

Foreign Direct Investment and the business cycle: new insights after the great recession

Carlos Rodríguez, University of the Basque Country
carlos.rodrieguezg@ehu.es

Ricardo Bustillo, University of the Basque Country
ricardo.bustillo@ehu.es

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Abstract

In this paper we examine how business cycles in the home country affect OFDI flows. We employ a panel data set of OFDI flows for a representative sample of countries from 1970 to 2011. The findings of the regression models we have used are consistent with the hypothesis that OFDI flows have a pro-cyclical behaviour. This is the case for different country subsamples, for different business cycle specifications and for the inclusion of other control variables as well. Beyond this main conclusion, home country interest rate and exchange rates reveal a negative effect upon OFDI flows.

Introduction

World FDI flows showed an unprecedented growth during the past decade, surpassing the growth of trade flows and GDP, eventually reaching an historical maximum in 2007 (around 2000 billion dollars, 4% GDP) just before the outbreak of the financial crisis. The great recession had apparently a remarkable impact on world FDI flows during 2008 and 2009, reducing almost half that figure (-46%); but in 2010 flows started to recover and by 2011 have regained a large part of that decline. These fluctuations have not been however the first ones: world FDI data collected by UNCTAD since 1970 show world FDI declines in the first years of the 80s and again in the beginning years of the 90s and 2000s. Those four negative periods seem to last only for a couple of years and flows recover thereafter the upward long run trend. This increasing long run trend has been the major concern of the research about FDI. However, despite their recurrence the cyclical evolution in the short run has been downplayed or even ignored by the theory and the empirical studies about the determinants of FDI.

In fact, the theory of the multinational enterprise, which explains how FDI flows determinants are derived, consists of a general equilibrium model. Empirical studies have mainly focused on the cross-country bilateral dimension of this phenomenon by looking at the long run determinants for firms to invest abroad and become multinational (Brainard, 1997; Markusen et al. 1999; Carr et al. 2001...). These studies largely ignored time series fluctuations and look at persistent factors as market size, distance, factor endowments similarity, institutional dimensions, trade costs and the like.

So, the principal aim of this research is to focus on the short run determinants of FDI outward flows (OFDI). In other words we attempt to shed some light on the relationship between business cycles and OFDI. It is a relevant question to know the business cycle effects on OFDI, especially during the ongoing recession affecting major investing countries. From the host countries' point of view, the FDI flows they might receive, can be an important contribution in exiting from the crisis. Moreover, for investing countries it is a relevant way to expand market opportunities and tap on new technological upgrading chances. In this sense, it has been clearly accredited that multinational enterprises are able to stand better during bad times. On the other hand

although FDI flows might not be a large part of total capital inflows for major industrial countries, it is still a relevant one, and this is even more true for emerging countries. A “sudden stop” of FDI outflows could provoke a shock in countries’ capital balance. So, in the context of this recession the cyclical behaviour of OFDI flows becomes an issue not only of academic but also of practical relevance.

As far as we are aware of it, there are only a few studies that deal partially with the issue regarding the cyclical behaviour of FDI flows, but fall short to reach a consensus about how short run GDP fluctuations (business cycle) exert an influence over OFDI flows. Levi et al. (2007) when examining how business cycles in developed countries affect FDI flows to developing countries, find their results are consistent with the fact that FDI outflows tend to move in opposite directions (counter-cyclically) during the cycles in USA and Europe throughout the eighties and nineties. Wang and Wong (2007), when researching business cycle effects for a country’s direct investment outflows, reach the result that volatility in economic growth has a negative and significant impact on FDI outflows stating that fluctuations in economic growth discourage OFDI but only when countries are in a recession, but do not affect OFDI significantly in a boom. Cavallari (2013) when analysing the role of real output volatility in driving OFDI finds that it strongly deters foreign investment, especially for the decision to invest in a foreign country in the first place. Buch and Lipponer (2005) using industry data of German firms find out that there is a positive response of German OFDI to positive cyclical development abroad and to a real depreciation of the source country currency.

Following this array of research, this paper further contributes to this issue. To avoid some inconsistencies and confusion with previous literature, we will focus mainly on home country’s business cycle affecting OFDI (but being aware of the possible influence of host countries’ business cycles) but not on the effect of uncertainty deriving from GDP volatility associated with business cycles. Our main country sample includes 22 OECD countries which represent the bulk of world OFDI and for which data availability allows us to run a panel data regression model to test the main home country variables affecting these countries’ OFDI in the short run. Furthermore, our data set covers the period 1970-2011 including the recent recession and recovery, which is of major relevance. The main findings of this paper can be summarized as follows: (i) the cyclical component of GDP exerts a positive impact on OFDI (shows a procyclical

nature) even checking for different country samples, business cycle definitions and other possible control variables; (ii) other variables such as exchange rates, interest rates, domestic investment, and the host countries' GDP cycle do also exert an influence on OFDI.

The paper is organized as follows. After this introduction in the second section we present a brief theoretical discussion about the different channels through which business cycles could affect OFDI flows pointing out the different hypotheses to test. In the third section we deal with the empirical part describing the data, specifying the econometric models and discussing the results. The final section summarizes the main findings and concludes.

2. Theoretical hypotheses

The model that can be applied to deduct some hypotheses about this issue is the model for a closed economy with financial restrictions, but extended for an open economy. This model links pro-cyclical investments to changes in the net worth of firms and the marginal cost of finance (Bernanke et al. 2000). It is the usual financial accelerator hypothesis but carried through in an international setting (Gilchrist and Himmelberg, 1995; Cavallari, 2010). As long as the net worth of multinational firms moves pro-cyclically foreign investments should increase during a cyclical expansion in the source country and decrease in a recession. Summarising the idea, in a boom when firms enjoy larger profits and cash flow (net worth in general) they have more internal funds for investment at home and abroad. On the other hand, the higher the net worth and the higher the share of investment financed through own funds, the lower the external finance premium is because the agency problem diminishes. Therefore external financing costs decline and this encourages investments (at home and abroad).

Early attempts to investigate the role of borrowing opportunity for financing an investment overseas have mainly focused on the link between exchange rates and FDI (Froot and Stein, 1991). Again, the relationship between exchange rates and FDI is based in imperfect capital market model. These authors state that an appreciation of the domestic currency increases domestic firms' wealth (or cash flows) relative to foreign

firms, which results in larger foreign investment flows from the domestic country, especially when FDI is directed towards the acquisition of firms as a way of entry in a foreign market. This reasoning can be extended to the link between business cycles and OFDI by domestic firms as well. If GDP is reduced during a recession, firms' cash flow would shrink, which makes OFDI more difficult. On the other hand GDP expansionary periods would have the opposite effect.

Finally, Levy et al. (2007) consider that there are different channels through which the business cycle could affect FDI outflows. They use the term "income effect" referring to the positive influence of expansions (i.e. when the cyclical component of output is positive) on OFDI because of firms' higher earnings to invest at home and abroad during the positive part of the cycle. Thus, OFDI should display the same pro-cyclical behaviour documented for domestic investment as in the accelerate hypothesis mentioned above. However they refer to a "substitution effect" that would reduce OFDI. This negative effect would occur because in an upturn the marginal productivity of capital increases at home making foreign investment less attractive, even more considering that OFDI is riskier than home investment. This substitution between foreign and domestic investment is an arbitrage between different investment options. Furthermore, if monetary policy is conducted in a countercyclical manner, increasing interest rates in the source country during a boom, it would increase financing costs and investment (at home and abroad). This substitution effect would generate a countercyclical OFDI behaviour. Thus the a priori hypothesis that OFDI behaves procyclically must be tested empirically.

3. Empirical Analysis

Illustrative Overview

Apparently, as can be seen in figures 1 and 2, there is no clear common co-movement between OFDI and GDP in the short run. But, before entering in a deeper analysis in the next part to figure out this relationship in more detail, we will first comment broadly the evolution of world FDI outflows briefly. World and developed countries OFDI shows a growing long run trend, punctuated by four main peaks and troughs describing several complete cycles. Throughout the seventies decade, there was a slight upward tendency fed mostly by USA multinationals' access to world markets; however, increase in oil prices (1979) and the subsequent economic crisis coincide in time more or less with

reduced OFDI volumes in 1980 and 1981. The eighties decade witnessed a steady and stronger rise in OFDI up to the beginning of the nineties. During his period European and Japanese multinationals added to world FDI, encouraged by a process of increased capital market liberalization and the ongoing globalization trend. This expansion period ended again at the end of the 90s. Following World Investment Report analysis of global OFDI trends, the 1991 report starts saying that volatility in FDI flows is closely related to cyclical fluctuations and that recession in USA and UK explains world OFDI slowdown. However, commenting on the evolution of these flows for 1992, which grew even in a recessionary year, they cast some doubts about the effect of economic growth on OFDI, stating that “this suggests that TNCs may become less influenced by cyclical fluctuations (or influenced by a time lag)” (p. 14 and 15) and that TNCs seemed to give more importance to long term goals.

Figure 1: World GDP and OFDI

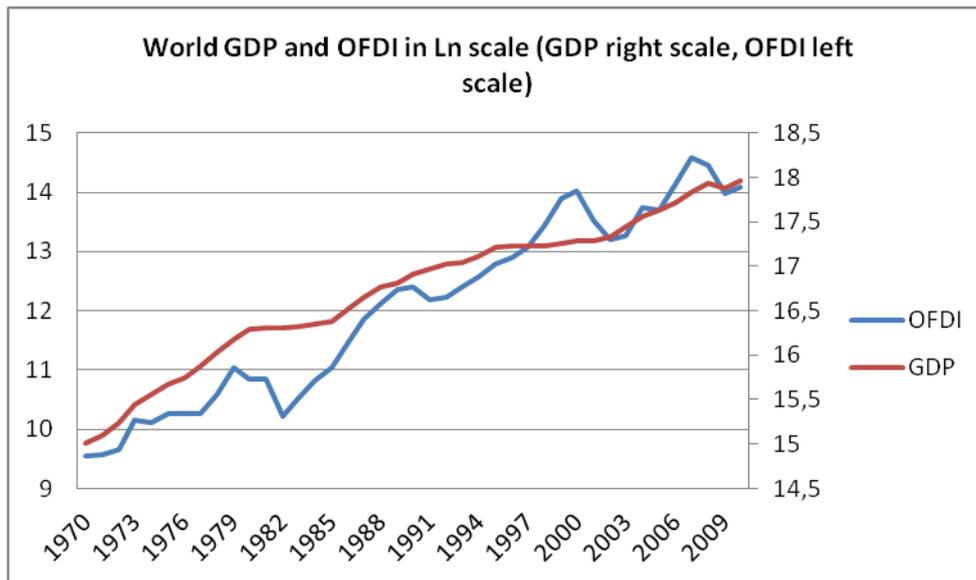
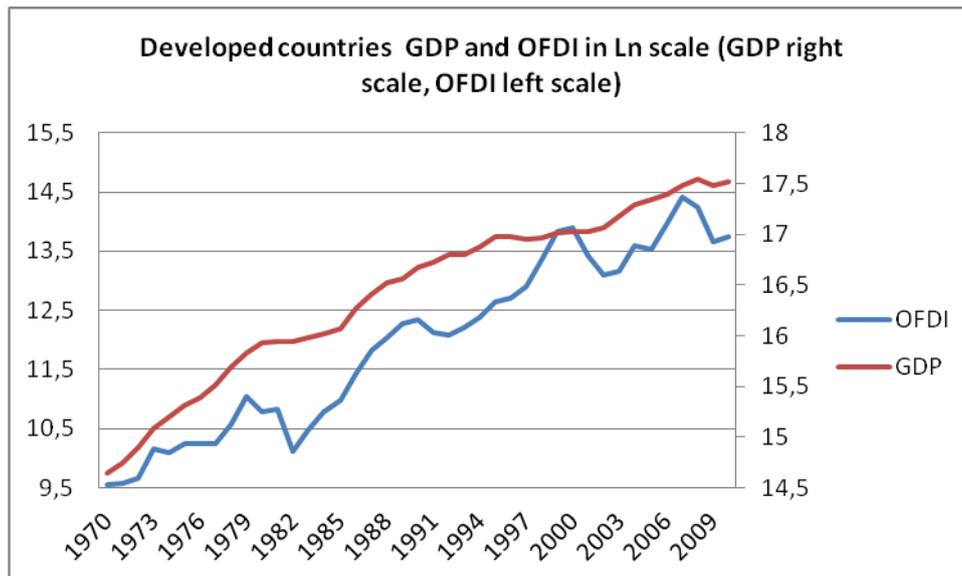


Figure 2: Developed countries GDP and OFDI



The third expansion occurred until 2000. During the nineties decade OECD countries, which were still almost the exclusive investors, enjoyed a period of moderate economic growth favoured by successful stabilising macroeconomic policies with low interest rates and abundant financial resources. Apart from macroeconomic stability factors, other relevant determinants of this growing trend that can be mentioned are related to production structural changes that permitted firms in the manufacturing, and service sectors as well, to outsource increasing parts of the production process to lower cost countries, in what is called vertical FDI strategies. Undoubtedly, the development of Information and Communication Technologies and transport favoured firms' international expansion by reducing transaction, management and transport costs. Another important element is, of course, the liberalisation process of foreign capital inflows happened especially among developing countries, which was encouraged by the Washington Consensus, a parallel privatization process in the latter countries and the transition to market economies among former Communist countries. This permitted OECD multinational companies to take advantage of their superior technology, management and market power to gain access into developing countries' markets, cheap and unskilled labour and natural resources.

Regarding the unprecedented level in OFDI flows in 1995 UNCTADs WIR (96) comments that "given that FDI flows respond to cyclical fluctuations in economic growth with one or two year lags, the 1995 surge is not surprising" and again argues

that the underlying upward trend in OFDI flows over the 80s and the fact that each cyclical upswing in economic activity has led to progressively higher peaks in FDI flows suggests that other factors are also at work. In the remaining reports until 2000 UNCTAD explains that world OFDI growing figures were not negatively affected by the backdrop of numerous unfavourable conditions affecting mostly Japan and emerging countries (financial instability).

In the beginning of the 21st century FDI outflows started a decline throughout two years in a row, 2001 and 2002. The reasons mentioned for this downturn were the slowing of economic activity growth in major industrial economies and a sharp decrease in their stock market activity, which caused a fall in stock market valuations. Lower corporate profitability, a slowdown in the pace of corporate restructuring in some industries and the winding down of privatization in some nations explained as well the above mentioned decrease in OFDI. In fact OFDI was severely damaged, apparently more than expected by the relatively slight deceleration in GDP growth.

Since 2003 OFDI started to grow at an unprecedented rate, ending this expansionary period abruptly in 2008 after reaching an historic record of 2.2 trillion dollars in 2007 (3.5% of world GDP and 15.7% of world gross capital formation). The main drivers behind this high growth in world OFDI were the same structural factors mentioned above plus some new ones, such as the new role emerging countries started to play as investors in the global economic scenario. Moreover, this remarkable growth is also explained by the wave of international mega Mergers and Acquisitions that took place especially between OECD countries' firms in many industries (Telecommunications, Motor Vehicle, Chemicals and Finance), which was favoured by the stock prices boom. Last but not least, the GDP growth recovery occurred in the same period of time. Historically low interest rates and increasing financial integration, led private equity firms to undertake direct investments abroad (WIR, 2005).

Already in 2008 a relevant decrease in OFDI happened, (-12%), and deepened the following year 2009 (-38%). This decrease, despite being significant, has been smaller than the accumulated fall in 2001 and 2002 (-39% and -29% respectively). Moreover, world OFDI recovery has been even faster than in the previous period, clearly as a consequence of the fact that emerging countries have continued investing abroad

increasingly. To sum up, superficial view and analysis by UNCTAD and by looking into the evolution permit to detect a procyclical behaviour of OFDI and with some lags.

The model

Our large data base comprises gross OFDI flows from 100 countries coming from UNCTAD. The data set has a panel structure reporting annual data from 1970 to 2011. Because of data availability and because in fact the bulk of world OFDI comes from a small group of advanced countries, most of the analysis will focus on a subset of 22 OECD countries which represent for the whole period more than 80% of world OFDI. In the end we arrive to the 22 country sample panel data structure with a longer time series dimension than the cross sectional one (22x42, reaching 924 observations). Since we are interested in the impact of business cycles in the source country our research abstracts from the analysis of pull factors (host country FDI inflows determinants). So, we use total OFDI to the rest of the world regardless of investment destination. Including host country determinants would complicate the econometric specification without adding new insights about the main objective of the study.

$$\text{Equation (1): } OFDI_{it} = \beta_0 + \beta_1 LGDPTrend_{it} + \beta_2 GDPgap_{it} + \beta_3 rr_{it} + \beta_4 rer_{it} + Z_{it} + U_{it}$$

OFDI data have been deflated by the corresponding country GDP deflator. Since even for the subset sample UNCTAD reports OFDI data with missing values and zeros indistinctively, we have taken zeros as missing values because reported zeros seem to be quite unrealistic data for those countries that could bias the results. Taking logs for FDI flows is the usual way to regress these data because it reduces skewness and provides a useful normalisation procedure rendering a better fit in gravity equations. However the transformations required to applied logs for negative observations –and there are many– are controversial (Levy et al, 2007). That is why we decide not to transform the dependent variable.

“L_GDP_Trend” is for the log of real GDP trend obtained by the decomposition of GDP between the long run trend and the cyclical component. There are several procedures to empirically observe the business cycle and to test for the effect of expansions and recessions upon the dependent variable. Wang and Wong (2007) use the absolute value of the residual of a typical growth regression model (Ramey and Ramey,

1995), Levy et al. (2007) use a dummy that takes the value of zero and one for recessions and expansions respectively (obtained from the calculation of GDP gap based on the long term GDP growth and alternatively using the official dating of recessions and expansions by the OECD). We decided to use the Hodrick Prescott (1997) HP filter because it is the most common way to do it and because we count with a long annual time span to compute it properly. Furthermore, this procedure renders a continuous variable for GDP trend and the GDP gap allowing a better estimation of the parameters. Nevertheless, we alternatively employ dummies in some specifications for robustness check as will be discussed below. “GDPgap” is then the value (negative or positive) of the cyclical component of GDP. “ r ” is the short real rate of interest in the source country as a proxy for the cost of investment and “ rer ” is the real exchange rate in terms of local currency per US \$.

We expect a positive sign for the parameter corresponding to “LGDPTrend” because larger countries would tend to invest more than reduced dimension countries. As for “GDP gap”, following the above mentioned theoretical discussions, we cannot foresee the sign of the parameter. It would be positive when the so called income effect is larger than the substitution effect. However we would expect intuitively the income effect to be larger, an idea coming from the previous discussion and the general overview. In relation to the real interest rate sign we expect a negative one, since “*ceteris paribus*” higher interest rates would increase the cost of financing an investment project. In this sense, we did not detect a positive correlation between the GDP Cycle and the interest rate implied in the above mentioned argument about the countercyclical nature of monetary policy. This is probably because it was not until the mid eighties when monetary policy, in the framework of inflation targeting, started to systematically be implemented in a countercyclical manner, through short term interest rates as the main policy instrument. Regarding the exchange rate we expect a negative sign, since as already mentioned a depreciation of the domestic currency (an increase in the exchange rate) raises the cost of acquiring foreign assets and therefore discourages OFDI.

We perform the Breusch-Pagan (1979) LM test to compare random/fixed effects and OLS estimations and the Hausman specification test to compare random and fixed

effects estimation. The random effect estimation seems to be the most appropriate one and therefore we concentrate on this estimation procedure in what follows¹.

The corresponding regression results for equation (1) are reported in the tables below, for the large country sample (model 1) and for the 22 OECD countries subsample (model 2).

Table 1: Regressions for OFDI – Random Effects estimation: large and 22 OECD country samples

Independent variable	Large Country Sample (model 1)	Independent variable	22 OECD countries (model 2)
	<i>Coefficient</i>		<i>Coefficient</i>
Const	-18.4519***	const	-118.994***
l_GDP_Trend	6.34721***	l_GDP_Trend	32.7401***
GDP_Gap	0.0807068***	GDP_Gap	0.105689***
Real_interest_r	-0.00172417	real_short_inte	-0.863089*
Exchange_Rates	1.36975e-05	REER_IFS	-0.595002***
Observations	2221		706
Time-series length	42		42
R ²	0.3521		0.4350
Adjusted R ²	0.3507		0.4310
Breusch-Pagan test - Null hypothesis: Variance of the unit-specific error = 0	Asymptotic test statistic: Chi-square(1) = 4956.11 with p-value = 0		Asymptotic test statistic: Chi-square(1) = 356.237 with p-value = 1.85798e-079
Hausman test - Null hypothesis: GLS estimates are consistent	Asymptotic test statistic: Chi-square(4) = 86.2667 with p-value = 8.16922e-018		Asymptotic test statistic: Chi-square(4) = 90.6902 with p-value = 9.39436e-019

As can be observed in Table 1 the “GDP gap” parameter shows a positive and significant sign for both models: that is OFDI rises when output is above trend and declines when output is below trend. In other words, outward flows seem to behave procyclically. Regarding the result for “GDP trend” the sign is positive and significant for the two sample countries as well. As expected, the larger the GDP trend is the more do countries invest abroad. Although model 1 and 2 are not totally comparable because the

¹ OLS and fixed effects were also performed. The fixed effect estimation shows similar results as the random effect which reassures the robustness of the results. We have not reported the fixed effect estimation but it is available upon request.

variables for the interest rate and for the exchange rate are not exactly the same,² as what for the effect of the business cycle on OFDI is concerned results are similar.

The rest of the variables of model 2 (baseline model) have the expected sign as well and are statistically significant. Commenting about their signs, apparently an increase in home countries interest and effective real exchange rates (i.e. a depreciation of the domestic currency) diminishes OFDI. So, an increase of the costs needed to finance the acquisition of foreign assets, in terms of higher interest rates or lower purchasing power of the domestic currency, has a negative impact on outward investment projects.

Since Levy et al. (2007) and Wang and Wong (2007) seem to detect different results regarding the effect of business cycles over OFDI depending on the home country samples³, we further illustrate this issue by splitting our 22 OECD country sample in two subsamples: one composed of the 12 initial Euro Area member countries (EA 12) and the other 10 OECD countries.

Table 2: Regressions for OFDI – Random Effects estimation: OECD country subsamples

Independent variable	EA 12: model 3	EA 12: Model 4	Independent variable	10 OECD : model 5
	<i>Coefficient</i>	<i>Coefficient</i>		<i>Coefficient</i>
const	-88.7203***	-21.4796***	const	-156.311***
l_GDP_Trend	27.4492***	14.5113***	l_GDP_Trend	38.3847***
GDP_Gap	0.38088***	0.30478***	GDP_gap	0.0801689**
real_short_inte	-1.06179**	0.547262	real_short_inte	-0.478267
REER_IFS	-0.559814***	-0.596686***	REER_IFS	-0.615149***
Euro_Dummy		28.5191***		
observations	386	386		320
Time-series length	42	42		37
R ²	0.3641	0.5584		0.4813
Adjusted R ²	0.3557	0.5514		0.4730
Breusch-Pagan test -	Asymptotic test	Asymptotic test		Asymptotic test

² For the reduced country sample the data for the interest rate correspond to the real short interest rates (up to 3 months from AMECO and OECD) and for the exchange rate is the real effective exchange rate. The real effective Exchange rate from IFS is the measure of the value of a currency against a weighted average of several foreign currencies divided by a price deflator. The latter data are better proxies and there are more observations available as well. Moreover those 22 OECD countries are the major world investor countries throughout the whole period. So, for the rest of the analysis we keep model 2 as the baseline model.

³ Wang and Wong (2007) do not find a significant relationship between OFDI and their measure of business cycle for non OECD countries. Levy et al. (2007) find a significant result (negative) but only for USA and Europe.

Null hypothesis: Variance of the unit-specific error = 0	statistic: Chi-square(1) = 120.717 with p-value = 4.40656e-028	statistic: Chi-square(1) = 168.934 with p-value = 1.26495e-038		statistic: Chi-square(1) = 118.214 with p-value = 1.55631e-027
Hausman test - Null hypothesis: GLS estimates are consistent	Asymptotic test statistic: Chi-square(4) = 56.6333 with p-value = 1.47692e-011	Asymptotic test statistic: Chi-square(5) = 5.10445 with p-value = 0.403266		Asymptotic test statistic: Chi-square(4) = 50.5729 with p-value = 2.74132e-010

Differing from the findings in Levy et al. (2007) and Wang and Wong (2007), we do not observe a different behaviour for our country subsamples, which seems to imply that OFDI is always procyclical. However, there is a minor difference in the results which has to do with the real short term interest rate. Although the sign is negative, it loses significance for the 10 OECD country subsample. Apparently, considering the absolute value of the “GDP gap” and “GDP Trend” coefficients, it seems that OFDI in EA 12 countries reacts more strongly to the GDP gap than in the case of the 10 OECD countries subsample. Taking into account that in the 10 OECD sample there are countries such as USA and UK, that already in the 80s had accumulated a large stock of OFDI, their lower response to the “GDP gap” might be explained by the fact that their high reinvested profits, which are included as OFDI, bear no relationship with source countries’ business cycle (proxied by “GDP gap”).

Finally, in order to test the effect of the introduction of the common currency and the single monetary policy in the euro area, a dummy variable has been included (with value 1 for data since 1999 and value 0 for data before 1999). A positive and significant coefficient is obtained, revealing a positive impact of euro on OFDI. This result coincides with the much commented increase in intra euro zone OFDI flows after the introduction of the single currency. Nevertheless, the real interest rate seems to lose the effect, probably as a consequence of the single monetary policy that generated a convergence in real short interest rates.

Discussing alternative specifications for the business cycle

There are possible alternatives for the measurement and dating of business cycles. All have been extensively discussed in the literature (a production function approach, a linear projection of GDP rate of growth...). As already mentioned above, the papers from Levy et al. (2007) and Wang and Wong (2007) use different measures and specifications for the business cycles in their models, for example dummies for

recessionary and expansionary periods. So, in order to compare our previous results, for the 22 OECD countries subsample, but using a business cycle measurement in terms of dummies instead of the “GDP gap” (HP filter), we have carried out below three different econometric specifications for this purpose. In the first one (model 6) instead of the variable “GDP gap” we include a dummy for the GDP gap (“GDP gap dummy”) taking the value of 1 for expansionary years (i.e. when the GDP gap is positive) and 0 otherwise. Another possibility to further enlighten that the variable for the business cycle (“GDP gap”) we have used in the baseline model (model 2) renders correct results for the effect of business cycles on OFDI, is splitting the panel into two subsamples: one consisting in all observations with a positive GDP gap (“GDPgap expansion”, i.e. observations when countries are in expansion, model 7) and the other one consisting in all observations with a negative GDP gap (“GDPgap recession”, model 8). Finally following Wang and Wong (2007) we interact the GDP gap with the dummy variable (“Dummy*GDPgap”, model 9).

Table 3: Regressions for OFDI – Random Effects estimation: different specifications for the business cycle

Independent variable	22 OECD model 6	22 OECD model 7	22 OECD model 8	22 OECD model 9
	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>	<i>t-ratio</i>
const	-134.018***	-59.6081**	-64.8975***	-92.9125***
l_GDP_Trend	34.3483***	23.6177***	18.5893***	26.1256***
real_short_inte	-0.704784*	-1.29859*	-1.06749**	-1.04975**
REER_IFS	-0.598429***	-0.637267***	-0.320749**	-0.487201***
GDP gap dummy	10.1104***			
GDP gap expansion		0.382043***		
GDP gap recession			-0.143005***	
Dummy*GDP gap				0.49849***
GDPgap				-0.139763***
observations	706	340	366	706
Time-series length	42	22	23	42
R ²	0.4135	0.5209	0.5281	0.4800
Adjusted R ²	0.4093	0.5122	0.5215	0.4769
Breusch-Pagan test - Null hypothesis: Variance of the unit-specific error = 0	Asymptotic test statistic: Chi-square(1) = 345.277 with p-value = 4.52522e-077	Asymptotic test statistic: Chi-square(1) = 56.1743 with p-value = 6.63242e-014	Asymptotic test statistic: Chi-square(1) = 55.3983 with p-value = 9.84234e-014	Asymptotic test statistic: Chi-square(1) = 211.421 with p-value = 6.72864e-048
Hausman test - Null hypothesis: GLS estimates are consistent	Asymptotic test statistic: Chi-square(4) = 82.8381 with p-value = 4.36017e-017	Asymptotic test statistic: Chi-square(4) = 53.1923 with p-value = 7.76749e-011	Asymptotic test statistic: Chi-square(4) = 66.0702 with p-value = 1.53096e-013	Asymptotic test statistic: Chi-square(5) = 94.6893 with p-value = 6.94115e-019

Model 6 offers almost the same results as the baseline model (model 2) and again the dummy for the GDP gap (“GDP gap dummy”) is positive, which means that OFDI behaves procyclically. This is not a surprising result, but helps to reassure the

correctness of the previous estimation. In relation to model 7 and in line with what would be expected, when we run the model just for expansions, the sign for the parameter “GDP expansion” is positive and significant. Again, during those years when GDP is above potential OFDI increases. The rest of the variables maintain the correct sign and their significance as well, thus the cost of financing FDI projects abroad exerts a negative impact. Model 8 exhibit a negative and significant coefficient clarifying that recessions provoke lower OFDI levels. However, it is worth mentioning that this coefficient is lower in absolute terms than the one for expansions; something that could be interpreted as a lower sensitivity of OFDI to recessions than to expansions. This interpretation is at odds with Wang and Wong (2007) statement that fluctuations in economic growth discourage OFDI but only when country is in recession. Finalising this section, model 9 is the only one where the business cycle, captured this time by the interaction of “GDP gap” with “GDP gap dummy” (“Dummy*GDP gap”), seems to exert a negative impact on OFDI. However, although apparently this outcome contradicts our results obtained so far, in fact it should not be interpreted as such, but a pure consequence of the interaction term that eliminates the positive GDP gap effect during expansions.

Extended model for domestic investment and host countries' business cycle

Theoretically, there might be an effect of domestic investment on OFDI. In case of imperfect capital markets firms might be financially constrained and therefore a firm decision to invest domestically would mean that there are fewer (or no) funds to invest abroad, thus having a negative effect on OFDI. This could be interpreted as an additional substitution effect to the one mentioned above (during expansions the marginal productivity of capital increases and makes OFDI less attractive). Following this argument Wang and Wong (2007) assume there must be a negative influence of home investment over OFDI. However a different hypothesis can be put forward to this respect: for some companies and activities investment at home and abroad might be complementary. When multinational firms are vertically integrated an increase in capacity at home might require a rise in capacity abroad conveying more OFDI. From that point of view, there could be a positive effect exerted by a rise in home investment over OFDI. In order to check for this effect we have extended our baseline model (model 2) including an additional explanatory variable for home investment (model 10), namely the ratio of domestic investment over GDP (“GFCF_GDP”).

Although we are mainly interested in short run OFDI push factors we cannot ignore a quite natural extension of the base line model to analyse the effect on OFDI of the GDP gap but of the host countries as well (model 11). It does make sense to argue that OFDI might increase when foreign markets are in expansion and vice versa because one of the most cited reasons for investing abroad in the literature is the FDI market seeking hypothesis. Briefly: for a given size of the host markets, the faster it grows the more will foreign firms invest there. In fact many empirical studies of FDI determinants have shown the positive relationship between inward FDI and GDP growth in the host country. As we do not have bilateral data, we have constructed a variable representing the weighted average of the other countries' business cycles. Following Wang and Wong (2007) the weight is the share of each home country's GDP in the sum of all other countries' GDP in the sample. For the baseline model (model 2) the 22 OECD countries included are not only the major investing countries but also the major receiving countries. So, we are not losing a relevant amount of OFDI directed towards the rest of world countries. For the variable "Host GDP gap" we would expect a positive sign for the parameter: holding home country's business cycle constant an expansionary year in the host country would encourage OFDI and vice versa.

Table 4: Regressions for OFDI – Random Effects estimation: extended models

Independent variable	22 OECD model 2	22 OECD model 10	22 OECD model 11
	<i>Coefficient</i>	<i>Coefficient</i>	<i>Coefficient</i>
Const	-118.994***	-63.3942***	-50.6782**
l_GDP_Trend	32.7401***	26.7119***	26.3139***
GDP_Gap	0.105689***	0.119623***	0.065045**
real_short_inte	-0.863089*	-1.07745**	-1.2233***
REER_IFS	-0.595002***	-0.54283***	-0.513315***
GFCF_GDP		-1.101452**	-1.58446***
HostGDP_Gap			8.67832***
observations	706	706	706
Time-series length	42	42	42
R ²	0.4350	0.5001	0.5249
Adjusted R ²	0.4310	0.4958	0.5202
Breusch-Pagan test - Null hypothesis: Variance of the unit- specific error = 0	Asymptotic test statistic: Chi- square(1) = 356.237 with p-value = 1.85798e-079	Asymptotic test statistic: Chi- square(1) = 186.436 with p-value = 1.62478e-038	Asymptotic test statistic: Chi- square(1) = 166.848 with p-value = 3.61176e-038
Hausman test - Null hypothesis: GLS estimates are consistent	Asymptotic test statistic: Chi- square(4) = 90.6902 with p-value = 9.39436e-019	Asymptotic test statistic: Chi- square(4) = 121.279 with p-value = 1.68219e-024	Asymptotic test statistic: Chi- square(4) = 104.781 with p-value = 2.51908e-020

Results of model 10 are reassuring: the sign and significance of the control variables is maintained and the sign for home investment ratio is negative and significant. Hence, it seems that there is a negative or substitution effect between domestic and foreign investment, holding all the other explanatory variables constant. So, in some sense there is an indirect countercyclical behaviour of OFDI as far as an expansion at home that tends to increase domestic investment would reduce OFDI. However we did not detect such a closed positive relationship between home GDP gap and domestic investment in our country sample as to support this indirect effect.

As for the most extended model (11) and in line with our expectations the average host country GDP gap exerts a positive influence over OFDI. The main variables render the same results even controlling for the effect of these two variables reassuring our principal hypothesis, namely that OFDI is pro-cyclical.

This main result contradicts the findings of Levy et al. (2007), and is partially in contrast to Wang and Wong (2007) as well. Anyway, Levy et al. (2007) use a different procedure consisting in employing bilateral OFDI flows towards developing countries, a different focus which justifies the opposing conclusions. Nevertheless, our results are not so divergent in comparison with Wang and Wong (2007), whose analysis found a procyclical behaviour solely during recessions and no statistically significant effect during expansions, that is to say OFDI decreases in recessions but does not increase during expansions.⁴

Concluding Remarks

After reviewing WIRs from 1991, in line with what could be a priori expected about the effect of business cycles over OFDI flows and according to the investment accelerator principle, our main conclusion of the analysis conducted is that OFDI has a pro-cyclical behavior. Although this conclusion might be considered a trivial one, however the scarce empirical literature dealing with this issue does not reach a unanimous consensus.

⁴ To check for the repeatedly mentioned issue regarding the time lagged effect of GDP Cycle over OFDI, the model has also been computed including additionally a one year lag for the GDP Gap variable, but the parameter for the new variable is not significant.

Employing an important sample of countries throughout a large time period (including the last recessionary years) this research uses the output gap, derived from the HP filter, as the explanatory variable to capture the cyclical disturbances of the economy. By doing this, we obtained that an economic expansion/recession has a positive/negative effect on OFDI.

Beyond this main conclusion, the study reveals that fluctuations in the financial cost in the source country for the acquisition of foreign capital (i.e. exchange rates and interest rates) are an important determinant of changes in OFDI flows when – as is usually the case- foreign operations are financed in the home capital markets, in local currency and requiring external financial sources.

Since the OFDI flows are the most important way for the integration of the economies globally, it would advance at a higher or lower speed depending on the cyclical performance of the home countries' economies and cost of financing fluctuations.

References

- Bernanke, B. S., M. Gertler, and S. Gilchrist (2000). The Financial Accelerator in a Quantitative Business Cycle Framework. In J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics*. Amsterdam: North-Holland.
- Brainard, S. Lael, (1997): "An Empirical Assessment of the Proximity–Concentration Trade-off between Multinational Sales and Trade," *American Economic Review* 87 520–44.
- Breusch, T.S.; Pagan, A.R. (1979). "Simple test for heteroscedasticity and random coefficient variation". *Econometrica* (The Econometric Society) 47 (5): 1287–1294.
- Buch, C. and Lipponer, A. (2005) Business cycle and FDI: evidence from German sectoral data, *Review of World Economics* (Weltwirtschaftliches Archiv), 141, 732–59.
- Calvo, G., Fernández-Arias, E., Reinhart, C., Talvi, E., (2001). The growth-interest rate cycle in the United States and its consequences for emerging markets. Inter-American Development Bank, Research Department, Working Paper 458.
- Carr, David L., James R. Markusen, and Keith E. Maskus, (2001): "Estimating the Knowledge-capital Model of the Multinational Enterprise," *American Economic Review* 91 693–708.
- Cavallari, L. (2010) Exports and FDI in an endogenous-entry model with nominal and real uncertainty, *Journal of Macroeconomics*, 32, 300–13.
- Froot, Kenneth and Jeremy Stein, (1991): "Exchange Rates and Foreign Direct Investment: an Imperfect Capital Markets Approach," *Quarterly Journal of Economics* 106 1191–217.
- Gilchrist, Simon and Charles Himmelberg (1995): "Evidence on the Role of Cash Flow for Investment", *Journal of Monetary Economics* 36 541–72.
- Hausman, J.A. (1978): "Specification test in econometrics". *Econometrica*. 46: 1251-1271.
- Hodrick, Robert, and Edward C. Prescott (1997), "Postwar U.S. Business Cycles: An Empirical Investigation," *Journal of Money, Credit, and Banking*, 29 (1), 1–16.
- Levy Yeyati, E., Panizza, U. and Stein, E. (2007) The cyclical nature of north-south FDI flows, *Review of International Economics*, 15, 146–63.
- Markusen, James R. and Keith E. Maskus, (1999): "Discriminating among Alternative Theories of the Multinational Enterprise," NBER working paper 7164.

Ramey, Garey and Ramey, Valerie A. (1995): "Cross Country Evidence on the Link between Volatility and Growth," *American Economic Review*, 85 1138–51.

Reinhart, C., Reinhart, V., (2001): What hurts most? G-3 exchange rate volatility or interest rate volatility. National Bureau of Economic Research Working Paper 8535.

UNCTAD (1991-2011) World Investment Report, United Nations, New York and Geneva.

Wang, M. and Wong, S. (2007) Foreign direct investment outflows and business-cycle fluctuations, *Review of International Economics*, 15, 146–63.

Annex 1. Employed Variables Summary and Expected Signs

Name	Variable	Proxy	Unit of Measure	Source	Theoretical justification	Expected Sign
OFDI	Real OFDI World Flows (dependent variable)		Constant US Dollars (billions)	UNCTAD		
GDP_Cycle	Home country GDP Gap	Business Cycle	Constant US Dollars (billions)	UNCTAD	Procyclical Countercyclical	?
l_GDP_Trend	Natural Log of the home country GDP trend	Long Run GDP growth	Constant US Dollars (billions)	UNCTAD	Home country market size	+
real_short_inte	short real interest rate	Cost of investment	Annual percentage rate	IFS	Capital market imperfections	-
REER_IFS	Home Country real exchange rate in terms of local currency per US \$.	International Average purchasing capacity	Annual percentage average rate	IFS	Natural Currency price influence over purchasing power	-
GFCF_GDP	Gross Fixed Capital Formation home country's GDP share	Home country's investment returns	Percentages	WDI	Domestic and Foreign investments substitutability	-
Host GDP Cycle	Weighted Average Host Countries average GDP Cycle	Output gap in the rest of the world except the home country	Constant US Dollars (millions)	UNCTAD	Business Cycle in the host countries	-

Annex 2. Summary Statistics, using the observations

Variable	Mean	Median	Minimum	Maximum	Std. Dev.
OFDI	22.4107	7.28267	-31.1370	370.363	42.9317
GDP_Cycle	-1.29870e-008	-0.115460	-467.048	381.610	44.5646
l_GDP_Trend	5.97969	5.74446	2.25725	9.50958	1.40749
real_short_inte	2.37346	2.29180	-12.6134	21.8890	3.43948
REER_IFS	98.3854	98.9950	63.3382	143.727	11.6576
GFCF_GDP	22.9618	22.4000	9.00000	42.9000	4.26189
HostGDP_Cycle	-0.000751802	-0.0679657	-2.89102	2.95350	0.847081

Annex 3: Correlation coefficients, using the observations

OFDI	GDP_gap	real_short_inte	REER_IFS	GFCF/GDP	Host GDP Gap	l_GDP_Trend	
1,000	0,1012	-0,0877	-0,0013	-0,281	0,1576	0,5425	OFDI
	1,000	0,0201	0,0252	0,143	0,3827	0,0027	GDP_gap
		1,000	0,1079	-0,181	0,011	-0,0214	real_short_inte
			1,000	-0,0553	0,0023	0,1631	REER_IFS
				1,000	0,19	-0,1765	GFCF/GDP
					1,000	0,0016	Host GDP Gap
						1,000	l_GDP_Trend

In bold: 5% critical value (two-tailed) = 0.0645 for n = 924