THE IMPACT OF TAXATION AND AGGLOMERATION ECONOMIES ON FDI

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Abstract

This paper aims at extending the empirical literature on foreign direct investment (FDI) determinants by examining how FDI reacts to corporate tax rates and whether this reaction is conditional on some other economic factors, such as agglomeration economies. To that end, we gather the relevant data on developed market economies and employ an appropriate econometric technique (Pooled Mean Group - PMG estimator) which allows for both dynamics and parameter heterogeneity to be included in the model. Our results suggest that both taxation and agglomeration economies play an important role in attracting FDI.

Key Words: *FDI, taxation, agglomeration economies, PMG estimation*

JEL Classification: F21; L52; C33

1. INTRODUCTION

At the heart of debate over the appropriate fiscal design is the question of how FDI reacts to taxation, and whether this reaction is conditional on some other economic factors. Over the past decade, according to Hajakova et al. (2006), interest in this issue has been growing in parallel with the increasing mobility of capital and internationalisation of businesses. A widely-held view is that taxes are likely to matter more in choosing an investment location as non-tax barriers are removed and as national economies converge (OECD, 2008). Recently, in the light of the fiscal harmonization efforts in the European Union, the scientific interest in international tax competition has increased even more (Feld and Heckemeyer, 2011).

To support the view that there is increasing competitive pressure on governments to reduce their corporation tax rates, Devereux et al. (2008) show that the average statutory rates of corporation tax in OECD countries fell from around 50 percent in the early 1980s to under 35 percent in 2001. Along the same line, as pointed by Dembour (2008), governments can also engage in a costly and wasteful "subsidy tournament", while competing to subsidize FDI. Numerous empirical studies show that governments can influence the locational behaviour of firms using public expenditures, particularly for infrastructure and education. Bellak et al. (2009) argue that, from a public finance perspective, both the revenue and the expenditure side of public budgets are interlinked with regard to FDI attraction policies. In particular, they demonstrate that the tax-rate elasticity of FDI is a decreasing function of infrastructure endowment, implying that countries with an above-average infrastructure endowment can, at least in part, afford to finance their infrastructure by taxing corporations without a loss of FDI. In this light, OECD (2008) suggests that countries with relatively high effective tax rates are also very successful in attracting FDI. This may suggest the importance of their attractive investment strategies and/or, as emphasised by the new economic geography literature, the importance of location-specific benefits stemming from agglomeration economies. Empirical literature on the location decisions of firms does suggest that agglomeration externalities are among important factors and that firms do reap potential benefits from locating near to other firms.

In what follows we estimate the effect of each of those factors (taxation, public expenditures and agglomeration economies) on FDI, while controlling for other important variables identified in the literature.

2. MODEL SPECIFICATION, METHODOLOGICAL ISSUES AND RESULTS

Despite the importance of this topic in the field of international and public economics, the literature review suggests that there is no single core theory of the effect of the host country government intervention on FDI, only various fragmented theoretical explanations. This leaves us with no comprehensive, explicitly formulated and testable theoretical model which could help us answer the question of why a particular country succeeds in competing for inward FDI. Therefore, we follow an eclectic approach.

Our data set consists of annual observations spanning 18 developed countries from 1979 to 2005. Such dimensions of the data set allows us to address some important methodological issues, while aiming to consistently estimate the long-run relationship between the FDI inflows and various explanatory variables. Not only do panels with "large T" dimension provide larger samples which may improve efficiency and mitigate multicollinearity, they can also allow for more explicit treatment of parameter heterogeneity and allow for more complex dynamic models, all of which is relevant for assessing the determinates of the FDI inflows. Adding dynamics in models that describe the behaviour of FDI inflows is particularly important given that the evolution of FDI inflows is likely to be a dynamic process. Assuming a degree of inertia in the FDI inflows, we expect it to be a function of both current and past values of explanatory variables, as well as of its own past values. The traditional fixed and random effects estimators employed to estimate such intrinsically dynamic panel data models may lead to biased and inconsistent results, especially if slope coefficients are not identical across countries (Pesaran and Smith, 1995). To obtain consistent estimators of the means of the slope coefficients, Pesaran et al. (1999) offer the Pooled Mean Group (PMG) estimator which imposes homogeneity of the slope coefficients entering the long-run relationships, but allows for heterogeneity of the coefficients characterizing the short-run dynamics. Following Pesaran et al. (1999) PMG procedure, we estimate a formulation in which the long-run equilibrium appears explicitly as a so-called error correction term:

$$\Delta F_{i} = {}_t \phi_i \left[D_{i-1t} - \theta_{0t} DI - \theta_k (X_{ki}) I_{-1} \right] + (\delta_k)_{i0} \Delta(X_k)_i + {}_t \varepsilon_i$$

where ΔFDI_{it} is the first difference of the dependent variable, $\phi_i = -(1 - \lambda_i)$ is the error-correction parameter, FDI_{it-1} is the lagged dependent variable,

$\theta_{0i} = \dfrac{\gamma_i}{1-\lambda_i}$ is a country-specific constant, $\theta_{k\ i} = \dfrac{(\delta_k)_{i0} + (\delta_k)_{i1}}{1-\lambda_i}$ are parameters on the K lagged explanatory variables, $(\delta_k)_{i0}$ are parameters on the differenced explanatory variables, $(X_k)_{it-1}$ is a set of K lagged explanatory variables, while $\Delta(X_k)_{it}$ is a set of differenced explanatory variables and ε_{it} is the error term assumed to be independently and identically distributed across countries and time and uncorrelated with the regressors.

In what follows, we briefly comment on the rationale and expected sign of influence of our main variables of interest; namely, taxation, government goods and services and agglomeration economies.

The conventional wisdom holds that the volume and location of FDI are inversely related to host country tax rates. The tax burden reduces the efficiency and profitability of an investment and weakens the location advantage of the host country, and should, consequently, be negatively related to the inflow of FDI. The empirical literature assessing the effects of various measures of tax burden on FDI choices is relatively abundant, but quite inconclusive. The heterogeneity of the empirical results is mainly related to the lack of a coherent theoretical framework that would result in a preferred empirical specification; consequently, different determinants are included in an ad hoc manner.

De Mooij and Ederveen (2003, 2006) carry out a meta-analysis and find a median FDI tax-rate elasticity (semi-elasticity) of about - 3, implying that a one percentage point reduction in the host-country tax rate raises FDI in that country by about 3 per cent.

An important part of the difficulty in gauging how FDI responds to tax burden is uncertainty related the relevant tax burden measure. It is impossible, as pointed by Mooij and Ederveen (2003, 2006) and Bénassy-Quéré et al. (2005), to capture all the complex details of the tax system that potentially affect foreign investment in an empirical analysis. Some authors believe that investors compare the statutory corporate income tax rates (*str*). Others take the view that average effective tax rates (*eatr*) are more important in explaining FDI than the statutory corporate tax rates, given that they account for rules determining the percentage of profits that are taxable. Although the majority of the empirical studies use the statutory corporate tax rate, Bellak et al. (2009) and Mooij and Ederveen (2003, 2006) argue that forward-looking effective average tax rates are the conceptually proper measure of the corporate income tax burden for examining the investment decisions of firms. Statutory rates, namely, can be a misleading indicator of the

tax burden since low statutory rates can be offset by a broader definition of taxable income. In our model, however, we use both measures of tax burden. Devereux et al. (2008) compute bilateral cross-border EATRs for a number of countries. Upon updating and correcting for mistakes, Klemm (2008) provides access to the Devereux et al. database, and we use it as a main data source in our analysis.

The recent literature suggests the effect of taxes on FDI should not be analysed in isolation of other measures of government intervention, as these can also affect the profitability of an investment (Hansson and Olofsdotter, 2012; Goodspeed et al., 2007). Using a comprehensive indicator for 'infrastructure quality', Wheeler and Mody (1992, in Bellak et al., 2009) find a significant positive effect of high infrastructure quality on FDI. In this light, Bellak et al. (2009) demonstrate that high-tax countries can also successfully attract FDI, as their governments may compensate for higher corporate taxes by offering foreign investors a more favourable infrastructure endowment. The infrastructure, they explain, generates location-specific and immobile 'infrastructure rents', which can be taxed without a loss of FDI. To allow for the possibility that government provided goods and services favourably influence inward FDI, we include real government net capital stock as a percentage of real GDP (*govcap*) from Kamps (2005).

Devereux et al. (2002, 2007) demonstrate that the effect of fiscal incentives does exist, but becomes marginal in the presence of yet another important location factor; namely, the agglomeration externalities. They find evidence that the effect of government grants is relatively small and less effective in influencing firms' location decisions in the face of alternative locations offering countervailing co-location or agglomeration benefits. This result is confirmed by Barrios et al. (2006, in Dembour, 2008) who find evidence that for hi-tech firms in Ireland agglomeration economies were a more important locational determinant than public incentives. Brülhart et al. (2008) show that agglomeration economies can reduce the importance of tax differentials for firms' location choices and thereby lessen the intensity of corporate tax competition. On theoretical level, the importance of agglomeration externalities for location decisions is emphasised by the proponents of the new economic geography literature. From this perspective, firms have an incentive to concentrate geographically, that is, close to other firms, whether within the same industry or within the diversified industrial setting. To account for agglomeration economies in our model we include GDP per square kilometre (*gpdsq*) and geographic concentration index (*gci*).

As for additional variables, in our model we include those suggested by the literature on FDI determinants; namely, a variable for market size (*gdp*), labour costs (*ulc*) and labour quality (*lq*).

The list of variables used in our model and their sources is given in Table 1 below.

Table 1 Data Documentation: Definition, Construction and Sources

Variable	Definition and Construction	Source
FDI (*fdi*)	Foreign direct investment, net inflows in current US$	WDI
STR (*str*)	Statutory Corporate tax rates	Klemm (2005)
EATR (*eatr*)	Effective average tax rate paid by the companies on a hypothetical projects, as a share of discounted pre-tax profits	Klemm (2005)
Government capital stock (*govcap*)	Real government net capital stock as a percentage of real GDP	Kamps (2005)
GDP (*gdp*)	Nominal Gross domestic product in current US$	WDI
Unit labour cost (*ulc*)	Exchange rate adjusted Unit Labour Cost, Total Economy	OECD
Tertiary school enrolment (% gross) (*lq*)	Ratio of total tertiary enrolment, regardless of age, to the population of the age group that officially corresponds to the tertiary education, with a 5 year lag	WDI
GDP per km^2 (*gdpsq*)	Real GDP per square kilometre	Own calculations
Geographic Concentration Index (*gci*)	Ratio of a countries share of the (real) World GDP to the countries share of a world land area	Own calculations

Note: Data are on an annual basis

3. RESULTS

As a starting point, we estimate the first-order ARDL model with all the variables included. This specification rendered some economically insensible results. Moreover, due to computational difficulties, it left us with no possibility to include additional lags for the potentially endogenous variables, and as such it is not the preferred one. In an attempt to reach a preferred specification, we have undertaken a series of estimation attempts as well as thorough robustness checks. Nonetheless, to save space, in this paper we report the main findings in Table 2,

and briefly comment on those coefficients which appear to be statistically significant at conventional levels of statistical significance. Estimation results of alternative specifications and robustness check results are available upon request.

Table 2 The PMG estimates of the preferred specification (dependent variable ΔlnFDI)

Variable	Est. coefficient	p-value
lnEATR	-1.455***	(0.000)
lnGDP	0.702**	(0.011)
lnGDPsq	4.190***	(0.000)
ΔlnEATR	-2.490	(0.879)
ΔlnGDP	-2.077	(0.593)
ΔlnGDPsq	7.130***	(0.001)
Constant	-1.304*	(0.072)
EC coefficient	-0.554***	(0.000)
No of obs	323	

Notes: A country-specific constant term is included. Numbers reported in parentheses are p-values. *, ** and *** denote significance at the 10, 5 and 1 percent, respectively. Δ denotes first differences, while (-1) denotes the first lag.

The results indicate firstly that, as expected, the error correction coefficient is negative and statistically significant (bottom panel of Table 2). This important finding suggests that there is a strong, statistically highly significant, cointegrating relationship between FDI inflows and its determinants. The evidence that there exists an adjustment mechanism implies, by definition, that there must be a long-run equilibrium relationship between the variables. In line with our a priori expectations are the estimated long-run coefficients on our variables of interest; namely, the taxation variable (*lneatr*) and the agglomeration economies variable (*lngdpsq*). Among the control variables, the one which proves to be regularly significant is the market size variable (*lngdp*). The taxation variable is statistically significant and negative, suggesting that, ceteris paribus, as the effective average tax rate rises FDI inflows decline in the long run (long-run coefficients are reported in top panel of Table 2). The coefficient on agglomeration economies is highly statistically significant and positive. This finding suggests that in the long-run agglomeration economies positively stimulate FDI inflows. Agglomeration economies do seem to lead to reduction of costs for companies. Finally, the market size, as expected, has a positive effect on FDI inflows. In the short-run (middle panel of Table 2), only agglomeration economies exert a significant effect.

We point out, but do not report, that the results remain almost unchanged when we use statutory corporate tax rates (*lnstr*), or effective average tax rates corrected for inflation rate (*lneatr$_i$*), instead of effective average tax rate. Moreover, we have undertaken an important robustness check; namely, we have scrutinised the consistency of our results in the presence of cross-sectional dependence. From economic point of view, we expect FDI inflows in one country to depend on the extent of FDI inflows in other countries. This could be explained by the fact that business cycles in different countries are overlapping, especially if the economies of the two countries are interconnected. In this case, increased FDI inflows in one country would increase economic activity, and thus provide more investing opportunities (increased aggregate demand) in other countries with which it has extensive economic interrelation. Consequently, this encourages FDI inflows in those countries. From econometric point of view, a fail to take into account cross-sectional dependence will bias the results. To account for cross-sectional dependence, we create a new variable called "cross-sectional influences"

($\sum_{c \neq i} w_{ic} FDI_{ct} = WFDI_{it}$; the W matrix represents the weights of influences that

countries have on each other. Each matrix row represents the weights that every other country has on the particular observed country. The weights are computed as the inverse values of the distances between countries' biggest agglomerations. The matrix is standardized such that sum of each row equals 1). In the presence of this variable, the results remain consistent, with one exception; namely, the taxation variable now becomes somewhat less statistically significant (p-value 0.122).

4. CONCLUSION

From a perspective of policy makers who continually re-examine their fiscal arrangements to ensure their countries are attractive to inbound investment, identifying how tax sensitivity reacts to non-tax factors is of great importance. By contributing to a better understanding of the determinants of FDI, this research offers a basis for relevant policy proposals and also informs debate on the appropriate tax reform.

Recent burgeoning literature in this filed, although heterogeneous and inconclusive, seems to support the view that investors do compare tax burdens in different locations, and that foreign investments are attracted to countries offering lower corporate tax rates. Moreover, while tax is recognized as being an important factor in decisions on where and how much to invest, the recent literature has

begun to incorporate some other, non-tax aspects of the economic environment which could also influence the long-term profitability of an investment. In this vein, our results confirm that both taxation and agglomeration affect the attractiveness of a country in terms of FDI inflows to that country.

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