 0, $j \in$ NMS				-6.13^c
				(3.51)
STR diff. > 0, $j \in$ EU15				-8.22^a
				(1.79)
STR diff. < 0, $j \in$ NMS				-1.99
				(2.44)
STR diff. < 0, $j \in$ EU15				-4.27^a
				(1.53)
N	1560	1652	1560	1652
R^2	0.773	0.79	0.778	0.79
RMSE	1.269	1.271	1.256	1.271

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

Once again, unit labor cost differentials only impact FDI when the recipient belongs to the EU15. Turning to tax differentials, columns (1) and (2) suggest that only *positive* tax differentials (adversely) affect FDI, meaning that FDI is diverted by higher taxes in the recipient, while lower taxes either have no significant impact (in the case of ITR, column (1)), or have a significantly smaller impact (in the case of STR, column (2)). These results seem to be mostly robust in the case of statutory taxation (see column (4), where positive and negative tax differentials are further interacted with a geographical belonging dummy).
The fact that FDI is not much attracted by low taxes in the recipient, but diverted by higher taxes, tends to confirm previous results obtained on the OECD (see Bénassy-Quéré et al. (2005)).
The non-linear impact of tax differentials on FDI is also investigated within the extended gravitational framework. Therefore, the following equation is estimated, both on ITR and STR differentials:

$$\begin{aligned}
\ln FDI_{ijt} &= \beta + \varphi_1 dTAX_{ijt} + \varphi_2 dTAX_{ijt}^3 \\
&\quad + \chi_1 EU_j \cdot dULC_{ijt} + \chi_2 \left(1 - EU_j\right) \cdot dULC_{ijt} \\
&\quad + \alpha_1 \ln DIST_{ij} + \alpha_2 CONTIG_{ij} + \mu_{it} + \nu_{jt} + \epsilon_{ijt} \qquad (22) \\
\ln FDI_{ijt} &= \beta + \varphi_1 EU_j dTAX_{ijt} + \varphi_2 (1 - EU_j) dTAX_{ijt} \\
&\quad + \varphi_3 EU_j dTAX_{ijt}^3 + \varphi_4 (1 - EU_j) dTAX_{ijt}^3 \\
&\quad + \chi_1 EU_j \cdot dULC_{ijt} + \chi_2 \left(1 - EU_j\right) \cdot dULC_{ijt} \\
&\quad + \alpha_1 \ln DIST_{ij} + \alpha_2 CONTIG_{ij} + \mu_{it} + \nu_{jt} + \epsilon_{ijt} \qquad (23)
\end{aligned}$$

The results are displayed in Table 16.

Table 16: Non-linearity of tax effects

	Dependent Variable: Ln of FDI			
Model :	(1)	(2)	(3)	(4)
intcpt	7.31^a	7.41^a	12.98^a	12.85^a
	(1.83)	(1.82)	(1.63)	(1.63)
ITR diff.	-30.99^a			
	(11.67)			
Cubic ITR diff.	15135.35^c			
	(8706.23)			
ITR diff., $j \in$ EU15		-18.14		
		(12.31)		
ITR diff., $j \in$ NMS		-45.98^b		
		(18.37)		
Cubic ITR diff., $j \in$ EU15		25351.15^a		
		(9518.48)		
Cubic ITR diff., $j \in$ NMS		-16672.99		
		(18653.1)		
STR diff.			-5.33^a	
			(1.35)	
Cubic STR diff.			-6.33	
			(5.47)	
STR diff., $j \in$ EU15				-5.74^a
				(1.36)
STR diff., $j \in$ NMS				-0.86
				(2.07)
Cubic STR diff., $j \in$ EU15				-3.21
				(5.66)
Cubic STR diff., $j \in$ NMS				-42.92^b
				(18.42)
ULC diff., $j \in$ EU15	-9.38^a	-8.44^a	-7.04^a	-6.06^a
	(2.43)	(2.44)	(1.81)	(1.86)
ULC diff., $j \in$ NMS	-3.09	-3.22	-2.51	-1.68
	(2.57)	(2.55)	(1.61)	(1.64)
Distance	-1.19^a	-1.18^a	-1.11^a	-1.09^a
	(0.09)	(0.09)	(0.08)	(0.08)
Contiguity	0.14	0.20	0.24^c	0.27^b
	(0.13)	(0.13)	(0.12)	(0.12)
N	1560	1560	1652	1652
R^2	0.769	0.774	0.789	0.79
RMSE	1.279	1.268	1.274	1.271

Note: Standard errors in parentheses: ^{a}, ^{b} and ^{c} stand for statistical significance at the 1%, 5% and 10% levels respectively.

The non-linear impact of taxation on FDI is once again confirmed: higher taxes tend to divert FDI (alternatively, because positive and negative tax differentials are not differentiated, lower taxes tend to attract FDI), but this effect is reversed once some threshold level is overcome. According to column (1), the threshold is close to a 2.6 percentage points ITR differential, which is larger that the threshold that derived from an estimation based on the standard gravity equation. This suggests that, in the cross-country (i.e. ij) dimension, FDI is more sensitive to tax differentials, a conclusion that is consistent with the results displayed so far.
Things are different when statutory taxation is used, since in that case the response of FDI flows to tax differentials is linear. A possible interpretation of this result is that, because statutory taxation is more transparent and observable, firms can react quite simply to shifts in taxation.
On the opposite, because implicit taxation is much more difficult to observe (among other reason, because it is known with some delay due to the tax collection systems) and therefore subject to some noise, firms may find it costly to relocate when tax changes are small - because it can be difficult to determine whether the change in tax is a permanent or transitory shock - or when they are large - because large change in ITR can also compensate for larger public expenses for instance, that can enter positively the production function of the firms.
Notice that, in all cases, differentiating according to the geographical belonging of destination countries yields no consistent result.

The results so far suggest that intra-EU FDI does indeed react to tax differentials, but that this reaction is subtle - if not fragile. When estimates are run mostly on the time dimension, it is only implicit taxation that has an impact on FDI - and more precisely tax developments in the EU15 countries. Tax developments in the NMS fail to have any significant impact on FDI inflows. When the empirical analysis relies predominantly on the cross-country dimension of the panel, the conclusions are reversed for implicit taxation, which appears to be less significant, and when significant, mostly affecting FDI flowing to the NMS. As to statutory taxation, it appears to be significant in explaining FDI flows, and there is evidence that its impact is mostly concentrated on intra-EU15 FDI flows. This last set of results is used to draw some policy-oriented conclusions about the risks and consequences of tax competition/harmonization within the enlarged EU, through the use of simulation exercises. Before these exercises are implemented, a word of caution is needed, since the results show that the impact of taxation on FDI is highly conditional to the specification - i.e. to the kind of information, cross-sectional or temporal, that is privileged.

5 Scenarios for tax harmonization within the EU25

Here, the estimates on statutory taxation are used to investigate the impact of various harmonization/competition scenarios in the enlarged EU. Indeed, statutory taxation is an economic policy tool, that can be directly and easily handled.
However, the semi-elasticities of FDI to tax differentials are non-significant for NMS, and simulation exercises focusing on the impact of tax changes in these countries could appear to be worthless (see for instance Table 14). Still, the elasticities are estimated over the past, and for this reason, the estimates performed on a sample including the NMS (hereafter labeled "*in sample*" estimates) might no reflect the long-run behavior of these countries. Indeed, FDI inflows in the NMS might so forth have been reflecting more their fast opening-up to capital flows and their recent economic restructuring, than their long-run behavior as regards inward capital flows.
In the longer run, while the NMS converge towards EU15 income levels and capital ratios,

they might behave more similarly to the EU15 in many respects, which would imply that the tax elasticity of FDI inflows could be similar in the NMS and in the EU15. In the following, a number of simulations of the impact of various competition/harmonisation scenarios are performed, according to the assumption that the NMS and the EU15 will eventually behave similarly in terms of capital sensitivity to taxes.
The large number of estimates provided in this paper using the "general" gravity equation (i.e. using it and jt fixed effects) all converge to a same elasticity of FDI to statutory tax differentials, close to -5 (see columns (3) and (4) in Table 13, where EU15 and NMS recipients are not differentiated, columns (4) and (6) in Table 14 where they are differentiated, or even column (3) in Table 16, where non-linearity is allowed). Therefore, this value is chosen here as the benchmark one, and used for all simulations.

Two scenarios of tax changes are investigated:[31]

1. Strict harmonisation: implicit tax rates are constrained to be equal (hence the tax differentials are zero). Because the estimates are run on tax differentials, and harmonisation by definition implies that these are set to zero, the exercise is unable to investigate the impact of setting the harmonized tax rate to different levels. In particular, it is not possible to differentiate between the impact of tax competition, defined as a cut in tax rates to the lowest level of the sample, and the impact of harmonization of a potentially high common tax level.[32] Notice however that strict harmonization is quite unlikely within the EU, given the large dispersion in social preferences which makes unanimity on this issue quite difficult to reach. For this reason, an alternative scenario is also simulated.

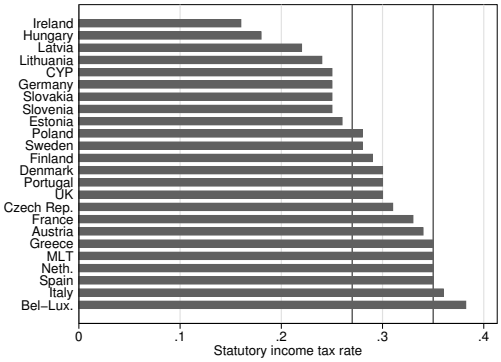
2. Harmonization of tax rates within a range. Harmonizing tax rates within a range leaves room for different social preferences to coexist, but also provides boundaries to tax competition. The main issue is to determine the width of the range, since an excessively tiny range is equivalent to strict harmonization, while a very large range provides weak limitations to tax competition. Here, the range is set at $\pm$ one standard deviation around the (non-weighted) mean of the observed implicit tax rates in 2002. Hence, countries are constrained to exhibit tax rates either at their existing level, whenever this lies inside the range, or a the nearest extreme value of the range. More precisely, the range lies within the $[0.27, 0.35]$ interval, the mean STR being 31%.

Figure 3 summarizes the data for taxation in the countries of the sample.

[31] Simulations are run only on those pairs of countries for which an investment flow was recorded in 2002, in order not to bias the comparison between the baseline - observed tax differentials - and the scenario.

[32] The impact would be the same as harmonization, the only difference being that more FDI might be attracted from the rest of the world, an issue that is out of the focus of this paper since the analysis is run on a close, EU25, setting.

Figure 3: Statutory tax rates in 2002



Source: Eurostat. The vertical lines describe the lower and upper tax rates that are allowed when harmonisation is restricted to take place within a range of tax rates.

5.1 Harmonisation

The consequences of complete harmonization of statutory tax rates (i.e., setting tax differentials to zero) is plotted in Figure 4.[33] All figures should be read *other things equal*, since the simulation exercise only consists in changing the tax differential for each country.

The average statutory tax differential is close to -5%, with some cross-country variance, since its standard deviation is close to 8%. This is the reason why the magnitude of the gains/losses lies between -5 and 5% of total FDI flowing to the countries of the sample. The ranking of winners and losers is trivially similar to the ranking of countries by level of statutory tax rate, as displayed in Figure 3: the low-taxing countries would lose to a convergence of statutory tax rates to the same level, as their "competitive" advantage would then be cut. Symmetrically, the high-taxing countries would gain from being more competitive in terms of taxation, against their partners. Because most NMS exhibit low taxes, they would almost all belong to the set of losers (to the exception of the Czech Republic, which would be indifferent to tax harmonization).

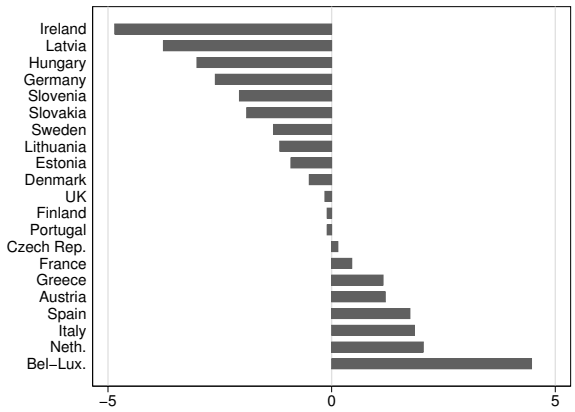
Still, the order of magnitude of gains and losses is in most cases limited. In the case of Hungary for instance, *total* inward FDI[34] in 2002 was only 4.5% of GDP, a 3% loss in FDI inflows would amount to 0.14% of GDP, which is not a very large impact - even less if only EU15 FDI flows were considered of course. The impact is more important for Ireland, where FDI is a much larger share of GDP (almost 24%) and where a 5% of FDI flows would therefore represent 1.2% of GDP - once again, the impact for intra-EU FDI would be less. In

[33] Recall that, in this setting, strict harmonization is technically identical to a *race to the bottom* that would bring all tax rates to the lowest level.

[34] Here, we use FDI data from the World Investment report; FDI data are aggregated, and concern both FDI flowing from the EU15 and from the rest of the world. While this raises some issue about the comparability with the results of the estimations, data are consistent as far as GDP and FDI flows are concerned. This amounts to considering that the STR elasticity of FDI inflows is the same whether FDI stems from the EU15 or the rest of the world - essentially the US and Japan

Figure 4: Strict harmonization of statutory tax rates

Impact on total FDI flowing to the country, in %.



the case of Luxembourg and Belgium, data are only available for 2001, and point to a 1.8% of GDP impact of setting tax differentials to zero. However, because these are small countries, the amounts are limited: the loss would be 1.4 billions USD in the case of Ireland, and the gain would be 4.4 billions USD in the case of Belgium-Luxembourg, to be compared to a total amount of FDI inflows into the the EU of 420 billions of USD in 2002 (source: World Investment Report 2004, recall that calibration is done here on total inward FDI, not only intra-EU FDI flows).

5.2 Setting a range of tax rates

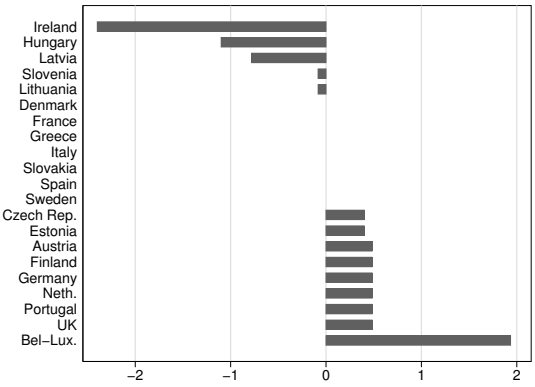
Tax rates are constrained to belong to a range, which is centered on the mean of statutory tax rates in 2002, and which bounds are $\pm$ the standard deviation of the implicit tax rates in 2002. The range is measured using tax rates for all EU25 countries, and lies within the $[0.27, 0.35]$ interval. The outcome of such a harmonization is described in Figure 5.

By construction, most countries belong to the range: for them, harmonization leads to unchanged tax levels (and little affected tax differentials), so that the impact on inward FDI is very limited, in most cases less than 1% of observed FDI flows. The main loser would be Ireland, which, with a 16% tax rate, exhibits the lowest tax rate of the sample, more than 8 percentage points lower than the lower bound of the harmonization rule set here. With a tax rate over 38%, the Belgium-Luxembourg area would gain a large amount of FDI from harmonization within a range - but would gain even more from complete harmonization.

Obviously, because the losses and gains would be smaller, and because most countries would be unaffected, harmonization within a range would probably by easier to implement than a convergence of all taxes to the same level.

Figure 5: Harmonization of tax rates within a range

Impact on total FDI flowing to the country, in %.



6 Conclusion

Since the beginning of the transition process, Central and Eastern European countries have engaged in a high-speed opening-up process, which has resulted, among other phenomena, in increasing opening to capital flows. This has went along with large corporate tax reforms in most countries, consisting in both lowering statutory rates and broadening the definition of the taxable income. This double process has raised suspicion that these countries were undertaking (potentially successful) tax competition, and might force their neighbors to engage into a "race to the bottom".

Measuring the tax elasticity of FDI flows is needed to assess the strength of such an argument. Recent work in this field suggests that the gravity equation is a powerful tool to investigate the determinants of foreign direct investment flows. Moreover, it allows for a bilateral analysis, which is the most appropriate way to account for the impact of tax incentive on the location decision by firms. In this paper, FDI flowing from EU15 countries to the EU15 and the NMS is explained by the size of the investor, the market potential of the host, the distance between both country and additional gravity variables (contiguity, common language). It can be shown that these are structural determinants of FDI, in the sense that their impact is unconditional on the region of destination of FDI. Within this framework, taxation appears as an unevenly significant determinant of FDI. Using a more général framework, where the size variables are captured through origin-and-time and destination-and-time fixed effects does not affect this général conclusion.

More precisely, when the standard gravity equation is used, estimates are performed using the remaining variance in the sample, which lies in the time-series dimension of the panel. In this case, only implicit taxation can be shown to be a significant tax determinant of FDI flows, while statutory and *ex-ante* taxation fail to significantly explain location decisions. Moreover, the EU25 sample is heterogeneous with respect to the impact of "attractiveness" determinants on FDI. Indeed, we show that the impact of taxation and unit labor costs depends on the region of destination of FDI flows. Unit labor costs are shown to have an overall unexpected impact on FDI, since higher labor costs in the recipient country tend to

increase FDI; this effect however is limited to FDI flowing to the EU15 countries, which could reflect a quality measurement problem. As to tax differentials, when significant, they also only affect investment decision when the investor targets an EU15 country, with a potential non-linear impact. Taking into account competition between potential host countries for attracting FDI confirms that tax incentives are significantly affecting FDI decisions only within the EU15 countries of the sample: on the whole sample, higher taxes in alternative potential locations tend to increase FDI in a given country, but this proves to be the result of the sensitivity of FDI flows going the EU15 only, since FDI flowing to the NMS is not affected by tax changes in other potential locations.

When the extended gravity framework is used, the remaining variance lies in the cross-sectional (ij) dimension. In this case, statutory taxation and effective average taxation can also be shown to significantly affect FDI, together with implicit taxation. Still, this does not lead to reverse the main conclusion that, over the period of analysis, taxation has mainly affected investment decisions *within* the EU15, while FDI flowing to the NMS where little dependent on tax differentials.
Who should then be afraid of tax competition? According to the finding in this paper, there is indeed some ground for "old" member states to fear the impact of uncoordinated drops in taxation. However, while most old and continental member states would fear competition from Eastern European new member states, this paper shows that tax cuts in these countries are ineffective determinants of capital flows, and that the EU15 is mostly affected by tax changes *within* the EU15.

However, this does not mean that tax competition stemming from NMS should not be a concern for the future. The asymmetry this paper evidences between "old" and "new" EU countries is deemed to narrow with the real convergence of the NMS. Part of it might have already disappeared. Indeed, the empirical analysis is run mostly on the 1990s, a period when FDI was flowing to the NMS mostly thanks to the privatization process. At that period, tax incentives were most likely weighting very little compared to the other determinants of FDI flows (entering and possibly preempting new markets, that were additionally close to the EU15). However, the privatization process is now running to its end, and more traditional determinants of FDI will probably have a larger impact on FDI decisions. The recent reforms in taxation, marked by a lowering of statutory tax rates (although the definition of the taxable income was simultaneously enlarged), could well lead to more tax-motivated FDI. Nevertheless, simulation exercises based on the results for statutory taxation show that tax competition might have limited impact on FDI: based on FDI and tax developments in 2002, the convergence of all tax rates to the same level would have produced a maximum drop of FDI by 5% of observed flows (in Ireland), while the impact would have bee less than ($\pm$) 2% in most countries of the sample, depending on their initial tax levels. Harmonizing tax rates to that tax differentials lie within a range would have almost no impact on most of the countries of the sample, and could be considered as a way to dampen the fears for tax competition.

References

Anderson, J. E. & van Wincoop, E. (2003), 'Gravity with gravitas: a solution to the border puzzle', *American Economic Review* **93**(1), 170–92.

Andersson, F. & Forslid, R. (2003), 'Tax competition and economic geography', *Journal of Public Economic Theory* **5**(2), 279–303.

Baldwin, R. E. & Krugman, P. J. (2004), 'Agglomeration, integration and tax harmonisation', *European Economic Review* **48**(1), 1–23.

Bellak, C., Leibrecht, M. & Römisch, R. (2005*a*), 'Foreign direct investment and taxation: Some methodological aspects and new evidence for central and eastern european countries', *OeNB Workshop Proceedings* **Capital Taxation after EU Enlargement**.

Bellak, C., Leibrecht, M. & Römisch, R. (2005*b*), 'Foreign direct investment in central- and east european countries: A panel study', *mimeo* .

Bénassy-Quéré, A., Fontagné, L. & Lahrèche-Révil, A. (2005), 'How does foreign direct investment react to corporate taxation?', *International Tax and Public Finance* **12**(5), 583–603.

Beyer, J. (2002), 'Please invest in our country. how successful were the tax incentives for foreign direct investment in transition countries?', *Communist and Post-Communist Studies* **35**(2), 191–211.

Brenton, P., Di Mauro, F. & Lücke, M. (2000), 'Economic integration and foreign direct investment: An empirical analysis of foreign direct investment in the eu and in central and eastern europe', *Empirica* **26**(2), 95–121.

Campos, N. F. & Kinoshita, Y. (2003), 'Why does foreign direct investment go where it goes? new evidence from the transition economies', *NBER Working Paper* **WP/03/223**.

Carstensen, K. & Toubal, F. (2005), 'Foreign direct investment in central and eastern european countries: A dynamic panel analysis', *Journal of Comparative Economics* **32**(1), 3–22.

Cheng, I.-H. & Wall, H. J. (2005), 'Controlling for heterogeneity in gravity models of trade and integration', *Federal Reserve Bank of St. Louis Review* pp. 49–63.

De Mooij, R. A. & Ederveen, S. (2003), 'Taxation and foreign direct investment: a synthesis of empirical research', *International Tax and Public Finance* **10**, 673–93.

De Mooij, R. A. & Ederveen, S. (2005), How does foreign direct investment respond to taxes? a meta analysis. Paper prepared for the Conference on Foreign Direct Investment and Taxation, Nottingham, Monday 3th October 2005.

Desai, M. A. & Hines, J. R. (2001), 'Foreign direct investment in a world of multiple taxe', *NBER Working paper* **8440**.

Devereux, M. (2003), 'Measuring taxes on income from capital', *CESIFO Working Paper* **962**.

Devereux, M. & Griffith, R. (1998), 'Taxes and the location of production: Evidence from a panel of us multinationals', *Journal of Public Economics* **68**(3), 335–67.

Devereux, M. & Griffith, R. (2002), 'Evaluating tax policy for location decisions', *CEPR Discussion paper* **3247**.

Diamond, P. A. & Mirrlees, J. (1971), 'Optimal taxation and public production, i: Production efficiency (ii: Tax rules)', *American Economic Review* **61**, 8–27.

Edmiston, K., Mudd, S. & Valev, N. (2003), 'Tax structure and foreign direct investment: The deterrent effects of complexity and uncertainty', *Fiscal Studies* **24**, 341–59.

Garibaldi, P., Mora, N., Sahay, R. & Zettelmeyer, J. (2001), 'What moves capital to transition economies?', *IMF Staff Papers* **48**, 109–45.

Gordon, R. H. (1986), 'Taxation of investment and savings in a world economy', *American Economic Review* **76**, 1086–1102.

Gordon, R. H. & Hines, J. (2002), 'International taxation', *NBER Working Paper* **8854**.

Haufler, A. & Wooton, I. (1999), 'Country size and tax competition for foreign direct investment', *Journal of Public Economics* **71**, 121–39.

Head, K., Ries, J. & Swenson, D. (1999), 'Attracting foreign manufacturing: Investment promotion and agglomeration', *Regional Science and Urban Economics* **29**, 197–218.

Hines, J. R. (1999), 'Lessons from behavioral responses to international taxation', *National Tax Journal* **52**(2), 305–23.

King, M. A. & Fullerton, D. (1984), *The Taxation of Income from Capital*, Chicago: University of Chicago Press.

Ludema, R. D. & Wooton, I. (2000), 'Economic geography and the fiscal effects of regional integration', *Journal of International Economics* **52**(2), 331–57.

Markusen, J. R. (1995), 'The boundaries of multinational enterprises and the theory of international trade', *Journal of Economic Perspectives* **9**, 169–189.

Mody, A., Razin, A. & Sadka, E. (2002), 'The role of information in driving foreign direct investment: Theory and evidence', *NBER Working Paper* **9255**.

Mutti, J. & Grubert, H. (2004), 'Empirical asymmetries in foreign direct investment', *Journal of International Economics* **62**, 337–58.

Portes, R., Rey, H. & Oh, Y. (2001), 'Information and capital flows: The determinants of transactions in financial assets', *European Economic Review* **45**, 783–96.

Razin, A. & Sadka, E. (1991), 'Efficient investment incentives in the presence of capital flight', *Journal of International Economics* **31**, 171–18.

Scholes, M. & Wolfson, M. A. (1990), 'The effects of changes in tax law on corporate reorganization activity', *Journal of Business* **63**, 141–164.

Shiells, C. (2003), 'Foreign direct investment and the investment climate in cis countries', *IMF Policy Discussion Paper* **forthcoming**.

Stöwhase, S. (2002), Profit shifting opportunities, multinationals, and the determinants of foreign direct investment, Discussion Papers in Economics 29, University of Munich, Department of Economics. available at http://ideas.repec.org/p/lmu/muenec/29.html.

Tiebout, C. M. (1956), 'A pure theory of local expenditures', *Journal of Political Economy* **64**(64), 416–24.

Walkenhorst, P. (2004), 'Economic transition and the sectoral patterns of foreign direct investment', *Emerging Markets Finance and Trade* **40**(2).

Wilson, J. D. (1999), 'Theories of tax competition', *National Tax Journal* **LII**(2), 263–304.

A Source of data and definition of variables

Foreign direct investment. Foreign direct investment data are taken from Eurostat. The raw data are in current euro (ECU before 1999) millions. They are converted into volumes using the price index of the gross fixed capital formation (GDCF) of the destination country. GFCF data are taken from national data sources (using Datastream) or from the OECD. When unavailable, these data where built using the implicit GFCF deflator, computed from GFCF data in volume and value. GFCF indices are in national currency, and were converted into euros using the nominal exchange rate (source: World Bank, *Word Development indicators*).

Tax data. Statutory taxation was taken from the Devereux-Griffith database, when available. Eurostat and national sources were used to fill missing values. Implicit tax rates were computed using the tax revenue of corporate income taxation (OCDE, line 1200) and GDP (OCDE) or value added (source: World Bank, *Word Development indicators*). Effective average taxation is taken from Devereux and Griffith for the EU15 countries, and from Bellak et al. (2005*a*) for the NMS.

Gravity variables. GDP data were taken from the World Bank, *Word Development indicators*. These are volume data, converted using purchasing parity standards (PPS). This ensures comparability of GDP data both in the time and in the cross-sectional dimension. International and internal distance, together with common language and contiguity dummies, were taken from the CEPII website.[35] The market potential is defined as GDP (in volume and PPS) deflated by internal distance. Alternative measures (described in the text) sum the market potential of a given country with the market potential (or GDP, depending on the definitions) of its partners, weighted by bilateral distance.

Other cost variables. The real exchange rate is computed using nominal exchange rate and CPI indexes, all data being taken from the IMF, *International financial statistics*, line 00rf for the nominal exchange rate and 64 for the CPI. The real exchange rate is normalized to 100 in 2000, and an increase in its value is a real appreciation in the investing country, and a real depreciation for the host country. Unit labor costs are taken from the OECD, and converted into the same currency using nominal exchange rates.

[35] Free download at http://www.cepii.fr/anglaisgraph/bdd/distances.htm

B Correlation statistics

Table 17: Correlation of exogenous variables

	$dITR$	$dSTR$	$dEATR$	$dULC$	$\ln RER$	$\ln GDP$	$\ln MPOT$	SUM GDP
$dITR$	1.0000							
$dSTR$	-0.0560	1.0000						
$dEATR$	-0.1081	-0.0848	1.0000					
$dULC$	-0.0025	0.0308	-0.0713	1.0000				
$\ln RER$	0.1747	-0.1047	0.2156	-0.3896	1.0000			
$\ln GDP$	0.0131	-0.3626	0.2249	-0.1257	-0.0600	1.0000		
$\ln MPOT$	-0.0707	0.3696	-0.2543	0.1385	0.0321	-0.2078	1.0000	
SUM GDP	-0.0000	0.0000	0.0000	-0.0000	0.0000	0.7115	0.4962	1.0000

Note: $dITR$: implicit tax rate differential; $dSTR$: statutory tax rate differential, $dEATR$: ex-ante tax rate differential, as provided by Bellak et al. (2005*a*).

LIST OF THE WORKING PAPERS RELEASED BY CEPII

N°	*Titre*	*Auteurs*
2006-10	A Quantitative Assessment of the Outcome of the Doha Development Agenda	Y. Decreux & L. Fontagné
2006-09	Disparities in Pension Financing in Europe: Economic and Financial Consequences	J. Château & X. Chojnicki
2006-08	Base de données CHELEM-BAL du CEPII	
2006-07	Deindustrialisation and the fear of Relocations in the Industry	H. Bouhol & L. Fontagné
2006-06	A dynamic Perspective for the Reform of the Stability and Gowth Pact	C. Deubner
2006-05	China's Emergence and the Reorganisation of Trade Flows in Asia	G. Gaulier, F. Lemoine & D.Ünal-Kesenci
2006-04	Who Pays China's Bank Restructuring Bill ?	G. Ma
2006-03	Structural Determinants of the Exchange-Rate Pass-Through	G. Gaulier, I. Méjean & A. Lahrèche-Révil
2006-02	Exchange-Rate Pass-Through at the Product Level	G. Gaulier, I. Méjean & A. Lahrèche-Révil
2006-01	*Je t'aime, moi non plus* : Bilateral Opinions and International Trade	A.C. Disdier & T. Mayer
2005-23	World Trade Competitiveness: A Disaggregated View by Shift-Share Analysis	A. Cheptea, G. Gaulier & S. Zignago
2005-22	Chômage et réformes du marché du travail au Japon	E. Dourille-Feer
2005-21	Profitability of Foreign and Domestic Banks in Central and Eastern Europe: Does the Mode of Entry Matter?**,**	O. Havrylchyk & E. Jurzyk
2005-20	ECB Governance in an Enlarged Eurozone,	A. Bénassy-Quéré & E. Turkisch
2005-19	What Are EU Trade Preferences Worth for Sub-Saharan Africa and Other Developing Countries?	F. Candau & S. Jean
2005-18	Binding Overhang and Tariff-Cutting Formulas	M.H. Bchir, S. Jean & D. Laborde
2005-17	International Trade and Income Distribution: Reconsidering the Evidence	I. Bensidoun, S. Jean & A. Sztulman
2005-16	China and the Relationship between the Oil Price and the Dollar	A. Bénassy-Quéré, V. Mignon & A. Penot
2005-15	Consequences of Alternative Formulas for Agricultural Tariff Cuts	S. Jean, D. Laborde & W. Martin

2005-14	Is Erosion of Tariff Preferences a Serious Concern?	A. Bouët, L. Fontagné & S. Jean
2005-13	The Consequences of Agricultural Trade Liberalization for Developing Countries: Distinguishing Between Genuine Benefits and False Hopes	J.C. Bureau, S. Jean A. Matthews
2005-12	From Bound Duties to Actual Protection: Industrial Liberalisation in the Doha Round	M.H. Bchir, L. Fontagné & S. Jean
2005-11	Impact de l'ouverture financière sur les inégalités internes dans les pays émergents	A. Bénassy-Quéré & V. Salins
2005-10	Disentangling Horizontal and Vertical Intra-Industry Trade	L. Fontagné, M. Freudenberg & G. Gaulier
2005-09	China's Integration in East Asia: Production Sharing, FDI & High-Tech Trade	G. Gaulier, F. Lemoine D. Ünal-Kesenci
2005-08	Tax Competition and Public Input	A. Bénassy-Quéré, N. Gobalraja & A. Trannoy
2005-07	Trade Liberalisation, Growth and Poverty in Senegal: A Dynamic Microsimulation CGE Model Analysis	N. Annabi, F. Cissé, J. Cockburn & B. Decaluwé
2005-06	Migration, Trade and Wages	A. Hijzen & P. Wright
2005-05	Institutional Determinants of Foreign Investment	A. Bénassy-Quéré, M. Coupet & T. Mayer
2005-04	L'économie indienne : changements structurels et perspectives à long terme	S. Chauvin & F. Lemoine
2005-03	Programme de travail du CEPII pour 2005	
2005-02	Market Access in Global and Regional Trade	T. Mayer & S. Zignago
2005-01	Real Equilibrium Exchange Rate in China	V. Coudert & C. Couharde
2004-22	A Consistent, *ad-valorem* Equivalent Measure of Applied Protection Across the World: The MAcMap-HS6 Database	A. Bouët, Y. Decreux, L. Fontagné, S. Jean & D. Laborde
2004-21	IMF in Theory: Sovereign Debts, Judicialisation and Multilateralism	J. Sgard
2004-20	The Impact of Multilateral Liberalisation on European Regions: a CGE Assessment	S. Jean & D. Laborde
2004-19	La compétitivité de l'agriculture et des industries agroalimentaires dans le Mercosur et l'Union européenne dans une perspective de libéralisation	N. Mulder, A. Vialou, B. David, M. Rodriguez &

	commerciale	M. Castilho
2004-18	Multilateral Agricultural Trade Liberalization: The Contrasting Fortunes of Developinc Countries in the Doha Round	A. Bouët, J.C. Bureau, Y. Decreux & S. Jean
2004-17	UK in or UK out? A Common Cycle Analysis between the UK and the Euro Zone	J. Garnier
2004-16	Regionalism and the Regionalisation of International Trade	G. Gaulier, S. Jean & D. Ünal-Kesenci
2004-15	The Stock-Flow Approach to the Real Exchange Rate of CEE Transition Economies	B. Egert, A. Lahrècche-Révil & K. Lommatzsch
2004-14	Vieillissement démographique, épargne et retraite : une analyse à l'aide d'un modèle d'équilibre général à agents hétérogènes	C. Bac & J. Chateau
2004-13	Burden Sharing and Exchange-Rate Misalignments within the Group of Twenty	A. Bénassy-Quéré, P. Duran-Vigneron, A. Lahrèche-Révil & V. Mignon
2004-12	Regulation and Wage Premia	S. Jean & G. Nicoletti
2004-11	The Efficiency of Fiscal Policies: a Survey of the Literature	S. Capet
2004-10	La réforme du marché du travail en Allemagne : les enseignements d'une maquette	S. Capet
2004-09	Typologie et équivalence des systèmes de retraites	P. Villa
2004-08	South – South Trade: Geography Matters	S. Coulibaly & L. Fontagné
2004-07	Current Accounts Dynamics in New EU Members: Sustainability and Policy Issues	P. Zanghieri
2004-06	Incertitude radicale et choix du modèle	P. Villa
2004-05	Does Exchange Rate Regime Explain Differences in Economic Results for Asian Countries?	V. Coudert & M. Dubert
2004-04	Trade in the Triad: How Easy is the Access to Large Markets?	L. Fontagné, T. Mayer & S. Zignago
2004-03	Programme de travail du CEPII pour 2004	
2004-02	Technology Differences, Institutions and Economic Growth: a Conditional Conditional Convergence	H. Boulhol
2004-01	Croissance et régimes d'investissement	P. Villa
2003-22	A New Look at the Feldstein-Horioka Puzzle using a Integrated Panel	A. Banerjee P. Zanghieri

2003-21	Trade Linkages and Exchange Rates in Asia :The Role of China	A. Bénassy-Quéré & A. Lahrèche-Révil
2003-20	Economic Implications of Trade Liberalization Under the Doha Round	J. Francois, H. van Meijl & F. van Tongeren
2003-19	Methodological Tools for SIA - Report of the CEPII Worshop held on 7-8 November 2002 in Brussels	
2003-18	Order Flows, Delta Hedging and Exchange Rate Dynamics	B. Rzepkowski
2003-17	Tax Competition and Foreign Direct Investment	A. Bénassy-Quéré, L. Fontagné & A. Lahrèche-Révil
2003-16	Commerce et transfert de technologies : les cas comparés de la Turquie, de l'Inde et de la Chine	F. Lemoine & D. Ünal-Kesenci
2003-15	The Empirics of Agglomeration and Trade	K. Head & T. Mayer
2003-14	Notional Defined Contribution: A Comparison of the French and German Point Systems	F. Legros
2003-13	How Different is Eastern Europe? Structure and Determinants of Location Choices by French Firms in Eastern and Western Europe	A.C. Disdier & T. Mayer
2003-12	Market Access Liberalisation in the Doha Round: Scenarios and Assessment	L. Fontagné, J.L. Guérin & S. Jean
2003-11	On the Adequacy of Monetary Arrangements in Sub-Saharian Africa	A. Bénassy-Quéré & M. Coupet
2003-10	The Impact of EU Enlargement on Member States: a CGE Approach	H. Bchir, L. Fontagné & P. Zanghieri
2003-09	India in the World Economy: Traditional Specialisations and Technology Niches	S. Chauvin & F. Lemoine
2003-08	Imitation Amongst Exchange-Rate Forecasters: Evidence from Survey Data	M. Beine, A. Bénassy-Quéré & H. Colas
2003-07	Le Currency Board à travers l'expérience de l'Argentine	S. Chauvin & P. Villa
2003-06	Trade and Convergence: Revisiting Ben-Davil	G. Gaulier
2003-05	Estimating the Fundamental Equilibrium Exchange Rate of Central and Eastern European Countries the EMU Enlargement Perspective	B. Egert & A. Lahrèche-Révil
2003-04	Skills, Technology and Growth is ICT the Key to Success?	J. Melka, L. Nayman, S. Zignago & N. Mulder

2003-03	L'investissement en TIC aux Etats-Unis et dans quelques pays européens	G. Cette & P.A. Noual
2003-02	Can Business and Social Networks Explain the Border Effect Puzzle?	P.P. Combes, M. Lafourcade & T. Mayer

CEPII
DOCUMENTS DE TRAVAIL / WORKING PAPERS

Si vous souhaitez recevoir des Documents de travail,
merci de remplir le coupon-réponse ci-joint et de le retourner à :

Should you wish to receive copies of the CEPII's Working papers,
just fill the reply card and return it to:

Sylvie HURION – Publications
CEPII – 9, rue Georges-Pitard – 75740 Paris – Fax : (33) 1.53.68.55.04
sylvie.hurion@cepii.fr

M./Mme / Mr./Mrs .....

Nom-Prénom / Name-First name .....

Titre / Title .....

Service / Department.....

Organisme / Organisation .....

Adresse / Address.....

Ville & CP / City & post code.....
Pays / Country..... Tél.....
Your e-mail .....

Désire recevoir les **Document de travail** du CEPII n° :

*Wish to receive the **CEPII's Working Papers No**:*.....

.....

.....

.....

.....

.....

.....

☐ Souhaite être placé sur la liste de diffusion permanente (**pour les bibliothèques**)
*Wish to be placed on the standing mailing list **(for Libraries)**.*