# PRODUCTIVITY SHOCKS, FOREIGN DIRECT INVESTMENT, AND CAPITAL TAXES

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***Abstract.*** *The present study deals with the effect that productivity and capital taxes have on foreign direct investment through a panel consisting of 41 countries utilising the GMM system on a dynamic spatial model. Evidence reveals that an increase in the domestic capital tax rate leads to less FDI inflows, and higher levels of domestic productivity growth lead to less FDI inflows. Foreign competition did not have a significant effect on domestic FDI inflows.*

***Key words:*** *FDI, productivity shock, capital taxes, tax competition*

## I. Introduction

This paper deals with the connection between Foreign Direct Investment (FDI), productivity shocks and capital taxes. The tripartite, complex interaction amongst these factors will be analysed so that the connections could be revealed. The question that will be addressed in this paper is the following: Which came first, the FDI or the productivity increase? The majority of the economic literature pertaining to FDI studies the impact that FDI has on productivity. However, there also exists work on the study of how productivity shocks affect FDI flows. The present study will seek to investigate the latter, as the research in this area is relatively sparse. In addition, this study will also take into account how capital taxes affect the FDI / productivity relationship in order to observe to what extent policy maker decisions are influencing this dynamics.

In the age of globalisation, FDI has emerged as an object of competition amongst nations. According to a Wall Street Journal article by House (2013), "For the first time, U.S. commercial missions in 32 countries will be instructed to make foreign investment a priority." In addition, FDI flows have shown a dramatic growth (with a few bumps along the road) and are predicted to increase in the future as evidenced in Fig. 1.

The investigation of how capital taxes and productivity shocks affect FDI flows can give valuable information to policy makers interested in attracting and maintaining FDI

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FIG. 1. **Global FDI Flows (billions of dollars)**
*Source:* World Investment Report 2013, UNCTAD.

inflows and the positive spillovers which these inflows can bring to a country, like jobs and technology.

## II. Review of the literature

The literature regarding FDI and productivity can be divided into two unequal camps. By far, the vast majority of the literature focus on how FDI inflows increase productivity, while only a few authors have attempted to look into the reverse – namely, how productivity increase can attract capital. The review of the literature will begin with a description of the research from the first camp and conclude with the ideas put forth from the second camp.

FDI is oft seen by economists as a way to positively increase productivity through spillovers of advanced foreign technologies, additional capital formation, and through knowledge transfers to indigenous workers (Piteli, 2009). The literature related to the relationship between FDI and its effects on productivity has been extensively reviewed by several authors (Görg, Greenaway, 2004; Gachino, 2010). These literature reviews illustrate the channels through which FDI theoretically transmits productivity spillovers. The first way in which FDI leads to improved productivity is through its effect on human capital. When multinational enterprises (MNEs) open factories or stores in a host nation, they will necessarily employ local labour to some degree. The local employees will be exposed to the MNEs' operations and management techniques, thus absorbing valuable knowledge which will allow them to be productive assets of local companies if they choose to leave the MNE. In addition, local employees may be involved in local research and development, fostering new technological knowledge amongst them (Fosfuri, Motta, Rønde, 2001). Another way that FDI can affect a country's productivity is through the fostering of increased competition among indigenous firms and the MNEs entering the

market (Glass, Saggi, 2002). As the MNEs are assumed to have better technology or management techniques, the local firms have to find ways to reduce costs and improve output, otherwise they will go bankrupt.

Despite the large amount of theoretical work devoted to linking FDI and productivity spillovers, the empirical literature has produced mixed results when the hypothesis has been tested (Rodrik, 1999). Some studies such as those done by Haskel, Pereira, and Slaughter (2007) and Keller and Yeaple (2003) found evidence of productivity spillovers in the United States and the United Kingdom, respectively. However, other studies found that the picture is not so clear when investigating the cases of several less developed countries. For example, Javorcik (2004) in her study on FDI into Lithuania found spillovers which increased productivity, but only across industries. FDI did not improve the productivity for firms within the industries where the FDI took place, which, upon closer reflection, would be a logical conclusion given that one of the primary motivations for MNEs to engage in FDI is to protect their trade secrets. A further study by Kugler (2006) of the Columbian economy also finds that industries with FDI did not see productivity increases, but other industries did. The reasoning given by the author is that MNEs that invest in Columbia will not help their competitors, but they do have an incentive to help their suppliers to lower their costs (through productivity increases), which can then be passed on the MNE.

One reason for why the majority of the academic literature focuses on the extent which FDI leads to productivity gains could be that authors and scholars have been most interested in studying how FDI affects developing countries. However, a quick look at any FDI statistics, like in Fig. 2, shows that a large amount of FDI flows go to developed countries which already have access to advanced technology and managerial techniques.

Thus far, this paper has presented a sample of the theoretical and empirical literature that aims to establish and test how FDI inflows lead to productivity spillovers in countries. As these areas have already been heavily researched, the author will now investigate a related question that has not attracted nearly as much attention from researchers and scholars. The research presented before assumed a one-way causality between FDI and productivity, but there is a reason to believe that, in fact, causality may run both ways. Thus, we can now address the question if productivity changes in a country influence FDI flows, and to what extent.

The theoretical justification for how a productivity shock can lead to changes in FDI flows is put forth in a work by Razin and Sadka (2007). They argue that in cases where one country experiences a productivity shock, the marginal return to capital will be affected for all companies. If a positive productivity shock occurs, foreign firms would now be incentivised by the lure of increased returns on investment and, thus, engage in FDI. Secondly, the authors argue that a positive productivity shock will raise the values

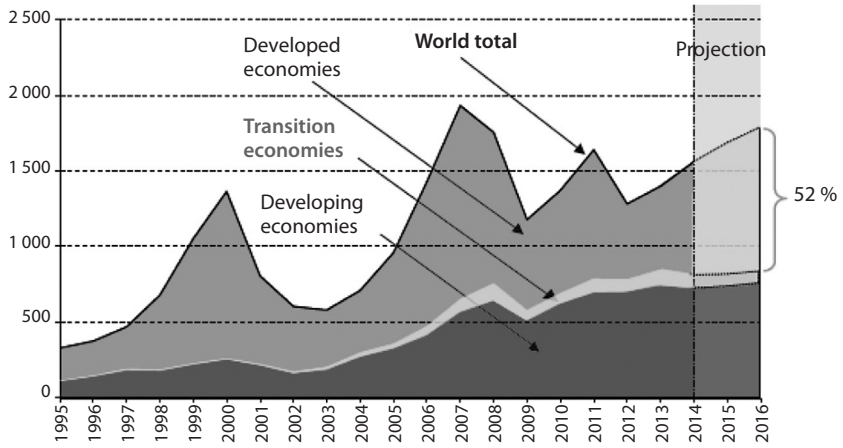


FIG. 2. **FDI inflows by groups of economies (billions of dollars)**
*Source:* World Investment Report 2014, UNCTAD.

of firms located in the country, thus, any mergers or acquisitions (which count as FDI) would rise in absolute value. In addition, the authors also include the effects that tax rates have on FDI flows.

However, the relationship explained before is based on the assumption that workers' wages are fixed. Razin, Sadka, and Tong (2008) create a model where productivity shocks may have different effects on FDI, depending on the assumptions. In their model, the authors construct a model similar to the one by Razin and Sadka, (2007) but in this case they allow for wage changes over time. As the productivity increases and the profits for firms increase, workers' wages will also gradually increase, thus lowering the initially realised increase of marginal return to investment. Thus, a positive productivity shock may make companies more profitable if labour is not a large input, or less profitable if the situation is reversed. The conclusion is that there are two forces pulling FDI flows in opposite directions, and to see which factor has the most influence empirical testing is required. The present work will use this theoretical foundation as the basis for the research to be presented later.

The amount of research done on this question is quite limited, but a few empirical works will now be presented. Piteli (2009) has tested how FDI in developed economies behaves. In it, the author finds that the total factor productivity (TFP) is the most important factor involved with FDI going from one developed country to another. Calderon, Loayza, and Serven (2004) also conduct a study looking into the determinants of FDI flows and find that FDI flows are attracted to nations with higher levels of economic growth. While economic growth is not the same thing as productivity growth, the two are certainly related.

This review of the academic literature has revealed that regarding the relationship between FDI and productivity, much of the research has been focused on addressing how or if FDI leads to productivity growth, while less has been focused on the question of how or if productivity shocks affect FDI flows. The current paper will thus attempt to add to the research with regard to the latter question.

Formally, the following hypotheses will be tested:

H1: A positive domestic productivity shock will increase FDI to a country

H2: A positive foreign productivity shock will decrease FDI to a country.

## III. Methodology

The present study will investigate how FDI inflows are affected by productivity shocks and capital taxes. As the hypothesis is framed with dependent and independent variables, regression analysis is the most appropriate method to employ. A problem arises when setting up a regression because according to the theory involved, FDI could cause productivity changes, but productivity changes could also cause FDI flows. This type of dual causality leads to endogeneity in regression models and can be quite problematic. Ordinary Least squares are a method to identify the relationships between variables, which only works under the condition of exogeneity (i.e. the variables are uncorrelated with the error term in the regression.) Unfortunately, the present study does not exclusively consist of exogenous variables, thus, another method must be found. One of the other possible causes for variables being correlated with the error term is if the country fixed effects cause an omitted variable bias. The solution for this problem is to employ the fixed effect operator as done by Piteli (2009). However, this method is not optimal when dynamic panel data are used (the lagged dependent variable is used as a regressor).

Two Stage Least Squares (2SLS) are a method which uses OLS but includes an extra stage of OLS, employing instruments to overcome the endogeneity problem. For example, Razin (2003) used 2SLS in an attempt to disentangle the endogeneity in his study of FDI and prdouctivity. However, 2SLS becomes unusable if poor instruments present themselves or if there are more instruments than regressors – the resulting system of equations, consisting of more variables than equations, is unsolvable. Due to the latter problem, the Generalized Method of Moments (GMM) was developed by Hansen (1982) as a way to most closely solve a system of equations having more regressors than equations. The relationship between FDI and productivity, as evidenced by the literature, is clearly problematic with regards to endogeneity. It is unclear whether FDI flows affect productivity, productivity affects FDI flows, or some combination of both exists. Such a relationship cannot be tested using OLS, thus, the present study will attempt to overcome this methodological obstacle through the use of GMM, of which there are several variants.

As the panel data for the study contain more countries (41) than years (15), the Arellano-Bond estimator presents itself as a valid choice. This type of model, put forth by Arellano and Bond (1991), works well for the previously mentioned data sets and includes the lagged dependent variable as a regressor. This model takes care of the fixed effects problem by first differencing the variables. This method is known as difference GMM and is described by Arellano and Bond (1991). Difference GMM is also an optimal choice when the selection of instruments is limited because this method takes lagged values of the regressors and uses them as instruments. However, lagged regressors do not always serve as the best instruments, so system GMM was developed as a way to find further valid instruments. System GMM was envisioned by Blundell and Bond (1998) to be like difference GMM but with the addition of taking levels equations, differencing them, and using the results as additional instruments. System GMM thus utilises more moment conditions and is consequently more efficient than difference GMM (Bond, 2002), therefore, the present study will use system GMM in its analysis. The contribution of the present article is that, to the author's knowledge, no researchers have yet attempted to test the impact of productivity shocks on FDI flows using system GMM.

The final methodological hurdle to address is that of the spatial problem. As the present research will be investigating interactions among a large set of countries encompassing different geographical areas, the use of spatial econometrics is in order. Kukenova and Monteiro (2009) run the Monte Carlo analysis on a spatial dynamic panel model and find that system GMM is the method which gives the most consistent results and most closely overcomes the endogeneity problem associated with the spatial error. As the hypotheses previously proposed require the inclusion of a variable for foreign tax rate and foreign productivity level, a method for constructing such variables will be employed. One method which is used in the literature by Devereux, Lockwood, and Redoano (2008) is to employ a geographic weighting scheme in order to derive one variable which is a weighted average; of all the foreign values (and to do this for each country in the panel). There are many ways to construct such a weighted average, for example, higher weights can be put on foreign countries, based on distance, cultural similarities, economic factors, etc.

## IV. Model specification

The econometric model tests the main hypothesis by using FDI inflows as the dependent variable while inserting independent variables – lagged FDI, domestic and foreign productivity levels, tax rates and control variables in order to prevent the variable omission bias. Due to the choice system GMM as a method choice, a mathematical model of that type will serve as the model. The standard specification of the Blundell–Bond estimator for the dynamic panel data model can be defined as follows:

$$y_{it} = \delta y_{i,t-1} + \beta X_{it} + u_{it}. \quad (1)$$

This most simple specification includes the dependent variable as a function of the lagged dependent variable, a set of control variables (X), and an error term (u). The subscripts *i* and *t* represent the home country and the year, respectively. The model specification for the present model is of the same form and can be more explicitly defined as the following equation:

$$FDI_{it} = \alpha + \beta^1 FDI_{i,t-1} + \beta^2 \tau_{i,t} + \beta^3 \sum_{j \neq i}^{n} \omega_{ij} \tau_{j,t} + \beta^4 Prod_{i,t} + \\ + \beta_5 \sum_{j \neq i}^{n} \omega_{ij} Prod_{j,t} + \beta_6 X_{i,t} + \eta_i + u_{it}. \quad (2)$$

In the presented specification, the subscripts are the same as before, but now *j* is included to represent the foreign country. The dependent variable used is the FDI inward position as a percentage of gross domestic product (GDP). This measure was chosen over pure FDI inward flows because of stationarity concerns. In addition, measuring FDI as a stock logically fits with the dynamic aspect of the model because the stock of this year's FDI will be strongly influenced by the previous year's FDI stock, which should be picked up in the autoregressive term. Thus, the first independent variable is the dynamic portion of the Blundell–Bond estimator included as per the methodology section.

The domestic and foreign tax rates are included to capture the effect of tax competition for FDI (Leibrecht, Hochgatterer, 2012). As a measure of tax ($\tau$), this study uses the average effective tax rate (AETR) because, according to Devereux, Griffith, and Klemm (2002), the AETR is the rate that companies would actually look at when making the decision of whether to make an investment or not. Including the foreign tax rate is not as straightforward as the domestic tax rate because the data available are aggregate and do not consist of bilateral flow information. The solution employed here is to take a weighted average of all foreign tax rates as mentioned in the methodology section. The specific weighting system chosen is the same one used by Liu (2013), as it gives higher weights to the countries which are geographically closer and also higher weights ($\omega$) to the countries which have similar development levels. As the dependent variable is FDI, the weighting scheme must reward countries which would naturally have higher levels of FDI. According to UNCTAD (2014), much of the world's FDI takes the form of Mergers and Aquisitions and flows among developed countries, which suggests that the appropriate weighting scheme should mean that countries of similar economic development should have more FDI flows among themselves. In addition, Blonigen (2005) points out that the gravity model from trade theory, which links the amount of trade to geographic distance, also applies to FDI flows. Therefore, using the two previously mentioned criteria in the weighting equation is a valid choice;

$$\omega = \frac{s_{ij} * d_{ij}}{\sum_{j=1}^{n} s_{ij} * d_{ij}}. \quad (3)$$

In this case, $s_{ij}$ is the inverse of the absolute value of the difference of GDP per capita between countries *i* and *j*. GDP per capita is used as a proxy for the economic development level of a country. If the GDP per capita between two countries is similar, the difference will be quite small, resulting in a small denominator, thus a large weight. In addition, $d_{ij}$ is the distance between countries *i* and *j*, also inverted, to put more weight on geographically closer countries. The product of $s_{ij}$ and $d_{ij}$ is then divided by the summed value of the product taken from all countries, so that when all of the weights are added together they sum to one.

The next set of independent variables is the measurements for domestic and foreign productivity (*Prod*). As before, the foreign productivity level will be included as a weighted average using the same formula as before. There are several ways of measuring productivity, but this study will use GDP per employed person as the proxy for productivity, the use of which is justified by Schreyer and Pilat (2001). The logarithm of values was taken to linearize the values, but a problem emerged when a test for stationarity was applied. Regarding the variable of domestic productivity, a test for stationarity, developed by Im, Pesaran, and Shin (2003), was employed and returned a *p* value of 0.084, testing the null hypothesis that all panels contain unit-roots. In order to obtain stationary variables, the differences of the log GDP per employee were taken and were found to be stationary. One problem with differencing is that the variable now no longer represents productivity but productivity growth.

The remainder of the variables labelled as *X* in the regression are control variables included to reduce the variable omission bias. The first variable included is the percentage of the population which is between 15 and 65, which is generally considered to be the working-age population and is used as a measurement of demographics as per Devereux, Lockwood, and Redoano (2008). The next control variable is that of governmental expenditure as a percentage of GDP. According to Görg, Molana, and Montagna (2009), there is a reason to believe that MNE's are attracted to countries not only because of tax rates but also because of the level of infrastructure which can make their operations more profitable. Thus, higher levels of governmental spending should attract more FDI. In addition, exports as a percentage of GDP are included as a proxy for country openness. According to Buckley and Jeremy (2007), countries which are more open should have more FDI inflows. For the last control variable, a time dummy is included with values of 1 for years until 2007 and values of 0 afterwards. The purpose of this time dummy is to account for the global financial crisis and also because Roodman (2009a) suggests adding time dummies to system GMM models because time dummies are able to capture

the correlation across individuals when there are disturbances. Finally, fixed effects and the error term () are included in the specification as is standard.

The data used for this study were acquired from the OECD, World Bank, CEPII, and the Oxford University Centre for Business Taxation; 41 countries were chosen, encompassing all of the OECD members and additional large economies in order to have a wide representation of the world's economies in the study, as seen in Table 1.

TABLE 1. **List of countries for the study**

| | | |
|---|---|---|
| Argentina | Australia | Austria |
| Belgium | Canada | Chile |
| Czech Republic | Denmark | Estonia |
| Finland | France | Germany |
| Greece | Hungary | Iceland |
| Ireland | Israel | Italy |
| Japan | Korea | Luxembourg |
| Mexico | Netherlands | New Zealand |
| Norway | Poland | Portugal |
| Slovak Republic | Slovenia | Spain |
| Sweden | Switzerland | Turkey |
| United Kingdom | United States | Brazil |
| China | India | Indonesia |
| Russian Federation | South Africa | |

*Source*: compiled by the author.

The panel includes data from the years 1998–2012 and is slightly unbalanced. The data collected can be classified as aggregate, thus there is no information with regard to specific bilateral FDI flows. The data availability will be taken into consideration when choosing the most appropriate method.

TABLE 2. **Summary of data**

| Variable | Obs | Mean | Std Dev | Min | Max |
|---|---|---|---|---|---|
| FDI position | 594 | .4162414 | .4036397 | .00138 | 3.22214 |
| Home tax | 594 | .2601104 | .0630347 | .086295 | .437722 |
| Foreign Tax | 615 | .2425411 | .0549849 | 0 | .3616911 |
| Pop 15–65 | 615 | 66.90841 | 2.46454 | 60.47337 | 73.50738 |
| Gov. expenditure | 609 | .1856965 | .0470787 | .0678053 | .313429 |
| Exports | 612 | .426842 | .2724273 | .06932775 | 1.817797 |
| Productivity growth | 615 | 10.35396 | .5718693 | 8.31801 | 11.13275 |
| Foreign productivity Growth | 615 | 10.25426 | 1.111527 | 0 | 11.0441 |

*Source*: compiled by the author.

TABLE 3. **Regression results**

| Variable: FDI position | Main regression | Minimal instruments | Lagged variables | Pre-2008 | Pre-2008 lagged |
|---|---|---|---|---|---|
| FDI position t-1 | 0.7033*** | 0.6839*** | 0.6181*** | 0.7998*** | 0.8528*** |
| (z-score) | (4.13) | (6.49) | (3.47) | (-1.71) | (10.32) |
| Home tax | -1.3150*** | -1.6462** | -0.2668 | -0.8456* | -0.6610* |
| | (-2.60) | (-2.14) | (0.46) | (-1.71) | (-1.76) |
| Foreign tax | 0.5254 | 0.5239 | 0.04218 | 0.5248 | 0.1485 |
| | (1.48) | (0.87) | (0.21) | (1.41) | (0.60) |
| Pop 15-65 | -0.0084 | -.0106 | -0.0057 | -.0075* | -0.0045 |
| | (-1.09) | (-1.36) | (-1.14) | (-1.87) | (-1.05) |
| Gov. expenditure | -0.3000 | -0.4226 | -0.2323 | -0.0098 | -0.0793 |
| | (-0.93) | (-1.20) | (0.53) | (-0.04) | (-0.50) |
| Exports | 0.2571 | 0.2421 | 0.4961** | 0.2431 | 0.2074* |
| | (1.17) | (1.56) | (2.40) | (1.12) | (1.66) |
| Productivity growth | -1.812*** | -2.6776** | -1.019*** | -.01949 | -1.1398** |
| | (-2.68) | (-2.07) | (-3.80) | (-0.27) | (-2.07) |
| Foreign productivity growth | -0.0268 | -0.02417 | -0.0046 | -0.0070 | 0.2699 |
| | (-0.41) | (-0.23) | (-1.11) | (-0.42) | (0.58) |
| Time dummy | 0.0597*** | 0.0812** | 0.0277** | | |
| | (3.43) | (2.28) | (1.96) | | |
| Observations | 540 | 540 | 505 | 341 | 306 |
| Instruments | 27 | 17 | 27 | 26 | 26 |
| AR(1) (p-value) | 0.083 | 0.059 | 0.117 | 0.047 | 0.001 |
| AR(2) (p-value) | 0.396 | 0.388 | 0.360 | 0.954 | 0.893 |
| Hansen test | 0.160 | 0.138 | 0.047 | 0.115 | 0.342 |
| Difference in Hansen test: | | | | | |
| (GMM instruments) | 0.628 | 0.260 | 0.557 | 0.070 | 0.318 |
| (IV instruments) | 0.625 | 0.171 | 0.147 | 0.180 | 0.075 |

*Source:* compiled by author (***for 1%, **for 5%, *for 10% significance level).

The previously specified econometric model will be solved using the Xtabond2 programme in Stata according to the suggestions of the author, Roodman (2009a). When setting up the Xtabond2 programme, the researcher must make certain specification choices depending on the data and model used. For the present study, the variables had to be separated according to endogeneity and exogeneity because the endogenous variables take lags as instruments and the exogenous variables instrument themselves. In the present specification, according to theory, the endogenous variables are the lagged dependent variable (FDI inflow position), the tax rate, and productivity. The remaining variables were considered to be exogenous. In the first specification (column 1) presented in Table 3, the endogenous lags are limited from between 2–4 lags, and the

instrument matrix is collapsed in order to prevent the overproliferation of instruments. Another technique suggested by Roodman (2009b) is to limit the instrument set as much as possible, because too many instruments tend to overfit the endogenous variables, producing inflated results. However, there is no rule concerning how many instruments are too many, but, as the rule of a thumb, the Xtabond2 programme suggests using less instruments than panel groups, which in the case of this paper is 41 groups. The limited instrument model is presented in the second column of results. This regression was limited to using only lags of 2 as instruments, and again collapsing the instrument set. In addition, two-step estimation was used because it renders the panel robust to the problem of heteroskedasticity. Also, the Windmeijer correction was applied due to the fact that the two-step system GMM has the tendency to downward bias standard errors when not corrected for. In addition, several more regressions run as part of the sensitivity analysis. Column 3 presents the results for the original model specification but with all of the independent variables lagged one year. The fourth and fifth columns use a reduced time data set to include only the years before the Global Financial Crisis of 2007. Colum 4 presents the original specification, and column 5 presents the specification with lagged variables.

## V. Results

Regarding the validity of the results presented, STATA performs several tests. The Arellano–Bond tests for autocorrelation in the differences are necessary because, if the instruments are autocorrelated, they would be endogenous with the error term. As described by Arellano and Bond (1991), the test for AR(1) is expected to show autocorrelation, thus the small *p* value rejects the null of no autocorrelation. However, the AR(2) test must not show autocorrelation if the instruments are to be valid, and this holds true for the results presented. Thus, all of the regressions pass the test for no autocorrelation. The next tests included are the Hansen test for overidentifying restrictions. The Hansen test checks the exogeneity of the instruments used. Since, in this case, the nulls are rejected, we can assume that the model uses valid exogenous instruments with the exception of the regression in column 3 which has a worrying Hansen *p* value of 0.047. Also included are the Difference in Hansen tests which also check the exogeneity of the different GMM instrument sets which are generated in the system GMM.

A further check that is suggested by Roodman, (2009a) is to check that the first lag of the dependent variable has a coefficient less than 1, which in the present case is true. While a large coefficient for the lagged dependent variable does suggest a large autoregressive component, this is to be expected given the choice of FDI stock as the dependent variable, meaning that the past values should strongly affect the future values. Also, Bond (2002) suggests running the regression with OLS and fixed effects (FE)

models as an additional test. The OLS model has an upward bias, and the FE model produces a downward bias, thus the coefficient of the lagged dependent variable should be between the coefficients produced by the other two models. In the case of the present model, regressions were run with OLS and FE and are available upon request. The coefficients for the lagged dependent variables are 0.899 for OLS and 0.689 for FE. Thus, the first regression displayed satisfies this condition.

Interpreting the results, the present study finds that the FDI inward position is strongly affected by the previous year's position, by the home tax rate, and by the home productivity growth rate. These results appear to be fairly robust to the five different regressions that were tried. The coefficient on the home tax rate is negative, which would be expected, as higher home tax rates should drive away FDI. Regarding the first hypothesis presented, the results show that a positive productivity shock has a negative impact on FDI inflows, thus we can reject the first hypothesis. As a reasoning for why this is the case, we can refer back to Razin et al. (2008) where they argue that increases in productivity lead to higher wages for workers which will then lower profits for MNEs and discourage investment. Regarding the second hypothesis (positive foreign productivity shocks will decrease home FDI), the present study finds no statistically significant results. Finally, the time dummy variable was statistically significant, showing the impact of the shock from the Global Financial Crisis beginning in 2007.

## VI. Conclusions

The present study employs the system GMM on a dynamic panel in order to measure the relationship among FDI, productivity, and taxes. The study also incorporates spatial weighting in order to account for foreign variables. This study has found that the two most important variables, which influence FDI inflows, are the home tax rate (AETR) and the home productivity growth rate. The weighted foreign variables for tax rate and productivity growth were not significant, despite the logic that if one country's tax rate matters for international investment, then other country's tax rates should also matter. The findings of no significance here may be due to the aggregation of the data and the weighting scheme employed. Other studies may attempt to employ different weights or focus on bilateral FDI data. One problem with the present study was that the productivity could not be used because of the stationarity concerns.

For policy makers, the results of this study can be of use despite the fact that both of the study's hypotheses were rejected. The decision to raise the corporate tax rate has a significant impact on FDI flows, such that a 1% increase in the tax rate results in a 1.32% decrease in the FDI inflow position. This finding adds evidence to the debate on whether the so-called "race to the bottom" is occurring for capital taxes. Policy makers have an incentive to compete their tax rates ever lower, as the effect of the lower taxes

increases FDI inflows. In addition, productivity growth in a home country leads to a reduced FDI inflow position. Knowing this relationship, policy makers may plan FDI incentives accordingly.

The connection between FDI inward stock and productivity growth may be because FDI inflow position is measured as a percentage of GDP, thus, if GDP rises without the corresponding FDI inflows, the figure will fall in value. Additionally, if productivity growth is increasing, this could be interpreted as a negative sign to foreign companies due to the nature of the marginally decreasing productivity of capital. If a positive productivity shock occurs as a late reaction to previous inflows, it would mean that the economy is relatively saturated with capital and should thus yield marginally smaller returns in the future, encouraging foreign investors to pull out and look for better opportunities abroad.

Nevertheless, this article has established that productivity growth significantly affects the inflow of FDI. Combining this with the past theoretical and empirical work which suggests that FDI affects productivity, this study's results point to a two-way causal relationship between the two factors. Consequently, the question of which comes first, FDI or productivity growth, is more similar to the question of the chicken and the egg than once thought.

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