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PUTTING THE EMU INTEGRATION INTO A NEW PERSPECTIVE: THE CASE OF CAPITAL MARKET HOLDINGS

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Abstract

This article investigates by means of an augmented gravity model, the impact of EMU on financial market integration across time by assessing its effect on capital (equities and bonds) holdings. We contribute to the respective literature by investigating this effect from a global perspective and also investigate the case of a pre-EMU effect on both equity and bond markets. Furthermore, we focus on the potential impact of recent financial crisis on international equity and bond holdings. Our estimates indicate that intra-EMU integration effect improved in both equity and bond markets during the period close to the formation of EMU i.e. 1997, 2001 and 2002. In the case of the EMU equity market, this effect is mostly centered on 2001 (18% increase of EMU holdings) reflecting the beneficial impact of EMU and the introduction of the euro, while in the case of bond market this EMU effect is centered on 1997 (50%), reflecting the existence of pre-EMU integration effects. These integration effects have been also accompanied by increased demand from the side of non-EMU investors in both markets. Lastly, these integration effects weaken significantly after 2007, mainly reflecting a post-crisis disintegration of EMU capital markets both internally and globally. These findings may be regarded as a red flag over the current status quo within EMU which is characterized by low levels of integration. This finding provides support for a push for a new EMU architecture in the form of greater fiscal and financial integration and supervision. Only in this way will EMU become a true currency union.

Keywords: Market integration, Gravity models, equity holdings, bond holdings, EMU.

JEL classification: F36, F30, F10, F41, G11.

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1. Introduction

Over the last decade, the Eurozone has come full circle. At the beginning of the previous decade, European Monetary Union was perceived as one of the most important policy developments in the international financial system. Following the influential work of Mundell (1961) and Mundell (1973) on the necessary institutional steps towards an optimum currency area, the formation of EMU and the introduction of a single currency, opened up possibilities for a new fully integrated European financial market comparable to that of US. By eliminating sources of market segmentation, EMU financial assets became closer substitutes. However, EMU appears to have been a necessary condition for the emergence of a pan-European capital market but not a sufficient one. Other frictions, in the form of tax systems, administrative burdens, different settlement systems and informational asymmetries, remain impediments to full integration.

This view assumed some support, at the end of the last decade. The Eurozone sovereign debt crises, which highlighted the significant link between sovereign debt and the financial sector, has counterbalanced the huge benefits and scale economies stemming from a more integrated Eurozone.

This paper uses the gravity model to explore the effect of the euro on financial integration. We seek to quantify the effect of the crisis on the degree of integration and thus gain more insight into whether EMU has fulfilled its purpose of integrating EMU asset markets, both within the Eurozone itself and also with other global asset markets such that of US, UK, Japan and Australia.

Our analysis is founded on the latest theoretical developments on the determinants of transaction costs that affect international capital flows based on the work of Portes and Rey (2005). In general, gravity models have been widely used empirically in assessing bilateral economic relations between two economies. These relations are satisfactorily explained in these models by the positive contribution of the market size of each economy and by the negative contribution of the physical distance between them. Among the most common application of gravity models is the assessment of the effect of EMU on trade integration in goods and services market. This integration effect accounts for the economic motivation behind EMU. Based on a set of economic size variables (GDP,

population etc.), transaction cost variables (distance etc.) and other variables expressing cultural and institutional proximity, the effect of EMU has been widely examined in the context of trade flows (Micco et al. (2003), Bun et al. (2002)), mergers and acquisitions (Di Giovanni (2005)), FDI flows (Petroulas (2007)), and tourism flows (Gil Pareja et al. (2007)).

By contrast, investigation of the effect of EMU on financial integration is more limited and has focused largely on the co-movement of asset returns and yields. Hardouvelis et al. (1999) report that integration effects between EMU stock markets started even prior to the creation of EMU. They also report a 2% decrease in the cost of capital as a result of the reduction in country specific risk. Cappiello et al. (2008) report an increase in the degree of co-movement of equity returns in EMU after the introduction of the euro. In the case of EMU bond markets, Pagano et al. (2004) and Adam et al. (2001) report that EMU bond yields converged dramatically in the run-up to EMU implying that integration effects from EMU were present before its existence.

Quantity-based (stocks and flows of assets) assessment of the impact of EMU on financial integration lows is limited. To our knowledge, only two articles follow a quantitative approach. The first is the work of Lane (2006) who reports the significant impact of a currency union on EMU bond holdings. The second is the work of Coeurdacieur et al. (2006) who report significant EMU integration effects on both equity and bond holdings. Our work has the advantage over the aforementioned ones that it is based on a sound theoretical background while also discounts for the underlying global integration and valuation effects (depicted by trending variables in our gravity equation). It is shown that failing to account for these effects leads to an unjustifiably large effect from the impact of EMU on integration in equity and bond markets. Moreover, our investigation is based not only on EMU based integration but also examines the impact of EMU formation on international portfolio decisions[1]. Lastly, a novelty of our paper compared to the previous literature is that it explores time variations in the degree of

[1] For the purpose of our analysis, we examine three types of integration effects. Firstly, an *EMU integration effect* that reflects increased holding of EMU assets by EMU investors, Secondly, a *global integration effect* reflecting increased holding of assets by non-EMU members (increased attractiveness for EMU assets) and lastly an *EMU extroversion* effect reflecting increased holding of non-EMU assets by EMU investors (diversification incentives for EMU investors).

integration (global and EMU based) throughout the entire decade, shedding light on the effects of the 2008-2009 financial and sovereign debt crisis[2] on capital market integration.

Our results suggest that integration increased (both in EMU and global level) strongly around the creation of the currency union. However, recent fiscal and financial crises appear to partly neutralize this integration effect, in both equity and bond markets creating a far more segmented Eurozone with respect to initial policy planning.

We begin in section 2 with some stylized facts and the basic motivation for examining the EMU effect for equity and bond holdings. In section 3, the theoretical background behind a gravity specification of capital holdings is presented, while section 4 provides a description of the data. In section 5, the empirical results of the impact of EMU on financial integration from the period before EMU and thereafter are presented taking into explicit account the effect of the recent crisis. Lastly, section 6 concludes.

2. Basic motivation and stylized facts

The formation of monetary union and the adoption of a common currency were anticipated to act as catalysts for financial market integration[3] within the currency union but also at a wider international level. Theoretically, these beneficial effects from the introduction of the euro may be categorized into two broad categories. The first is the direct reduction of transaction costs and the second the indirect effect of improved price transparency due to redenomination in a common currency.

[2] The recent theoretical and empirical literature is quite prolific on the fiscal-financial nexus. The literature provides theoretical and empirical support for the presence of fiscal-financial inter-linkages. The severity of such interactions crucially depends on several factors, most importantly: (i) the size of the banking sector; (ii) the capital structure of the banking sector; (iii) the initial financial condition of the banking sector; (iv) the initial fiscal condition of the sovereign; (v) the amount of domestic sovereign bonds held by domestic banks; and (vi) the extent to which banking crises cut through to the real sector, thereby adversely affecting tax revenues. For more recent information please refer to Acharya et al. (2012), Mody et al. (2012), Breton et al. (2012), Merler et al. (2012).

[3] The notion of financial integration reflects the reduction of obstacles to cross border investment projects, the efficient allocation of risk through the financial system and the provision of high quality financial services across EU. This prolific investment climate as implied by an integrated EMU financial market is an important contributor for the economic growth of EU economies.

The direct effects on financial markets from establishing EMU and adopting a common currency were anticipated to be the following: the canceling of intra-European exchange rate risks[4], the subsequent elimination of related investment constraints for institutional investors (i.e. pension and mutual funds), price standardization and transparency which would lead to an increased competition in the financial services sector across EMU and the convergence of equity returns and bond yields. Additionally, the indirect effects are again significant in both bond and stock markets. In particular, in the case of bond markets using a common currency is beneficial because of[5]: increased depth and liquidity which reduces liquidity risk, reduced bond issuance costs, increased opportunities for diversification and risk sharing and lastly the easier operation of euro-area wide electronic trading platforms (i.e. EuroMTS (government bonds) and EurocreditMTS (corporate bonds)). In the case of stock markets, the indirect effects from the euro are reflected in the improved transparency and information flows that investors have when valuating foreign securities and the improved portfolio allocation and diversification opportunities. In this way, the euro enhances cross-border equity investments allowing the share of euro equities in global portfolios to increase.

Before proceeding with the theoretical set up, a brief presentation of some stylized facts is necessary to explain the motivation behind this paper. The period after the introduction of the euro is mainly described by a steady upward trend in the volume of cross-border holdings which, after the 2008 Lehman Brothers episode, appears (at best) to be neutralized not to say reduced. In the case of bond markets (Figure1, appendix), intra-EMU holdings increase, and this trend is particularly marked after 2001. More specifically, EMU bond holdings from domestic investors increased from 5% of GDP to 52% of GDP and then fell again in 2010 (44%) following the 2008-2009 crises. At the same time, starting from 2001, EMU investors also increased holdings of non-EMU bonds from 3.6% of GDP in 2001 to 24% of GDP in 2010. In the case of EU-3 members (UK, Sweden, Denmark), holdings of EMU bonds also increased from 12% of GDP in

[4]According to De Santis et al. (1998) in the case of EMU countries, currency risk is a significant factor for investors who are compensated for their risk exposure with an increased risk premium.

[5] On the other hand, the effect of the euro on public bonds may be also adverse since the constraints imposed by the Stability and Growth Pact on budget deficits and debt management put a constraint on the supply of government bonds from the Eurozone.

1997 to 27% in 2008 and follow again the previous pattern of a post-2009 reduction. In the case of investors from the rest of the world (RoW=US, Canada, Japan, Switzerland, Australia), holdings of EMU bonds have increased following the usual trend (from 2.3% in 1997 to 7.3% of GDP in 2009) and then subsided with a small reduction observed in 2010. Moreover, data available for the years after the 2009 sovereign crisis suggest the upward trend in holdings of EMU bonds by domestic investors has come to a halt.

In the case of the EMU equity markets, after 2001, a sharp increase in intra-EMU holding of equities is observed which is undone in the turmoil of the 2008 financial crisis (Figure 2, appendix): Holdings increased from 3% of GDP in 1997 to 25% of GDP in 2007 and then decreased to 20% of GDP in 2010. The same pattern is also observed in the case of non-EMU equity holdings from EMU investors (they rise from 3% of GDP in 1997 to 18% of GDP in 2006 and subsequently decline to 14% of GDP in 2010). The same pattern of expansion of holdings is also present in the case of holdings of EMU equities, firstly, from the side of EU-3 investors and, secondly, in the case of investors from the RoW. More specifically, in the case of the EU-3, equity holdings in EMU, gradually increased from 9.2% of GDP to 16% of GDP in 2007 and then marginally fell to 14% of GDP in 2010. RoW equity holdings of EMU equities increased from 3% of GDP in the pre-euro period to 7% of GDP in 2007 before returning to a lower level of 5% of GDP in 2010.

The observed post 2001 expansion in the holdings of EMU equities and bonds raises a number of questions. For example, to what extent can this observed increase in the case of EMU countries be attributed to the arrival of the euro and the creation of EMU? Did the creation of EMU make euro markets more attractive destinations for global investors? Did EMU and the euro play a role in the decisions of EMU investors to hold assets from other non EMU countries? If significant, how has this EMU effect evolved over time and, especially, after 2008 and 2009? Has the recent financial crisis led to a disintegration of EMU and global financial integration? As mentioned earlier, this last question represents an important contribution of our paper to the literature.

3. Model set up

In the context of bilateral asset holdings, the gravity model may be founded as a general equilibrium Arrow Debreu model of static, multi-good, multi-agent economy with fully optimizing agents and exogenous market capitalization[6]. Agents are risk averse, assets (i.e. investment projects) are not perfect substitutes so that demand for diversification emerges while cross-border asset transactions incur a specific cost. Finally, the implied game is taking place in two periods.

More specifically, the model assumes an exogenous number of projects n_i in each country i, with$0 \leq n_i \leq N$, and an equal number of investors (agents) living two periods. In the first period, agent h of country i (h_i) is endowed with y_i units of traded goods and also one risky project whose price is denoted p_i. Let us also normalize the number of shares of each project so that they are equal to one. In the first period, agent h_i decides upon: his consumption, the selling of shares in his project and the purchase of shares in other agents' projects. In this respect, agents in country i pay $p_j * (1 + t_{ij})$ for purchasing the share of a project run by country j where t_{ij} is an 'iceberg type' cost for trading assets between countries i and j. These trading costs capture banking commissions and fees, tax costs, exchange rate risks and other transaction costs like information costs and asymmetries.

In the second period, the gravity model assumes there are Φ exogenously determined and equally alike states of nature that may take place. As assumed in the Arrow-Debreu economy, in the second period a risky project[7] pays dividends d_j if a particular state of the world is observed, (this state belongs to a specific {1,…..,Φ} set) and 0 otherwise. In this stochastic environment, it is also assumed that the total number of available projects in the world $W = \sum_{J=1}^{N} n_j$ is less than the total number of the states of the world *L* so that markets are incomplete. This incompleteness implies that there is no possibility of hedging against all risks when holding a portfolio of all assets.

[6] Martin and Rey (2004) originally showed the "gravity" character in the case of US based asset flows. They found that *"a gravity specification explains cross border financial flows at least as well as trade in goods transactions*". In the same context, following Portes at al. (2005) and Aviat et al. (2007) this gravity context can be also extended to the case of bilateral asset holdings.

[7]Since both equities and bonds are considered risky assets, the above theoretical gravity approach is considered appropriate.

The representative agent in country i is assumed to maximize a two-period Dixit-Stiglitz type of utility function[8] subject to a budget constraint. Let $x_{lj}(h_j)$ denote the number of shares bought by agent h in country i (origin or source country) from agent l in country j (destination country). Then, the above maximization problem can be written as:

$$\underset{\left\{c_1(h_i),\ x_{l_j}(h_i), 1 \le i \le N, 1 \le l_j \le n_j\right\}}{Max} \left\{ c_1(h_i) + \beta * E\left(\frac{c_2(h_i)^{\left(1-\frac{1}{\sigma}\right)}}{\left(1-\frac{1}{\sigma}\right)} \right) \right\} \quad (1)$$

Subject to the constraint:

$$c_1(h_i) + \sum_{j=1}^{N} \sum_{l_j=1}^{n_j} \left(p_j\left(1+\tau_{ij}\right) x_{l_j}(h_i) \right) = y_i + p_i$$

$c_1$and c_2 denotes consumption in the first and the second period, β denotes the respective discount rate and σ denotes the inverse of the degree of risk aversion. Following the assumption that all risky projects provide a dividend in only one state, the symmetry hypothesis is assumed implying that $x_{lj}(h_j)$ equals $x_j(h_j)$ and thus the maximization problem is equivalent to:

$$\underset{\left\{c_1(h_i),\ x_j(h_i), 1 \le i \le N, 1 \le j \le n_j\right\}}{Max} \left\{ c_1(h_i) + \frac{\beta}{\left(1-\frac{1}{\sigma}\right)} * \frac{\left(\sum_{J=1}^{N} n_j \left(d_j * x_j(h_i) \right)^{\left(1-\frac{1}{\sigma}\right)} \right)}{\Phi} \right\} \quad (2)$$

Subject to the same constraint:

$$c_1(h_i) + \sum_{j=1}^{N} \sum_{j=1}^{n_j} \left(p_j\left(1+\tau_{ij}\right) x_j(h_i) \right) = y_i + p_i$$

Solving out the demand of agent h_i in country i for projects in country j denoted by $x_j(h_i)$ we get the following solution:

$$x_j(h_i) = \frac{d_j^{\sigma-1}}{\left(p_j\left(1+\tau_{ij}\right) \right)^{\sigma}} * \frac{\beta^{\sigma}}{(\Phi)^{\sigma}} \quad (3)$$

[8]Corresponds to 'love of diversity' agents in each country.

If we denote as$T_{ij}$the value of aggregate asset holdings of country *i* from country *j* then we come up with the following representation:

$$T_{ij} = n_i * n_j * p_j * \left(1 + \tau_{ij}\right)\left(x_j(h_i)\right) = m\frac{n_i * n_j}{\left(1 + \tau_{ij}\right)^{\sigma-1}} * \left(\frac{d_j}{\left(\Phi * p_j\right)}\right)^{\sigma-1} \quad (4)$$

where m is a parameter that equals $\frac{\beta^{\sigma}}{\Phi}$.

In this respect, equality (4) underlines the *'gravity character'* of bilateral asset holdings, since in its log form:

$$log\left(T_{ij}\right) = log(n_i) + log\left(n_j\right) + (1 - \sigma) * log\left(1 + \tau_{ij}\right) + log(m) \; + log\left(R_j\right) (5)$$

where$R_j = \frac{d_j}{\Phi * p_j}$ denotes the (expected) return of all projects in destination country j.

This last relationship shows that bilateral asset holdings between two countries i and j (referred to as source and destination countries, respectively) depend on the market size of the countries (captured by variables n_i and n_j, respectively), the trading costs τ_{ij} and expected returns R_j of the asset market in destination country j. m can be treated as a constant[9]. This relationship, implied by the gravity model, can be employed to examine the integration effects of EMU on asset holdings, T_{ij}.

The current empirical model (5) reflecting demand for assets and thus bilateral asset holdings can be further extended with other gravity type variables that appear to strongly influence asset holdings. Following standard gravity literature (see, e.g., Flam et al. (2003), Micco et al. (2003)), these reflect administrative, technological and cultural differences. Moreover, the current empirical model is further extended with a variety of transaction or trading cost variables that reflect information asymmetries since these are considered as important for international investment choices (see, e.g. Portes et al. (2005)). In practice, the informational component of transaction costs between investor's home and destination countries is approximated by, firstly, physical distance, secondly, an index of inside information and, thirdly, an index reflecting technological advancement of the destination country. Moreover, in the current approach, transaction

[9] Remaining parameters like m are not easily measurable and thus cannot be used individually in the current empirical context. We consider them incorporated in the error term of our empirical models.

technology and cost efficiency are proxied by an index reflecting market sophistication of the investment destination. Lastly, following Aviat et al. (2007))[10], trade flows are also included in our specification so as to capture remaining trading costs and informational proximity (τ_{ij}).

The above fundamental specification of asset holdings implied by the gravity model can be used as a yardstick in our attempt to estimate the integration effects of EMU on asset holdings especially in the current economic crisis. In order to examine the integration effects on capital holdings stemming from the creation of EMU, during the last decade, we employ the following set of dummy variables:

- $EMU12_{ijt}$, is equal to 1 if both countries *i* and *j* belong to EMU in period *t*, (this dummy captures integration effects within the EMU);
- $inward\_EMU12_{ijt}$, is equal to 1 if country *i* does not belong to EMU while country *j* belongs to EMU in period *t*, (this dummy captures effects on holdings of European assets by investors from non-EMU members, and thus expresses attractiveness of EMU capital markets);
- $outward\_EMU12_{ijt}$, equals to 1 if country *i* belongs to EMU while country *j* does not in period *t* (this dummy captures extroversion and diversification effects of EMU based investors for assets outside EMU).

Appropriate trend variables are included[11] so as to capture firstly remaining integration related to developments such as the ongoing financial services action plan (FSAP, initiated in 1998) in EMU and global integration effects, and secondly potential valuation effects frequently met in asset holdings when expressed in values and thirdly avoid potential overestimation of EMU effect as observed when assessing the euro's trade effect. In our specification, proper trend variables are employed denoted by $EMU_trend_{ijt}$and $trend_{ijt}$ that reflect valuation effects and the ongoing FSAP effect along with global integration effects.

[10]The basic intuition behind this inclusion is that, in the case where countries trade a lot, information frictions and costs concerning capital markets are smaller and thus increased flows of trade should have a positive contribution on asset holdings.

[11]Our motivation for using trend variables in a gravity model stems from the work of Bun et al. (2007) who assess EMU and euro's trade effect. More specifically, they report that including a time trend in standard gravity models reduces the euro effect on trade considerably.

In total, the extended linear representation of formula (5) can be written as follows:

$$log(T_{ijt}) = \{\alpha_1 * log(size_{it}) + \alpha_2 * log(size_{jt}) + \alpha_3 * log(dist_{ijt}) + \alpha_4 * cborder_{ijt} + \alpha_5 * clang_{ijt} + \alpha_6 * tax\_treaty_{ijt}\} +$$

$$\{\beta_1 * insider_{it} + \beta_2 * insider_{jt} + \beta_3 * mark\_soph_{it} + \beta_4 * mark\_soph_{jt} + \beta_5 * tech\_adv_{it} + \beta_6 * tech\_adv_{jt} + \beta_7 * \log(trade_{ijt})\} +$$

$$\{\gamma_1 * EMU12_{ijt} + \gamma_2 * inward\_EMU_{ijt} + \gamma_3 * outward\_EMU_{ijt} + \gamma_4 * R_{jt} + \gamma_5 * EMU\_trend_{ijt} + \gamma_6 * trend_{ijt} + e_{ijt}\} (6)$$

where the variables of the model are defined as follows:

- $size_{jt}$: denotes value of stock market capitalization of country j in the case of equity markets and GDP as a proxy for total size of domestic bond markets(expressed in millions of US dollars)[12];
- $dist_{ijt}$: denote physical distance between capital cities of country i and j;
- $cborder_{ijt}$/$clang_{ijt}$: denotes dummy variable taking value of 1 if country i and country j share a common border/language;
- tax_treaty_{ijt}: denotes a dummy variable that takes the value of 1 if country i and country j have a capital taxation treaty in year t;
- $insider_{jt}$: is a proxy indicator variable for capital market transparency, based on the date of the endorsement of laws against inside trading in country j[13];
- $mark\_soph_{jt}$: denotes an indicator for economic sophistication and depth of a capital market in country j reflecting transaction technology;
- $tech\_adv_{jt}$: denotes an indicator variable for the technological advance of country j;
- R_{jt}: expresses country j equity market return proxied by percentage changes in the equity market index and by the 10-year government yield in the case of bond market;

[12] Moreover, for consistency checking, in the case of bond markets, public debt (US dollars) has been also used as a size proxy for bond market.

[13] This transparency proxy variable is calculated for every country by the following equation: $insider_i = Current\ year - Year\ of\ first\ enforcement\ of\ ananti\ inside\ information\ lawin\ country\ i$. Effectively this formula gives more credit to countries with a longer record of this type of legislation.

- trade_{ijt}: express the value (in US dollars) of bilateral trade of manufactured goods between country i and country j in year t;

Lastly, in the above specification (6), trend variables EMU_trend_{ijt} and $trend_{ijt}$ are incorporated. The first denotes a trend variable starting from 1998 if economies i and j belong both to EMU and 0 if not, and the second trend variable denotes a trend variable starting from 1997 for all countries.

4. Data coverage

Our data set consists of yearly observations for 20 developed economies for 1997 and then the period 2001-2010. Out of these 20 developed economies, twelve are Eurozone members, three are members of the European Union (United Kingdom, Denmark, Sweden) and five are developed non-EU economies (United States, Canada, Australia, Switzerland, Japan). The possible bilateral combinations are 380 (20x19) and the total number of observations is 4180 (20x19x11).

The basic source of data refers to bilateral asset holdings and is taken from the Coordinated Portfolio and Investment Survey (CPIS) of the International Monetary Fund (IMF). This comprehensive dataset refers separately to equity and bond holdings (valued in US $) of 67 countries. Limitations of this database exist, since the first wave of this survey refers to 1997 and the next wave refers to 2001 thus creating a three year gap. This means that the effect of EMU in the years 1998-2000 cannot be estimated. Still the employed dummy variables approach with respect to a control country group overcomes this limitation and allows an assessment of EMU effects based on data for the years 1997, 2001 and up to 2010. In this respect, our study investigates the case of a pre-EMU effect based on the data for 1997 and an EMU and euro effect based on the available data for the period 2001-2010. Another limitation of CPIS database is that it reports only aggregate holdings, not distinguishing between private and public sectors.

The dependent variable of eq. (6) is the logarithm of asset holdings. Equity holdings refer to the ownership of equity (common stocks), preferred stocks by individuals, mutual funds and investment trusts while debt holdings refer to the

ownership of bonds, notes, options, futures and swaps by individuals, mutual funds and investment trusts. Market capitalization, the stock of public debt and GDP are taken from Eurostat and the World Bank. Data on the sophistication of capital markets and credit ratings of various economies have been derived from the Global competitiveness report (GCR) of the World Economic Forum (WEF).

Data for the insider trading indicator from the GCR do not cover all the economies for the period examined. To this end, we have proxied this insider indicator by a trend variable starting from the date of the first enforcement of an Insider trading (IT) law based on the work of Bhattacharya et al. (2001). The logic of such an index is that markets that have been effectively enforcing an IT law in their capital markets for a longer period are more transparent and exhibit a smaller degree of informational asymmetry between domestic and foreign investors. Asset holdings in these markets should be higher relative to other markets in which anti-IT legislation has been effective only for a shorter period.

Common language and Common border are the respective bilateral dummies (used extensively in the literature of trade flows) based on the CIA fact book. Trade flow between two countries i and j is the sum of the value (expressed in US $) of imports from country j to country i and exports from country i to country j of manufactured goods (codes 84-96) taken from International trade by commodity statistics (ITCS), OECD. Returns on equity markets are proxied by the percentage changes in the respective stock price indexes taken from Eurostat and various statistical agencies. In the case of bond markets, returns are proxied by data on yields of 10-year government bonds taken from Eurostat and International Monetary Fund (International Financial Statistics). Lastly, information on the existence of tax treaties between the economies studied is available from UNCTAD.

5. Empirical findings

5.1 Pre-EMU integration effect

For the estimation of relationship (6), we rely on panel regression procedures. In order to examine the robustness of our results, both GLS and fixed vis-á-vis random

effect estimators are employed[14]. Finally, all reported coefficients have been corrected for heteroskedasticity following White's procedure (see Wooldridge (2002)). Our initial empirical approach reflects the pre-EMU effect and is based on the assumption that the integration effects of EMU are evident in 1997 (ex-ante EMU data). Practically, dummy variables $EMU12_{ijt}$, $inward\_EMU12_{ijt}$ and $outward\_EMU12_{ijt}$ have been specified as taking the value of one from 1997 onwards[15].

Tables 3A, 3B and 4A, 4B of the appendix, provide the results of estimating relationship (6) for both the equity and bond markets, using the above two estimation procedures (GLS and fixed effect). Our empirical results show that in both bond and equity markets, the model which treats the individual effects as fixed constitutes a better specification of our data. The results in the tables for the initial year 1997 (first column of results), indicate that the extended version of the gravity model, given by equation (6), fits the data very well. The model has a coefficient of determination (the *within* coefficient of determination-$\overline{R}^2$) which is very high for fixed effects panel data estimators (i.e. 0.66 for equity holdings and 0.62 for bond holdings).

According to the same results, estimates of dummy variable $EMU12_{ijt}$, (i.e. γ_1) are positive and significant for both capital markets and the set of estimates used. This indicates that a significant integration effects in both the case of equity and bond markets exists from 1997 and onwards coinciding with EMU formation. Still the estimated integration effect is stronger in the case of bond market as expected. According to our estimates, intra-EMU bond holdings increased by 50% and 22% respectively (according to GLS and fixed effects model), while in the case of equity holdings, we estimate a milder integration effect with increases of 14% and 13% respectively. It should be noted,

[14] In the tables reporting the estimation results, we present the standard Hausman's statistic, testing whether the individual effects are random against the alternative hypothesis that they are fixed. As a robustness test we also perform the more general over-identifying Schaffer and Stilman's (2007) statistical procedure (xtoverid command). Broadly speaking, findings under both test statistics are common.

[15] No change of starting date is employed in the case of EMU_trend and trend variables since they express exogenous factors.

however, that these increases are somewhat smaller than those reported in the literature (see e.g. Lane (2006), Coeurdacier (2006) and Coeurdacier et al (2006))[16].

Looking at estimates (tables 3A,3B and 4A,4B, 1997 column) for the dummy variable *inward_EMU12*$_{ijt}$, we can conclude that EMU integration effects in the case of bond markets have also affected non-EMU investor's choices, since coefficient γ_2 is found to be positive and significant indicating an increase in EMU bond holdings by 7% and 17% (GLS and fixed effect estimate respectively) by non-EMU investors. This can be attributed to the greater homogeneity of EMU bond markets and the expectation that fiscal discipline in EMU countries was secured through initial optimism about the effectiveness of the Stability and Growth Pact (SGP) and Eurozone fundamentals. By contrast, this effect is not observed, at least in this initial stage, in the case of equity markets, given that the sign of γ_2 coefficient is negative and significant under both estimations indicating a reduction of EMU equity holdings by non-EMU countries.

Finally, coefficient γ_3, which is the slope of the extroversion coefficient (*outward_EMU12*$_{ijt}$), is positive and significant in the case of bond holdings indicating an increase of 8% and 13% in the case of GLS and fixed effect estimates. This substantial increase suggests that, since EMU led to more homogeneous and integrated bond markets, largely euro-denominated, EMU investors opted for non-EMU bonds reflecting a need for diversification. By contrast, in the case of equity market the same coefficient is estimated to be negative and significant under both estimators. More specifically, in both estimates it appears that EMU equity investors reduced the non-EMU part of their portfolios, by almost 12% and 18%, respectively. This result suggests that in the case of the equity market, the initial expansion of EMU equities in EMU-investors' portfolios (considered as improving EMU equity integration) was at the cost of diversification opportunities for EMU investors.

Gross return of destination market (r_{jt}) are positive and significant determinants under both estimation procedures for bilateral capital holdings in both cases of markets (coefficient estimates γ_4).Finally, a positive and statistically significant contribution of

[16] According to these estimates, integration effects in the case of EMU bond and equity markets are significantly larger. This should be attributed to the different trend structure compared with the currently employed specification.

global financial integration ($trend_{ijt}$) followed by a smaller though significant effect from the FSAP (EMU_trend_{ijt}) in bilateral holdings is observed in GLS estimates (see coefficient estimates γ_5, γ_6).

Concerning the estimated coefficients on the remaining explanatory variables, the results are quite consistent with the respective literature and theory under both estimators employed. In the case of equity markets, market capitalization of source and destination countries appears to play an important role in determining the level of equity holdings since α_1 and α_2 are positive and significant. In the bond market case, the GDP of both source and destination country (measure of economic mass[17]) have the usual expected significant and positive sign.

Moreover, the effect of distance on bonds and equity holdings (expressed by α_3 estimate) has the expected negative and statistically significant impact. Estimates range from -0.38 (GLS estimates) to -0.82 (fixed effect estimates) in the case of equity markets and from -0.46 (GLS estimates) to -1.05 (random effect estimates) in the bond market, indicating that greater distances reflect greater informational costs and asymmetries which are especially important in the case of bond holdings.

Among the variables reflecting administrative and cultural differences, the common border is not statistically significant (α_4) while common language remains statistically significant, related positively to both types of holdings under examination[18]. On the other hand, in both types of markets the significance of the effect of bilateral double taxation treaties is not robust (coefficient estimates α_6) since it appears to differ across estimations.)

[17]As a robustness test, the same estimations were performed using the stock of public debt in source and destination countries to represent economic mass. The results of the effects of EMU remained broadly unchanged and the variables representing size remained significant and had a negative effect on bond holdings.
Theoretically, a negative sign of source country public debt implies that, in highly indebted countries, investors may choose to hold national bonds rather than foreign bonds due to informational asymmetries. In this case, domestic investors are more likely to withhold a larger part of domestic bonds in their portfolio and reduce the share of foreign debt in their portfolio. On the other hand, a negative sign on destination country public debt implies that increased public debt of a country is a discouraging factor for foreign investors reflecting informational asymmetries, larger uncertainties and higher default probability.

[18] Under fixed effects estimates both common language and common border are excluded from the estimation of gravity specification.

Based on the same estimates, the effects of improved *capital market transparency* ($insider_{it}$), *sophistication* ($mark\_soph_{it}$) and *technological advancement* ($tech\_adv_{it}$) of source and/or destination markets represent important and positive contributors to bilateral capital holdings (tables 1 and 2, coefficient estimates β_1–β_6, respectively). Starting from the case of equity markets, improved transparency, sophistication and technological advancement of investors' source country enhance equity holdings[19] (β_1, β_3, β_5) from other countries. Additionally in the case of destination equity markets, market transparency (β_4) appears to be the only factor that has an important positive effect. Practically this finding qualifies the existence of anti-inside information legislation as a prerequisite in global equity investment decisions. In the case of bond markets, improved transparency, sophistication and technological advancement of both source and destination markets prove important in bilateral bond holdings under both estimation approaches.

Trade flows ($trade_{ijt}$) are also found to be an important determinant of bilateral investment holdings). The results for both estimators reveal that a 1% increase in the value of trade in manufactures between source and (issuer) destination counties lead to an increase of close to 0.08% and 0.04% (GLS-FE estimates). In the bond market case, these estimates are considerably higher and reach 0.27% and 0.10% (GLS-FE estimates), respectively. These findings can be attributed to the improved exchange of information due to increased trade flows that lead to higher bilateral capital holdings.

5.2 The EMU and euro effect on equity and bond holdings

Our previous analysis though providing evidence of strong capital market integration between EMU members, primarily in the bond market, assumes that the initiation of EMU effect took place in 1997. No evidence is provided over the evolution of this integration effect in the following years. In this part of our analysis, the evolution of the EMU integration effect is investigated. In this context, we make use of dummies that reveal the evolution of the EMU effect across time following Micco et al. (2003) and

[19] This enhancement represents greater extroversion from more mature source capital markets.

Flam and Nordstrom (2003) investigation of the euro's role in trade in goods and services and Petroulas (2007) in his investigation of euro's role on FDI.

More specifically, we evaluate the EMU effect across time by changing the starting date (initiation date) of EMU related dummies[20] *($EMU12_{ijt}$ (γ_1), $inwards\_EMU_{ijt}$ (γ_2), $outwards\_EMU_{ijt}$ (γ_3))* and recursively estimate equation (6). Changing the starting date of these dummies, allows us to observe the evolution of the EMU integration especially after the recent crisis. According to our estimates for both bonds and equities, fixed effect estimation is preferable to random effect estimation.

Our estimates in the case of bond holdings, (table 1below and table 3A, 3B in the appendix),[21]indicate that the integration effects of EMU have been significant in the transition period towards EMU, since 1997 is the year with the largest impact for EMU integration (starting from 1997, bond holdings increased by 50% and 22% respectively (according to GLS and fixed effects model)). To a large extent, this may reflect, investor's tendency, to build up their euro portfolio positions in the eve of the EMU. Moreover, in 2001 (the year of the euro's physical entrance), the intra-EMU integration effect is limited to 16% and 31% increase respectively followed by an increased effect (compared to 1997) for inward holdings of EMU bonds (by 19% and 10% under both estimates). Still outwards holdings appear to have increased (by 21% and 16%, respectively) compared to 1997 reflecting increased diversification by EMU investors. In the following years (2002 up to 2006), no evidence of an EMU integration effect exists since the respective coefficients (γ_1, γ_2, γ_3) are either negative and significant or insignificant.

[20] More specifically, we recursively estimate eq. (6) and replace dummies emu12, inwards_emu12 and outwards_emu12 that refer to 1997 with: a) $EMU12_{ijt}$which equals to 1 if counties i, j belong to EMU starting from year t (initiation date), b) $outward_EMU12_{ijt}$which equals to 1 if counties i, does not belong to EMU and country j belongs in EMU starting from year t (initiation date), c) $\text{inward_EMU12}_{\text{ijt}}$which equals to 1 if counties i, belongs to EMU and country j does not belong to EMU starting again from year t (initiation date). The coefficients obtained should be individually regarded as cumulative effects of the remaining period starting from time t up to 2010.
The percentage increases with respect to baseline holdings expressed by the EMU dummies are derived by the formula$(exp(a) - 1)$ where α is the respective coefficient.

[21] In the Appendix, full results are provided in both cases of capital markets (tables 3A, 3B and 4A, 4B).

Table 1: EMU effect over time/Dependent variable: log (bond holdings)

	EMU initiation year								
	2001	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***
A. FGLS estimates									
$EMU12_{ijt}$	0.141***	0.00992	0.0319	0.0306	0.0316	-0.094***	-0.18***	-0.11***	-0.08***
	(7,5)	*(0,52)*	*(0,77)*	*(0,76)*	*(0,77)*	*(-5,13)*	*(-11,02)*	*(-6,61)*	*(-4,79)*
inward $\_EMU12_{ijt}$	0.165***	0.0669***	0.0149	-0.064***	0.0470**	0.00224	-0.09***	-0.071**	-0.054*
	(7,89)	*(2,99)*	*(0,68)*	*(-2,91)*	*(2,09)*	*(0,1)*	*(-2,91)*	*(-2,2)*	*(-1,91)*
outward $\_EMU12_{ijt}$	0.198***	0.0678***	0.0157	0.0614*	0.0433*	0.0193	-0.12***	-0.046**	-0.075**
	(10,1)	*(3,36)*	*(0,8)*	*(1,66)*	*(1,81)*	*(0,96)*	*(-3,27)*	*(-2,32)*	*(-2,02)*
B. Fixed effect estimates									
$EMU12_{ijt}$	0.291***	-0.0126	-0.052***	-0.00876	0.0303	0.000592	-0.19***	-0.17***	-0.10***
	(5,58)	*(-0,55)*	*(-2,66)*	*(-0,37)*	*(1,32)*	*(0,02)*	*(-4,1)*	*(-4,3)*	*(-3,09)*
inward $\_EMU12_{ijt}$	0.088***	0.070***	-0.0161	-0.062***	0.0578**	0.0264	-0.08***	-0.04**	-0.021
	(2,82)	*(2,6)*	*(-0,70*	*(-2,6)*	*(2,54)*	*(1,18)*	*(-2,77)*	*(-2,06)*	*(-1,09)*
outward $\_EMU12_{ijt}$	0.142***	0.0940***	-0.0318	0.00578	0.0219	0.0456*	-0.15***	0.0468	-0.088**
	(3,41)	*(3,28)*	*(-1,16)*	*(0,21)*	*(0,82)*	*(1,71)*	*(-3,33)*	*(0,64)*	*(-2,19)*

Note: t_{stat} reported in parentheses which are robust to heteroskedasticity and autocorrelation. (*** denote significance at 1%, ** denote significance at 5%, * denote significance at 10%). When choosing between Random effect and Fixed effect modeling, the Hausman test was employed (stata command: Hausman fixed_group command was used). According to our estimates, under all different EMU dummies, fixed effect estimation qualified.

Estimation results for 2007 onwards, indicate that there is a significant and gradually decaying negative effect that partially offsets initial positive effects observed in 1997 and 2001. Starting from 2007, this negative effect is reflected into: a) lower integration of EMU equity markets (reduction by 22% of holdings based on both estimates); b) negative effects reflecting the flight of international investors from the EMU bond market (reduction in holdings almost by 11% according to our estimates); and c) higher home bias for EMU domiciled bond investors (reduction in extra EMU holdings ranging from 13% to 19%). As before, this effect is also observed in the following years 2008, 2009 though with a lower intensity.

By contrast, the market integration effect of EMU and the euro in the case of equity markets is a more gradual effect since it can be also traced in 2001 and 2002, the years following the euro's introduction (table 2 below and 4A, 4B in the appendix). Specifically, the effect of EMU on market integration $(EMU12_{ijt})$ intensifies further in 2001 and 2002 since EMU equity holdings increase by 18% and 7% respectively (7% and 4% in the fixed effect case) respectively. On the other hand, the initial (pre-EMU) home

bias of EMU domiciled investors *(outward _EMU12$_{ijt}$)* is cancelled since in 2001 and the two consecutive years an increase in non-EMU holdings of 13%, 7% and 5% respectively (7%, 4% and 2,5% in the fixed effect case) is observed. According to the same estimates, during the period 2001-2002, under both types of estimates there are also signs of a beneficial effect from the attractiveness of EMU equity *(inward_ EMU12$_{ijt}$)* markets. Estimates vary from 2% to 12% for 2012 and from 3% to 6% in the following years.

These initial positive EMU effects, observed mainly in 2001-2002 appear to recede after 2004. Following our results, the two years that appear to significantly cancel these initial effects are 2004 and 2007. Even if one argues that 2004 maybe considered as a rebalancing of equity holding to their new long-run equilibrium, the estimated effect for 2007 is more likely to reflect the eruption of the subprime mortgages crisis that eventually evolved in the widely reported re-pricing of risks, that occurred firstly during the global financial crisis and secondly during the EMU sovereign and financial crisis.

Table 2: EMU effect over time/Dependent variable: log (Equity holdings)

	EMU initiation year								
	2001	***2002***	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***
A. FGLS estimates									
EMU12$_{ijt}$	0.163***	0.0684***	0.0208	-0.122***	-0.0277	-0.061***	-0.24***	-0.048**	-0.09***
	(8,57)	*(3,42)*	*(1,07)*	*(-6,32)*	*(-1,37)*	*(-3,05)*	*(-11,06)*	*(-2,30)*	*(-4,58)*
inward _EMU12$_{ijt}$	0.104***	0.0196	-0.0295*	-0.087***	0.00123	-0.0209	-0.11***	-0.0343*	-0.0136
	(6,5)	*(1,21)*	*(-1,83)*	*(-5,40)*	*(0,073)*	*(-1,21)*	*(-6,07)*	*(-1,77)*	*(-0,72)*
outward _EMU12$_{ijt}$	0.118***	0.0527***	0.0463***	-0.0336**	0.0407***	0.072***	-0.16***	-0.09***	-0.06***
	(8,08)	*(3,6)*	*(3,24)*	*(-2,27)*	*(2,75)*	*(4,84)*	*(-3,70)*	*(-5,16)*	*(-3,80)*
B. Fixed effect estimates									
EMU12$_{ijt}$	0.0576**	0.0316*	0.0385**	-0.074***	0.0304*	0.0144	-0.25***	-0.12***	-0.0032
	(2,48)	*(1,78)*	*(2,32)*	*-4,38*	*-1,81*	*(0,84)*	*(-11,93)*	*(-6,63)*	*(-0,18)*
inward _EMU12$_{ijt}$	0.191***	0.0548***	-0.0333*	-0.052***	0.0226	0.00278	-0.16***	0.054***	0.0416
	(8,17)	*(2,58)*	*(-1,69)*	*(-2,69)*	*(1,22)*	*(0,15)*	*(-7,64)*	*(2,69)*	*(0,22)*
outward _EMU12$_{ijt}$	0.089***	0.0276**	00152**	-0.070***	0.0227	-0.058***	-0.19***	0.072***	-0.05***
	(3,00)	*(2,39)*	*(2,00)*	*(-3,64)*	*(1,21)*	*(-3,23)*	*(-9,10)*	*(3,62)*	*(-2,60)*

Note: t_{stat} reported in parentheses which are robust to heteroskedasticity and autocorrelation. (*** denote significance at 1%, ** denote significance at 5%, * denote significance at 10%). When choosing between Random effect and Fixed effect modeling, the Hausman test was employed (stata command: Hausman fixed_group command was used). According to our estimates, under all different EMU dummies, fixed effect estimation qualified.

This adverse effect observed after2007 reflects: a) lower integration of EMU equity markets (reduction of 30% of holdings based on both estimates),b) the fact that EMU equity markets became a less attractive investment destination (reduction of holdings ranging from 12% to 17% according to our estimates)and c) stronger home bias for EMU domiciled investors (reduction of holdings by almost 21% based on our estimates). Lastly, this adverse effect occurs at a lower intensity in the years after 2007.

The above analysis suggests that the initial positive impact of EMU on the degree of integration and attractiveness of both bond and equity market reflecting mainly the abolition of impediments to capital transactions and the lower exchange rate costs has been largely reversed due to the detrimental impact of the recent sovereign crisis. As presented in our analysis the recent financial crisis followed by the Eurozone sovereign crisis has led to EMU disintegration both internally as well as globally. In this context, the size and timing of the actual economic benefits of EMU should be considered more dubious.

6. Conclusions

Summing up, based on our gravity model analysis, common wisdom over the beneficial effects of a common currency on financial integration through greater transparency, reduced service costs for global investors and expanded opportunities for EMU and global investors is largely confirmed. Following an extensive representation of transaction and administrative cost factors in our empirical model, it is evident that the theoretical context of free capital mobility, elimination of currency risk and reduced risk prospects have positively contributed to a more complete and efficient EMU market. These benefits in the case of EMU area have been expressed in a three-fold way: firstly, into greater EMU wide integration for bond and equity markets, secondly, into greater attractiveness for global non EMU investors and thirdly, into greater extroversion for EMU investors, promoting in the last two cases global integration.

Still these findings are not axiomatic since our analysis proves that these gains were not of a permanent nature especially after the recent crisis. We provide evidence of a negative effect on financial integration, for both equity and bond markets, starting from

2007 onwards that cancels the initial gains from the formation of the single currency. These findings should be seen as a red flag over the current level of financial integration, suggesting the need for a quick policy response for a new EMU architecture in the form of greater fiscal and banking integration and supervision. Only in this way will EMU become a true currency union.

References

1. **Acharya, Viral V., ItamarDrechsler and Philipp Schnabl (2012),** "A Tale of Two Overhangs: The Nexus of Financial Sector and Sovereign Credit Risks", Banque de France Financial Stability Review No. 16, 51-56.
2. **Adam K., Jappelli T., Menichini A., Padula M., Pagano M., (2001),** "Analyze, Compare and apply alternative Indicators and Monitoring methodologies to measure the evolution of capital market integration in the European Union". Report to the European Commission.
3. **Aviat A., Coeurdacier N., (2007),** "The geography of trade in good and asset holdings". Journal of International Economics, Vol. 71, pp. 22-51.
4. **Bhattacharya U., Daouk H., (2002**), "The World price of Insider Trading", Journal of Finance, Vol. 57, p 75-108.
5. **Bun M., Klaasen F. (2002),** "Has the euro increased trade?". Tinbergen Institute Discussion Paper, No. 02-1080/2.
6. **Breton, Régis, Caroline Pinto and Pierre-Francois Weber (2012),** "Banks, Moral Hazard and Public Debts", Banque de France Financial Stability Review No. 16, 57-70.
7. **Cappiello L., Kadareja A. Manganelli S. (2008),** "The impact of the euro on equity markets", ECB working paper series, no. 906.
8. **Coeurdacier N., Martin P., (2006),** "The geography of the asset trade and the euro: Insiders and outsiders", ESEC working paper (dr 06020).
9. **De Santis G., Gerard B., (1998),** "How big is the premium for currency risk?",Journal of Financial Economics, Vol. 49, no. 3, pp. 375-412.
10. **Di Giovanni, Julian. (2005),** "What drives capital flows? The case of cross-border M&A activity and financial deepening", Journal of International Economics, Vol. 65, no. 1, pp. 127-149.

11. **Flam, H., Nordstrom H., (2003),** "Trade volume effects of the euro: Aggregate and sector estimates", Institute for International Economic Studies, Stockholm University.

12. **Gil-Pareja S., Llorca-Vivero R., Serrano J. (2007),** "The Effect of EMU on Tourism", Review of International Economics, 2007, Vol. 15, no. 2, pp. 302-312.

13. **Hardouvelis G., Malliaropulos D. and Priestley R. (1999),** "EMU and European Stock Market Integration", CEPR Discussion Paper No. 2124.

14. **Lane, P., (2006),** "Global Bond Portfolios and EMU", International Journal of Central Banking, Vol. 2, no. 2.

15. **Martin P., Rey H., (2004),** "Financial super-markets: size matters for asset trade". Journal of International Economics, Vol. 64, pp. 335-361.

16. **Merler, Silvia and Jean Pisani-Ferry (2012),** "Hazardous Tango: Sovereign-Bank Interdependence and Financial Stability in the Euro Area", Banque de France Financial Stability Review No. 16, 201-210.

17. **Micco A., Stein E., Ordonez G. (2003),** "The Currency Union effect on trade: Early evidence from EMU". Economic Policy, Vol 18, no 37, pp. 315-356.

18. **Mody, Ashoka and DamianoSandri (2012),** "The Eurozone Crisis: How Banks and Sovereigns Came to be Joint at the Hip", Economic Policy April 2012, 199-230.

19. **Mundell, R.A. (1961),** "A theory of optimum currency areas", American Economic Review, Vol.51, 509-517.

20. **Mundell, R.A. (1973),** "A plan for a European currency", in H.G. Johnson and A.K. Swoboda (eds), The Economics of Common Currencies, London: Allen and Unwin.

21. **Nunziata, L. (2002),** "XTBAC: A Stata Command for the Baltagi Autocorrelation Test in Panel Data" http://www.decon.unipd.it/~nunziata/software.htm

22. **Pagano M. and Von Thadden E. (2004),** "The European Bond markets under EMU", Oxford Review of Economic Policy, Vol. 20, no. 4 pp. 531-534.

23. **Petroulas P., (2007),** "The effect of the euro on foreign direct investment". European Economic Review, Vol. 51, pp. 1468-1491.

24. **Portes R., Rey H., (2005),** "The determinants of cross border equity flows". Journal of International Economics, Vol. 65 no.2, pp. 269-296.

25. **Schaffer, M., Stillman, S., (2007),** "XTOVERID: Stata module to calculate tests of over-identifying restrictions after xtreg, xtivreg, xtivreg2 and xthtaylor". http://ideas.repec.org/c/boc/bocode/s456779.html.

26. **Woolridge, J.M., (2002),** "Econometric Analysis of Cross Section and Panel Data", Cambridge, MA: MIT Press.

Appendix

Figure 1.EMU, EU-3 and RoW total holdings of EMU and non EMU bonds as percent of total GDP (Own calculations, survey data for 1998, 1999, 2000 are not provided).

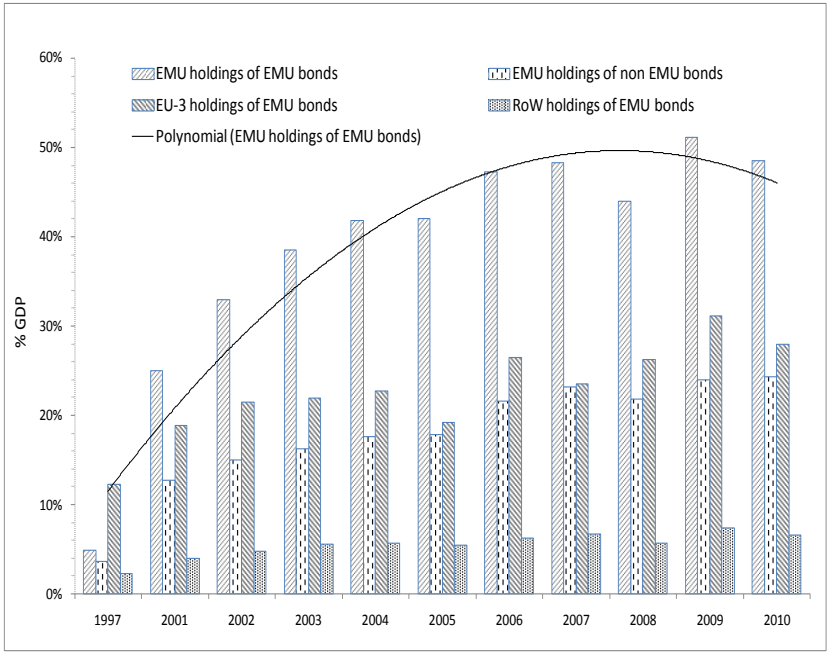

Figure 2.EMU, EU-3 and RoW total holdings of EMU and non EMU equities as percent of total GDP (Own calculations, survey data for 1998, 1999, 2000 are not provided).

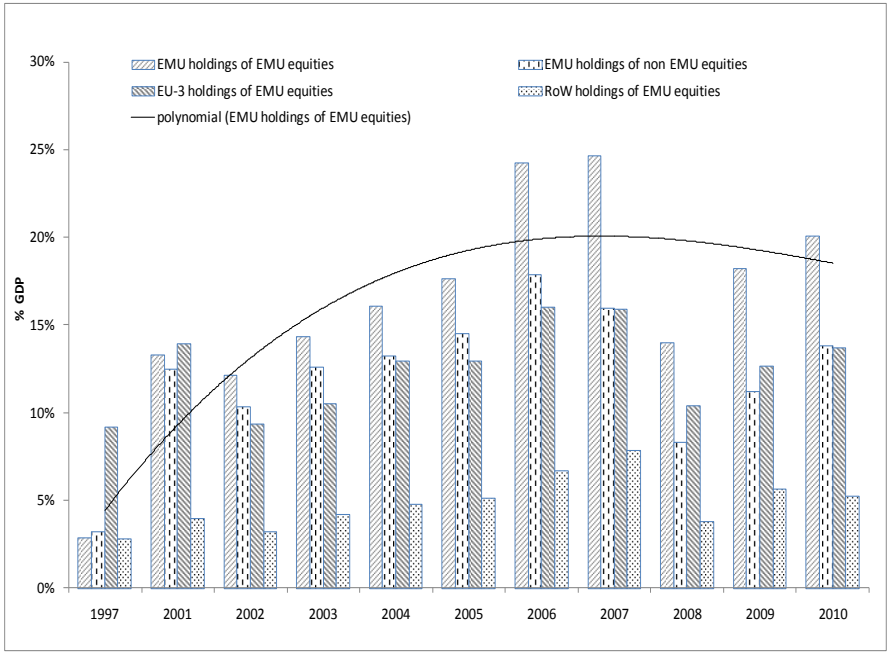

Table 3A: Sequential estimates of gravity models on bond holdings

Dependent variable: log bond holdings

initiation of EMU effect (year)	***GLS***									
variables	**1997**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
$log(size_{it})$	0.379***	0.287***	0.207***	0.279***	0.251***	0.239***	0.285***	0.263***	0.260***	0.255***
	11,35	*8,37*	*5,51*	*7,97*	*7,58*	*6,95*	*8,19*	*7,54*	*7,43*	*7,29*
$log(size_{jt})$	0.467***	0.363***	0.253***	0.316***	0.293***	0.295***	0.334***	0.290***	0.296***	0.289***
	13,12	*10,14*	*6,54*	*8,66*	*8,52*	*8,29*	*9,13*	*7,99*	*8,11*	*7,92*
$log(dist_{ijt})$	-0.457***	-0.409***	-0.330***	-0.373***	-0.369***	-0.353***	-0.363***	-0.368***	-0.347***	-0.352***
	-12,12	*-10,35*	*-8,09*	*-9,42*	*-9,66*	*-8,98*	*-9,12*	*-9,11*	*-8,55*	*-8,71*
$cborder_{ijt}$	-0.0104	-0.0499	-0.0476	-0.0382	-0.0389	-0.0472	-0.0338	-0.0409	-0.0329	-0.0359
	-0,33	*-1,41*	*-1,35*	*-1,11*	*-1,18*	*-1,40*	*-0,99*	*-1,16*	*-0,92*	*-1,01*
$clang_{ijt}$	0.264***	0.250***	0.257***	0.259***	0.231***	0.242***	0.256***	0.256***	0.257***	0.255***
	6,97	*5,88*	*6,08*	*6,29*	*5,88*	*6,02*	*6,21*	*6,12*	*6,05*	*6,04*
tax_treaty_{ijt}	0.0385	0.0192	0.0325	0.0372	0.0282	0.0387	0.0381	0.0346	0.0344	0.0340
	1,14	*0,58*	*1,00*	*1,12*	*0,86*	*1,16*	*1,15*	*1,06*	*1,06*	*1,05*
$insider_{it}$	0.00848***	0.00655***	0.00992***	0.00918***	0.00919***	0.00924***	0.00911***	0.00947***	0.00961***	0.00979***
	6,63	*4,58*	*7,09*	*6,60*	*6,96*	*6,79*	*6,65*	*6,76*	*6,82*	*6,94*
$insider_{jt}$	0.0147***	0.0116***	0.0169***	0.0161***	0.0165***	0.0163***	0.0158***	0.0179***	0.0160***	0.0170***
	11,31	*8,35*	*11,99*	*11,93*	*12,50*	*12,35*	*11,88*	*12,88*	*11,51*	*12,23*
$mark\_soph_{it}$	0.0492***	0.0494***	0.0337***	0.0403***	0.0586***	0.0466***	0.0433***	0.0368***	0.0426***	0.0406***
	4,87	*4,89*	*3,30*	*3,91*	*5,75*	*4,52*	*4,29*	*3,61*	*4,18*	*4,02*
$mark\_soph_{jt}$	0.0465***	0.0641***	0.0410***	0.0521***	0.0645***	0.0491***	0.0536***	0.0442***	0.0536***	0.0484***
	4,60	*6,42*	*3,98*	*5,16*	*6,20*	*4,72*	*5,36*	*4,33*	*5,20*	*4,79*
$techn\_adv_{it}$	0.0359***	0.110***	0.0604***	0.0637***	0.0499***	0.0607***	0.0672***	0.0641***	0.0544***	0.0566***
	3,52	*10,19*	*5,64*	*6,07*	*4,84*	*5,78*	*6,46*	*6,05*	*5,23*	*5,44*
$techn\_adv_{jt}$	0.103***	0.0327***	0.0684***	0.0744***	0.0933***	0.0765***	0.0732***	0.0793***	0.0719***	0.0746***
	10,36	*3,06*	*6,51*	*7,15*	*9,24*	*7,36*	*7,04*	*7,63*	*6,91*	*7,17*

Table 3A Continued

log(trade $_{ijt}$)	0.266***	0.346***	0.414***	0.360***	0.383***	0.397***	0.355***	0.371***	0.375***	0.377***
	8,96	*11,57*	*12,70*	*11,73*	*13,16*	*13,19*	*11,56*	*12,16*	*12,25*	*12,36*
EMU12 $_{ijt}$	0.470***	0.141***	0.00992	0.0319	0.0316	0.0316	-0.0944***	-0.183***	-0.115***	-0.0838***
	16,43	*7,50*	*0,52*	*0,77*	*0,76*	*0,77*	*-5,13*	*-11,02*	*-6,61*	*-4,79*
inward_EMU12 $_{ijt}$	0.0597**	0.198***	0.0678***	0.0157	0.0614*	0.0433*	0.0193	-0.125***	-0.0463**	-0.0749**
	2,51	*10,10*	*3,36*	*0,80*	*1,66*	*1,81*	*0,96*	*-3,27*	*-2,32*	*-2,02*
outward_EMU12 $_{ijt}$	0.0745***	0.165***	0.0669***	0.0149	-0.0645***	0.0470**	0.00224	-0.089***	-0.071**	-0.054*
	3,10	*7,89*	*2,99*	*0,68*	*-2,91*	*2,09*	*0,10*	*2,91*	*2,20*	*-1,91*
return $_{jt}$	*0.0150***	0.00799	0.00499	-1.79e-05	-0.0173***	0.00687	0.00808	*-0.00594*	-0.00104	-0.00301
	2,31	*1,29*	*0,76*	*0,00*	*-2,74*	*1,04*	*1,24*	*-0,94*	*-0,17*	*-0,49*
EMU_trend $_{ijt}$	0.00224	0.0703***	0.0678***	0.0732***	0.0752***	0.0745***	0.0726***	0.0629***	0.0622***	0.0626***
	0,40	*16,20*	*15,44*	*16,91*	*18,39*	*18,04*	*18,10*	*16,55*	*16,37*	*16,47*
trend $_{ijt}$	0.0253***	0.00828**	0.0245***	0.0245***	0.0255***	0.0246***	0.0268***	0.0247***	0.0265***	0.0257***
	6,37	*2,06*	*6,25*	*6,11*	*6,59*	*6,03*	*6,67*	*6,37*	*6,87*	*6,66*
Constant $_{ijt}$	-1.399***	-1.402***	-0.227	-0.706**	-0.397	-0.580**	-0.959***	-0.413	-0.596**	-0.478*
	-5,11	*-4,90*	*-0,77*	*-2,44*	*-1,46*	*-2,05*	*-3,27*	*-1,44*	*-2,08*	*-1,67*
Random vs Fixed effect (X^2)	-	-	-	-	-	-	-	-	-	-
Test for serial autocorrelation (F_{stat})	53,60	51,60	54,70	61,60	55,40	53,50	54,30	54,60	54,60	54,30
adjusted R_squared (within)	-	-	-	-	-	-	-	-	-	-
Observations	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028
Number of panel	380	380	380	380	380	380	380	380	380	380

Note: (1) tstat reported below coefficients which are robust to heteroskedasticity and autocorrelation, (2) (***) denote 1% level of significance, (**) denote 5% level of significance, (*) denote 10% level of significance, (3) In the case of fixed effect estimation independent variables that vary only across cross sections are excluded (clang, cbord) from estimation. In order to choose among Fixed Effects and Random Effects estimators, Hausman test is used. The null hypothesis of this generalised Hausman test is random effect best fit and the alternative is the fixed effect best fit, (4) Test for serial correlation is performed by means of the more general xtbac stata command proposed by Nunziata (2002) for estimating with xtreg, xtgls, reg or areg, (5) In the case of GLS xtgls command is employed while in the case of Fixed effect the xtregar command is employed.

Table 3B: Sequential estimates of gravity models on bond holdings

Dependent variable: log bond holdings

initiation of EMU effect (year)	***Fixed effect***									
variables	**1997**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
log(size$_{it}$)	0.666***	0.725***	0.711***	0.695***	0.696***	0.751***	0.692***	0.756***	0.711***	0.707***
	7,64	*7,91*	*7,61*	*7,71*	*7,77*	*8,22*	*7,46*	*8,22*	*7,75*	*7,74*
log(size$_{it}$)	0.463***	0.477***	0.451***	0.467***	0.466***	0.494***	0.466***	0.503***	0.484***	0.496***
	5,59	*5,62*	*5,20*	*5,51*	*5,43*	*5,80*	*5,32*	*5,86*	*5,62*	*5,77*
log(dist$_{ijt}$)	-1.050***	-1.216***	-1.118***	-1.159***	-1.138***	-1.196***	-1.117***	-1.216***	-1.167***	-1.168***
	-8,61	*-9,28*	*-8,53*	*-9,35*	*-9,03*	*-9,57*	*-8,59*	*-9,65*	*-9,26*	*-9,34*
cborder$_{ijt}$	0	0	0	0	0	0	0	0	0	0
	(0)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*
clang$_{ijt}$	0	0	0	0	0	0	0	0	0	0
	(0)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*
tax_treaty $_{ijt}$	-0.0390	-0.0263	-0.0344	-0.0351	-0.0328	-0.0282	-0.0302	-0.0259	-0.0312	-0.0303
	-0,87	*-0,59*	*-0,76*	*-0,78*	*-0,73*	*-0,63*	*-0,67*	*-0,58*	*0,05*	*-0,67*
insider$_{it}$	0.00870	0.00507	0.00369	0.00351	0.00381	0.000258	0.00155	0.00156	0.00182	0.00337
	1,49	*0,82*	*0,60*	*0,58*	*0,64*	*0,04*	*0,25*	*0,26*	*0,30*	*0,55*
insider$_{it}$	0.0163***	0.0183***	0.0146**	0.0151***	0.0158***	0.0130**	0.0136**	0.0159***	0.0141**	0.0152***
	2,92	*3,13*	*2,50*	*2,63*	*2,77*	*2,25*	*2,33*	*2,73*	*2,39*	*2,60*
mark_soph$_{it}$	-0.0221	-0.0149	-0.0234	-0.0208	-0.0249	-0.0203	-0.0187	-0.0297*	-0.0179	-0.0206
	-1,38	*-0,93*	*-1,45*	*-1,29*	*-1,51*	*-1,27*	*-1,16*	*-1,82*	*-1,10*	*-1,29*
mark_soph $_{it}$	0.0471***	0.0518***	0.0434***	0.0450***	0.0509***	0.0441***	0.0440***	0.0316**	0.0446***	0.0418***
	3,10	*3,36*	*2,82*	*2,92*	*3,26*	*2,88*	*2,88*	*2,03*	*2,88*	*2,73*
techn_adv $_{it}$	-0.0118	0.0119	-0.0101	0.00107	-0.00410	-0.00852	-0.00477	0.0112	-0.00619	-0.00388
	-0,68	*0,66*	*-0,58*	*0,06*	*-0,24*	*-0,49*	*-0,28*	*0,63*	*-0,35*	*-0,23*
techn_adv $_{it}$	-0.0222	-0.0131	-0.0186	-0.0169	-0.0190	-0.0231	-0.0198	-0.0373**	-0.0219	-0.0266
	-1,28	*-0,74*	*-1,06*	*-0,97*	*-1,09*	*-1,33*	*-1,13*	*-2,06*	*-1,25*	*-1,51*

Table 3B Continued

log(trade $_{ijt}$)	0.0718**	0.0494	0.0820***	0.0729**	0.0822***	0.0603*	0.0829***	0.0631**	0.0724***	0.0696***
	2,42	*0,97*	*3,57*	*2,44*	*3,61*	*1,85*	*4,60*	*2,24*	*3,41*	*2,77*
EMU12 $_{ijt}$	0.198***	0.291***	-0.0126	-0.0518***	-0.00876	0.0303	0.000592	-0.184***	-0.189***	-0.102***
	3,94	*5,58*	*-0,55*	*-2,66*	*-0,37*	*1,32*	*0,02*	*-4,10*	*-4,30*	*-3,09*
inward_EMU12 $_{ijt}$	0.160***	0.142***	0.0940***	-0.0318	0.00578	0.0219	0.0456*	-0.152***	0.0468	-0.0883**
	3,61	*3,41*	*-3,28*	*-1,16*	*0,21*	*0,82*	*1,71*	*-3,33*	*0,64*	*-2,19*
outward_EMU12 $_{ijt}$	0.110***	0.0877***	0.0701***	-0.0161	-0.0622***	0.0578**	0.0264	-0.081***	-0.04**	-0.021
	3,67	*2,82*	*2,60*	*-0,70*	*-2,60*	*2,54*	*1,18*	*2,77*	*2,06*	*-1,09*
return $_{jt}$	*0.045***	0.0439***	0.0565***	0.0539***	0.0412***	0.0383***	0.0479***	*0.0438***	0.0519***	0.0506***
	4,20	*3,88*	*4,59*	*4,99*	*3,40*	*3,30*	*4,39*	*4,06*	*4,85*	*4,77*
EMU_trend $_{ijt}$	-0.0295	-0.0804***	-0.0555**	-0.0483**	-0.0583**	-0.0507**	-0.0372	-0.0537**	-0.0551**	-0.0546**
	-1,49	*-3,47*	*-2,52*	*-2,19*	*-2,52*	*-2,03*	*-1,40*	*-24,30*	*(0.0221)*	*-2,47*
trend $_{ijt}$	-0.0285*	-0.00403	-0.0261	-0.0241	-0.0164	-0.0371*	-0.0414**	-0.0258	-0.0258	-0.0273
	-1,72	*-0,21*	*-1,39*	*-1,30*	*-0,88*	*-1,90*	*-20,39*	*-1,37*	*(0.0189)*	*-1,45*
Constant $_{ijt}$	0.504***	0.435***	0.610***	0.696***	0.623***	0.605***	0.669***	0.573***	0.627***	0.607***
	12,76	*9,26*	*15,80*	*17,85*	*16,31*	*15,76*	*15,97*	*14,92*	*(0.0382)*	*15,85*
Random vs Fixed effect (X^2)	42,10	203,10	273,60	478,50	185,01	340,40	843,40	91,53	86,90	135,50
Test for serial autocorrelation (F_{stat})	53,60	51,60	54,70	61,60	55,40	53,50	54,30	54,60	54,60	54,30
adjusted R_squared (within)	0,44	0,34	0,35	0,37	0,36	0,36	0,38	0,38	0,37	0,37
Observations	3648	3648	3648	3648	3648	3648	3648	3648	3648	3648
Number of panel	380	380	380	380	380	380	380	380	380	380

Note: (1) tstat reported below coefficients which are robust to heteroskedasticity and autocorrelation, (2) (***) denote 1% level of significance, (**) denote 5% level of significance, (*) denote 10% level of significance, (3) In the case of fixed effect estimation independent variables that vary only across cross sections are excluded (clang, cbord) from estimation. In order to choose among Fixed Effects and Random Effects estimators, Hausman test is used. The null hypothesis of this generalised Hausman test is random effect best fit and the alternative is the fixed effect best fit, (4) Test for serial correlation is performed by means of the more general xtbac stata command proposed by Nunziata (2002) for estimating with xtreg, xtgls, reg or areg, (5) In the case of GLS xtgls command is employed while in the case of Fixed effect the xtregar command is employed.

Table 4A: Sequential estimates of gravity models on equity holdings

Dependent variable: log equity holdings

initiation of EMU effect (year)	***GLS***									
variables	**1997**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
$log(size_{it})$	0.463***	0.501***	0.464***	0.460***	0.476***	0.475***	0.474***	0.424***	0.445***	0.483***
	24,37	*25,82*	*24,17*	*23,83*	*25,05*	*24,61*	*24,82*	*21,97*	*22,14*	*25,03*
$log(size_{it})$	0.637***	0.664***	0.637***	0.637***	0.645***	0.643***	0.645***	0.621***	0.619***	0.650***
	29,77	*31,03*	*29,63*	*29,49*	*30,14*	*29,77*	*30,14*	*29,29*	*27,88*	*30,09*
$log(dist_{ijt})$	-0.379***	-0.452***	-0.421***	-0.416***	-0.409***	-0.419***	-0.425***	-0.384***	-0.406***	-0.413***
	-15,92	*-18,52*	*-17,91*	*-17333,33*	*-17,48*	*-17,91*	*-18,48*	*-16,70*	*-17,73*	*-17,88*
$cborder_{ijt}$	0.0679**	0.0161	0.0149	0.0283	0.0470	0.0318	0.0249	0.0368	0.0168	0.0397
	2,33	*0,56*	*0,52*	*0,95*	*1,64*	*1,11*	*0,92*	*1,35*	*0,61*	*1,42*
$clang_{ijt}$	0.406***	0.441***	0.429***	0.427***	0.415***	0.420***	0.422***	0.412***	0.414***	0.422***
	16,11	*16,64*	*17,02*	*16,42*	*16,60*	*16,80*	*17,15*	*17,10*	*16,97*	*17,22*
tax_treaty_{ijt}	0.109***	0.0665**	0.0996***	0.0909***	0.0953***	0.105***	0.114***	0.113***	0.114***	0.114***
	4,01	*2,41*	*3,52*	*3,27*	*3,48*	*3,68*	*4,04*	*4,12*	*4,06*	*4,01*
$insider_{it}$	0.0171***	0.0128***	0.0147***	0.0151***	0.0154***	0.0147***	0.0145***	0.0171***	0.0151***	0.0156***
	15,13	*11,03*	*13,24*	*13,25*	*13,87*	*13,13*	*13,18*	*15,41*	*13,85*	*14,18*
$insider_{jt}$	0.00505***	0.00163	0.00380***	0.00451***	0.00495***	0.00390***	0.00401***	0.00553***	0.00376***	0.00395***
	4,95	*1,54*	*3,76*	*4,38*	*4,95*	*3,86*	*4,02*	*5,54*	*3,82*	*3,98*
$mark\_soph_{it}$	0.0842***	0.0767***	0.0818***	0.0808***	0.0892***	0.0849***	0.0872***	0.0669***	0.0998***	0.0835***
	11,32	*10,62*	*10,94*	*10,90*	*11,94*	*11,25*	*11,60*	*8,76*	*12,49*	*11,00*
$mark\_soph_{jt}$	-0.00351	-0.00671	-0.00978	-0.00481	-0.00418	-0.00481	-0.00469	-0.0286***	0.00886	-0.00822
	-0,47	*-0,94*	*-1,30*	*-0,65*	*-0,56*	*-0,64*	*-0,62*	*-3,69*	*1,10*	*-1,08*
$techn\_adv_{it}$	0.0334***	0.0555***	0.0348***	0.0293***	0.0254***	0.0323***	0.0321***	0.0567***	0.0290***	0.0277***
	4,49	*7,40*	*4,61*	*3,98*	*3,47*	*4,32*	*4,30*	*7,48*	*3,87*	*3,65*
$techn\_adv_{jt}$	0.000365	0.0277***	0.00560	-0.00204	-0.00384	-0.000330	0.00349	0.0114	-0.00478	-0.00127
	0,05	*3,68*	*0,74*	*-0,27*	*-0,51*	*-0,04*	*0,46*	*1,52*	*-0,63*	*-0,17*

Table 4A Continued

log(trade $_{ijt}$)	0.0842***	0.0802***	0.106***	0.100***	0.0854***	0.0987***	0.102***	0.113***	0.132***	0.0919***
	5,36	*5,14*	*6,67*	*6,29*	*5,41*	*6,21*	*6,54*	*7,29*	*7,76*	*5,85*
EMU12 $_{ijt}$	0.126***	0.163***	0.0684***	0.0208	-0.122***	-0.0277	-0.0608***	-0.239***	-0.0482**	-0.0903***
	4,60	*8,58*	*3,42*	*1,07*	*-6,32*	*-1,38*	*-3,06*	*-11,06*	*-2,31*	*-4,58*
inward_EMU12 $_{ijt}$	-0.0890***	0.104***	0.0196	-0.0295*	-0.0875***	0.00123	-0.0209	-0.116***	-0.0343*	-0.0136
	-5,24	*6,50*	*1,21*	*-1,83*	*-5,40*	*0,07*	*-1,22*	*-6,07*	*-1,78*	*-0,72*
outward_EMU12 $_{ijt}$	-0.110***	0.118***	0.0527***	0.0463***	-0.0336**	0.0407***	0.0717***	-0.1675***	-0.0872***	-0.0610***
	-7,10	*8,08*	*3,66*	*3,24*	*-2,27*	*2,75*	*4,84*	*-3,70*	*-5,16*	*-3,79*
return $_{jt}$	*3.85e-06***	4.68e-06***	3.15e-06***	3.39e-06***	3.99e-06***	3.00e-06***	2.80e-06***	2.54e-07	2.92e-06***	2.95e-06***
	1,12	*5,02*	*3,03*	*3,23*	*3,84*	*2,88*	*2,77*	*2,49*	*2,81*	*2,89*
EMU_trend $_{ijt}$	-0.00168	0.0153***	0.0185***	0.0208***	0.0269***	0.0254***	0.0277***	0.0328***	0.0212***	0.0238***
	-0,39	*4,40*	*5,24*	*5,91*	*7,91*	*7,54*	*8,45*	*10,28*	*6,84*	*7,80*
trend $_{ijt}$	0.0103***	-0.00257	0.000306	0.00214	0.00652**	0.00112	0.000971	0.00451*	3.65e-06	0.00422
	3,69	*-0,90*	*0,11*	*0,77*	*2,37*	*0,41*	*0,36*	*1,68*	*0,00*	*1,58*
Constant $_{ijt}$	-2.814***	-3.061***	-2.715***	-2.646***	-2.778***	-2.792***	-2.832***	-2.545***	-2.761***	-2.839***
	-18,15	*-19,13*	*-17,63*	*-17,07*	*-18,16*	*-18,13*	*-18,51*	*-16,53*	*-17,93*	*-18,44*
Random vs Fixed effect (X^2)	-	-	-	-	-	-	-	-	-	-
Test for serial autocorrelation (Fstat)	104,2	99,8	96,4	105,5	105,1	104,2	103,8	104,6	111,4	111,4
adjusted R_squared (within)	-	-	-	-	-	-	-	-	-	-
Observations	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028	4,028
Number of panel	380	380	380	380	380	380	380	380	380	380

Note: (1) tstat reported below coefficients which are robust to heteroskedasticity and autocorrelation, (2) (***) denote 1% level of significance, (**) denote 5% level of significance, (*) denote 10% level of significance, (3) In the case of fixed effect estimation independent variables that vary only across cross sections are excluded (clang, cbord) from estimation. In order to choose among Fixed Effects and Random Effects estimators, Hausman test is used. The null hypothesis of this generalised Hausman test is random effect best fit and the alternative is the fixed effect best fit, (4)Test for serial correlation is performed by means of the more general xtbac stata command proposed by Nunziata (2002) for estimating with xtreg, xtgls, reg or areg, (5) In the case of GLS xtgls command is employed while in the case of Fixed effect the xtregar command is employed.

Table 4B: Sequential estimates of gravity models on equity holdings

Dependent variable: log equity holdings

initiation of EMU effect (year)	***Fixed effect***									
variables	**1997**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
$log(size_{it})$	0.317***	0.314***	0.301***	0.303***	0.299***	0.298***	0.309***	0.187***	0.259***	0.310***
	11,08	*10,94*	*10,64*	*10,71*	*-10,60*	*10,42*	*10,88*	*6,47*	*8,96*	*10,92*
$log(size_{it})$	0.636***	0.625***	0.614***	0.615***	0.611***	0.615***	0.612***	0.534***	0.578***	0.610***
	20,92	*20,70*	*20,47*	*20,50*	*-20,37*	*20,36*	*20,26*	*17,74*	*18,95*	*20,27*
$log(dist_{ijt})$	-0.828***	-0.906***	-0.835***	-0.844***	-0.890***	-0.837***	-0.844***	-0.687***	-0.808***	-0.853***
	-15,19	*-16,01*	*-15,61*	*-15,75*	*16,67*	*-15,70*	*-15,98*	*-12,75*	*-15,13*	*-15,97*
$cborder_{ijt}$	0	0	0	0	0	0	0	0	0	0
	(0)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*
$clang_{ijt}$	0	0	0	0	0	0	0	0	0	0
	(0)	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*	*(0)*
tax_treaty_{ijt}	-0.0149	-0.0293	-0.0230	-0.0222	-0.0308	-0.0214	-0.0232	-0.0111	-0.0335	-0.0255
	-0,39	*-0,77*	*-0,60*	*-0,58*	*0,81*	*-0,56*	*-0,61*	*-0,30*	*-0,89*	*-0,67*
$insider_{it}$	0.00270	0.00624	0.00575	0.00639	0.00761*	0.00566	0.00456	0.0137***	0.00558	0.00577
	0,64	*1,50*	*1,39*	*1,54*	*-1,82*	*1,37*	*1,10*	*3,21*	*1,34*	*1,37*
$insider_{it}$	-0.000392	0.00191	0.00226	0.000868	0.00418	0.00111	0.000708	0.00854**	0.00144	0.00165
	-0,09	*0,46*	*0,55*	*0,21*	*-1,00*	*0,27*	*0,17*	*2,01*	*0,35*	*0,39*
$mark\_soph_{it}$	0.0321***	0.0373***	0.0333***	0.0336***	0.0437***	0.0360***	0.0340***	0.0161	0.0553***	0.0356***
	3,18	*3,66*	*3,26*	*3,29*	*-4,24*	*3,56*	*3,37*	*1,61*	*5,27*	*3,52*
$mark\_soph_{it}$	0.00218	0.00800	0.00307	0.00801	0.0163	0.00690	0.00490	-0.0106	0.0255**	0.00598
	0,21	*0,79*	*0,30*	*0,79*	*-1,58*	*0,68*	*0,49*	*-1,06*	*2,43*	*0,59*
$techn\_adv_{it}$	0.0124	0.0140	0.00929	0.00849	0.00966	0.00861	0.00916	0.0386***	0.00237	0.00427
	1,36	*1,49*	*1,02*	*0,94*	*-1,07*	*0,95*	*1,01*	*4,10*	*0,26*	*0,46*

Table 4B Continued

techn_adv $_{jt}$	0.0295***	0.0300***	0.0227**	0.0239***	0.0257***	0.0250***	0.0234***	0.0630***	0.0175*	0.0279***
	3,26	*3,24*	*2,51*	*2,65*	*-2,87*	*2,77*	*2,59*	*6,62*	*1,93*	*3,01*
log(trade $_{ijt}$*)*	0.0358***	0.0219***	0.0267***	0.0154***	0.00792	0.0133***	0.0194***	0.0634***	0.0740***	0.0180***
	3,31	*4,81*	*5,98*	*3,57*	*1,29*	*3,49*	*4,72*	*6,37*	*6,61*	*4,66*
EMU12 $_{ijt}$	0.120***	0.0576**	0.0316*	0.0385**	-0.0740***	0.0304*	0.0144	-0.253***	-0.126***	-0.00321
	3,86	*2,48*	*1,78*	*2,32*	*4,38*	*1,81*	*0,84*	*-11,93*	*-6,63*	*-0,18*
inward_EMU12 $_{ijt}$	-0.234***	0.191***	0.0548***	-0.0333*	-0.0516***	0.0226	0.00278	-0.159***	0.0538***	0.0416
	-3,46	*8,17*	*2,58*	*-1,69*	*2,69*	*1,22*	*0,15*	*-7,64*	*2,69*	*0,22*
outward_EMU12 $_{ijt}$	-0.161**	0.089***	0.0276**	00152**	-0.0699***	0.0227	-0.0587***	-0.192***	0.0721***	-0.0489***
	-2,44	*3,00*	*2,39*	*2,00*	*3,64*	*1,21*	*-3,23*	*-9,10*	*3,62*	*-2,60*
return $_{jt}$	*1.09e-05***	1.17e-05***	1.13e-05***	1.11e-05***	1.21e-05***	1.09e-05***	1.14e-05***	4.73e-06***	1.02e-05***	1.12e-05***
	7,12	*7,65*	*7,43*	*7,30*	*-7,96*	*7,08*	*7,50*	*3,03*	*0,67*	*7,37*
EMU_trend $_{ijt}$	-0.0243**	-0.0166	-0.0202*	-0.0228*	-0.0197	-0.0229*	-0.0176	-0.00472	-0.0416***	-0.0216
	-2,06	*-1,36*	*-1,73*	*-1,92*	*1,61*	*-1,85*	*-1,40*	*-0,35*	*-3,15*	*-1,62*
trend $_{ijt}$	-0.00999	-0.00682	-0.0108	-0.0115	-0.00582	-0.0145	-0.0163	-0.00264	-0.0119	-0.0116
	-0,96	*-0,64*	*-1,03*	*-1,08*	*0,54*	*-1,36*	*-1,54*	*-0,24*	*-1,11*	*-1,05*
Constant $_{ijt}$	0.847***	0.813***	0.852***	0.918***	0.988***	0.936***	0.935***	0.998***	0.995***	0.943***
	42,78	*37,29*	*42,18*	*47,56*	*-52,83*	*49,79*	*49,47*	*55,14*	*53,21*	*47,15*
Random vs Fixed effect (X^2)	368	172	235	360	1200	201	199	542	288	223
Test for serial autocorrelation (Fstat)	104,2	99,8	96,4	105,5	105,1	104,2	103,8	104,6	111,4	111,4
adjusted R_squared (within)	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68	0,68
Observations	3648	3648	3648	3648	3648	3648	3648	3648	3648	3648
Number of panel	380	380	380	380	380	380	380	380	380	380

Note: (1) tstat reported below coefficients which are robust to heteroskedasticity and autocorrelation, (2) (***) denote 1% level of significance, (**) denote 5% level of significance, (*) denote 10% level of significance, (3) In the case of fixed effect estimation independent variables that vary only across cross sections are excluded (clang, cbord) from estimation. In order to choose among Fixed Effects and Random Effects estimators, Hausman test is used. The null hypothesis of this generalised Hausman test is random effect best fit and the alternative is the fixed effect best fit, (4)Test for serial correlation is performed by means of the more general xtbac stata command proposed by Nunziata (2002) for estimating with xtreg, xtgls, reg or areg, (5) In the case of GLS xtgls command is employed while in the case of Fixed effect the xtregar command is employed.

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