The Effect of the Euro on Foreign Direct Investment

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Abstract

In this paper the recent effect of the European Monetary Union on inward FDI-flows is examined. We use a difference-in-differences approach and fixed effects with common time controls. The estimated results of the latter approach show that the introduction of the Euro raises inward FDI by 17 percent within the Euro-area and by 9 and 12 percent to and from non-member countries respectively. Moreover the geographical effects of the Euro are explored. The results show partial agglomeration tendencies for the euro area. There are also some indications of increased importance of vertical specialization in the sample.

Keywords: Foreign Direct Investment, EMU, Panel Data
JEL classification: F1, F0, C23

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1 Introduction

A large body of empirical literature on the effects of the European currency union on trade is now forming, following the seminal paper by Rose (2000). These include Bun and Klaasen (2002), Barr et al. (2003), Micco et al. (2003) and Flam and Nordström (2003). Their results show that the European currency union has increased trade volume with a magnitude ranging between 15 to 38 percent. Moreover, this trade increase has not been confined to member states only, but has extended also to non-member countries as well.

This paper will address an interrelated issue, namely the question of whether the European currency union has had any effects on foreign direct investment (FDI) flows. FDI flows can be considered to be an interrelated issue to trade since, at least on a theoretical basis, it is often viewed as either a substitute of trade (*horizontal FDI*) or a complement to trade (*vertical FDI*). In addition, it can give an indication of whether the EMU creates better conditions for firms making long-term decisions for investment. One argument against floating currencies is that higher exchange rate variability creates uncertainty that discourages international investment and trade. Fixing the exchange rate eliminates this risk, hence encouraging international investment and trade, as well as making firms cost calculations and pricing decisions easier. Adopting a single currency is a very credible commitment to exchange rate stability and has the advantage of reducing transaction costs that would otherwise occur, independently of the aforementioned volatility channel. Both effects should promote international investment, i.e. FDI flows.

In spite of the intuitive appeal of the argument that lower exchange rate volatility will increase *FDI flows* empirical evidence regarding the effects of the European currency union on FDI flows is currently absent.[1] The approach of this paper is novel since little or no research, to my knowledge, has been devoted to appraise the effects of the European currency union on *FDI flows*. On a broader perspective, the recent economic and policy debate, concerning the economic effects of the European currency union on its member states, has been based on an increasing amount of empirical evidence and this paper is an attempt to investigate yet another aspect of this occurrence.

[1] A partial exception is Barr et al. (2003) that present stylized facts concerning european FDI flows.

We use a new dataset on FDI flows, a panel of unilateral FDI flows is formed between 18 developed countries for the years 1992 to 2001. Since we are trying to find potential effects of an institutional reform, a difference-in-differences and a fixed effects with efficient common time controls approach, suitable for identifying such structural changes, is used to gauge the effects of the EMU on inward FDI. The results of this study show that the EMU increases inward FDI flows within the Euro area with approximately 17 percent and inward FDI to and from non members with around 9 to 12 percent respectively.

The remainder of this paper is organized as follows. In Section 2 some stylized facts and basic concepts concerning FDI are presented. Section 3 discusses the data, and Section 4 considers the empirical methodology. Section 5 presents the main results, whereas Section 6 deals with the robustness of these results. Section 7 combines trade and FDI data in order to examine potential economic geography effects of the euro. Section 8 concludes the paper.

2 Basic Concepts and Stylized Facts

A FDI is a cross-border investment made by an investor with the intent of obtaining a lasting interest in an enterprise resident in another country.[2] In principle, when a firm wishes to make sales abroad it has a variety of modes that can be employed, such as export, license, agents or direct investment. FDI's are an alternative equivalent to producing directly in the country one wishes to serve.

In latter years, FDI has become an increasingly important factor in the global economic activity, with world FDI flows growth rates that, by far, exceeding those of GDP or trade (*Table 1*), even though a huge drop has befallen world FDI flows after the turn of the millennium.

Another interesting feature of the FDI flows is that they have been primarily concentrated to developed economies (*Table 2*), receiving about 70 percent of

[2] According to Eurostat, who follow the OECD benchmark definition of FDI (third edition), an international investment is classed as FDI when an investor owns ten percent or more of ordinary shares or voting rights in an incorporated or unincorporated enterprise abroad.

world inflows during the 90's, and who, after several recent financial crises in developing countries have increased their share to more than 80 percent.[3]

Table 1
Growth in FDI, Trade and GDP

	Period growth rates %, world, current US$			
	1992-96	1996-2001	1992-2001	1992-2000
FDI, Inflows	78.7	70.5	154.7	236.4
Exports and Imports	34.6	14.2	48.9	52.6
GDP per capita	5.4	6.8	12.2	12.3
GDP PPP, current	0.2	0.22	0.42	0.4

Source: World Bank, World Development Indicators

Table 2
FDI inflows, share in total

	High Income	*Middle Income*	*Low Income*	*SSA**
	Inflows	Inflows	Inflows	Inflows
92-95	90.40	3.83	0.23	0.01
96-98	94.61	25.02	0.35	0.02
99-01	84.47	10.51	0.06	0.04

Source: World Bank, World Development Indicators

*Abbreviation for Sub Saharan Africa

The existence of FDI has several major explanations. One type is market oriented, where FDI gives companies access to foreign markets thus acting as a substitutes for trade, so called *horizontal* FDI. Another rationale for FDI is production oriented and driven by cost minimizing incentives, where global companies gain strategic advantage by shifting low paid jobs abroad while keeping high value added research at home thereby producing parts, or the entire final product, in low-cost areas, so called *vertical* FDI. Finaly a third rationale implies that the mode of outsourcing depends on the market structure. The distinction between horizontal and vertical FDI is a theoretical construct,[4] where a horizontal FDI is said to solely sell its products in the foreign market, while a vertical serves the home market. It is a construct insofar that no FDI acts solely

[3] With the majority of FDI inflows, 40 percent, to developing countries going to China. The developed countries share of world outflows is of course even higher, ranging between 85 to 95 percent. See Markusen 2002, Ch. 1.

[4] See Ekholm, Forslid and Markusen (2003).

as either and the debate of whether most FDI act as if they were horizontal or vertical is not settled.

From a theoretical perspective the avant-garde literature on FDI focuses on two main areas. The first focuses on explaining the rationale behind the existence and the consequences of multinational activity within a general equilibrium framework. This consists, mainly, of attempts to incorporate FDI into the new trade theory of economic geography and the models focus primarily on real factors of production. Questions concerning capital flows, i.e. the financing decisions of the firms are believed to be largely separable from the decisions regarding location of production and the direction of trade and are hence left out of the economy. The second focuses on ideas stemming from organization theory, where FDI are studied with endogenous firm organizations and general equilibrium models of industrial structures.[5]

From an empirical analysis perspective, there are also two mainstream paths to consider. The first concerns the determinants of FDI and can be derived either from a specific model or created in an ad hoc manner,[6] and the second concerns the consequences of FDI on the economic environment.[7]

Another bifurcation in the empirical literature occurs in the source choice of FDI where researchers either use plant-level panel microdata, when available, or they use FDI flows from the Balance of Payments (BoP). The former data is better, since measurement errors are smaller, though it is lacking in international availability. This forces us to turn to the latter, namely, BoP data which carries larger measurement errors but is more readily available. Since the question to be addressed here is whether the European currency union has had an effect on FDI flows, a panel data approach is used. We utilize a coherent dataset of BoP FDI flows from Eurostat that covers 18 countries for the years 1992-2001.[8]

[5] Grossman and Helpman (2002 a, b), Puga and Trefler (2002).
[6] See Braunerhjelm and Ekholm (1998), Chakrabarti (2001) and Markusen (2002).
[7] See Keller 2001 for an overview.
[8] The 2001 data is complete and revised, while data for 2002 is preliminary and far from complete at this point of time. Inclusion of existing 2002 data does not in anyway alter any conclusions in this paper.

3 Data

Eurostat provides satisfactory data for bilateral and unilateral FDI, at least for the eighteen reporting economies. Total FDI flows are divided into three general subcategories, namely: *Equity, Other Capital* and *Reinvested Earnings*, with the third part suffering in availability due to mis-reporting. Hence in this paper the FDI flows refer to *Equity and Other Capital.* All FDI flows are net flows, where *net* does not imply a net between a country pair $(FDI_{ij} - FDI_{ji})$ but implies rather, *net of disinvestment.*

Following the trade literature, these kind of regressions are usually conducted on bilateral data, but in order to increase the observations to two for each country pair in the empirical specification one-way FDI flows will be used, defined as *inward FDI flows*, where an investment in country i from country j is represented as FDI_{ij} and is viewed an *inward FDI* from country $i's$ perspective. The investigation in this paper entails a panel of 18 OECD countries, hence $(18 * 17) = 306$ country pairs, with yearly data spanning the period 1992-2001. However, country $i's$ *inward FDI* can of course, be measured in two different ways. That is, either the recipient country, i, reports an inflow from country j or if investing country, j, reports an outflow to country i. In an ideal world the above difference would be redundant, but since there is a difference in reported values, even at aggregate world level, between inflows and outflows and there are no indications that one is "better" reported than the other, it is prudent to try and ameliorate any effects stemming from this difference.

Two attempts to correct this measurement error are made in this paper, or at least see what results 'dominate'. Firstly, if the 'true' value of FDI flows lie somewhere between country $i's$ reported inflows and country $j's$ reported outflows, it is possible to improve the estimation by taking an average of the two creating the series called *Average*. Moreover, in order not to lose the majority of the observations, since inflows and outflows have different missing values, it has to be done stepwise by firstly approximating missing data on inflows by their outflow counterpart, if available.[9] This approximation is done by dividing the sample into three major entities, Europe, USA, Japan, calculating an average asymmetry between these and correcting each missing points by their average asymmetry. The new variables that are created are *Inflows Corr* and *Outflows*

[9] See Appendix I for methodological issues on asymmetries.

Corr. The results obtained from these "corrected" series mirror the ones obtained from the raw data series which allows us to move on to the second step and take an average of the two new series, hence creating a new variable called *Average Corr*. In the second approach we use outflows (inflows) to instrument for inflows_{ij} (outflows), which will give us consistent estimates even if measurement errors are present. The drawback of instrumenting is as usual the loss of efficiency in the estimations.

Another issue with the data is caused by the erratic nature of FDI flows between any country pair, where many flows can be, and are, negative due to disinvestment. The negative values in the dependent variable precludes a conversion of the data set into a logarithmic scale. However, it is still possible to obtain elasticities for the point estimates, since the predicted means are positive values, by using the chain rule. This enables us to obtain a clear picture of the magnitude of the effect due to the currency introduction. The main results will then contain two panels, with the first depicting the raw results and the second, below, depicting the elasticities of the predicted means.

4 Empirical Specification

The introduction of the Euro can be viewed as a sharp change in the economic environment of the affected countries. This change makes it appropriate for us to use a difference-in-differences strategy. The idea behind this estimation strategy is to assess the effect of the introduction of the euro on inward FDI for the euro-countries, while keeping the effects for all other time-invariant variables, as well as common and country specific time-varying effects constant, whether these are observables or unobservables.[10] A general specification of this model can be expressed as:

$$FDI_{ij,t} = \alpha_{ij} + \beta_t + \beta_0 X_{ij,t} + \delta EMU_{ij,t} + \varepsilon_{ij,t}$$

where the dependent variable is $FDI_{ij,t}$ in millions of current US dollars. On the right hand side the explanatory variables include dummies to control for unobservable effects, specifically a country pair effect that is fixed over time (α_{ij}), in order to control for time-invariant unobservables, and a time effect that is

[10] See Angrist and Krueger (1999).

common to all countries (β_t), in order to control for time-specific unobservables. The set of explanatory variables ($X_{ij,t}$) is comprised by a constant and a subset of variables that have been found, in one way or another, significant in explaining FDI flows in prior empirical investigations. These variables include measures of market size for each country Y_{it} and Y_{jt} that are represented by GDP in current millions of US dollars. The set includes a measure of capital- or financing ability for country j measured as country j's stockmarket value of listed companies, $Stock_{jt}$ and, in hope to capture potential forward looking elements, a measure of payoff for investing in country i that is measured as the percentage change in country i's stockmarket value of listed companies, $\Delta Stock_{it}$ is included. Moreover, since the dependent variable is "one-way" FDI, a real exchange rate index is needed for country i and j, denoted REX_{it} and REX_{jt}.[11] Finally, we have our variables of interest ($EMU_{ij,t}$), with the acompaning vector of estimates (δ) that capture the effect of the euro for the euro-countries. The ($EMU_{ij,t}$) are interacted dummies by membership and time, where the interaction term is zero in the absence of the intervention i.e. prior to the introduction of the euro in 1999 or in the case of non-membership. There are three such interacted dummy variables of primary interest here: one for inward FDI flows between euro countries ($EMU11$), one for inward FDI flows to euro countries from non-euro countries ($EMU12$) and one for inward FDI flows from euro countries to non-euro countries ($EMU21$) and where the point estimates of these variables represent the average effect of the euro introduction.[12]

Our specification also includes dummy variables that capture the EU's common market effect are included as well, both for EU12 ($EU12in$, $EU12out$) as well as for Austria, Sweden and Finland ($ASFin$, $ASFout$). Where the EU12 dummy is zero in 1992 and one thereafter, while the ASF dummy takes the value one after 1995. Hence the full model to be estimated is:

$$\begin{aligned} FDI_{ij,t} \quad = \quad & \alpha_{ij} + \beta_t + \beta_0 + \beta_1 Y_{i,t} + \beta_2 Y_{j,t} + \beta_3 Stock_{j,t} + \beta_4 \Delta Stock_{i,t} + \beta_5 REX_{i,t} + \\ & \beta_5 REX_{j,t} + \beta_8 EMU11_{ij,t} + \beta_9 EMU12_{ij,t} + \beta_{10} EMU21_{ij,t} + \\ & \beta_{11} EU12in_{ij,t} + \beta_{12} EU12out_{ij,t} + \beta_{13} ASFin_{ij,t} + \beta_{14} ASFout_{ij,t} + \varepsilon_{ij,t} \end{aligned}$$

[11] Explanatory variables such as openness and trade barriers, are superfluous due to the sample in this paper. See Chakrabarti (2001) for an overview and an EBA analysis on the FDI determinants.

[12] A more precise description of the variables used in the regressions, sources and construction, can be found in Appendix II.

Lastly we come to the specification issue of controlling for common unobservable time effects. The most flexible specification, albeit not always efficient, is yearly dummy variables. However, in order to increase efficiency but maintain maximum flexibility we can restrict our regression by imposing a parametric specification in the form of *spline function*, which is a kinked time trend, to control for common unobservable time effects. We will see that inward FDI for our groups of interest as well as our control group has very similar time evolution at an aggregate level. This leads us to believe that common time effects can be captured by a spline specification and thereby increase the efficiency of our regressions.[13] This takes us to a specification strategy, spawned from the difference-in-differences approach, of fixed effects OLS with common time controls.

5 Results

Before we enter the world of regressions, it is of natural interest to see if there are any indications of euro effect in the raw data. The sample of 18 OECD countries is divided into four categories: 1) inward FDI flows between euro countries (EMU 11) , 2) inward FDI flows to euro countries from non-euro countries (EMU 12), 3) inward FDI flows to non-euro countries from euro countries (EMU 21) and 4) inward FDI flows between non-euro countries (EMU 22).

In *Figure 1*, where the *Aver Corr* series is used to measure *FDI flows* in millions of US dollars, we see that all categories evolve almost at the same rate until 1999, when inward FDI drops for non-euro countries, but continues upward for the rest.[14] It is clear from *Figure 1* that the development of *inward FDI*, for all the groups, follows a non-linear development over time. Actually, a simple fitted exponential trendline is able to explain 50-90 percent of the different groups, while a linear trend line has consistently 10 to 20 percent lower explanatory power. *Figures 2* and *3* show the relative development of our groups of interest (EMU 11, EMU 12 and EMU 21) in terms of our control group (EMU 22) for different time periods. It is clear that the three euro-categories

[13] See Greene Ch. 8.

[14] This increase is irrespective of the exchange rate measure, FDI flows in euro exhibit the same pattern, hence the dollar fluctuation of the examined period is irrelevant. The same is true when it comes to the empirical estimations, where the results are extremely similar for both dollar as well as euro estimations.

exhibit a sharp increase around 1998-1999. Also, the spike exhibited in Figure 2, for 1996, is not due to any large increase in the three groups of interest but rather due to large disinvestment in countries that belong in group EMU 22. More precisely it is due to US disinvestment in Sweden and the UK and due to Japanese disinvestment in the USA.[15]

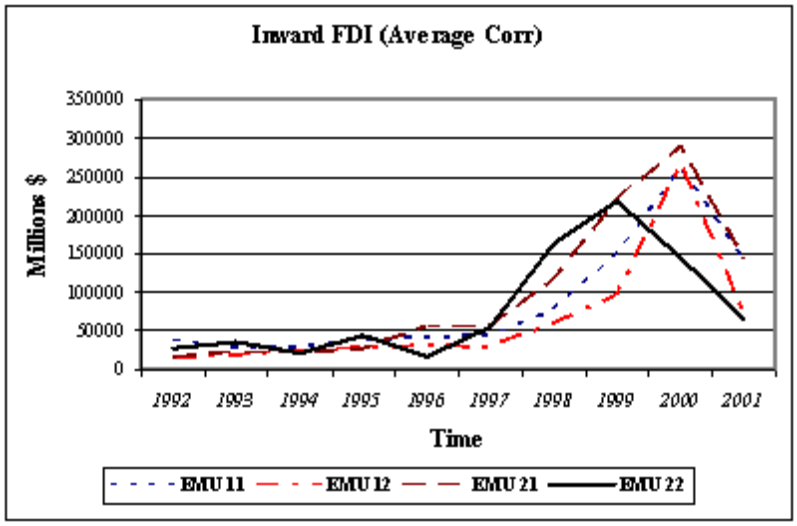
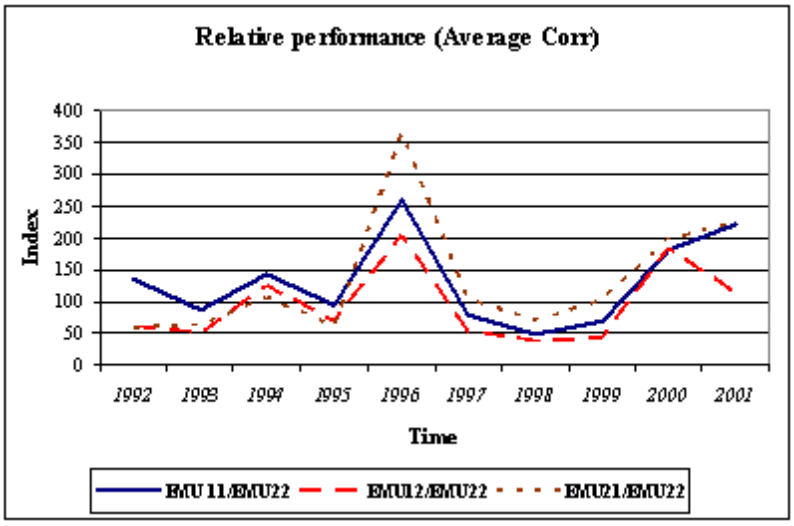


Figure 1: *Inward FDI by Group. Millions of US $.*



[15] Figures for absolute and relative development for the other measures of inward FDI can be found in Appendix II.

Figure 2: *Relative Development of EMU-area groups.*

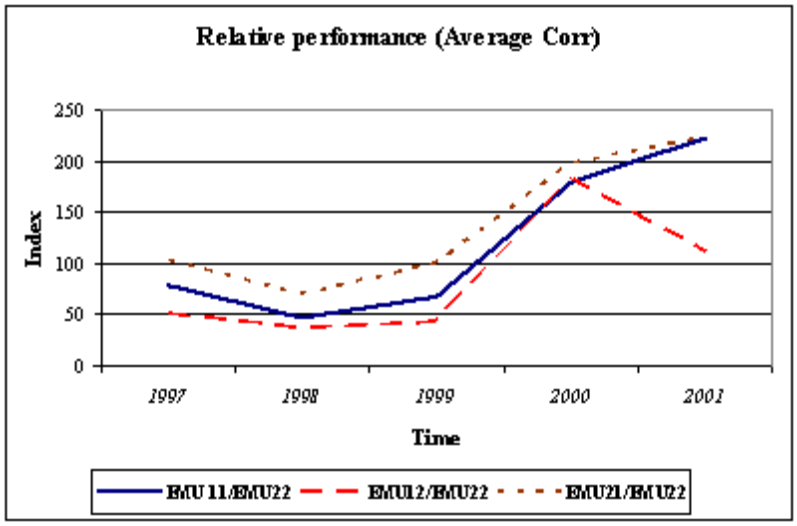


Figure 3: *Relative Development of EMU-area groups.*

These figures demonstrate two important facts. Firstly, the development of inward FDI for the different groups is very similar and secondly countries belonging to the EMU area have experienced a large relative increase after the introduction of the euro. However, even if this relative increase is clear we still have to estimate the partial effects of various FDI determinants, including the partial effects of the euro.

5.1 Regressions

In *Table 3*, the main results of this paper are presented, where inward FDI is measured as an average between inflows and outflows, or where IV-estimations are used. Columns 1, 2 and 3 deal with issues concerning common time effects, while a comparison of columns (3), (4) and (5) attempts to shed some light into the measurement problem that we encounter in the data. In *Table 3: Panel II* the elasticities of prior regressions are depicted, adding a measure of size to the pure direction effects of *Panel I*. The fact that the estimators in *Panel II* have

a higher t-value than their counterparts in *Panel I* can be attributed to the fact that the logarithmic form has a better "fit".

Several interesting features emerge from the regressions in *Table 3*. In regression (1) yearly dummies are used in order to capture common time effects and we may note that the EMU variables are insignificant. Comparing the estimates of the EMU variables with those obtained in regression (2), where the EMU variables are significant, we see that the point estimates of both equations are not significantly different. This leads us to believe that even if regression (1) is the most flexible in its definition, it is not the most efficient. From the figures presented above we may easily fit common time trends to the development of FDI. We can thereby increase the efficiency in our estimations by imposing a functional form on our regression. This is done in equation (3), where two splines are introduced as a mean to cope with common time effects. Our first spline comes from *Figure 1* and is a simple quadratic exponential function which, as mentioned earlier, explains fifty to ninety percent of the variables in *Figure 1*. The second spline comes from *Figure 2* and *3* and is linear until 1999 and increasing thereafter, in order to control for any common structural breaks around that period. Since the point estimates of regression (3) are not significantly different from those of regression (1), we can conclude that by controlling for common time effects in an efficient, albeit restricted, manner the effects of the EMU on *inward FDI* become more pronounced.[16]

Moving on with a comparison of regressions (3), (4) and (5) in Table 3, we can note that equations (4) and (5) are not really helpful when it comes to correcting potential measurement errors. The instrumented variables take on entirely the attributes of the instruments. That is, IV-inflows (IV-outflows) look, in terms of significance and magnitude, very much like the regressions using outflows (inflows) directly.[17] Since no gain in consistency is apparent from the IV-estimations,[18] the end result is only loss of efficiency that comes from using instruments. On the other hand we see that regression (3) seems to inherit the significant attributes from both inflows as well as outflows. This leads us, in light of prior arguments, to believe that regression (3) is to be preferred both for both measurement as well as estimation method issues.[19]

[16] In addition, both splines tend to be significant as a rule, even if not reported.

[17] We can compare the output of the IV-regressions with the regressions in Appendix III.

[18] Hausman tests reject the use of instruments in this case. The null of no difference in estimates is accepted with χ^2 values of 0.92 and 0.68.

[19] See Appendix III for the regression results of inflows and outflows.

Table 3: panel I

Dependent variable: Inward FDI, millions US

	(1)	(2)	(3)	(4)	(5)
	Aver Corr	Aver Corr	Aver Corr	IV-Inflows	IV-Outflows
Y_i	0.005^{***}	0.005^{***}	0.005^{***}	0.004^{***}	0.003^{***}
	(4.29)	(4.56)	(4.39)	(4.30)	(3.21)
Y_j	-0.002^{**}	-0.002^{**}	-0.002^{**}	-0.003^{*}	0.001
	(2.19)	(2.45)	(2.16)	(1.83)	(1.07)
$Stock_j$	0.0004^{***}	0.001^{***}	0.001^{***}	0.001^{**}	0.0003^{**}
	(2.61)	(3.09)	(2.71)	(2.09)	(2.07)
$\Delta Stock_i$	0.25	2.14	0.07	−0.21	−0.86
	(0.14)	(1.32)	(0.04)	(0.17)	(0.30)
REX_i	23.6	13.7	14.5	10.7	−4.31
	(1.20)	(0.70)	(0.73)	(0.55)	(0.25)
REX_j	76.3^{**}	63.5^{**}	65.6^{**}	42.0	54.1^{**}
	(2.29)	(2.09)	(2.13)	(1.35)	(2.04)
EMU 11	1288.9	1597.7^{***}	1755.9^{***}	1192.4^{***}	1352.5^{***}
	(1.56)	(4.25)	(3.7)	(3.08)	(2.81)
EMU 12	656.3	1088.2^{*}	1238.1^{**}	861.2	1113.5^{**}
	(0.71)	(1.95)	(2.03)	(1.15)	(2.05)
EMU21	1022.4	1417.8^{***}	1588.2^{***}	1192.7^{**}	1420.2^{**}
	(1.14)	(2.88)	(2.61)	(2.35)	(2.27)
$EU12in$	-834.7^{*}	−537.0	-668.5^{*}	−473.4	-729.5^{***}
	(1.78)	(1.61)	(1.91)	(0.65)	(2.59)
$EU12out$	−100.7	182.5	45.6	−257.1	2571.0
	(0.11)	(0.21)	(0.05)	(0.47)	(1.12)
$ASFin$	−491.4	−403.5	-600.7^{**}	−675.2	-685.3^{***}
	(1.60)	(1.39)	(1.96)	(1.42)	(2.78)
$ASFout$	-435.6^{*}	-307.6^{*}	−544.2	−254.8	-538.3^{***}
	(1.90)	(1.85)	(2.78)	(1.47)	(3.11)
Obs.	2722	2722	2722	2201	2113
R^2	0.36	0.35	0.35	0.30	0.39
Year Effects	**Dummies**	**No**	**Splines**	**Splines**	**Splines**

Notes: Robust |t-values| in parenthesis, Fixed effects not reported.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

Table 3: panel II

Elasticities $d(\ln y)/d(\ln x)$ at the mean. Fitted values

	(1)	(2)	(3)	(4)	(5)
	Aver Corr	Aver Corr	Aver Corr	IV-Inflows	IV-Outflows
Y_i	5.02^{***}	5.40^{***}	5.26^{***}	3.14^{***}	2.53^{***}
	(4.52)	(4.92)	(4.69)	(4.54)	(3.33)
Y_j	-2.31^{**}	-2.69^{***}	-2.54^{**}	-2.18^{*}	-0.89
	(2.29)	(2.58)	(2.25)	(1.89)	(1.09)
$Stock_j$	0.41^{***}	0.55^{***}	0.50^{***}	0.39^{**}	0.25^{**}
	(2.62)	(3.17)	(2.77)	(2.15)	(2.10)
$\Delta Stock_i$	0.003	0.03	0.001	-0.002	-0.01
	(0.14)	(1.31)	(0.04)	(0.17)	(0.30)
REX_i	1.95	1.13	1.20	0.69	-0.31
	(1.19)	(0.69)	(0.73)	(0.55)	(0.25)
REX_j	6.31^{**}	5.25^{**}	5.43^{**}	2.74	3.84^{**}
	(2.45)	(2.22)	(2.26)	(1.40)	(2.10)
EMU 11	0.12	0.14^{***}	0.16^{***}	0.10^{***}	0.12^{***}
	(1.57)	(4.85)	(3.75)	(3.30)	(2.92)
EMU 12	0.05	0.08^{**}	0.09^{**}	0.04	0.08^{**}
	(0.71)	(2.05)	(2.13)	(1.19)	(2.11)
EMU21	0.08	0.10^{***}	0.11^{***}	0.08^{**}	0.07^{**}
	(1.14)	(3.02)	(2.70)	(2.45)	(2.29)
$EU12in$	-0.09^{*}	-0.06^{*}	-0.07^{**}	-0.02	0.08^{***}
	(1.85)	(1.66)	(1.98)	(0.66)	(2.69)
$EU12out$	-0.01	0.02	0.005	-0.03	0.10
	(0.11)	(0.21)	(0.05)	(0.47)	(1.12)
$ASFin$	-0.01	-0.01	-0.02^{**}	-0.01	-0.02^{***}
	(1.62)	(1.39)	(1.99)	(1.44)	(2.83)
$ASFout$	-0.04^{**}	-0.03^{*}	-0.05^{***}	-0.02	-0.04^{***}
	(1.98)	(1.91)	(2.99)	(1.52)	(3.31)

Notes: Robust |t-values| in parenthesis, Fixed effects not reported.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

Concentrating on regression (3) we see that, by far, the most important determinant both in magnitude and significance is the variable for market size

Y_i.[20] This is not a surprising result, since both at an empirical as well as a theoretical level the variable of market size is considered *the* determinant for FDI.[21] What is a surprising feature in the regression though, is that the measure for the investing country's market size, Y_j, is negative and significant. This occurs due to the inclusion of the measure for capital- or financing ability for the investing country, $Stock_j$. Controlling for the investing country's financing ability implies that Y_j is to be interpreted in a relative and not as an absolute measure, indicating that larger countries make relatively less FDI. This result has an intuitive appeal since large domestic economies give, by default, domestic companies a large home market, while companies from small economies need to invest abroad in order to gain access to a large market.[22]

Another interesting feature are the dummy variables for the creation of the European common market in the regression. From *Panel 2* we can see that FDI to the EU12 countries from non EU countries drops by around 7 percent and by 2 percent for Austria, Finland and Sweden. It can be assumed that the creation of the EU made some investment non-profitable due to the removal of trade barriers, since a similar investment somewhere in the EU could service the entire market.[23]

The most interesting result though, and the aim of this paper, is the impact of the euro on FDI. The table above shows that *inward FDI* for the *intra- EMU* area (EMU 11) increases by 17 percent approximately. The increase is certainly not trivial and surpasses in magnitude the increase in trade volume found by Micco et al. (2003) as well as Flam and Nordström (2003). As the findings concerning trade, regression (3) shows that there are evidence concerning positive spillovers of the EMU to their partners, represented by *EMU12* and *EMU21*.[24] The magnitudes of *EMU 12* and *EMU 21* are also non-trivial with an increase of the former by 9 percent and the latter by 12 percent.

After trying to address issues of measurement and time effects, the results

[20] The investing countries real exchange rate is of equal magnitude but it is not significant across the measurment spectrum of inward FDI and since it is not a variable of primary interest in this paper, we do not dwell on it.

[21] See Chakrabarti (2001).

[22] This is conditional on exporting being less profitable.

[23] These results can be put in conjunction with some results obtained by Flam and Nordström (2003) where dummies for the creation of the EU tend to have a positive effect on exports from non-EU countries to EU countries.

[24] When outflows or outflows corr. are used as a measure EMU12 becomes insignificant, while for the inflows series all EMU variables become significant.

indicate that we can be fairly confident of the positive effects the creation of the EMU had on *inward FDI*. These positive effects are not only within the designated EMU area but also affects its partners. The results suggest that positive spillovers exist and that they are going in both directions. The remainder of the paper will use regression (3) as a base reference and if any of the other measurements of *inward FDI* have an effect on the results it will be duly noted.

6 Robustness Check

In this section the robustness of the obtained results is checked to changes in country and time sample.[25] Firstly it is of great importance to see if the results truly capture a euro effect or if it is something else. As mentioned earlier, the euro can affect international investment through several channels. Some of these channels can have a long transmission period and not have a direct impact, while other effects could be anticipated in advance. By changing the date of the euro creation dummy and running our regression again, we can observe the significance of the dummy variables. If we truly capture a euro effect, we should observe a jump around the formal creation in 1999.[26] The baseline regression for this exercise is regression (3) in *Table 3*, where the dependent variable is as always inward FDI, represented by the Average Corr series and the full model is used to estimate the effects. The results displayed in *Table 5* are the post estimation elasticities of the EMU variables.[27]

Firstly we can note that prior to 1998 the euro dummies have no significant impact. From Table 4 above we see that *EMU 11* and *EMU 21* show effects starting in 1998, while this is not true for *inward FDI* from non-EMU countries. This can be seen as an indication of either superior information concerning the EMU effects for member countries, or as expressing a sense of "euphoria" for the member states. The information concerning the EMU in 1998 was about its launch one year ahead, while in 1999 the member states exchange rate was locked to the euro. In addition we can note that the EMU's effects on trade volume has

[25] For space considerations only the results of the EMU variables will be presented in the tables. On a general basis the remaining explanatory variables sustain their significance throughout the robustness check.

[26] Micco et al. (2003), Flam and Nordström (2003) find that for trade, the euro has been anticipated and positive results start to show in 1998.

[27] The results are robust in terms of dependent variable choice.

exhibited a similar pattern. In all equations, the explanatory variables retain their significance.

Table 4: EMU effect over time, changing starting date.
Dependent variable: Inward FDI

	EMU starting date:						
	1993	1994	1995	1996	1997	1998	1999
EMU 11	−0.01	−0.05	−0.05	−0.03	0.02	0.11***	0.16***
	(0.15)	(0.86)	(0.73)	(0.54)	(0.48)	(2.87)	(3.75)
EMU 12	0.10	0.002	−0.03	−0.03	−0.01	0.04	0.09**
	(0.86)	(0.03)	(0.45)	(0.54)	(0.12)	(1.08)	(2.13)
EMU 21	−0.04	−0.06	−0.04	−0.01	0.03	0.08*	0.11***
	(0.29)	(0.82)	(0.59)	(0.20)	(0.50)	(1.94)	(2.70)

Notes: Robust |t-values| in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

The time aspect of the robustness check also requires a shortening of the time period prior to the EMU in order to check that the estimated effects are not obtained due to any sample selection bias.

Table 5: Time sensitivity
Dependent variable: Inward FDI

	Sample starting at:				
	1992	1993	1994	1995	1996
EMU 11	0.16***	0.18***	0.18***	0.18***	0.18***
	(3.75)	(4.15)	(4.04)	(3.83)	(3.47)
EMU 12	0.09**	0.09**	0.09**	0.09**	0.08*
	(2.13)	(2.23)	(2.16)	(2.12)	(1.75)
EMU 21	0.11***	0.12***	0.13***	0.13***	0.14***
	(2.70)	(2.89)	(2.84)	(2.87)	(2.76)

Notes: Robust |t-values| in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

Table 5 presents the elasticities of the EMU variables obtained from the

regressions where the pre-euro time period is shortened and we see that the results are stable in terms of significance, with a slight inflation when the pre-EMU period is shortened.

Continuing the sensitivity analysis, we now check whether the EMU results are driven by any particular country/countries, or whether they are more widespread.[28] Countries are excluded both as receivers of investment and investors (i and j respectively). As in *Table 4* and *5* the results presented in the table are the post estimation elasticities of the EMU variables.

Table 6: Country sensitivity, single country exclusion
Dependent variable: Inward FDI

	Independent variables					
	EMU 11		*EMU 12*		*EMU 21*	
Country dropped						
None	0.16***	(3.75)	0.09**	(2.13)	0.11***	(2.70)
Austria	0.16***	(3.94)	0.09**	(2.24)	0.12***	(2.92)
Belgium-Luxembourg	0.07**	(2.03)	0.05	(1.16)	0.08*	(1.85)
Finland	0.17***	(4.07)	0.09**	(2.28)	0.12***	(2.95)
France	0.13***	(2.85)	0.10**	(1.98)	0.09*	(1.87)
Germany	0.10***	(2.95)	0.06	(1.47)	0.10**	(2.06)
Greece	0.16***	(3.79)	0.08**	(2.05)	0.11***	(2.57)
Ireland	0.15***	(3.72)	0.09**	(2.15)	0.12***	(2.81)
Italy	0.18***	(4.19)	0.10**	(2.37)	0.13***	(3.06)
Netherlands	0.14***	(3.09)	0.10**	(2.06)	0.11**	(2.31)
Portugal	0.16***	(4.02)	0.09**	(2.28)	0.13***	(3.04)
Spain	0.16***	(3.70)	0.09**	(2.19)	0.12***	(2.87)

Notes: Robust |t-values| in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

We see clearly from *Table 6* that the exclusion of Belgium-Luxembourg (BeLux) or Germany weakens the results. Further examination reveals that when both countries are excluded simultaneously the regressions cease to exhibit any euro effects, which is perhaps not so surprising since we have removed

[28] The methodology of this experiment follows Micco et al. (2003), Table 6 and 7.

the most central locations in the euro area.[29] Continuing however with this investigation we notice an important feature, to wit, that if BeLux and Germany are excluded only as receivers (country i), or only as investors (country j) results showing a positive effect for the euro introduction remain significant. These results are of importance for two reasons. Firstly, the aim of this paper is to investigate uni-directional FDI, hence the importance of examining the exclusion of FDI flows in only one direction, and secondly these results clearly illuminate the fact that Belgium-Luxembourg and Germany act as a hub for the EMU-area *inward FDI* but they are not the sole driving receivers of FDI nor are they the sole driving investors. *Table 7* presents the elasticities of some chosen regressions that clarify the point made above.

Table 7: Excluding Germany and BeLux
Dependent variable: Inward FDI

Excluded as country:	(i) *and* (j)	(i)	(j)
EMU 11	0.04	0.07**	0.10***
	(1.26)	(2.09)	(2.80)
EMU 12	−0.01	0.01	0.10*
	(0.20)	(0.37)	(1.88)
EMU 21	0.05	0.13**	0.06
	(0.98)	(2.31)	(1.43)

Notes: Robust |t-values| in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

Table 7 above gives some sense of what is happening in the data. Firstly, in all cases the intra-EMU (EMU 11) values decrease when Germany and BeLux are excluded either as receivers or as investors. Secondly, they seem to be a driving force of both attracting FDI from non-EMU countries, as well as investing outside the euro area, since *EMU 12* and *EMU 21* become in turn insignificant.[30] Hence what can be said about Germany and BeLux is that while

[29] When the measure of inward FDI is outflows and outflows corr. the results for EMU 11 borderline insignificant and have a magnitude of about 5 percent.

[30] The slight inflation of the estimate *EMU 12* (*EMU 21*) when Germany and Belux are excluded as country i (j), is due to a different relative importance of the remaining EMU countries.

they play a vital role in the euro-area for inward FDI (EMU 11) as well as for the spillovers (EMU 12 and EMU 21) they do not explain the entire story. The fact that intra-EMU effects retain their significance when Germany and BeLux are excluded either as receivers of FDI or as investors validates the question of whether the positive effects of the euro in attracting FDI are widespread across the members or if the effects are more concentrated. This is a topic which will be further investigated in the next section.[31]

7 On the Economic Geography of the Euro

In this Section groups of countries will be excluded as receivers (country i) of FDI or investors (country j) in order to check for any potential concentration of inward FDI. The obtained results will be compared to similar regressions on unilateral trade, measuring exports, where $Export_{ij}$ *denotes exports from country* i *to country* j.[32] The purpose here is twofold. Firstly, it will give an indication of whether the introduction of the euro has induced any agglomeration effects on economic activity. Agglomeration tendencies, or lack thereof, are possibly important as objects of policy importance for any future EMU-members. Moreover, the direction of trade in conjunction with the direction of FDI might be able to reveal something of the character of FDI, that is if the directions correspond to the notion of vertical or horizontal FDI, and where we can keep in mind that a significant percentage of world trade, about 30 to 40 percent, is intrafirm trade.[33] Secondly, this section can also be seen as being a continuation of the robustness check performed previously.

In the new trade literature the focus has been put on the geographic distribution of economic activity, where models display both forces of agglomeration as well as forces of dispersion. One key effect to agglomeration is the "market access effect". It states that firms tend to locate their production in the big market and export to small markets.[34]

[31] As we have seen the magnitude varies of course, but the question is whether all members have had some effect of varying degree or if all effects are concentrated to some countries.

[32] The dataset on exports is from the paper by Flam and Nordström (2003). The datasets in this part of the paper are compressed in order to obtain the same observations in time and space, for both exports and inward FDI.

[33] See, Markusen 2002, Ch.1 pp. 5-6.

[34] See Baldwin, Forslid, Martin, Ottaviano and Nicoud (2003).

As mentioned above, the "new economic geography" models feature forces of both agglomeration as well as forces of dispersion. Their relative strengths are determined by trade costs. Mostly these models show how lower trade costs may lead to increased agglomeration of economic production. However, agglomeration forces are, as a rule, hump shaped in their relation to trade costs and depending on the starting point dispersion forces may dominate when trade 'feeness' is increased.[35] The introduction of the euro has had a significantly positive effect on trade volumes and it can be seen as a step of reducing such trade costs. Yet, since we are not quite sure about our position on the hump prior to the euro we can not make any a priori assumptions about agglomeration effects.

Moving on to the empirical considerations we can notice that in order to compare our results from exports and inward FDI, the datasets have to cover the same time period and country sample.[36] The division of the sample into "big" and "small" economies is based on market size. The "big" sample of euro countries contains Germany, France, Italy and Spain, while the remaining countries are found in the "small" sample. The baseline regressions for this exercise are: for *inward FDI*, regression (3) in *Table 3* and for *Exports*, regression (6) in *Table 4*, in Flam's and Nordström's (2003) paper. The regressions are run by excluding the "big" or "small" group firstly as country i, i.e. as receivers of FDI and as Exporters *(Table 8.1)* and subsequently as country j, i.e. as investors and as receivers of exports *(Table 8.2)*. Moreover, since we only exclude countries as (i) in *Table 8.1*, we can disregard *EMU 21* for both FDI as well as exports. The same holds for *EMU 12* in *Table 8.2* where the exclusion is only countries as (j). The changes in *EMU 21* and *EMU 12* respectively will be due to changes in relative importance of the remaining data. They are quite cumbersome to interpret yet do not add anything to the analysis. The comparison of the obtained elasticities are in the case of exports straightforward, where we can compare the group elasticities with their full sample counterparts and be able to discern some pattern in the direction of trade. In the case of the FDI regressions it is not so straightforward, since the elasticities obtained are calculated using the chain rule and are applied to the predicted mean of the respective regression. This mean is represented in millions of dollars and varies when the sample is changed. In order to ease the understanding of the results

[35] See Baldwin et al. (2003).

[36] Exports for years other than 1992-2001 are dropped as well as FDI concerning Greece. Lastly, the euro dummies have 1999 as their starting date.

the predicted means for each FDI regression ($\hat{y}$) are presented in the Tables 8.1 and 8.2.

Table 8.1: EMU elasticities of inward FDI and Exports, country (i)

Dependent variable: Inward FDI					
	Receivers of FDI				
	(1)	(2)	(3)	(4)	(5)
	All	$\text{Small}^{a}_{i-Euro}$	Big^{b}_{i-Euro}	$\text{Small}^{c}_{i-BeLux}$	Big^{d}_{i-All}
EMU 11	0.16***	0.11***	0.11***	0.06**	0.17**
	(3.75)	(3.46)	(2.68)	(2.14)	(3.43)
EMU 12	0.09**	0.07**	0.05	0.01	0.08*
	(2.13)	(2.03)	(1.17)	(0.56)	(1.66)
$\hat{y}$	1301.9	1310.4	1558.7	1216.4	2098.7
Dependent variable: Exports,					
	Exporters				
	All	$\text{Small}^{a}_{i-Euro}$	Big^{c}_{i-Euro}	$\text{Small}^{b}_{i-BeLux}$	Big^{e}_{i-All}
EMU 11	0.14***	0.16***	0.13***	0.16***	0.12***
	(6.14)	(5.50)	(4.97)	(4.51)	(3.59)
EMU 12	0.07***	0.06**	0.09***	0.06**	0.07**
	(3.29)	(2.51)	(4.20)	(2.11)	(2.32)

Notes: Robust $|t|$-values in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

[a] Excluding Germany, France, Italy and Spain

[b] Excluding Ireland, Portugal, Finland, Austria, Netherlands and BeLux

[c] Excluding Germany, France, Italy, Spain and BeLux

[d] Excluding Ireland, Portugal, Finland, Austria, BeLux, Netherlands, Sweden, Norway, Denmark and Switzerland

Starting with the first three columns in *Table 8.1* it is not clear, at first glance, when comparing the estimates in regressions (1), (2) and (3) that "big" countries receive more FDI flows. Both subsamples experience a seemingly equiproportional increase in the *EMU 11* variable and the "small" sample seems to drive the results for *EMU 12* . However this is not entirely true. A comparison of the predicted average inward FDI, ($\hat{y}$), and the elasticities in regressions (1), (2) and (3) indicate that the "big" sample receives a larger share of the intra-EMU FDI than the "small" sample, after having controled for a host of factors

including marketsize. Moreover, the results for the "small" sample are to a large extent driven by BeLux, which is a large receiver and sender of FDI. Separate figures for the two countries can be found for the year 2002 from Eurostat. These figures show that the share of Luxembourg, in the combined BeLux figures, is 89 percent of the inflows and 93 percent of the outflows from and to the EU15. A possible explanation for this occurence is that Luxembourg acts as a tax haven for investment. Furthermore, if these figures for 2002 are representative for BeLux' FDI flows in earlier years we can conclude that BeLux is far from a 'typical' "small" economy and therefore exclude it from the sample. Regression (4) shows the results when BeLux is removed from the "small" sample. The results then become very clear insofar that inward FDI is highly concentrated in "big" countries. Even if "small" EMU countries experience a significant increase in intra-EMU FDI, the increase for the "big" economies is much larger and Wald tests confirm that the elasticities of *EMU 11* are significantly different between regressions (3) and (4). Moreover, we can see that BeLux solely drives the results for *EMU 12*. Lastly, from regression (5), that includes only FDI between large countries, we see that the elasticity for EMU 11 is even larger than prior regressions. This indicates that a large part of the inward FDI increase due to the EMU is concentrated to a few large economies.

The results concerning exports in Table 8.1 differ markedly from their FDI counterparts. Firstly, we see that regressions (2) and (4) are virtually identical for exports, which implies that BeLux does not drive any results when exports are concerned. Secondly, for the intra- EMU area (*EMU 11*) the estimates inflate, compared to the base regression, when the "big" sample is dropped as exporter, but deflate when the "small" sample is dropped. Hence, the export increase is larger for the "small" countries. For *EMU 12* the opposite holds and the increase is dominated by the big countries exports to non-EMU members.

Turning our attention to the opposite side of this equation, namely where do the FDI come from and to whom do the countries export to, several patterns begin to emerge. In *Table 8.2* we see again the pivotal role of BeLux for the results of the "small" sample. When, BeLux is excluded from the "small" sample, regression (4), it is clear that the "big" economies are the ones that spawn most of the FDI, both within the EMU-area (*EMU 11*) as well as outside the same (*EMU 21*). The estimates of EMU 11 are again significantly different from each other in regressions (3) and (4) for inward FDI. The regressions dealing with

the export side of this experiment show an equal clear tendency where a clear increase occurs when "small" countries are dropped as receivers of exports, and conversely a clear decrease occurs when "big" countries are dropped. Hence the receivers of export are clearly dominated by "big" countries, both for *EMU 11* as well as *EMU 21*.

Table 8.2: EMU elasticities of inward FDI and Exports, country (j)

Dependent variable: Inward FDI

	Source of FDI				
	(1)	(2)	(3)	(4)	(5)
	All	$\text{Small}^{a}_{j-Euro}$	Big^{c}_{j-Euro}	$\text{Small}^{b}_{j-BeLux}$	Big^{d}_{j-All}
EMU 11	0.16^{***}	0.11^{***}	0.10^{***}	0.04^{*}	0.07^{*}
	(3.75)	(2.67)	(3.45)	(1.86)	(1.94)
EMU 21	0.11^{***}	0.06	0.08^{**}	0.01	0.04
	(2.70)	(1.55)	(2.37)	(0.41)	(0.84)
$\hat{y}$	1301.9	1236.4	1444.7	1097.9	1981.3

Dependent variable: Exports

	Receivers of Exports				
	All	$\text{Small}^{a}_{j-Euro}$	Big^{c}_{j-Euro}	$\text{Small}^{b}_{j-BeLux}$	Big^{e}_{j-All}
EMU 11	0.14^{***}	0.11^{***}	0.21^{***}	0.09^{***}	0.17^{***}
	(6.14)	(3.89)	(8.97)	(3.07)	(5.13)
EMU 21	0.08^{***}	0.04	0.13^{***}	0.03	0.10^{***}
	(3.63)	(1.62)	(5.85)	(0.91)	(3.07)

Notes: Robust |t-values| in parenthesis.

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

^{a} Excluding Germany, France, Italy and Spain

^{b} Excluding Ireland, Portugal, Finland, Austria, Netherlands and BeLux

^{c} Excluding Germany, France, Italy, Spain and BeLux

^{d} Excluding Ireland, Portugal, Finland, Austria, BeLux, Netherlands, Sweden, Norway, Denmark and Switzerland

Overall, the results from *Tables 8.1* and *8.2* indicate that, excluding BeLux, FDI flows do indeed concentrate into the "big" economies. However, within the EMU area the FDI originate also mostly from the same countries. Exports on the other hand tend to increase more for "small" countries as a rule and

are directed towards "big" countries, with an exception of EMU exports to non members, where the "big" members increase their exports more to "big" non members.

So, are there any agglomeration tendencies apparent from this exercise? The answer to this is: only partially. Partially yes, since "big" economies attract a larger share of the total increase in inward FDI, after controling for a host of factors including market size. Hence we observe an increase in the concentration of production and the sample displays agglomeration tendencies. However, exports tend to increase slightly more for small countries, which may indicate an increase in production and, in terms of economic geography, increased dispersion.

While there are no clear agglomeration tendencies of economic activity, in some cases there is similarity in the direction of FDI and exports which is consistent with the notion of vertically integrated FDI. This creates the suspicion that perhaps intrafirm trade and vertical FDI increase in importance with the introduction of the euro. This suspicion is supported by findings from Flam and Nordström (2003) where they use regressions on one-digit SITC sector exports and find that export increases are concentrated on differentiated and processed input goods. Flam and Nordström note that the estimated increase for trade can be explained by increasing vertical specialization along the lines suggested by Yi (2003).

8 Conclusions

Several theoretical arguments exist on why the introduction of the euro should increase international investment. In this paper a difference-in-difference and a fixed effects with efficient common time controls approach has been used in order to gauge the effects of the euro introduction on *inward FDI* for the EMU members. After attempting to correct potential measurement problems and various time effects in the data we estimate that the introduction of the euro has increased *inward FDI* by 17 percent within the euro area. Moreover, the euro has had significant positive spillover effects on *inward FDI* both to and from the euro area by 9 and 11 percent respectively. The results are robust to changes in time and country sample with one exception. If the central locations of Germany

and Belgium-Luxembourg are excluded simultaneously as both receivers of FDI and investors most of the euro effects disappear. However, if they are excluded either as receivers or investors the euro effects reappear, which indicates that the two countries act as a hub for FDI flows in the euro area. Finally, an investigation of the economic geography of the euro was conducted by combining the inward FDI results with results obtained from regressions on exports, for the same countries and years, and examining direction patterns for "big" and "small" economies. At a first glance the increase in FDI seems to be equally divided between "big" and "small" countries. When excluding BeLux though, indications of partial agglomeration forces appear in the results. Excluding BeLux an overwhelming majority of the increase in FDI is attracted to "big" economies. Moreover, in some cases FDI and exports follow the same direction pattern, which indicates an increase of vertical specialization in the sample.

The fact that the results show that the increase of FDI seem to locate, excluding BeLux, in the "big" economies in conjunction with the results indicating that export of input goods are increasingly directed from "small" to "big" economies raises several stepwise questions of relevance for future research. The first step is directed to the question of whether "small" economies are increasingly acting as suppliers of input goods to multinational enterprises that, in turn, are increasingly located in "big" economies? If this is the case, a second natural step is to investigate whether "small" economies are going to encounter a more volatile future in their production when exogenous shocks hit the EMU area due to this vertical specialization and the implied supplier status. Moreover, the question arises of whether such a development will impede further on the possibilities of "small" economies to pursue independent policies?

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APPENDIX I: Data description

Variable	Measurement	Description	Source
Inward FDI$_{ij}$		Equity + Other Capital, net	*Eurostat,*
	Inflows	Inward FDI for country i reported as	*New Cronos 2003*
		an inflow for country i.	
		Millions current US $	
	Outflows	Inward FDI for country i reported as	
		an outflow for country j.	
		Millions current US $	
	Average	Inward FDI for country i measured as	
		the average of above variables.	
	Corrections	Extension of inward FDI dataset by	
		correcting for missing values, when	
		possible, for inflows (outflows) by	
		using their outflow (inflow) counterpart	
		corrected by an average asymmetry.	
REX i or j		Real Effective Exchange Rate	*IMF,*
		Index, CPI Based	*IFS 2003*
Y i or j		GDP, *Millions current US $*	
Stock		Market capitalization of listed companies	*World Bank,*
		share price $*$ no. of shares outstanding	*WDI 2003*
		Millions current US $	

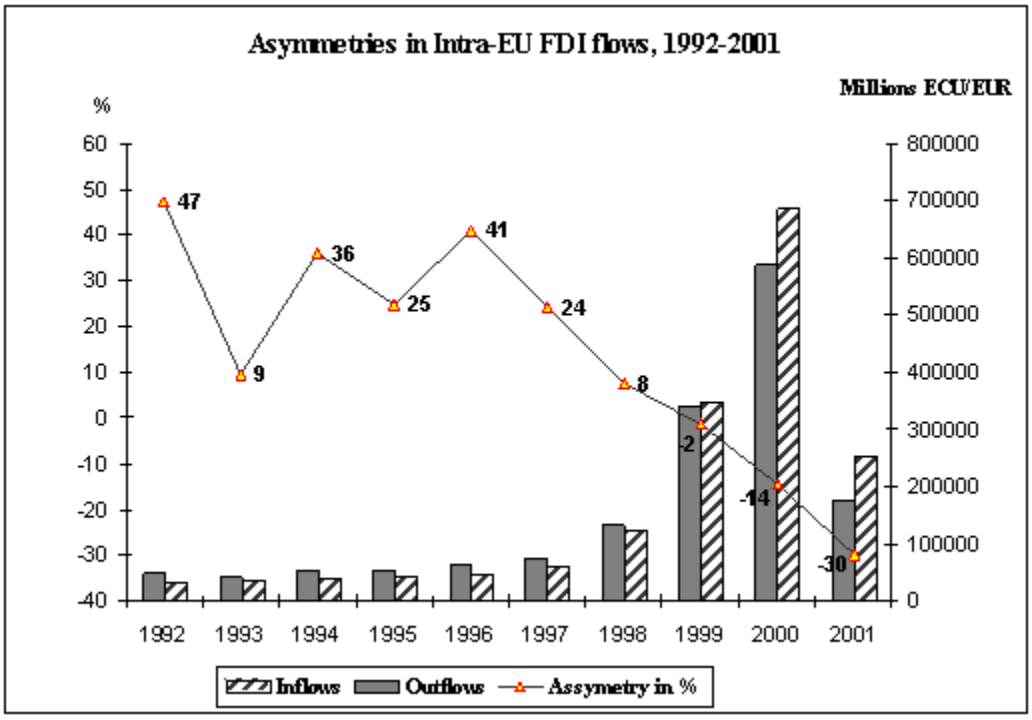
Dummy Variables	Description
EMU	0 prior to the introduction of the Euro in 1999, 1 afterwards if
EMU 11	both countries i and j belong to the EMU.
EMU 12	country i belongs to the EMU and country j does not.
EMU 21	country j belongs to the EMU and country i does not.
EU 12	0 prior to 1993 and 1 afterwards if
EU 12 in	country i belongs to EU 12 and country j is non EU
EU 12 out	country j belongs to EU 12 and country i is non EU
Austria Sweden Finland	0 prior to 1995 and 1 afterwards if
ASF in	country i belongs to ASF and country j is non EU
ASF out	country j belongs to ASF and country i is non EU

Countries in the sample

- **Group 1, EMU members:** Austria, Belgium-Luxembourg, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain.
- **Group 2, non-EMU members:** Denmark, Japan, Norway, Sweden, Switzerland, UK, USA.

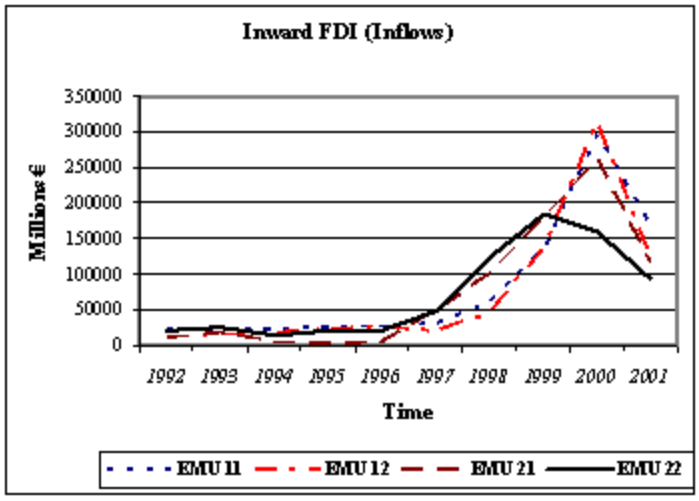
Average asymmetries

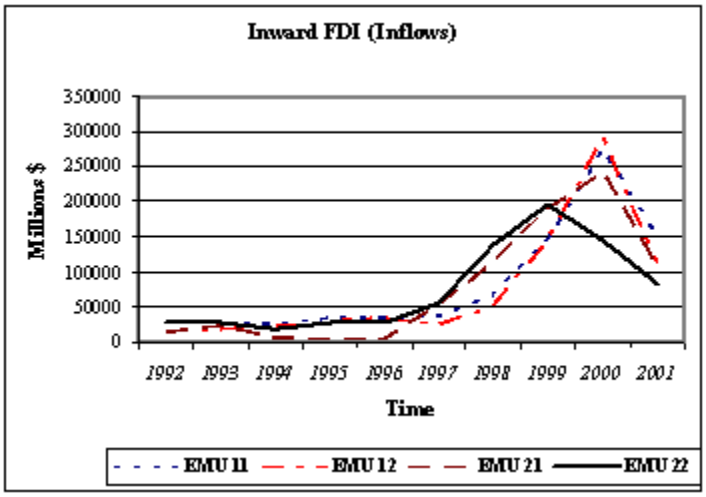
Average asymmetries are used to calculate corrected series. For each year there is a difference for reported aggregate inflows and outflows for a certain area. This aggregate difference is used to correct missing data on inflows(outflows) between two countries for a certain year, if their outflow(inflow) counterpart exists.

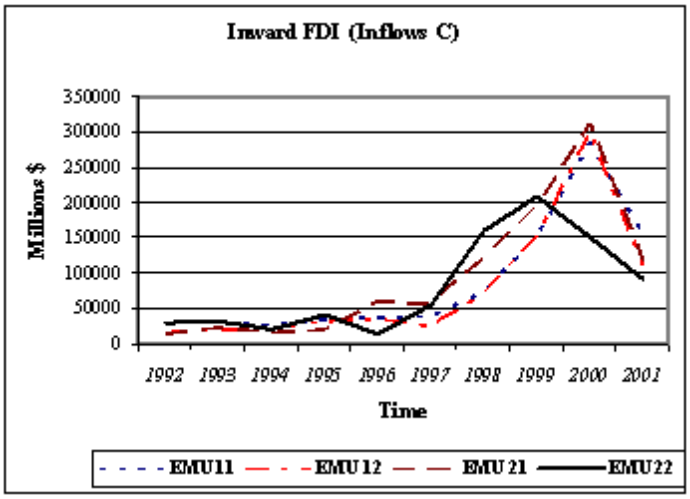


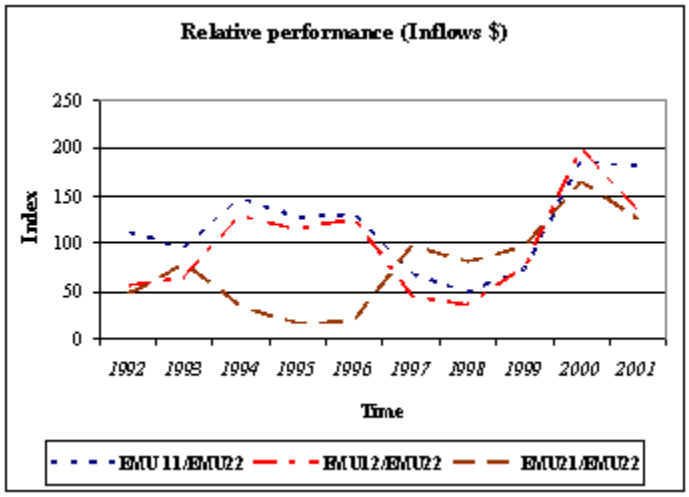
APPENDIX II: FDI development

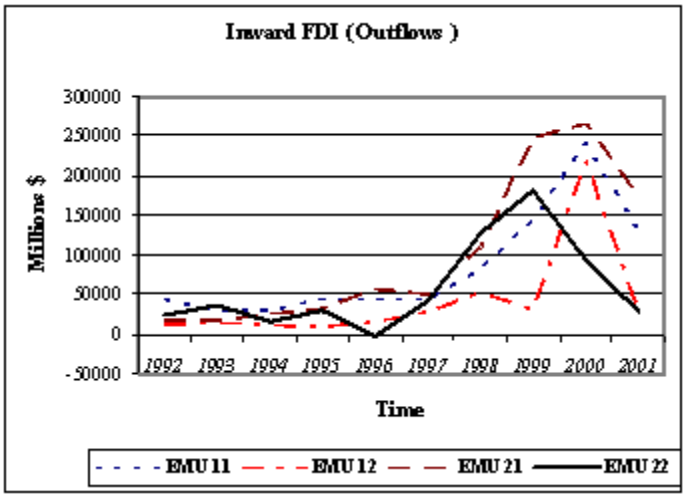
As mentioned in the paper, some results may vary depending on the measure used for inward FDI. The first two diagrams show the development of the same variable but with different exchange rates, while the other diagrams can be used to compare the absolute or relative development of the different FDI groups depending on measure. The last diagram shows the proportion of world or OECD total FDI that is used in this paper.

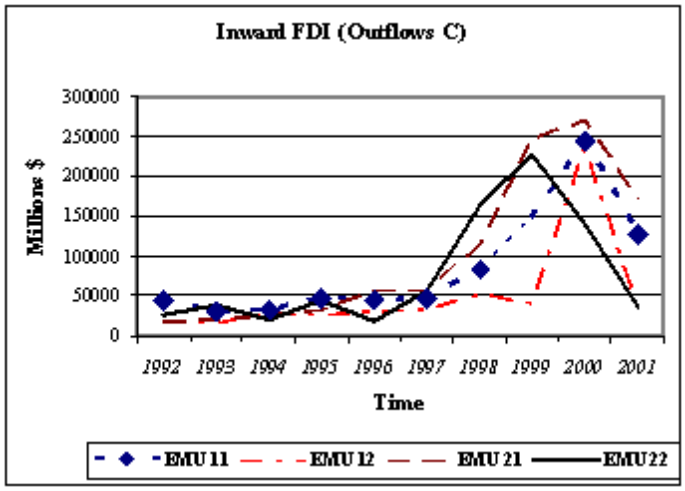


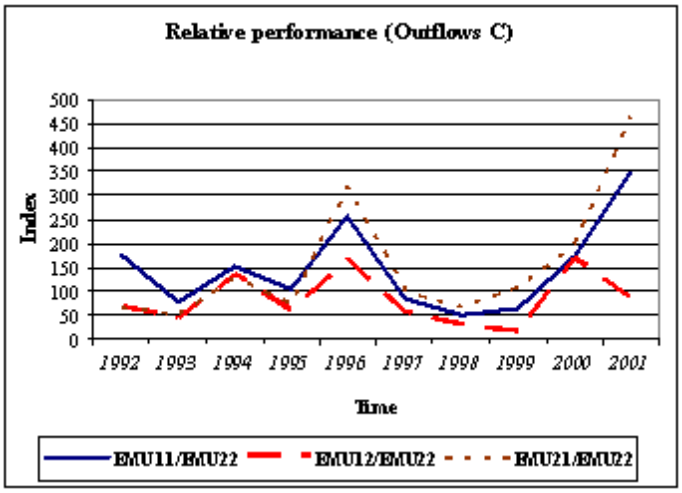


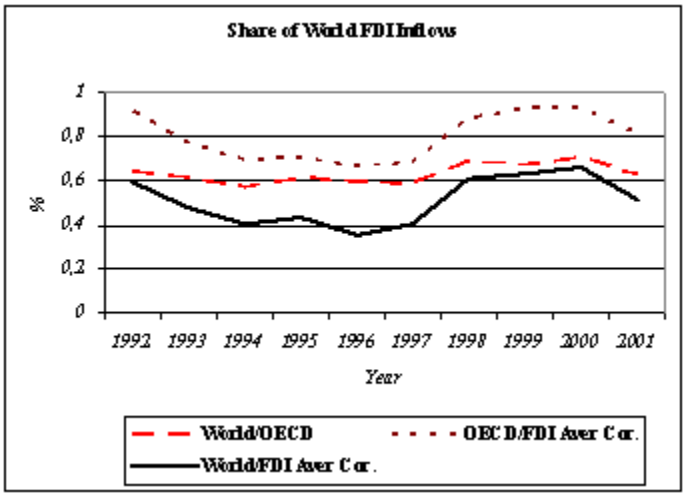

Inward FDI (Inflows C)
Millions $
350000
300000
250000
200000
150000
100000
50000
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Time
EMU11
EMU12
EMU21
EMU22


Relative performance (Inflows $)
Index
250
200
150
100
50
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Time
EMU11/EMU22
EMU12/EMU22
EMU21/EMU22


Inward FDI (Outflows)
300000
250000
200000
150000
100000
50000
0
-50000
Millions $
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Time
EMU 11
EMU 12
EMU 21
EMU 22


Inward FDI (Outflows C)
300000
250000
200000
150000
100000
50000
0
Millions $
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Time
EMU 11
EMU 12
EMU 21
EMU22


Relative performance (Outflows C)
500
450
400
350
300
250
200
150
100
50
0
Index
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Time
EMU11/EMU22
EMU12/EMU22
EMU21/EMU22


Share of World FDI Inflows
1
0,8
0,6
0,4
0,2
0
%
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Year
World/OECD
OECD/FDI Aver Cor.
World/FDI Aver Cor.

APPENDIX III: Measurement regressions

Table A: panel I

Dependent variable: Inward FDI, millions US

	(1)	(2)	(1)	(2)	(1)	(2)
	Inflows	Inflows C	Outflows	Outflows C	Average	Average C
Y_i	0.005***	0.005***	0.006***	0.005***	0.006***	0.005***
	(3.21)	(3.85)	(4.30)	(4.32)	(3.61)	(4.39)
Y_j	−0.001	−0.002*	-0.005*	−0.002*	−0.004*	−0.002**
	(1.07)	(1.85)	(1.83)	(1.94)	(1.72)	(2.16)
$Stock_j$	0.0005**	0.001***	0.001**	0.001**	0.001**	0.001***
	(2.07)	(2.77)	(2.09)	(2.13)	(2.13)	(2.71)
$\Delta Stock_i$	−1.30	0.34	−0.33	0.20	−2.89	0.07
	(0.30)	(0.16)	(0.17)	(0.11)	(0.57)	(0.04)
REX_i	−6.49	8.14	16.88	20.86	−9.50	14.49
	(0.25)	(0.44)	(0.55)	(0.83)	(0.25)	(0.73)
REX_j	81.56**	75.34**	66.58	55.94	89.9*	65.64**
	(2.04)	(2.21)	(1.35)	(1.47)	(1.75)	(2.13)
EMU 11	2039.6***	1791.9***	1889.2***	1720.0***	2270.7***	1755.9***
	(2.81)	(3.04)	(3.08)	(3.25)	(2.76)	(3.47)
EMU 12	1679.2**	1591.5**	1364.3	885.3	2265.3**	1238.1**
	(2.05)	(2.20)	(1.15)	(1.15)	(2.08)	(2.03)
EMU21	2141.7**	1337.7*	1889.7**	1838.6**	2770.5**	1588.2***
	(2.27)	(1.91)	(2.35)	(2.54)	(2.46)	(2.61)
$EU12in$	−1100.1***	−894.7**	−749.9	−442.3	−1979.6	−688.5*
	(2.59)	(2.45)	(0.65)	(1.05)	(1.63)	(1.91)
$EU12out$	3877.2	199.5	−407.3	−108.3	1230.3	45.6
	(1.12)	(0.21)	(0.47)	(0.13)	(0.40)	(0.05)
$ASFin$	−1033.5***	−872.1***	−1069.7	−329.4	−1810.6**	−600.7**
	(2.78)	(2.63)	(1.42)	(0.92)	(2.11)	(1.96)
$ASFout$	−811.7***	−564.2***	−403.7	−524.1**	−708.4**	−544.2***
	(3.11)	(2.65)	(1.47)	(2.46)	(2.20)	(2.78)
Obs.	2113	2722	2201	2722	1555	2722
R^2	0.39	0.35	0.30	0.29	0.39	0.35

Notes: Robust |t-values| in parenthesis, Fixed effects not reported. Common time effects: Splines

*,** ,*** denote significance at the 10-, 5- and 1 %-level respectively.

Table A: panel II

Elasticities $d(\ln y)/d(\ln x)$ at the mean. Fitted values

	(1)	(2)	(1)	(2)	(1)	(2)
	Inflows	Inflows C	Outflows	Outflows C	Average	Average Corr
Y_i	3.66***	5.28***	6.00***	5.25***	4.69***	5.26***
	(3.36)	(4.13)	(4.57)	(4.59)	(3.84)	(4.69)
Y_j	−1.29	−2.38*	−4.16*	−2.70**	−3.33*	−2.54**
	(1.10)	(1.92)	(1.94)	(2.03)	(1.80)	(2.25)
$Stock_j$	0.36**	0.50***	0.75**	0.49**	0.68**	0.50***
	(2.11)	(2.84)	(2.18)	(2.14)	(2.22)	(2.77)
$\Delta Stock_i$	−0.01	0.004	−0.003	−0.03	−0.02	0.001
	(0.30)	(0.16)	(0.17)	(0.11)	(0.58)	(0.04)
REX_i	−0.45	0.65	1.31	1.79	−0.58	−1.20
	(0.25)	(0.44)	(0.54)	(0.82)	(0.25)	(0.73)
REX_j	5.56**	6.01**	5.22	4.81	5.50*	5.43**
	(2.13)	(2.32)	(1.45)	(1.57)	(1.87)	(2.26)
EMU 11	0.18***	0.16***	0.19***	0.16***	0.20***	0.16***
	(2.95)	(3.18)	(3.44)	(3.61)	(2.89)	(3.75)
EMU 12	0.12**	0.11**	0.07	0.06	0.11**	0.09**
	(2.13)	(2.29)	(1.22)	(1.21)	(2.20)	(2.13)
EMU21	0.10**	0.09*	0.15**	0.14***	0.14**	0.11***
	(2.29)	(1.92)	(2.51)	(2.72)	(2.49)	(2.70)
$EU12in$	−0.12***	−0.09**	−0.04	−0.05	−0.10*	−0.07**
	(2.71)	(2.55)	(0.67)	(1.09)	(1.69)	(1.98)
$EU12out$	0.15	0.02	−0.05	−0.01	0.05	0.004
	(1.11)	(0.21)	(0.47)	(0.13)	(0.40)	(0.05)
$ASFin$	−0.03***	−0.02***	−0.02	−0.01	−0.03**	−0.02**
	(2.83)	(2.65)	(1.46)	(0.94)	(2.17)	(1.99)
$ASFout$	−0.06***	−0.05***	−0.04	−0.05***	−0.06**	−0.05***
	(2.38)	(2.82)	(1.56)	(2.68)	(2.34)	(2.99)

Notes: Robust |t-values| in parenthesis, Fixed effects not reported. Time effects: Splines

*,** ,*** denote significance at the 10-, 5- and 1 % respectively.

Table A makes us enables us to discern differences in the way measurement of inward FDI affect the results. One difference is that the use of inflows gives consistently about a 10 percent increase in explanatory power. Another is that the significance of various explanatory variables differ between the

measurements. Moreover, very little seems to change in regressions (2) when the raw data are expanded. Concerning the measurement of the averages we can note that they seem to inherit the significance of the explanatory variables for both measurements, a result that was a happy surprise for once. All regressions use splines in order to control for common time effects.