Global Bond Portfolios and EMU*

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This paper examines the bilateral composition of international bond portfolios for the euro area and the individual EMU member countries. I find considerable support for euro-area bias: EMU member countries disproportionately invest in one another relative to other country pairs. Another striking pattern is the positive connection between trade linkages and financial linkages in explaining asymmetries across EMU member countries in terms of their outward bond investments vis-à-vis external counterparties. My empirical results underline the impact of currency union on financial integration and support the notion that financial regionalization is the leading force underlying financial globalization.

JEL Codes: E42, F41, G15.

1. Introduction

Financial globalization is a key force that is reshaping the nature of the linkages across the major economic zones in the world economy. One dimension of globalization is the rising share of financial assets and liabilities held by foreign investors.[1] However, it is by no means the case that the pattern of foreign ownership is uniformly globalized in the sense that the national identity of investors has ceased to matter. Rather, the "international investor base" significantly differs across countries and regions, reflecting variation in both aggregate

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[1] See, for instance, Lane and Milesi-Ferretti (2003).

economic fundamentals (i.e., some countries are more attractive than others to all investors) and also bilateral linkages (i.e., the demand by an investor in region i for the financial assets issued by region j may be influenced by bilateral economic variables and also common institutional and cultural ties).

Such heterogeneity in the investor base potentially matters for two reasons. First, the cost of capital and the stability of international demand for the assets issued by a given country or region will depend on the characteristics of its international investor base. Second, the bilateral pattern of investment holdings will in itself influence the transmission of financial shocks and the nature of international risk sharing and also potentially affect exchange rate regime choices.[2]

In this paper, I investigate these issues by analyzing the bilateral patterns in international bond holdings, with a particular emphasis on European Monetary Union (EMU). I ask various questions about EMU: Do EMU members disproportionately invest in other EMU member countries, relative to other destinations? With respect to external financial linkages, is there systematic heterogeneity in the external bond portfolios of the individual EMU member countries? By addressing such questions, the contribution of the paper is to build a profile of the role of the euro in shaping global bond portfolios.

At an empirical level, I address these questions by exploiting the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS), which reports the portfolio holdings of sixty-seven investor countries in 220 destination territories. The availability of the CPIS data set represents a considerable advance relative to previous studies that relied on smaller samples and used data on transactions rather than holdings (see, for example, Portes, Rey, and Oh 2001).

This work builds on a number of recent contributions. Lane and Milesi-Ferretti (2004) develop a general empirical modeling approach for the study of bilateral investment positions, with an application to the international equity holdings for a large sample of investor nations. In related work, Lane and Milesi-Ferretti (2005) investigate

[2]On the latter, see Devereux and Lane (2003) for some suggestive evidence.

the international equity holdings of euro-area investors. In terms of the empirical analysis of bond portfolios, Portes, Rey, and Oh (2001) study the geography of gross bond flows between the United States and forty partner countries, while Burger and Warnock (2004) analyze the international bond holdings of U.S. investors. Another related contribution is the analysis of bank asset portfolios by Aviat and Coeurdacier (2005). Finally, Anderton, di Mauro, and Moneta (2004); Baele et al. (2004); Geis, Mehl, and Wredenborg (2004); and Pagano and Von Thadden (2004) each provide useful surveys of recent developments in European financial markets and the growth in euro-denominated securities issued by international participants in global capital markets.

The structure of the rest of the paper is as follows. I briefly discuss the relevant theoretical issues in thinking about the geography of bond portfolios in section 2. Section 3 introduces the Coordinated Portfolio Investment Survey (the source of the data on international bond holdings) and, taking a euro-area perspective, describes some broad patterns in the data. A range of empirical questions concerning EMU and the importance of the euro area in international bond holdings are addressed in the econometric analysis in section 4. Finally, directions for future research and some concluding remarks are offered in section 5.

2. A Conceptual Framework

In a benchmark finance model (e.g., the International Capital Asset Pricing Model, or ICAPM), investors should hold the bonds of each issuer in proportion to its share of global bond market capitalization.[3] This is the case to the extent that there are no real or financial imperfections that distort international trade in goods or assets, such that the optimal allocation rule is independent of the nationality of the investor. However, the segmentation of product and capital markets, plus informational asymmetries and differences in institutions (such as tax and legal systems) across countries, means

[3]See Lane and Milesi-Ferretti (2004) for a more formal treatment and detailed literature review of international asset allocation, with an application to international investment patterns in equity markets. See also the discussion in Burger and Warnock (2004).

that the world is far distant from this benchmark. The presence of such frictions means that the optimal portfolio allocation strategy plausibly varies with the nationality of the investor.

The incompleteness of financial markets also means that international diversification strategies may vary across countries. In a multicurrency world, hedging against nominal currency risk is costly, such that there may be a preference for bonds issued in the investor's home currency.[4] In addition, to the extent that a group of countries shares a common financial infrastructure, this should raise intragroup financial trade relative to other destinations that may involve higher transactions costs (Martin and Rey 2000). These two factors are especially relevant for the euro area, to the extent that the single currency has both eliminated nominal exchange rate risk among the member countries and lowered transactions costs by improving liquidity through a deepening and broadening of the consolidated euro-area bond market, relative to the individual national bond markets that operated prior to the launch of EMU.

In terms of other factors, much recent research has emphasized that information sets vary greatly across investors. This is a popular rationalization of home bias in portfolios. The multicountry version of this argument is that bilateral investment patterns should correlate with the strength of informational linkages between different country pairs. Again, it may be argued that the single currency has substantially integrated the financial market of the euro area and thereby improved the information flow among member countries.[5]

An additional consideration is that investors in different countries face different "endowment" risks (e.g., nondiversifiable shocks to labor income or tax rates). The basket of international assets that offers the best hedge against these risks may vary on a bilateral

[4]Our data do not permit us to distinguish between the nationality and currency denomination of a bond issue. However, Burger and Warnock (2004) report that local-currency bonds represent 93 percent of total bonds outstanding for developed-country markets and 78 percent of total bonds outstanding for emerging markets. For advanced-country destinations, there is likely to be a strong overlap between the nationality of the issuer and the currency of issue; for developing-country destinations, in contrast, external investors primarily hold the foreign-currency bonds issued by these countries.

[5]See also Baele et al. (2004) for a recent review of the integration of the European financial markets. Pagano and von Thadden (2004) provide an extensive study of recent developments in the euro-area bond market.

basis.[6] In addition, with regard to the segmentation of product markets, there are several reasons to believe that trading partners should receive a higher weight in portfolios. A basic reason is that the volume of trade is a good predictor of the level of bilateral exchange rate volatility (Devereux and Lane 2003, Broda and Romalis 2003). As such, currency risk is minimized by preferring the bonds of major trading partners.

Along another dimension, Obstfeld and Rogoff (2001) show that the more investors are exposed to consumption risk through fluctuations in the supply of imported goods, the more the incentive to hold state-contingent foreign assets is increased. At the extreme, a country that just purchases domestic goods is not exposed to external shocks to its level of consumption and so need not be concerned with hedging against this risk. Lane and Milesi-Ferretti (2004) generalize this argument to an N-country setting, with the prediction that bilateral portfolio shares should be positively related to import shares in order to minimize consumption risk. Although these authors focused on international equity portfolios, analagous reasoning may apply to bond allocations. For instance, holding the domestic-currency bonds issued by a trading partner provides a natural hedge against bilateral real exchange rate movements: if the relative price of the import good rises, this is offset by the increased real return for the domestic investor from holding the foreign bond.[7]

I build my empirical specifications in the econometric work in section 4 on the basis of these theoretical arguments that provide some hypotheses as to why the composition of international bond portfolios may deviate on a country-by-country basis.

3. The Coordinated Portfolio Investment Survey (CPIS)

In this section, I first discuss some features of the CPIS, before presenting an overview of the broad patterns in the data on

[6] See Davis, Nalewaik, and Willen (2001) for a formal treatment of this point.

[7] Whether the hedged return on a foreign bond positively or negatively co-moves with the real exchange rate (or the terms of trade) is ambiguous. In general, it depends on the source of the relative price shock and the relative importance of nominal risk versus credit risk in determining the value of the foreign bond. See also a related example in Obstfeld (2004).

international bond portfolios, with a primary focus on the euro area as a source and destination for cross-border bond investments.

3.1 Data Issues

The source of data on bond holdings is the CPIS, which is organized by the International Monetary Fund. After a smaller survey in 1997, the annual survey since 2001 has included sixty-seven source countries and 220 destination territories.[8] I mainly focus on the 2004 cross-section in this study.[9] However, I also examine the changes in bond portfolios between 1997 and 2004 in seeking to establish the impact of EMU.

While the CPIS represents a major advance in availability of data on bilateral investment positions, Lane and Milesi-Ferretti (2004, 2005) point out that the survey is imperfect. First, holdings are surely underreported by some countries due to incomplete coverage or the complexities of tax-driven asset management structures.[10] Second, the bilateral data can be distorted by third-party holdings to the extent that final ownership of assets is not properly traced. This is a larger problem for those countries that primarily surveyed custodians rather than end investors. Third, in relation to debt securities, the survey offers relatively little information on the currency denomination of bonds.[11] Finally, the CPIS does not report the domestic holdings of investors; therefore, it does not provide a complete profile of the composition of portfolios but rather only details the geographical breakdown of the cross-border component of investment positions.

[8]The 1997 survey did not include some important investor nations (e.g., Germany) as source countries, severely limiting its usefulness in examining the investment patterns of the aggregate euro area. However, in the next section, I will compare changes in investment patterns between 1997 and 2001 in order to assess whether EMU membership has influenced portfolio allocations.

[9]In an earlier draft, I considered the 2001 cross-section. The release of the 2004 data in March 2006 has allowed me to take a longer time span in considering the impact of the euro on bond portfolios.

[10]For instance, the German survey did not cover holdings by households.

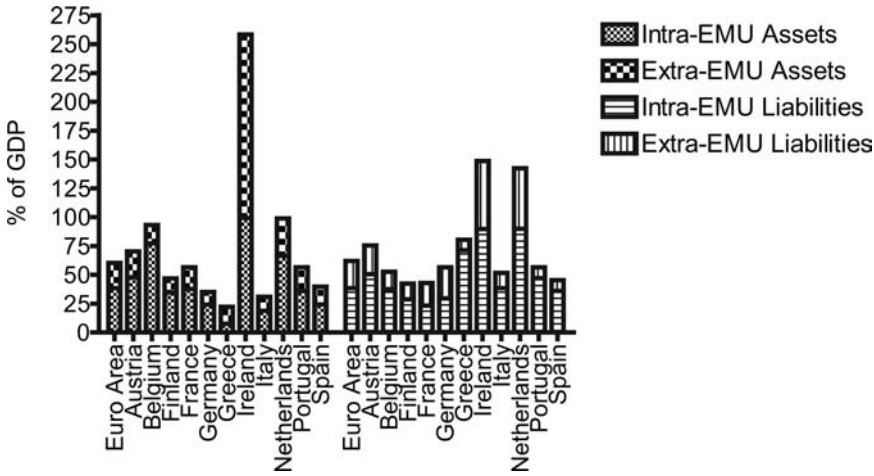
[11]See the analysis in Geis, Mehl, and Wredenborg (2004). Even for those countries that do report the breakdown across the major currencies, these data are provided only in the aggregate, rather than on a destination-by-destination basis.

It is also important to understand that the CPIS reports only aggregate holdings. It does not provide the decomposition in terms of whether securities are issued (or held) by public or private institutions and/or the relative holdings of individual investors versus financial intermediaries. Moreover, it does not give details as to the "age profile" of the holdings in terms of whether particular assets were recently acquired or have been held for a long time. For these reasons, the CPIS, while useful, by no means provides a complete profile of the investor base in international bond markets.

3.2 Broad Patterns

I begin in figure 1 by looking at the total international bond holdings of EMU member countries at the end of 2004.[12] The euro-area aggregate holdings amount to $5.7 trillion in cross-border assets, or 60.3 percent of GDP. Of these, 63.8 percent are invested in

Figure 1. International Bond Holdings of EMU Member Countries: End of 2004



Source: Author's calculations, based on CPIS data.

[12]Throughout the paper, we focus on the data for long-term debt securities. The CPIS does provide some information on short-term debt securities, but there are many more missing observations for this category.

other member countries, with extra-EMU bond holdings representing $2.1 trillion, or 22 percent of GDP. Of the individual countries, figure 1 does not include Luxembourg. Its cross-border bond holdings amount to 2,733 percent of its GDP, with the distribution between intra- and extra-area destinations similar to that for the aggregate. Clearly, this extraordinarily large bond portfolio reflects Luxembourg's status as a major financial center for European asset management and also highlights that a major proportion of these holdings have not been traced back to the end investor. Albeit to a lesser extent, Ireland also shows up as a major financial center, with a bond portfolio valued at 258 percent of its GDP.[13] At the other end of the distribution, Greece has by far the lowest ratio of international bond assets to GDP at 22.3 percent, with most of the other countries in the 30–60 percent range. Another noteworthy feature is that only Greece and Ireland devote more than 50 percent of their portfolios to territories outside the euro area, with the other countries exhibiting much higher levels of euro-area bias in the allocation of their international bond holdings.

In terms of external destinations, the United States and the United Kingdom are by far the two most popular individual destinations, although there is considerable heterogeneity across the member countries. With respect to external bond liabilities, Japan is the single biggest bond investor in the euro area, with the United Kingdom a close second and the United States and Switzerland also significant sources of total inward investment into the euro area. In the next section, I attempt to tease out some of the determinants of these various patterns in the relations between the euro area and global bond markets.

4. EMU and Cross-Border Bond Portfolios

I begin this section by analyzing whether a euro-area bias is evident in the data. Subsequently, I investigate the external bond holdings of the euro area, in order to establish whether there are systematic

[13]Ireland set up the International Financial Services Center (IFSC) in 1987, which has attracted many international firms to establish both back-end and front-end asset management operations there.

differences in the external bond portfolios (of assets and liabilities) of the individual EMU member countries.

4.1 Do EMU Member Countries Invest Disproportionately in Each Other?

Do EMU member countries invest disproportionately in each other? To address this question, I consider a sample of source countries that includes eleven EMU member countries and eleven other high-income countries from outside the euro area, to form a sample of twenty-two source countries.[14] By contrasting the behavior of members and similar nonmembers, I can investigate whether a country pair where both are members of the euro area has a different investment pattern than other country pairs.

The general specification is

$$\log(BOND_{ij}) = \phi_i + \phi_j + \rho EURO_{ij} + \gamma \log(IMP_{ij}) + \beta Z_{ij} + \varepsilon_{ij}$$
$$i = \{HIGH - INC\}, \tag{1}$$

where the dependent variable is the level of source-country j's bond holdings in host-country i. I include a pairwise dummy $EURO_{ij}$ that takes the value of 1 if both the source and host countries are members of the euro area and 0 otherwise. To the extent that the various control variables capture the natural variation in bilateral bond investment patterns, the pairwise *EURO* dummy variable will measure the impact of joint membership of the euro area "over and above" the other linkages that tie together the various pairings among EMU member countries. The inclusion of country dummies for each source and host country means that I control for all characteristics that determine a country's general propensity to invest externally and to be a recipient of inward investment, respectively (see Lane and Milesi-Ferretti 2004 for an extended discussion of this

[14] The eleven nonmember countries I consider are the United States, the United Kingdom, Denmark, Sweden, Switzerland, Norway, Japan, Canada, Iceland, Australia, and New Zealand. These countries are advanced economies that are structurally similar to the EMU member countries and, as such, form a natural comparator group. Luxembourg is excluded as a source country due to its special status as an offshore center.

specification).[15] As such, I rather seek to explain portfolio asymmetries: why does country A disproportionately invest in destination X, whereas country B relatively overweights destination Y?

The inclusion of double fixed effects means that the list of regressors is confined to bilateral variables that vary across country pairs (i, j). In addition to the volume of imports, I consider in a range of specifications a set of other variables that may proxy for informational linkages, the scope for diversification, and institutional similarities between country pairs. Finally, since there are a large number of zero or small-value bilateral holdings in the data (in terms of bond holdings in the smaller developing countries), I restrict attention to positions in excess of $1 million.[16]

I also provide some time-series evidence on this question by looking at changes in portfolio allocation between 1997 and 2004. The number of investor countries is reduced, since the 1997 survey covered a smaller number of countries. From this high-income group, two EMU members (Germany and Greece) and one important nonmember (Switzerland) are excluded.[17] Table 1 shows the growth in foreign bond holdings for each member country between 1997 and 2004. In most cases, the growth in holdings in other member countries far exceeds the growth in the aggregate portfolio. The differential is especially striking for Finland, Italy, and Spain.

In order to conduct a more formal investigation, I adopt the specification

$$\Delta \log(BOND_{ij}) = \phi_i + \phi_j + \rho EURO_{ij} + \gamma \Delta \log(IMP_{ij}) + \beta_1 \Delta Z^1_{ij} + \beta_2 Z^2_{ij} + \varepsilon_{ij} \qquad i = \{HIGH - INC\}, \tag{2}$$

where Z^1 is a set of regressors that are entered in first differences and Z^2 are entered in levels.[18]

[15] If the set of source countries was restricted to just the euro-area members, a *EURO* dummy could only be included by dropping the double-fixed-effects specification and employing a panel version of the specification similar to equation (3) below. It turns out that a *EURO* dummy is highly significant in such a specification. However, since it is not possible to include source- and host-country dummies, this alternative approach cannot rule out that omitted factors correlated with EMU membership are responsible for its significance.

[16] However, results are very similar if I include these data points.

[17] These countries are still included as host countries in the survey.

[18] I still include the double fixed effects in this specification.

Table 1. Changes in Holdings for EMU Member Countries: 1997 to 2004

	World	Euro Area
Austria	417.2	654.8
Belgium	278.8	425.6
France	461.8	729.8
Italy	202.6	835.8
Netherlands	394.8	385.6
Finland	1,013.1	2,771.9
Ireland	694.5	617.7
Portugal	568.9	883.2
Spain	1,495.5	3,425.1

Note: This table shows the percentage of growth in each country's international bond holdings: aggregate and in other euro-area countries.

The empirical results are shown in table 2. Columns 1–3 report levels specifications, while the findings from the differences specifications are displayed in columns 4–6.[19] In column 1, I just include the *EURO* dummy as the sole bilateral regressor (in addition to the fixed source- and host-country dummies). The dummy variable is highly significant, both statistically and economically. This basic specification suggests that the level of cross-border bond investment between two members of the euro area is 426 percent higher than between any other country pair in the sample.

In column 2, I include those bilateral variables that are most plausibly correlated with the joint membership of the euro area: the volume of bilateral imports, the level of bilateral exchange rate volatility, and joint membership in the European Union. In addition, I include some popular gravity-type variables: distance, a colonial dummy, a border dummy, and a common language dummy. I also add the correlation of output growth rates between the source and host countries and a tax treaty dummy to the specification. The former is intended to capture the scope for bilateral risk diversification, to the extent that output growth is a good proxy for bond returns.[20]

[19] Due to its offshoring role, I exclude Luxembourg from this exercise.

[20] See Chen (1991) and Ilmanen (1995). Data on bond returns are only available for a fairly small subset of the countries in the sample.

Table 2. Is there a Euro Bias?

	(1) Level	(2) Level	(3) Level	(4) Diff.	(5) Diff.	(6) Diff.
EURO Dummy	1.66 (9.9)***	1.21 (5.93)***	1.19 (5.99)***	0.68 (3.6)***	0.58 (2.15)**	0.77 (2.68)***
Log(Imports)		0.17 (2.99)***	0.27 (3.55)***		0.07 (1.88)*	0.11 (2.87)***
VOL(ER)		−0.1 (1.41)	−0.12 (1.66)		−0.22 (2.45)**	−0.13 (1.27)
EU Dummy		−0.37 (1.65)	0.29 (1.23)		−0.32 (1.14)	0.19 (.62)
Border		−0.23 (1.16)	−0.18 (1.08)		−0.23 (.98)	−0.02 (.08)
Log(Distance)		−0.59 (5.04)***	−0.24 (1.91)*		0.05 (.48)	0.27 (2.28)**
Colony		0.09 (.5)	0.16 (.85)		−0.11 (.46)	−0.21 (.76)
Common Language		0.29 (1.85)*	−0.005 (.03)		0.18 (.9)	−0.13 (.55)
Correl (Growth Rates)		−0.14 (.76)	0.35 (1.56)		−0.32 (1.21)	−0.33 (1.09)
Tax Treaty		0.33 (2.39)**	0.39 (2.25)**		0.37 (1.77)*	0.4 (1.68)*
Common Legal Origin			0.39 (3.3)***			0.31 (2.16)**
Number of Observations	1,230	1,108	716	764	701	526
Number of Sources	22	22	21	19	19	18
Number of Destinations	114	100	48	95	88	48
Adj R2	0.81	0.85	87	0.29	0.46	0.49
Marginal R2	0.05	0.21	0.33	0.02	0.06	0.10

Note: Estimation is by pooled least squares, with double fixed effects. Heteroskedasticity-corrected t-statistics are in parentheses. ***, **, and * refer to 1, 5, and 10 percent significance levels, respectively. Marginal R2 is the explanatory power of the bilateral variables in explaining the residuals from an "only fixed effects" regression. See appendix 2 for the definitions and data sources for the variables.

Despite the inclusion of these controls, the *EURO* dummy remains highly significant. In terms of magnitude, it now implies a 235 percent euro bonus in terms of bilateral bond investment. The fact that the *EURO* dummy remains significant even with the inclusion of these regressors indicates that the effect is not simply attributable to the elimination of exchange rate volatility among the member countries, the high level of intra-EMU trade, or common membership in the EU.

In turn, this indicates that the explanation for the euro effect lies in the institutional impact of EMU in terms of the unification of the euro-area bond market and the importance of "truly zero" currency risk in determining the composition of bond portfolios. At one level, EMU acts to reduce transactions costs due to the greater liquidity of the unified market and the elimination of currency conversion and hedging costs. At another level, EMU has altered the basic properties of the bonds issued by governments and corporations in the member countries; these now are much closer substitutes due to the absence of currency risk.

Finally, at the cost of a major reduction in sample size (in effect, the set of host countries now comprises only major industrial and middle-income countries), I include a dummy variable for "common legal origin" in column 3. This variable is intended to capture a basic level of institutional similarity between the source and host countries and has been found to have some explanatory power for bilateral patterns in equity investments (see Lane and Milesi-Ferretti 2004). Although the estimated coefficient for the *EURO* dummy does fall in value in column 3, it still indicates that cross-border bond investment is 229 percent larger among euro-area member countries than among other country pairs.

With respect to the other explanatory variables, the level of imports and distance are highly significant in both columns 2 and 3. As was discussed in section 2, there are multiple hypotheses as to why portfolio holdings are skewed toward trading partners and geographically proximate destinations. Regarding the role of trade, this may reflect an optimal risk-diversification strategy; alternatively, trade in goods may also be a good information vehicle. Regarding distance, this also has an information interpretation but may also proxy for institutional similarity or lower transactions

costs. Further research is required to discriminate between these various hypotheses.

The other individually significant regressors are colonial relationship (positive) and common language (positive). Each of these variables has the expected sign. In addition, the common legal origin variable is highly significant in column 3, indicating that institutional similarity may be important in determining bilateral holdings. The border variable is now also significant, albeit with a negative sign. However, the colonial and common language dummies are not individually significant in this smaller sample, perhaps suggesting that these variables are more relevant in explaining allocations across less-advanced economies that are not included in this smaller sample.

I turn to the time-series evidence in columns 4–6 by looking at changes in portfolio allocation between 1997 and 2004. As mentioned before, the number of investor countries is reduced, since the 1997 survey covered a smaller number of countries. From this high-income group, two EMU members (Germany and Greece) and one important nonmember (Switzerland) are excluded.[21] As previously noted, table 1 shows the growth in foreign bond holdings for each member country between 1997 and 2004. In most cases, the growth in holdings in other member countries far exceeds the growth in the aggregate portfolio: the differential is especially striking for Finland, Italy, and Spain.

The basic specification that is reported in column 4 of table 2 shows that bond holdings indeed grew significantly more quickly between members of the euro area than between other country pairs: the estimated coefficient indicates intra-EMU bilateral holdings grew by an additional 97 percent. It turns out that the inclusion of the other regressors in columns 5 and 6 only slightly reduces the estimated coefficient, with the estimated magnitude in the range of [79, 116] percent.

With regard to the control variables, the growth in imports and the tax treaty dummy are also significantly positive in both columns 5 and 6. The only other individually significant results are that exchange rate volatility reduces holdings in column 5, while those countries that are farther apart and those that share a common

[21] These countries are still included as host countries in the survey.

legal origin experienced faster growth in bilateral bond holdings in the specification in column 6. Taken together with its negative sign in the levels specifications, the positive sign on distance in the differences regression suggests that the propensity to invest in closer destinations is weakening over time.

Overall, the results in table 2 strongly indicate that the extent of bilateral financial integration is stronger between EMU member countries than between other country pairs. Of course, this finding requires more extensive testing by exploring other specifications and econometric techniques, but these initial steps establish a benchmark for such future empirical investigations.[22]

4.2 What Drives Variation in the External Bond Portfolios of Individual Member Countries?

In this subsection, I explore heterogeneity across euro-area members in terms of their external bond holdings. The exposure of member countries to external country risk is asymmetric to the extent that such heterogeneities are important. As in table 2, I again employ the double-fixed-effects specification

$$\log(BOND_{ij}) = \phi_i + \phi_j + \gamma \log(IMP_{ij}) + \beta Z_{ij} + \varepsilon_{ij} \quad i \in \{EMU\}, \tag{3}$$

where the set of source countries is restricted to members of the euro area, and the set of host countries now includes only destinations outside the euro area.[23] The results are reported in columns 1–3 of table 3.

I begin in column 1 by including just imports as a bilateral regressor. This variable is highly significant: the greater the import

[22] As one robustness check, I entered distance in a nonlinear (quadratic) format. This was done in view of the close geographic proximity of EMU member countries (relative to other country pairs). In general, the results are very similar for the *EURO* dummy.

[23] I exclude Luxembourg as a source country, in view of its predominant role as an offshore center. The external investment pattern for Luxembourg-associated holdings is reasonably similar to the euro-area average, with the exception that a lower weight is attached to the United Kingdom and a higher weight to "other Europe." The results are also essentially unchanged if Ireland (the other main euro-area offshore center) is excluded.

Table 3. Heterogeneity in the External Bond Portfolios of EMU Member Countries

	(1) Out	(2) Out	(3) Out	(4) In	(5) In	(6) In
Log(Imports)	0.57 (13.0)***	0.63 (11.6)***	0.71 (7.55)***	−0.05 (.49)	0.01 (.07)	0.14 (.95)
Log(Distance)		−0.03 (.35)	−0.14 (1.02)		−0.32 (.71)	−0.35 (.63)
Colony		−1.84 (3.95)***	−0.85 (1.63)		−1.31 (1.07)	−0.91 (.79)
Common Language		1.12 (3.35)***	0.67 (1.59)		−0.55 (1.13)	0.35 (.63)
Correl (Growth Rates)		0.5 (1.57)	1.09 (2.42)**		0.95 (1.27)	0.67 (.8)
Tax Treaty		0.84 (3.51)***	0.79 (2.28)**		−0.79 (1.9)*	−0.77 (1.83)*
Common Legal Origin			−0.08 (.3)			0.07 (.22)
Number of Observations	592	539	292	402	372	287
Number of Sources	11	11	11	51	48	38
Number of Destinations	99	90	36	11	11	11
Adj R2	0.27	0.41	0.43	0.52	0.55	0.55
Marginal R2	0.15	0.29	0.10	0.81	0.83	0.84

Note: Estimation is by pooled least squares, with double fixed effects. Heteroskedasticity-corrected t-statistics are in parentheses. ***, **, and * refer to 1, 5, and 10 percent significance levels, respectively. Marginal R2 is the explanatory power of the bilateral variables in explaining the residuals from an "only fixed effects" regression. See appendix 2 for the definitions and data sources for the variables.

dependence of a member country on a given external destination, the greater the level of bond holdings in that country. I expand the specification to include some gravity-type variables, plus the correlation in growth rates and the tax treaty dummy in column 2. Finally, again at the cost of a major reduction in sample size, I include a

dummy variable for common legal origin in column 3. The imports variable remains highly significant in these broader specifications, and its magnitude slightly increases to [88, 103] percent. It is important to emphasize that the import variable is largely unaffected by the inclusion of these gravity variables, despite their importance in explaining bilateral trade patterns. This suggests that the volume of trade per se is important in determining bond investment patterns, as opposed to imports merely proxying for these other informational variables.

Among the other explanatory variables, the tax treaty dummy is significantly positive in both columns 2 and 3. Again, this is best interpreted as an indicator of institutional similarity. The colonial dummy is significantly negative and the common language dummy significantly positive in column 2. Their loss of significance in column 3 may be explained by the greater importance of these variables in explaining allocations to developing-country destinations that are featured more heavily in the sample in column 2 than in column 3.[24] Distance is not significant: since the euro-area countries are close to one another, differences in the distances to particular external partners are relatively small, such that this variable may not have much marginal explanatory power. The fact that the correlation in growth rates enters in a significantly positive manner is, on the surface, puzzling—a diversification motive should point to lower allocations to those countries that share a business cycle with the home country.[25]

4.3 External Bond Investment in EMU Member Countries: Sources of Heterogeneity

In columns 4–6 of table 3, I examine which bilateral factors are important in determining asymmetries in the distribution of inward

[24]The colonial dummy actually enters with a negative sign. Its loss of significance in column 3 may also be related to the inclusion of the common legal origin dummy, which is highly correlated with the colonial dummy.

[25]As noted earlier, we have inadequate data on bond returns to study in more detail the relation between the co-movements in bond returns and allocations. In related work, Couerdacier and Guibaud (2005) argue that the apparent positive association between the bilateral co-movements in equity returns and bilateral equity holdings can be explained by reverse causation: an increase in bilateral portfolio holdings in equilibrium raises the correlation in equity returns.

investment across the individual member countries of the euro area. For this purpose, I again use a double-fixed-effects specification:

$$\log(BOND_{ij}) = \phi_i + \phi_j + \gamma \log(IMP_{ij}) + \beta Z_{ij} + \varepsilon_{ij} \quad j \in \{EMU\}. \tag{4}$$

Here, the set of source countries is restricted to nonmembers of EMU, and the set of host countries now includes only member countries.[26]

As before, I start in column 4 by just including imports as a regressor. Similarly to columns 2 and 3, I then expand the specifications in columns 5 and 6 to include a larger number of regressors, with an attendant reduction in sample size.

The only variable that turns out to be individually significant is the tax treaty dummy. In contrast to the pattern for the outward portfolio allocations of the EMU member countries, a tax treaty exerts a negative effect on the level of inward bond investment from a nonmember country to a member country, such that the tax treaty seems to have a highly asymmetric impact. The most sensible interpretation of the lack of significant variables in these specifications is that the bonds issued by EMU member countries are viewed as very close substitutes by external investors.

5. Conclusions

This paper has exploited the International Monetary Fund's Coordinated Portfolio Investment Survey to build a profile of the euro area as both a source and destination for international bond investment. I have documented the importance of the aggregate euro area in global bond markets but highlighted that there are substantial asymmetries in the external patterns of outward and inward investment with respect to the individual member countries.

My results are strongly indicative that EMU has had a substantial impact on global bond portfolios. In both levels and differences, cross-investment among euro-area members is substantially greater than among other country pairs, even controlling for other characteristics that may generate strong investment linkages across the euro area.

[26]I exclude Luxembourg as a host country.

In terms of understanding the sources of the euro bias, more research is required. In contrast to the literature that investigates the impact of EMU on trade in goods, there are two factors at work in terms of its impact on bond trade that are not easily separated: EMU both reduces bilateral trading costs and, by fundamentally altering the risk and payoff profiles of the bonds issued by the individual member countries, also changes the elasticity of substitution between these bonds.[27]

A second message from my empirical work is that there are asymmetries across member countries in terms of the bilateral composition of their bond assets. Another extension of this line of research is to push the analysis further by examining the extent to which the observed asymmetries in portfolios across euro-area members and between the euro area and the rest of the world materially contributes to asymmetries in wealth dynamics across these countries and regions. In this regard, the Argentina default provided an interesting localized example (Italian retail investors were among the main European financial casualties in that episode.) However, in the event of a more widespread crisis in international financial markets, such asymmetries may pose a more serious problem at both the European and global levels in terms of the optimal design of policy responses.

Finally, another direction for future research is to understand the implications for EMU for asset pricing and the degree of financial development. A unified market for euro-denominated securities with lower transactions costs raises the value of these assets, reducing required yields and the cost of capital.[28] In addition, an increase in cross-holdings increases the correlation in returns across countries, altering the international transmission mechanism for financial shocks. Accordingly, the macroeconomic and financial impact of greater financial integration within the euro area (and between the

[27]See Lane (2006) for an overview of the impact of EMU on goods trade. Anderson and van Wincoop (2004) provide a general survey of the impact of shifts in trading costs on the volume of goods trade; this relation turns on the elasticity of substitution between home and foreign goods (which is typically assumed to be a fixed parameter). Martin and Rey (2004) study the impact of a reduction in cross-border trading costs on asset trade but, again, take the elasticity of substitution between assets to be fixed.

[28]See, for example, Martin and Rey (2000, 2004).

euro area and the rest of the world) presents an exciting research agenda for economists.

Appendix 1. Countries and Regions Participating in the Coordinated Portfolio Investment Survey

Argentina, Aruba, Australia, Austria, the Bahamas, Bahrain, Belgium, Bermuda, Brazil, Bulgaria, Canada, Cayman Islands, Chile, Colombia, Costa Rica, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Guernsey, Hong Kong SAR of China, Hungary, Iceland, Indonesia, Ireland, Isle of Man, Israel, Italy, Japan, Jersey, Kazakhstan, Republic of Korea, Lebanon, Luxembourg, Macao SAR of China, Malaysia, Malta, Mauritius, Netherlands, Netherlands Antilles, New Zealand, Norway, Panama, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovak Republic, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom, United States, Uruguay, Vanuatu, Venezuela.

Appendix 2. Data Sources

This paper largely draws upon the data bank constructed by Lane and Milesi-Ferretti (2004). Other data sources include the following:

Long-Term Debt Securities: Issued by host-country residents and held by source-country residents. Source: 2004 Coordinated Portfolio Investment Survey.

Source-Country Imports: Imports of goods by source countries from host countries. Source: International Monetary Fund, Direction of Trade Statistics.

Distance: The logarithm of Great Circle distance in miles between the capital cities of the source and host countries. Source: Rose and Spiegel (2004).

Correlation in Growth Rates: The correlation between the GDP growth rate in the source and host countries. Source: Author's calculations based on World Bank, World Development Indicators.

Common Legal Origin: A dummy variable that takes the value of 1 if the source and host countries have a legal system with a common origin (common law, French, German, or Scandinavian).

Source: Author's elaborations based on La Porta, López de Silanes, and Shleifer (2006).

Exchange Rate Volatility: Exchange rate data are from *International Financial Statistics*. Exchange rate volatility is measured as the standard deviation of the monthly log difference in the bilateral nominal exchange rate over 1994–97 and 1999–2004.

Tax Treaty: A dummy variable that takes the value of 1 if the source and host countries have a tax treaty enacted prior to 1999. Source: Lane and Milesi-Ferretti (2004), based on treaty data taken from www.unctad.org.

Common Language: A dummy variable that takes the value of 1 if the source and host countries share a common language. Source: Rose and Spiegel (2004).

Colony Dummy: A dummy variable that takes the value of 1 if the source and host countries ever had a colonial relationship. Source: Rose and Spiegel (2004).

EURO Dummy: A dummy variable that takes the value of 1 if the source and host countries are both members of the euro area.

EU Dummy: A dummy variable that takes the value of 1 if the source and host countries are both members of the European Union.

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