Fiscal discipline and foreign direct investment[◇]

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Abstract

Foreign direct investment (FDI) decreased considerably during the global financial crisis and subsequent European public debt crisis. Policy makers were concerned that unsustainable fiscal policies were one of the reasons for the fall in FDI, particularly for GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain). Using a panel of bilateral FDI stocks for more than 150 countries between 2001 and 2011, we study the impact of fiscal discipline on FDI. We focus on two measures of fiscal discipline that are pillars of the convergence criteria of the Maastricht Treaty: budget balance, a measure of short-run fiscal discipline, and the public debt-to-GDP ratio, a long-run measure. We present a new methodology using domestic investment data in combination with bilateral FDI data to identify the impact of these country-specific variables on FDI. We find that inward FDI stocks are correlated with long-run fiscal discipline. However, unsustainable fiscal policies were not behind the fall of FDI in GIIPS countries.

JEL Classification Codes: F21, F45, E62, H62, H63

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1 Introduction

During the recent global financial crisis and subsequent European public debt crisis, global foreign direct investment (FDI) inflows fell by 16% in 2008, and further by 37% in 2009. Particularly developed economies were hit hard, with a reduction of FDI by 29% (2008) and 44% (2009). At the same time, FDI inflows into developing and emerging economies increased in 2008, but in 2009 eventually also fell, although compared with developed countries, at a lower rate of 27%.[1] Policy makers feared that unsustainable fiscal policies (large budget deficits and high levels of public debt) and the potential for sovereign default of some European countries were a deterrent to FDI.[2] There is, however, evidence that international investors pay little attention to country default (see, e.g. Lindert and Morton, 1989 and Tomz, 2007).

One reason may be that sovereign debt default is perceived as a too infrequent or too extreme event, and investors may look instead for early warning signs of a deterioration of the business environment in a potential FDI host country. Also, governments try to avoid hard sovereign default and frequently renegotiate their debt (see Trebesch and Zabel, 2017), so hard defaults indeed hardly ever occur. The main drivers of the recent public debt crisis are thought to be unsustainable levels of fiscal deficits and public debt. Investing foreign firms may use fiscal profligacy, measured as budget deficits in the short-run and accumulated debt levels in the long-run, as indicators about the suitability of a destination country for their investment. These measures may be particularly salient for investors as they are easily and continuously observable.

How may the fiscal situation of countries affect the investment decisions of foreign firms? Unsustainable fiscal behavior of governments may be an

[1] For these and further detailed FDI data during the crisis, see United Nations Conference on Trade and Development (UNCTAD) (2009, 2010).

[2] UNCTAD write in their annual world investment report that "the perception of increased risk of sovereign debt default in mid-2010 in certain European countries, and its possible transmission to the eurozone, could easily disrupt this upward trend [in FDI]" (United Nations Conference on Trade and Development (UNCTAD), 2010, p. 5; see also the discussion on p. 21).

early warning sign for heightened risk of expropriation of company assets. While outright expropriation is probably less of a concern for developed countries, governments may engage in what Schnitzer (2002) calls 'creeping expropriation' by increasing taxes or levying charges in order to increase tax revenues. These measures all directly reduce profits generated by foreign affiliates. Given the long-term nature of FDI, firms may refrain from investing in countries with unsustainable fiscal policies as their investment may only recover its cost after several years. If firms expect a tax-hike in the near future, they may not invest even long before a sovereign default occurs.

In this paper, we analyze the relationship between fiscal discipline and bilateral FDI. To do so, we rely on the convergence criteria of the Maastricht Treaty[3] and focus on two key indicators: the level of public debt and the budget balance. During the public debt crisis, these two measures were used in policy circles and the popular press to group countries into "good", mostly Northern European countries whose fiscal policies were perceived to be sustainable, and "bad", mostly Southern European countries (Greece, Ireland, Italy, Portugal, and Spain, the so-called GIIPS countries) with unsustainable levels of public spending and debt.[4] In a first step, we analyze the impact of fiscal discipline on FDI and whether the so-called GIIPS countries did experience larger reductions than non-GIIPS in international investment for comparable levels of deficit and public debt. In a second step, we check whether fiscal discipline is an important determinant of FDI beyond the European Union by using a world-wide sample of FDI stocks.

[3]Note that both the Maastricht convergence criteria for becoming a member of the Eurozone as well as the rules of the Stability and Growth Pact for the whole EU imply exactly the same thresholds for public debt and budget deficit. However, the debt and budget deficit criteria are commonly known as the "Maastricht criteria". We therefore refer to them by this name.

[4]The pejorative use of this country group is reflected in the fact that many commentators referred to these countries as PIGS or PIIGS, see, e.g., `https://www.independent.co.uk/news/business/analysis-and-features/while-greece-flails-are-the-rest-of-the-stricken-pigs-taking-off-10058352.html`, and `https://www.theguardian.com/business/2010/feb/12/pigs-piigs-debted-eu-countries` (accessed 21/03/2018). Similarly, a Google picture search for "pigs Portugal Ireland Greece Spain" reveals several political caricatures which show pigs adorned with the countries' flags and some reference to these countries' levels of public debt and spending.

To the best of our knowledge, we are the first to empirically test the impact of fiscal discipline on bilateral FDI. There is some evidence that FDI inflows are more correlated between countries with similar levels of public debt, see Alamá-Sabater et al. (2016). They study a cross-section of FDI inflows within the EU in 2007. They find that if two FDI destination countries violate the Maastricht criterion of a public debt-to-GDP ratio of more than 60 percent, their FDI inflows are correlated. The same holds for inflows into countries which are below the 60 percent threshold. While Alamá-Sabater et al. (2016) consider the correlation between FDI flows for countries with similar debt levels using spatial econometric estimators, they do not investigate the *direct* effect of a country's level of public debt on the amount of FDI it receives; neither do they analyze the impact of a country's budget balance on its FDI inflows. Chanegriha et al. (2017) find that central government debt is a robust economic determinant of aggregate FDI inflows. Given their use of aggregate FDI data, they cannot distinguish between potentially differential effects of FDI from EU versus non-EU countries. We introduce fiscal discipline measures in a gravity model of bilateral FDI. In addition, we consider both long-run and short-run fiscal discipline measures, and we test country-heterogeneity by checking the results for GIIPS countries and in two different sub-samples (intra-European and world-wide).

Our paper also makes a methodological contribution to the FDI gravity literature by presenting a novel and simple approach to quantify the impact of country-specific variables like the level of public debt on bilateral FDI in the presence of time-varying origin and destination effects. Gravity models have typically been used to quantify the impact of country-specific variables on bilateral trade or bilateral FDI data. A drawback of theory-consistent trade gravity models is that they cannot quantify the effect of country-specific variables like, e.g., the level of of public debt, see Head and Mayer (2014). This is due to an insight of Anderson and van Wincoop (2003): as bilateral trade depends not only on bilateral trade costs but also on the trade costs with all other countries ("multilateral resistance"), the researcher has to control for the level of a country's average trade costs by including country-specific fixed effects. As the fixed effects are perfectly collinear with country-specific vari-

ables, the effect of the variable of interest cannot be identified. This problem is well-known in the empirical trade literature but has not been perceived so much in the literature on FDI. However, a firm's decision to locate a plant in a specific country depends not only on trade and monitoring costs with this country but also on the relative cost compared to locating the plant in any of the other countries, so the same argument applies to FDI. Heid et al. (2017) present a solution to this problem for trade gravity models by using data on domestic trade flows. Monte Carlo studies by Sellner (2019) validate this approach as the best practice for gravity models and recommend it to be used to identify the effect of country-specific, i.e., non-discriminatory, trade policy variables. The method has subsequently been extended to country-specific variables by Beverelli et al. (2018), again in a trade context. We translate the approach by Heid et al. (2017) to FDI gravity models by using data on domestic investment in combination with our data on FDI, overcoming the perfect collinearity problem. Therefore, the methodology of our paper can readily be applied to investigate the impact of other country-specific variables on FDI such as exchange rates or political institutions while simultaneously controlling for time-varying origin and destination fixed effects.[5]

A complimentary line of research studies the impact of extreme events like sovereign default and financial crises on FDI, see Fuentes and Saravia (2010) and Stoddard and Noy (2015). We contribute to this literature by studying the impact of fiscal discipline on FDI, that is, the impact of indicators of potential crises or macroeconomic problems in the near future before the uncertainty is resolved (before a potential sovereign default or financial crisis happens). Another complementary line of research has established the importance of fiscal discipline measures such as the budget deficit and the level of public debt as drivers of portfolio flows, see, e.g., Fratzscher (2012).

The remainder of the paper is structured as follows: Section 2 describes the recent experience of fiscal discipline within the EU and explains the theoretical framework for the relation between FDI and fiscal discipline. Section

[5]Previous studies which use foreign direct investment data to analyze the impact of institutional variables on FDI, e.g., Daude and Stein (2007), do not control for these factors to avoid the collinearity problem.

3 describes our empirical strategy and the data. Section 4 analyzes the effect of fiscal discipline on bilateral FDI stocks using a panel gravity framework, and presents results for FDI among EU countries and for a world-wide sample of FDI. Section 5 concludes.

2 Fiscal discipline and FDI: recent experience and theoretical framework

International investors are aware about a country's fiscal policy, particularly a country's budget deficit and its level of debt. Besides frequent coverage in the media, these measures are regularly published by national statistical offices and are compiled by international organizations. However, the theoretical relationship between FDI and fiscal discipline is not clear.

Lower growth prospects are bad news for market-seeking FDI, as lower growth means a smaller potential market. At the same time, FDI might be motivated by cost advantages such as lower wage costs. Then, FDI inflows might actually increase with higher levels of debt, as wages may fall during an economic downturn, and hence make a country more attractive for foreign investors. This type of real devaluation was heavily discussed as one way to improve economic conditions and increase the attractiveness for domestic and foreign investment in the GIIPS countries as the option of devaluing their currency is not available to them as they are members of the Eurozone.

In the long-run, higher levels of debt imply a larger amount of government spending on interest payments. Debt tends to increase during economic downturns when the pressure on government spending is especially high due to a decline in tax revenue. To balance this, governments may well be forced to increase taxes. Such a tax spike lowers firm profits and eventually lowers the return for foreign investors from investing in a debt-ridden country. Therefore, foreign investors may decide to invest in countries committed to fiscal discipline.

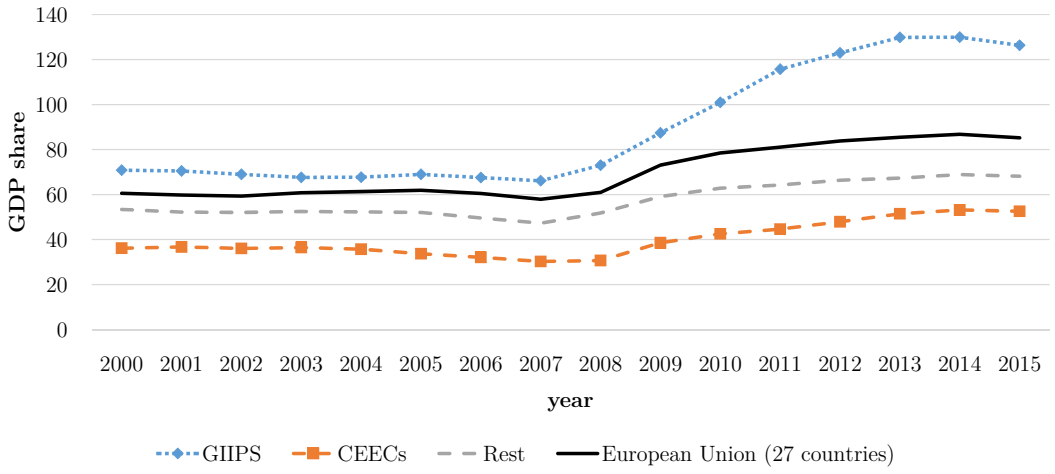
For euro member countries, an additional channel links fiscal discipline and FDI: higher government spending leads to higher expected interest rates

which crowds out private investment. In a multiple economy setting with flexible exchange rates, differential fiscal spending that leads to differences in local interest rates lead to an adjustment in the exchange rate to compensate investors and so capital does not need to move. However, within a monetary union, this adjustment cannot occur and so differences in real rates of return may persist across countries which in turn affects the distribution of capital across these countries. Then, increasing national debt levels may affect FDI.

Given the fact that EU member countries are required to keep to the Maastricht criteria of having a public debt-to-GDP ratio of less than 60 percent and a budget deficit which may not exceed 3 percent, it may be that investors are primed to care more about fiscal discipline when investing in EU countries with fiscal problems. Figures 1 and 2 show the evolution for both the budget balance as a share of the GDP and the debt-to-GDP ratios by distinguishing the trends for the average of all EU countries, the GIIPS countries, as well as the Central and Eastern European countries (CEECs), together with Malta and Cyprus, that accessed the EU in 2004 and 2007. We consider both a long-run fiscal discipline (public debt) and a short-run fiscal discipline measure (public budget balance). The reason is that measuring only long-run fiscal discipline may not completely capture investors' behavior. Indeed, investors may also consider the budget balance-to-GDP ratio as a measure of fiscal discipline. For example, Eichler and Maltritz (2013) find that short-run fiscal imbalances may indicate long-run country risks.

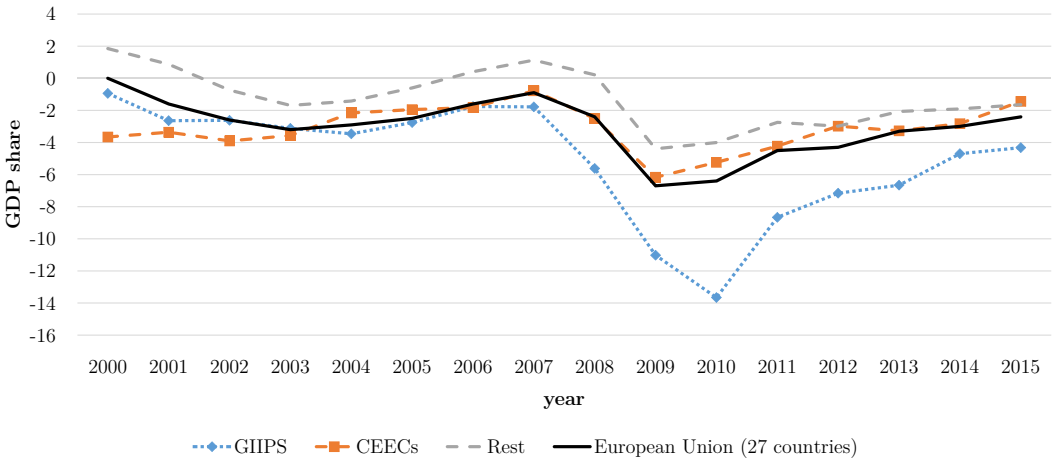
Figure 1 shows that GIIPS countries have consistently been above the average level of debt-to-GDP of the EU. Additionally, there is a steep increase beginning in 2007 in this group of countries. Regarding the public deficit, Figure 2 shows that it is also the GIIPS countries where the public deficit increased to a higher extent after the financial crisis and it is only from 2010 onwards that this ratio decreases. Hence, EU countries can be easily discriminated by their compliance regarding the Maastricht criteria. In our empirical analysis, we will test whether this translates into an effect on FDI, i.e., whether GIIPS countries did experience a differential effect of fiscal discipline on international direct investment.

Figure 1: Evolution of the debt-to-GDP ratio in the EU



Note: Graph depicts average values for the indicated groups of countries of public debt (government consolidated gross debt) as a share of GDP over time. Data from Eurostat.

Figure 2: Evolution of the budget balance in the EU



Note: Graph depicts average values for the indicated groups of countries of the budget balance (net lending (+) / net borrowing (-)) as a share of GDP over time. Data from Eurostat.

3 Empirical strategy

3.1 Panel gravity model for FDI

We follow the FDI literature and analyze the determinants of bilateral FDI stocks using a gravity model.[6] This framework takes into account the fact that FDI depends on origin and destination characteristics as well as a set of typically used bilateral variables such as geographical distance, common border, common language and colonial ties. We use directional bilateral fixed effects to control for these variables, following de Sousa and Lochard (2011). They proxy information costs which are modeled by standard gravity controls: larger bilateral distance increases information and coordination costs for investments, while common border, language and colonial ties imply lower information costs (see Portes and Rey, 2005 and Márquez-Ramos, 2011). In addition, using bilateral fixed effects has the advantage that it allows us to control for unobserved bilateral drivers of FDI. We also add measures of market size (GDP and population) which have been shown to correlate with FDI. To this set of variables, we add our variables of interest, our fiscal discipline measures, to analyze whether public debt and budget balance levels are correlated with FDI. We specify the following panel regression equation for bilateral FDI:

$$\begin{aligned} \ln FDI_{odt} &= \beta_1 \ln GDP_{ot} + \beta_2 \ln GDP_{dt} + \beta_3 \ln POP_{ot} + \beta_4 \ln POP_{dt} + \\ &+ \beta_9 EURO_{ot} + \beta_{10} EURO_{dt} + \\ &+ \beta_{11} FISCAL_{dt} + \delta_t + \xi_{od} + \varepsilon_{odt}, \quad \forall o, d, \text{ except } o = d \end{aligned} \tag{1}$$

FDI_{odt} are bilateral FDI stocks from origin country o invested in destination country d in year t, GDP_{ot} and GDP_{dt} are the GDPs in the origin and destination country in year t, and POP_{ot} and POP_{dt} measure the population in the origin and destination country in year t. Both GDP and population measure the respective investment potentials and market sizes of o and d. $EURO_{ot}$ is a dummy variable equal to 1 if o is a member of the Eurozone in

[6] See Anderson (2011) and Blonigen and Piger (2014) for recent literature reviews on modeling bilateral FDI.

year t, and similarly for $EURO_{dt}$. The importance of the Eurozone for FDI has been documented by de Sousa and Lochard (2011). Our bilateral fixed effects ξ_{od} control for the potential endogeneity of the Eurozone dummies.[7] Finally, we include a measure of fiscal discipline of the destination country in year t, $FISCAL_{dt}$.

We use two measures of fiscal discipline to differentiate between short-run and long-run fiscal discipline: for short-run fiscal discipline, we use $BUDGET_{dt}$ which measures the budget balance of the central government in destination country d in year t as a percentage share of GDP. For example, if $BUDGET_{dt} = 1.2$, destination country d's budget surplus is 1.2% of GDP, whereas if $BUDGET_{dt} = -4.5$, destination country d's budget deficit is 4.5%. For long-term fiscal discipline, we use $DEBT_{dt}$, which measures the level of public debt as a percentage share of GDP. Hence if $DEBT_{dt} = 72$, the destination country's level of public debt is 72% of its GDP.

δ_t controls for the common component in the business cycle across all countries, and hence controls, e.g., for the world-wide impact of the global financial crisis on FDI. Our bilateral fixed effects ξ_{od} also control for time-invariant origin and destination fixed effects, i.e., the multilateral resistance of FDI, avoiding the omitted variable bias pointed out by Anderson and van Wincoop (2003). They show the importance of what they call "multilateral resistance terms" for bilateral trade flows. These terms measure the relative trade costs between all countries, in a similar way to the multilateral attractiveness described in the FDI literature.[8] Importantly, they point out that bilateral trade flows between two countries do not only depend on the bilateral trade costs between these two countries but also by their average trade costs with other countries, i.e., multilateral resistance. The decision of an investing firm from an origin country to invest into a particular destination country depends not only on the trade costs (for vertical FDI) and monitoring costs (both horizontal and vertical FDI) between these two countries but also on the costs with all other countries. Therefore, a similar argument

[7] Bilateral fixed effects are commonly used to control for the endogeneity bias of regional trade agreements in bilateral trade flow gravity equations, see Baier and Bergstrand (2007).

[8] Head and Ries (2008) and de Sousa and Lochard (2011) point out that FDI into a particular country depends on the relative attractiveness of FDI in all other countries.

applies for the need to include origin and destination fixed effects to control for the multilateral resistance of FDI.

A potential problem with Equation (1) is that we only control for time-invariant origin and destination fixed effects, i.e., we control for time-invariant origin and destination country unobserved determinants of FDI which may be correlated with our regressors of interest. There exist numerous other potential time-varying factors which will affect our variables of interest. Therefore, one should include time-varying origin and destination fixed effects to control for these factors. However, using only foreign direct investment data, these fixed effects would be perfectly collinear with our regressors of interest, preventing the identification of their effect.

For bilateral trade gravities, Heid et al. (2017) show how this collinearity problem can be overcome when including trade flows from an origin country to the same destination country, i.e., trade with itself or domestic trade flows. We translate this approach to FDI data by including investment data from origin country in itself. The approach implies the following variation on Equation (1):

$$\begin{aligned} \ln FDI_{odt} &= \beta_1(I_{od} \times EURO_{dt}) + \beta_2(I_{od} \times FISCAL_{dt}) \\ &\quad + \delta_t + \mu_{ot} + \eta_{dt} + \xi_{od} + \varepsilon_{odt}, \quad \forall o, d, \text{ including } o = d \end{aligned} \tag{2}$$

where we now can introduce time-varying origin and destination fixed effects μ_{ot} and η_{dt}. I_{od} is a dummy variable which is 1 if the investment is a foreign investment, i.e., $o \neq d$, and 0 otherwise. Note that the market size variables are captured by μ_{ot} and η_{dt}.

Beverelli et al. (2018) demonstrate that when one applies the method by Heid et al. (2017) for country-specific variables, one can only identify an average effect which does not vary whether the country is the origin or destination of FDI. Accordingly, we only include destination country variables into Equation (2) without loss of generality.

Note that by including domestic investment, we identify the effect of fiscal discipline on FDI by using the variation between domestic and foreign investment. Accordingly, β_2 in Equation (2) measures the differential impact

of fiscal discipline on FDI. The overall business cycle effect of a change in the fiscal stance of governments on investment (both domestic and foreign) is captured by the origin and destination fixed effects μ_{ot} and η_{dt}.

Head and Ries (2008) point out that traditional log-linear FDI gravity regressions may suffer from a bias if FDI data are heteroskedastic. In addition, log-linearization drops all zero FDI stock observations. This is tantamount to throwing away data which may otherwise help with identification of the coefficients of interest. Santos-Silva and Tenreyro (2006) provide a simple solution to this problem. Instead of estimating the log-linear Equation (1), one can estimate it in levels, i.e., using FDI_{odt} as the dependent variable and estimate the coefficients via poisson pseudo maximum likelihood (PPML). The elegance of this approach lies in the fact that even though FDI data are not poisson distributed, one can still obtain consistent parameter estimates as long as the FDI equation is well-specified, i.e., it does not suffer from endogeneity bias, e.g., due to omitted relevant regressors. Hence, in terms of assumptions, PPML does not imply stricter assumptions than a standard linear regression but avoids the inconsistency of the estimated parameters due to the heteroskedasticity. In terms of interpretation, the estimated coefficients can be compared to OLS coefficients and can be interpreted in exactly the same way.[9] Our preferred specification therefore is estimating Equation (2) using PPML. For our PPML estimations we use the Stata package `ppmlhdfe` by Correia et al. (2019).[10] We use two-way clustered standard errors by Cameron et al. (2011) following the recommendation by Egger and Tarlea (2015) for gravity models. We allow for clustering across observations involving the same origin or destination country.[11]

[9] Using PPML to include zero FDI stocks is complementary to approaches that model the potential censoring and the selection bias of positive FDI stocks. Examples in the literature are Kristjánsdóttir (2010) who uses a Tobit model and Davies and Kristjánsdóttir (2010) who use a Heckman estimator.

[10] We present OLS results using the Stata package `reghdfe` by Correia (2014) in the Appendix.

[11] We do not allow for clustering across observations within a given year as we only have 11 years in our sample, invalidating the large sample properties needed for the consistence of the variance-covariance estimator by Cameron et al. (2011) if we clustered along this dimension.

3.2 Data

We use an unbalanced panel data set on bilateral stocks of FDI from UNCTAD's bilateral FDI statistics. It contains information about 157 origin countries and 189 destination countries of FDI stocks. We use data on FDI stocks because they have several advantages over FDI flow data: they contain less negative or zero values which cannot be used in typical log-linear FDI regressions, see, e.g., de Sousa and Lochard (2011). They are also less volatile than FDI flow data, see Bénassy-Quéré et al. (2007).

Our data on public debt levels and the budget balance as a percentage of GDP are from the World Development Indicators (WDI). However, we use data from Eurostat for EU member states as the WDI data have many missing observations for these countries.

For our regressions using the methodology of Heid et al. (2017), we need information on investment of origin country o in destination country $d = o$, i.e., domestic investment. UNCTAD data on *foreign* direct investment do not contain information about the level of domestic investment. Therefore, we follow the approach from Alamá-Sabater et al. (2017) and construct our measure of domestic investment by subtracting the sum of foreign direct investment stocks from all source countries different than o, i.e., $FDI_{oo} = CAPITAL_o - \sum_{o,o \neq d} FDI_{od}$ from a measure of country o's capital stock, $CAPITAL_o$. We use capital stock data from the Penn World Tables 8.1.[12] As the last year available of the Penn World Tables 8.1 is 2011, we consider the period from 2001 to 2011.

[12] We use *ck*, the capital stock in current million US$ (PPP) (note that FDI data are also in million US$). For an overview of the Penn World Tables and their capital stock measures, see Feenstra et al. (2013), Feenstra et al. (2015a), Feenstra et al. (2015b) and Inklaar and Timmer (2013).

4 Results

4.1 EU sample

In a first step, we analyze intra-EU FDI stocks, i.e., we restrict our analysis to FDI into EU member countries by EU-based firms. We present results in Table 1. All regressions are estimated by PPML and include directional country pair fixed effects. Note that these also control for time-invariant origin and destination fixed effects. In column (1), we include our measure of short-run fiscal discipline, $BUDGETBALANCE_{dt}$. We find that short-run fiscal discipline in the destination country alone does not correlate with FDI stocks. Concerning the other included variables, we find that an increase in the origin GDP increases FDI stocks overproportionally, i.e., an increase of origin GDP by one percent increases FDI stocks by 1.3 percent. A one percent increase in the GDP of the destination country also increases FDI stocks, but to a lower extent by only 0.7 percent. An increase of the population of the origin country increases FDI stocks *ceteris paribus*. As we control for GDP, this implies that FDI stocks decrease with an increase in GDP per capita, highlighting vertical motives for FDI within the EU. This is not surprising given the time period of our sample which implies that FDI into the new EU member states with relatively low levels of GDP per capita dominates the horizontal FDI motives typically found for FDI between older EU members with more similar levels of GDP per capita. We also find a positive effect of the euro on FDI stocks.

In column (2), we swap our short-run measure of fiscal discipline with our long-run measure, i.e., the level of public debt over GDP in the destination country. We do not find an impact of long-run fiscal discipline on FDI stocks. The estimated coefficients for the other regressors are very similar to the estimates from column (1).

Column (3) includes both measures of fiscal discipline at the same time, reflecting the notion that the budget balance may affect FDI stocks conditional on the level of public debt. Again, we do not find a significant impact of neither short-run nor long-run fiscal discipline.

It is possible that the impact of the budget deficit becomes larger the larger the level of public debt of a destination country. If this is the case, an interaction term between the budget balance and the level of public debt should be included. We report results including an interaction term in column (4). We do not find a significant effect neither of fiscal discipline measures nor the interaction term.

It may be that the GIIPS countries suffered more from a deterioration of the budget balance or an increase in their level of public debt, given that these countries' high budget deficits and levels of public debt have become particularly salient during the crisis. In column (5), we therefore include interactions of our two measures of fiscal discipline with a dummy variable $GIIPS_d$ which takes the value 1 if the destination country is either Greece, Ireland, Italy, Portugal, or Spain. We fail to find a significant correlation between fiscal discipline measures and FDI, for both EU countries and for GIIPS.

Until now, our regressions do not control for the influence of other time-varying unobservable variables in origin and destination countries by including origin×year and destination×year fixed effects, as is typically done in panel gravity regressions. We did not include these as they would be perfectly collinear with our variables of interest. In column (6) we use our adapted version of the method by Heid et al. (2017) augmenting the sample with observations for domestic investment stocks. This allows us to include origin×year and destination×year fixed effects and still identify the differential impact of our variables of interest on *foreign* direct investment. Therefore, column (6) is the most stringent specification as it simultaneously controls for bilateral time-invariant fixed effects and time-varying origin and destination country fixed effects. Therefore, in column (6) we identify the differential impact of fiscal discipline on foreign *versus* domestic investment. As our measures of market size (GDP and population) both scale domestic and international investment in the same way, they are captured by the origin×year and destination×year fixed effects. $EURO_{dt}$ now identifies the differential impact of the common currency on foreign investment versus domestic investment. Concerning our variables of interest, we find that whereas

short-run fiscal discipline does not affect FDI stocks, long-run fiscal discipline does matter, and the interaction term between short-run and long-run fiscal discipline mediates this effect: higher public debt leads to lower FDI if the budget deficit is smaller than 4 percent.[13] The effect is sizeable: if public debt increases by 1 percentage point for a destination country with a balanced budget ($BUDGETBALANCE_{dt} = 0$), FDI decreases by 0.4 percent. The marginal effect turns positive for very high levels of the budget deficit as observed in the GIIPS countries. This is consistent with the "fire-sale" hypothesis by Stoddard and Noy (2015): countries with high fiscal distress may sell their public assets at large discounts to finance their deficit, as has happened, e.g., in Greece during the public debt crisis, and which therefore attracts more FDI as investors use this opportunity to invest into undervalued assets. Turning to the marginal effect of $BUDGETBALANCE_{dt}$, we find that for the debt levels of EU countries, an increase in the budget balance leads to a reduction of FDI.[14] This may well be due to a contractionary effect of a budget surplus on aggregate spending which in turn may lead to lower FDI. We do not find any evidence that investors penalized GIIPS countries more for a given level of fiscal discipline. In fact, the interaction term of $DEBT_{dt}$ with $GIIPS_{dt}$ is positive and significant. Hence, a reduction in fiscal sustainability seems not to explain the fall of FDI in GIIPS countries.

Summing up, we find that FDI is correlated with fiscal discipline measures for intra-EU FDI. Our estimated effects are economically sizeable. In addition, we find evidence for the "fire-sale" of assets in times of fiscal distress, in line with recent episodes in GIIPS countries.[15]

[13] The marginal effect of an increase in the debt level is $\partial \ln(FDI)_{odt}/\partial DEBT_{dt} = \hat{\beta}_D + \hat{\beta}_{BD} BUDGETBALANCE_{dt} < 0$ if $BUDGETBALANCE_{dt} > -4$ where $\hat{\beta}_D$ is the estimated coefficient for $DEBT_{dt}$ and $\hat{\beta}_{BD}$ is the estimated coefficient of the interaction term between $BUDGETBALANCE_{dt}$ and $DEBT_{dt}$ from column (6) in Table 1.

[14] The marginal effect of an increase in the budget balance is $\partial \ln(FDI)_{odt}/\partial BUDGETBALANCE_{dt} = \hat{\beta}_B + \hat{\beta}_{BD} DEBT_{dt} < 0$ if $DEBT_{dt} > 13$ where $\hat{\beta}_B$ is the estimated coefficient for $BUDGETBALANCE_{dt}$ and $\hat{\beta}_{BD}$ is the estimated coefficient of the interaction term between $BUDGETBALANCE_{dt}$ and $DEBT_{dt}$ from column (6) in Table 1.

[15] In Table A.1 in the Appendix, we reestimate the models from Table 1 using OLS. Results on our control variables are similar, but coefficients associated to fiscal discipline measures are not significant in most of the cases, excluding two coefficients with an unex-

pected positive sign, in columns (3) and (6). This may be due to the heteroskedasticity of FDI stocks which leads to biased coefficients when using OLS as argued by Santos-Silva and Tenreyro (2006).

Table 1: Bilateral FDI stock panel regressions 2001-2011—EU sample

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP)_{ot}$	1.339***	1.343***	1.339***	1.338***	1.352***	
	(0.121)	(0.150)	(0.145)	(0.148)	(0.144)	
$\ln(GDP)_{dt}$	0.674**	0.602***	0.594***	0.566***	0.489**	
	(0.274)	(0.171)	(0.176)	(0.186)	(0.248)	
$\ln(POP)_{ot}$	3.495***	3.455***	3.484***	3.473***	3.384***	
	(0.871)	(0.892)	(0.897)	(0.897)	(0.826)	
$\ln(POP)_{dt}$	2.403	1.905	2.400	2.508	2.444	
	(2.531)	(2.127)	(2.492)	(2.494)	(2.543)	
$EURO_{ot}$	0.315***	0.315***	0.318***	0.317***	0.318***	
	(0.102)	(0.105)	(0.104)	(0.108)	(0.103)	
$EURO_{dt}$	0.206***	0.193**	0.202**	0.208**	0.208**	0.432*
	(0.076)	(0.082)	(0.082)	(0.087)	(0.088)	(0.230)
$BUDGETBALANCE_{dt}$	0.010		0.008	0.020	0.020	0.013
	(0.013)		(0.008)	(0.013)	(0.016)	(0.012)
$DEBT_{dt}$		-0.003	-0.001	-0.003	-0.004	-0.004**
		(0.004)	(0.003)	(0.003)	(0.003)	(0.002)
$BUDGETBALANCE_{dt} \times DEBT_{dt}$				-0.000	-0.000	-0.001**
				(0.000)	(0.000)	(0.000)
$BUDGETBALANCE_{dt} \times GIIPS_d$					-0.001	0.016
					(0.008)	(0.016)
$DEBT_{dt} \times GIIPS_d$					0.003	0.005*
					(0.005)	(0.003)
N	4,520	4,520	4,520	4,520	4,520	4,860

Note: Dependent variable is FDI_{odt}. Estimated by PPML. All columns contain bilateral fixed effects ξ_{od} which also control for time-invariant origin and destination fixed effects. In column (6), we add observations for domestic investment, FDI_{oot}. Column (6) also includes origin×year and destination×year fixed effects. We report two way clustered standard errors by Cameron et al. (2011) which allow for correlation of errors for observations including the same origin or destination country. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Bilateral FDI stock panel regressions 2001-2011—world-wide sample

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP)_{ot}$	0.655***	0.650***	0.651***	0.654***	0.663***	
	(0.222)	(0.237)	(0.238)	(0.241)	(0.241)	
$\ln(GDP)_{dt}$	1.190***	1.093***	1.105***	1.100***	1.080***	
	(0.163)	(0.200)	(0.200)	(0.199)	(0.217)	
$\ln(POP)_{ot}$	1.839**	2.103***	2.098***	2.094***	2.054***	
	(0.797)	(0.802)	(0.800)	(0.797)	(0.755)	
$\ln(POP)_{dt}$	-0.212	0.110	-0.012	0.047	0.080	
	(0.826)	(0.878)	(0.916)	(0.959)	(0.941)	
EU_{ot}	0.532***	0.514***	0.506***	0.505***	0.498***	
	(0.062)	(0.090)	(0.080)	(0.084)	(0.080)	
EU_{dt}	0.057	0.090	0.084	0.087	0.092	1.073***
	(0.113)	(0.112)	(0.109)	(0.111)	(0.113)	(0.164)
$EURO_{ot}$	0.411***	0.408***	0.402***	0.402***	0.392***	
	(0.088)	(0.095)	(0.093)	(0.092)	(0.094)	
$EURO_{dt}$	0.100	0.087	0.084	0.089	0.086	0.452**
	(0.095)	(0.104)	(0.103)	(0.107)	(0.107)	(0.201)
$BUDGETBALANCE_{dt}$	0.001		-0.004	0.002	0.000	-0.002
	(0.006)		(0.004)	(0.014)	(0.016)	(0.013)
$DEBT_{dt}$		-0.003	-0.004	-0.004	-0.006*	-0.004*
		(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
$BUDGETBALANCE_{dt} \times DEBT_{dt}$				-0.000	-0.000	-0.000
				(0.000)	(0.000)	(0.000)
$BUDGETBALANCE_{dt} \times GIIPS_{d}$					0.007	0.013
					(0.010)	(0.020)
$DEBT_{dt} \times GIIPS_{d}$					0.004	0.004**
					(0.003)	(0.002)
N	32,493	22,129	22,046	22,046	22,046	23,097

Note: Dependent variable is FDI_{odt}. Estimated by PPML. All columns contain bilateral fixed effects ξ_{od} which also control for time-invariant origin and destination fixed effects. In column (6), we add observations for domestic investment, FDI_{oot}. Column (6) also includes origin×year and destination×year fixed effects. We report two way clustered standard errors by Cameron et al. (2011) which allow for correlation of errors for observations including the same origin or destination country. *** p<0.01, ** p<0.05, * p<0.1.

4.2 World-wide sample

As we have found evidence for fiscal discipline affecting FDI within the EU, the natural question is whether fiscal discipline also matters for FDI stocks across the world. We therefore reestimate the models from Table 1 on a world-wide sample. We present results in Table 2. This table is organized in an identical way as Table 1, however, we now add EU_{ot} and EU_{dt}, dummy variables which take the value 1 if the origin or destination country is a EU member country in year t. Similar to column (1) in Table 1, we do not find an effect of short-run fiscal discipline on FDI. Interestingly, EU countries invest more, but do not receive more FDI from across the world, and similarly for euro member countries. Results for our measures of market size, GDP, and population are broadly similar to results obtained in Table 1. In column (2), we use the long-run measure of fiscal discipline, the level of public debt. As in our EU sample, public debt does not correlate with FDI. In column (3), we include both measures of fiscal discipline simultaneously and we fail to find an effect of fiscal discipline on FDI for the world-wide sample. This result is confirmed when including the interaction term between both measures of fiscal discipline in column (4).

As fiscal discipline measures may be particularly salient for investors as they are easily and continuously observable, GIIPS countries may have affected also investors from non-EU countries. Therefore, we again include interaction terms between our measures of fiscal discipline and $GIIPS_d$ in column (5). As in our EU sample, we do not find that GIIPS countries were particularly penalized, however, the impact of an increase in the level of public debt by one percentage point on FDI increases in absolute magnitude to -0.6 percent. When using our new method, which also includes observations for domestic investment in column (6) and origin×year and destination×year fixed effects, our preferred specification, we do validate the effect of long-run fiscal discipline on FDI. Finally, our results for the world-wide sample validate that the interaction term of $DEBT_{dt}$ with $GIIPS_{dt}$ is positive and significant. Again, a reduction in fiscal sustainability seems not to explain

the fall of FDI in GIIPS countries.[16]

5 Conclusion

The recent financial and public debt crises saw a large decline in foreign direct investment. Unsustainable fiscal policies have been seen as a major contributor to the severity of these crises. Consequently, policy makers fear that the lack of fiscal discipline may deter foreign direct investment, with potential negative consequences for economic growth.

We investigate whether the level of public debt and the budget balance have a significant impact on bilateral FDI for a large panel of countries over time. As fiscal discipline is a cornerstone of the Maastricht criteria and the Stability and Growth Pact of the European Union, we also investigate the impact of fiscal discipline for investment among EU member countries.

We find evidence for the impact of fiscal discipline on both intra-European and world-wide FDI. More specifically, inward FDI is sensitive to long-run fiscal discipline: higher public debt leads to lower FDI. However, contrary to much public commentary, GIIPS countries have not been particularly penalized by foreign investors.

Although countries can be easily discriminated by their compliance regarding the Maastricht criteria, as exemplified by the catchy GIIPS label used in the media, this label has not lead to an additional penalty, i.e., a decrease in FDI, beyond the levels expected by economic fundamentals such as market size. Indeed, GIIPS countries have not experienced a decrease of their FDI inflows as a consequence of unsustainable fiscal policy. This has important implications for the evaluation of both FDI and fiscal policies within the EU and beyond.

[16] In Table A.2 in the Appendix, we reestimate Table 2 using OLS. Note that because of the log-linear form, we loose many observations with zero bilateral FDI stocks compared to our PPML specifications. In these regressions, we fail to find any significant effect of fiscal discipline on FDI in our preferred specification. Given the heteroskedasticity bias as well as the reduced sample, these results have to be interpreted with caution.

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Appendix

A Regression results using log-linear model

The following Tables reestimate the models from Tables 1 and 2 in log-linearized form using OLS.

Table A.1: Bilateral FDI stock OLS panel regressions 2001-2011—EU sample

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP)_{ot}$	1.409***	1.417***	1.415***	1.415***	1.417***	
	(0.271)	(0.268)	(0.271)	(0.271)	(0.270)	
$\ln(GDP)_{dt}$	0.693***	0.786***	0.843***	0.841***	0.836***	
	(0.216)	(0.260)	(0.253)	(0.258)	(0.279)	
$\ln(POP)_{ot}$	2.031*	2.003*	1.946*	1.940*	1.940*	
	(1.040)	(1.019)	(1.049)	(1.068)	(1.072)	
$\ln(POP)_{dt}$	-2.280	-2.351	-1.996	-2.015	-2.041	
	(1.647)	(1.551)	(1.591)	(1.586)	(1.642)	
$EURO_{ot}$	0.289**	0.294**	0.291**	0.291**	0.291**	
	(0.135)	(0.133)	(0.133)	(0.133)	(0.132)	
$EURO_{dt}$	-0.119	-0.088	-0.094	-0.094	-0.094	0.313
	(0.136)	(0.131)	(0.130)	(0.130)	(0.130)	(0.189)
$BUDGETBALANCE_{dt}$	0.009		0.014**	0.016	0.016	0.034
	(0.007)		(0.007)	(0.016)	(0.019)	(0.031)
$DEBT_{dt}$		0.002	0.004	0.004	0.004	0.013***
		(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
$BUDGETBALANCE_{dt} \times DEBT_{dt}$				-0.000	-0.000	0.000
				(0.000)	(0.000)	(0.001)
$BUDGETBALANCE_{dt} \times GIIPS_d$					-0.002	-0.049
					(0.015)	(0.030)
$DEBT_{dt} \times GIIPS_d$					0.000	-0.003
					(0.004)	(0.006)
N	4,043	4,043	4,043	4,043	4,043	4,266

Note: Dependent variable is $\ln(FDI)_{odt}$. Estimated by OLS. All columns contain bilateral fixed effects ξ_{od} which also control for time-invariant origin and destination fixed effects. In column (6), we add observations for domestic investment, $\ln(FDI)_{oot}$. Column (6) also includes origin×year and destination×year fixed effects. We report two way clustered standard errors by Cameron et al. (2011) which allow for correlation of errors for observations including the same origin or destination country. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2: Bilateral FDI stock OLS panel regressions 2001-2011—world-wide sample

	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(GDP)_{ot}$	0.345**	0.342**	0.344**	0.344**	0.347**	
	(0.148)	(0.132)	(0.133)	(0.133)	(0.132)	
$\ln(GDP)_{dt}$	0.742***	0.882***	0.873***	0.869***	0.868***	
	(0.124)	(0.165)	(0.164)	(0.166)	(0.166)	
$\ln(POP)_{ot}$	0.801	0.903	0.896	0.889	0.876	
	(0.755)	(0.618)	(0.622)	(0.619)	(0.618)	
$\ln(POP)_{dt}$	-0.502	-0.303	-0.280	-0.289	-0.230	
	(0.790)	(0.921)	(0.920)	(0.930)	(0.909)	
EU_{ot}	0.385**	0.474***	0.472***	0.471***	0.471***	
	(0.169)	(0.172)	(0.173)	(0.173)	(0.174)	
EU_{dt}	0.221**	0.181**	0.183**	0.185**	0.189**	0.886***
	(0.091)	(0.078)	(0.079)	(0.081)	(0.080)	(0.194)
$EURO_{ot}$	0.333*	0.398**	0.396*	0.395*	0.399**	
	(0.187)	(0.198)	(0.199)	(0.198)	(0.197)	
$EURO_{dt}$	-0.188*	-0.192	-0.198*	-0.194	-0.193	0.324
	(0.112)	(0.117)	(0.118)	(0.118)	(0.120)	(0.308)
$BUDGETBALANCE_{dt}$	0.005		0.007	0.013	0.009	-0.012
	(0.005)		(0.007)	(0.014)	(0.014)	(0.032)
$DEBT_{dt}$		-0.003	-0.003	-0.003	-0.004	0.004
		(0.003)	(0.003)	(0.003)	(0.004)	(0.006)
$BUDGETBALANCE_{dt} \times DEBT_{dt}$				-0.000	-0.000	0.000
				(0.000)	(0.000)	(0.001)
$BUDGETBALANCE_{dt} \times GIIPS_{d}$					0.016*	-0.005
					(0.009)	(0.028)
$DEBT_{dt} \times GIIPS_{d}$					0.006*	0.005
					(0.003)	(0.007)
N	23,425	15,974	15,913	15,913	15,913	16,392

Note: Dependent variable is $\ln(FDI)_{odt}$. Estimated by OLS. All columns contain bilateral fixed effects ξ_{od} which also control for time-invariant origin and destination fixed effects. In column (6), we add observations for domestic investment, $\ln(FDI)_{oot}$. Column (6) also includes origin×year and destination×year fixed effects. We report two way clustered standard errors by Cameron et al. (2011) which allow for correlation of errors for observations including the same origin or destination country. *** p<0.01, ** p<0.05, * p<0.1.