The European Union, the Euro, and Equity Market Integration

Geert Bekaert
Columbia University, New York, NY 10027 USA
National Bureau of Economic Research, Cambridge, MA 02138 USA

Campbell R. Harvey
Duke University, Durham, NC 27708 USA
National Bureau of Economic Research, Cambridge, MA 02138 USA

Christian T. Lundblad
University of North Carolina, Chapel Hill, NC 27599 USA

Stephan Siegel*
University of Washington, Seattle, WA 98195 USA

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Abstract

At a time of historic challenges to the viability of the Eurozone, we assess the contribution of the EU and the Euro to equity market integration in Europe. We use a simple and essentially model free measure of bilateral market segmentation: two countries are segmented if there is a wide divergence in the valuations of their industries. We first establish that segmentation is significantly lower for EU versus non-EU members. Bilateral valuation differentials remain lower for EU members even after we control for several possible channels of integration, such as bilateral trade, direct investment positions, financial regulation, and interest rate differences. Importantly, we find that EU membership reduces equity market segmentation between member countries whether or not members have also adopted the Euro. The Euro adoption as well as the anticipation of the Euro adoption has minimal effects on market integration.

1 Introduction

No region in the world has done more to integrate its economies than the European countries, where the European Union (EU, henceforth) set out after World War II to free the movement of goods and services, capital, and labor. Not surprisingly, a large literature has attempted to assess the degree to which the European Union did or did not succeed in integrating markets across member countries. While Krueger (2000) finds that labor mobility among member countries has not significantly increased after the elimination of the remaining restrictions in 1993, Nicoletti, Haffner, Nickell, Scarpetta and Zoega (2001) document that goods prices, especially for tradables, are more similar within the EU than among other OECD countries. Blanchard and Giavazzi (2002) argue that increased trade and cross-border investment among EU member countries have weakened the association between national savings and investments more among EU and in particular Euro member countries than among other OECD countries.

Many financial economists have examined to which extent European debt and equity markets have become more integrated (see Baele, Ferrando, Hordahl, Krylova and Monnet (2004) for a survey of the literature). Yield spreads are the dominant metric to gauge the integration of debt markets, but measuring equity market integration is more challenging. Most of the existing research uses equity returns to measure the relative importance of an EU return factor (e.g. Hardouvelis, Malliaropulos and Priestley, 2006), dispersion or correlations trends (e.g. Adjaouté and Danthine, 2004), or the degree of news and volatility spill-overs among EU countries (see, for example, Baele, 2005; Fratzscher, 2002). A few studies also investigate quantity based measures, for example documenting the degree of home bias over time (for example Jappelli and Pagano, 2008).

We offer a different approach. We use stock market valuations of industry portfolios in different countries to assess the degree of bilateral integration in Europe and the impact of the EU. Stock market valuations reflect financial integration through their impact on discount rates as well as economic integration through their impact on capitalized growth opportunities. As we argue below, integration should lead to "valuation convergence" of

similar firms across different countries.

In contrast to existing studies on equity market integration, our method is essentially model-free, only requiring valuation ratios and therefore avoiding the joint hypothesis problem plaguing extant studies using equity return data. Valuation ratios also are much less volatile than equity returns allowing more powerful statistical tests. Our actual measurement focuses on the earnings yield, the inverse of the price-earnings ratio, which is easily interpreted in economic terms.

We establish that EU membership reduced average bilateral earnings yield differentials, with our estimates ranging from 60 basis points to as much as 330 basis points. This is a large change in valuation differences. Using the simple intuition of a Gordon model, a two percentage point change in the absolute valuation differential corresponds to a two percentage point change in the difference of the cost of capital or in the expected earnings growth rate, or a combination of the two.

This convergence happened against the backdrop of a global integration process that led to valuation convergence across the world (see Bekaert, Harvey, Lundblad and Siegel, 2010). Our analysis identifies the effect of EU membership above and beyond a general trend of global convergence. We also compare valuation differences in Europe with valuation differences computed from randomized U.S. portfolios, matched by industry composition and the number of firms per industry-country pair to our European data. We find that average bilateral valuation differentials within Europe are still significantly above the levels observed in U.S. data. But conditioning on EU membership, European valuation differentials become indistinguishable from those observed in U.S. data in 2000.

Of course, EU membership is not exogenous; country characteristics that increase the likelihood of early EU membership, such as economic and institutional development, may well be correlated with a higher propensity to integrate with other member countries. While it is very difficult to establish causality, the result of an independent EU effect is remarkably robust. It survives in a difference-in-difference specification that controls for country-pair and year fixed effects. It also survives and becomes even stronger in an instrumental variables regression, where we use the distance to Brussels as an instrument for EU membership. Many of the institutions of the EU are established in Brussels and a larger distance from Brussels

slows down EU ascension.

While much of the literature has stressed the effects of the introduction of the Euro on integration in Europe, we find only small and rather non robust effects of the Euro introduction on valuation differentials. Moreover, the EU effect is unchanged when the Euro introduction is added as an independent variable. We use our framework also to reflect on the potential EU membership of Turkey.

The remainder of the paper is organized as follows. In Section 2, we present our segmentation measure and characterize its evolution over time. Because the segmentation measure may be affected by temporary fluctuations in valuations and is bounded from below by zero, we establish a benchmark using randomized U.S. portfolios. Section 3 sets out our main regression framework and establishes the main results. In Section 4, we consider potential channels through which EU membership may have affected valuation differentials, examining among others, trade, FDI, regulation, financial development and differences in real interest rates. The final section offers some concluding remarks.

2 Equity Market Integration through a Valuation Lens

2.1 A market segmentation measure

The famous Gordon model assumes that the discount rate, r, is constant and expected earnings grow at a constant rate, g. If a firm pays out all earnings every year, its earnings yield simply is $r - g$. Hence, in this simple model, discount rates and growth opportunities are linearly related to the earnings yields. To come up with aggregate measures, suppose that systematic risk is industry rather than firm specific, as typically assumed in capital budgeting. Financial market integration then equalizes "industry betas" as well as risk premia across countries. Furthermore, assume that in economically integrated countries persistent growth opportunities are mostly industry rather than country specific or at least rapidly transmitted across countries. It then follows that market integration should cause valuation differentials between industries in different countries to converge. We build on this intuition to create bilateral valuation differentials that serve as our segmentation measure. Specifically, let $EY_{i,k,t}$ denote industry k's earnings yield in country i and $EY_{j,k,t}$ the corresponding

value for the same industry k in country j. Our main variable of analysis is the absolute value of the difference between the two industry valuations, $|EY_{i,k,t} - EY_{j,k,t}|$. The weighted sum of these bilateral industry valuation differentials is our measure of the degree of effective or *de facto* equity market segmentation between these two countries:

$$SEG_{i,j,t} = \sum_{k=1}^{N} IW_{i,j,k,t} |EY_{i,k,t} - EY_{j,k,t}|, \tag{1}$$

where $IW_{i,j,k,t}$ is the relative market capitalization of industry k and N is the number of industries. The relative market capitalization of a given industry is calculated as the combined market capitalization of the industry in both countries divided by the combined market capitalization of all industries in both countries. With this weighting scheme the industry structure of the country with the larger equity market has more influence on the segmentation measure.

Note that our measure requires nothing more than industry-level valuation ratios which are observed at every point in time. This contrasts with the standard approach in the international finance literature that employs *estimated* measures of segmentation based on, for example, the evolution of equity return correlations or systematic risk exposures (e.g., world market portfolio betas); see Bekaert, Hodrick and Zhang (2009) and the references therein. However, the construction of such measures requires both historical data and a particular estimation methodology. Furthermore, the interpretation of these measures often requires a formal international asset pricing model, about which there is little consensus.

Bekaert et al. (2010) provide a formal derivation of an analogous segmentation measure, comparing local with global industry valuations. They show that this segmentation measure can be biased by country-industry differences in leverage and in earnings growth and discount rate volatilities. In addition, the number of firms in a particular industry should affect the accuracy of the measure. Finally, the level of the market earnings yield itself may affect the observed segmentation level, as absolute differences would tend to decrease as earnings yields themselves becomes smaller. However, it is straightforward to control for these biases in a regression analysis, which is what we do in this article.

2.2 A first look at equity market segmentation in Europe

We construct our measure of bilateral valuation differentials, SEG, for a sample of 33 European countries listed in Appendix Table 1, using monthly firm-level data from Datastream from 1980 to 2007. While we construct monthly SEG measures, most of our subsequent analysis is at the annual frequency given the availability of other variables. We identify all local equity securities in these countries covered by Datastream and traded on a public exchange. Depository receipts as well as preferred stocks are excluded, as are securities whose International Securities Identification Number (ISIN) is not local. We then obtain monthly earnings yield, market capitalization (in USD) as well as USD return data. Datastream generally reports trailing 12-month earnings yields, where negative yields are set to zero. In addition, we delete earnings yields that are larger than one. Using Datastream's industry classification system,[1] we form 38 value-weighted industry portfolios for all countries. For each country-pair, we compute $SEG_{i,j,t}$ as described in (1). Since our panel data set is unbalanced, the number of country-pairs is growing over time, reaching the maximum of 521 country-pairs in 2006. Finally, to avoid the influence of possibly mis-measured cross-sectional outliers, we delete observations with a segmentation measure equal to or larger than the 99th percentile in a given year.

Figure 1, Panel A presents the time-series of valuation differentials averaged across all EU country-pairs as well as across non-EU pairs, where a country-pair is classified as an EU country-pair if at that time both countries are EU members, otherwise a pair is classified as a non-EU pair. While noisy at the beginning of our sample period, between 1985 and 2007 segmentation has consistently been more pronounced for non-EU country pairs, on average by about 1.8 percentage points. This time pattern corresponds closely to the efforts of the European Union since 1983 with respect to capital account liberalization (completed in 1992) and the harmonization of capital market regulation (still ongoing). With the emergence of Eastern European countries in the 1990s, the composition of initially non-EU pairs and later also EU pairs changed substantially. Panel B therefore presents absolute valuation

[1]Datastream employs the Industry Classification Benchmark (ICB) framework. For a list of the 38 industries used in our study, see Appendix Table 2. The industry is determined by the source of a firm's revenue or the source of the majority of its revenue. Firms that are not classified as one of these 38 industries are excluded from our study.

differentials excluding all Eastern European countries. The graph suggests that indeed some of the observed segmentation is due to the presence of Eastern European countries. However, even after excluding those, valuation differentials are still on average one percentage point lower for EU members than for non members between 1985 and 2007.[2]

While we observe a downward trend in bilateral segmentation, we do not expect that our measure of bilateral valuation differentials will be zero even under the null of full economic and financial integration. In order to provide an empirically meaningful benchmark, we use U.S. equity market data to measure the average level of segmentation for fictitious country-pairs that mimic our European pairs, but exclusively reflect U.S. valuations. To the extent that the U.S. is financially and economically integrated, this experiment provides us with a benchmark to judge whether European country-pairs are segmented or not. In particular, we identify all U.S. stocks that are covered by CRSP and Compustat. We obtain four quarter trailing earnings from Compustat and combine these with firm-level equity market capitalization from CRSP to calculate firm-level earnings yields.[3] As in our European data set, we set negative earning yields to zero and earnings yields larger than unity to missing. Next, we use these U.S. data to form country-industry portfolios by randomly drawing firms from the U.S. data set, mimicking the number of firms found in a given country-industry portfolio in a given year in our European data. We draw from the U.S. sample with replacement, as the total number of European firms per industry can be larger than the total number of available U.S. firms.[4] We then use these U.S. data based country-industry portfolios to calculate bilateral segmentation measures as described above. We repeat this process 500 times and thus obtain a distribution of the average level of bilateral segmentation to which we can compare the actual level of segmentation observed in Europe as well as in

[2]In the robustness section of our regression analysis, Section 3.3, we verify that using a balanced sample for the period 1990 to 2007 we find a significantly negative EU effect of -135 basis points in a difference-in difference estimation.

[3]In particular, we obtain "Income Before Extraordinary Items" (IBADJQ) for the previous four quarters. We pair these earnings with the market value of all outstanding equity securities at the end of December. We only use earnings data up to the end of September. Using industry information provided by Compustat (GICS and SIC codes), we assign an ICB code to each firm. For about 3% of all observations, we are unable to identify the appropriate ICB code.

[4]In a robustness exercise, we repeat the experiment, but ensure that each country-industry portfolio contains at least one unique firm. In very few cases, this is impossible as the total number of U.S. firms in a given industry is smaller than the number of countries. We find that our results are essentially unchanged.

the European Union.

Figure 2, Panel A shows the average random U.S. benchmark segmentation level from 1980 until 2007, together with a 90% confidence interval. Note that, even though the U.S. is an integrated market, the level of measured segmentation is mostly in the 2 to 3% range. Also shown is the average segmentation level for all European countries. With the exception of 2005, the valuation differentials between European countries are above the 90% confidence interval of valuation differences in the U.S. Panel B of Figure 2 presents the corresponding results conditional on EU membership. In contrast to Panel A, a convergence trend is now apparent. In 2000, the measured segmentation levels across EU countries were similar to those in the U.S. Since then, segmentation has again been larger across EU members than in the U.S. It is important to stress that this does not necessarily mean that EU membership is the cause of integration. For example, a quite plausible alternative hypothesis is that the general movement towards global market integration leads to narrower valuation differential across equity markets in the EU. Nevertheless, this still begs the question of why this convergence is more pronounced for EU countries than for Europe as a whole. In the next section, we use a regression framework to address this question.

3 The EU and equity market integration

3.1 Benchmark empirical model

In this section, we investigate the effect of EU membership on bilateral equity valuation differentials, controlling for several potentially confounding factors. The linear regression model is:

$$SEG_{i,j,t} = a + b_{EU} EU_{i,j,t} + b_X X_{i,j,t} + c_{i,j} + d_t + \epsilon_{i,j,t}, \tag{2}$$

where $EU_{i,j,t}$ is an indicator that is one in year t if both countries are EU members and zero otherwise, $X_{i,j,t}$ represents a set of controls, and $c_{i,j}$ and d_t represent country-pair and year fixed effects. All standard errors are robust to arbitrary correlation over time within country-pairs and across country-pairs within years (see Thompson, 2009; Cameron, Gelbach

and Miller, 2006; Bertrand, Duflo and Mullainathan, 2004).[5] Appendix Table 3 discusses the data source and construction of all variables used in our analysis and Appendix Table 4 provides summary statistics.

Table 1 reports the result of a regression of all country-pair valuation differentials on the EU indicator and different sets of controls. The first specification, with only the EU indicator, shows that absolute valuation differentials are about two percentage points lower for EU member countries. In specification 2, we add as controls the sum of the number of firms from both countries (in natural logs) used to calculate the segmentation measure,[6] the average absolute difference in industry leverage, in industry earnings growth volatility, and in industry return volatility for a given country-pair in a given year. These variables may cause variation in the SEG-measure unrelated to the degree of integration. Specification 2 also includes the average difference in per capita GDP in 1980 or in 1990 for country pairs involving Eastern European countries. It is natural to expect that countries with similar development have similar growth opportunities, and narrower valuation differentials. Given that EU membership is likely correlated with economic development, this is a potentially important control variable. One of the main findings in the home bias literature is that investors tend to invest relatively more in countries that are close by and "familiar" (see Chan, Covrig and Ng, 2005; Portes and Rey, 2005). To control for such familiarity effects, we include the distance between the two countries in a country-pair (measured in 1,000 kilometers between the most important cities) as well as a common language indicator as

[5] Adjusting standard errors for contemporaneous correlation across country-pairs is particularly important given that we use a measure of bilateral segmentation. Country-pairs that share one country, for example Germany and France and France and Italy, are by construction not independent of one another. We account for cross-sectional correlation by calculating the variance of the coefficient estimates as $(W'W)^{-1}(\sum_t W_t'\epsilon_t\epsilon_t'W_t)(W'W)^{-1}$ where W_t is the $N_t \times k$ matrix of all k right hand side variables for all N_t country-pairs in year t. To appreciate the importance of accounting for contemporaneous cross-sectional correlation, consider a regression of the bilateral segmentation measure on the EU indicator (point estimate -0.0080), including country-pair and year fixed effects. Now compare, for the EU indicator, heteroscedasticity robust standard errors (0.0013) to standard errors that account for contemporaneous cross-sectional correlation (0.0033) as well as to standard errors that account for contemporaneous cross-sectional correlation and time-series correlation within country pairs (0.0036). We use standard errors that account for contemporaneous cross-sectional correlation and time-series correlation within country pairs throughout this study.

[6] In unreported results, we consider additional controls related to the number of firms used to calculate the average bilateral industry valuation differential. In particular, we include the minimum as well as the absolute difference of the number of firms averaged across the relevant industries. We find that the estimated effect of joint EU membership is unchanged.

additional controls. Because Eastern European countries are transitioning from the Soviet era to market-based economies over the course of our sample, we include an Eastern Europe indicator that is one if at least one country is in Eastern Europe and zero otherwise. Finally, we must distinguish regional from global integration. We do so by including the earnings yield differential between the "Core European" countries,[7] and the U.S. This differential should capture integration between the U.S. and Europe and could therefore indirectly affect valuation differentials across European countries. We also include the market earnings yield for Core Europe because the variability of earnings yields may be higher at higher yield levels.

The results for specification 2 indicate that adding these controls is important. The R^2 increases from 7 to 19%. Many variables have the expected economic effect and together substantially reduce the absolute magnitude of the EU membership effect to 0.9%. As expected, segmentation is negatively associated with the number of firms, and positively associated with leverage and volatility differences. Economic development differences have no significant effect on segmentation. The distance between two countries has a positive and statistically significant effect, suggesting that an additional 1,000 kilometers in distance increases the valuation differential by 0.4 percentage points. A common language appears to have little effect on valuation differentials. Eastern European countries are on average less integrated, yielding a positive and highly significant coefficient estimate of 1.5%. Finally, as expected, segmentation between European countries is strongly related to segmentation between Europe and the U.S., reflecting the underlying trend of global market integration. The effect is economically important, as for every 1% decrease in global segmentation, intra-European differentials decrease by 1.9%. However, even after controlling for all these factors, the EU indicator remains statistically and economically significant.

In specification 3, we allow for additional, possibly unobservable time effects by including year fixed effects. The EU indicator is further reduced to -0.6% but remains statistically significant, being almost three standard errors from zero. All other coefficients remain largely unchanged.

[7]Namely Belgium, Denmark, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, and the United Kingdom.

While we have attempted to control for factors that might affect bilateral valuation differentials as well as EU membership, it remains possible that additional unobservable characteristics lead to a bias in our coefficient estimates for the EU indicator. To the extent that these unobservable characteristics are time-invariant, we can address the endogeneity concern by including country-pair fixed effects (see Glick and Rose (2002) for a similar application), essentially identifying the change in segmentation due to a change in membership status. In specification 4, we reestimate specification 1 augmented by country-pair fixed effects. Not surprisingly, the R^2 increases dramatically (from 7% to 25%), but the EU effect becomes actually more, not less, important, and is about -2.7%. This strongly suggests that it is the time series variation in the controls that reduces the magnitude of the EU effect, not cross-sectional characteristics of the country-pairs. In specification 5, we again add the controls with time-variation, and the EU effect indeed shrinks to -1.4%, but remains highly significant. In the last specification, we add year fixed effects to the model, which yields a difference-in-difference (DID) estimation. As before, the EU effect further declines to -73 basis points, but remains statistically significant.

In sum, we document a strong EU effect on segmentation levels across Europe, which is robust to country-pair fixed effects, but is reduced in magnitude when we control for time effects.

To interpret our results in economic terms, we only need to refer to the classic Gordon growth model. The earnings yield reflects either the cost of equity capital or expected earnings growth. While we measure absolute differences, EU membership typically reduces earnings yields towards the levels observed for EU members. Hence, our results indicate that EU membership is accompanied with a rather sizable reduction in the cost of capital or an improvement in growth opportunities. It is difficult to compare our findings to other studies of European equity market integration because most studies do not link their findings to cost of capital changes. One exception is an article by Hardouvelis, Malliaropulos and Priestley (2007) that reports a cost of equity decrease between 1 and 2% for several EU countries adopting the Euro, but no significant reduction for EU countries that do not adopt the Euro.

3.2 The EU or the Euro?

Another momentous change in Europe was the introduction of the single currency, the Euro, in 1999. Most, but not all, EU countries adopted the Euro, with some joining later and others, such as the UK and Denmark, still holding off. Because Euro adoption is often viewed as the culmination of the process towards economic and monetary integration within the EU, it is conceivable that our finding that the EU significantly contributed to equity market integration is in fact due to the adoption of the Euro, rather than to EU membership per se.

In fact, there has arguably been more research on the economic effects of Euro adoption than on the economic effects of EU membership. First, with the Euro area constituting a currency union, the vast literature on currency unions is relevant here. While the theoretical literature (Mundell, 1961; Alesina and Barro, 2002) focus on the general economic costs and benefits of currency unions, starting with Rose (2000), most empirical studies have focused on trade effects. While most empirical studies have documented increased bilateral trade associated with currency union membership (see, for example Frankel and Rose, 2002; Glick and Rose, 2002; Persson, 2001; Barro and Tenreyro, 2007), the exact magnitude of the effect is the subject of much debate (see Baldwin (2006) for an excellent survey). Studies focussing on the Euro also fail to agree: Micco, Stein and Ordoñez (2003) document a positive effect of the Euro on bilateral trade, but Santos Silva and Tenreyro (2010) fail to detect an effect. Second, an active literature focuses of the effects of the Euro on product and labor markets. For example, Alesina, Ardagna and Galasso (2008) find that the Euro has been associated with an acceleration of the pace of structural reforms in the product market, but not as much in the labor market. Finally, there are a number of articles focusing on the financial effects of the Euro. Bris, Koskinen and Nilsson (2008) show that corporate valuations have increased in the Euro member countries that previously had weak currencies. They relate the increase to lower interest rates and lower costs of equity. Hardouvelis et al. (2006, 2007) estimate a variant of Bekaert and Harvey's (1995) time-varying degree of integration model, using European equity market data. The first article claims that Euro adoption served to integrate European equity markets. The second article documents the aforementioned cost of

equity decrease of up to 2% in Euro-adopting EU countries between 1992 to 1998. Cappiello, Kadareja and Manganelli (2010) compare equity return comovements between EU member states before and after the introduction of the Euro in January 1999. For many country pairs, especially those that have adopted the Euro, they find an increase in return comovements after 1998.

While it is possible that our results are related to the introduction of the Euro, it is also conceivable that EU membership and the move towards global market integration may have already integrated EU equity markets before the advent of the Euro. By 1999, regional and global market integration may have moved far enough along for the Euro to have only small effects. In addition, *ex ante* we would expect the process of economic market integration to be more important for equity valuations than the adoption of a single currency. This is because currency movements account for only a small part of the total variation in equity returns and the variability of intra-Europe exchange rate changes before 1999 was quite limited.

In Table 2, Panel A, we add a Euro indicator variable to the various specifications from Table 1. The Euro indicator takes on the value of one if both countries in a country-pair are part of the Euro area in a given year and is zero otherwise. In specification 1, where we only include the EU and the Euro indicator, we find that the adoption of the Euro has an independent, but smaller negative effect on valuation differentials than EU membership has. However, when we introduce our control variables (specifications 2 and 3), the Euro effect disappears. In specification 4, country-pair fixed effects are included and the Euro effect remains negative, but once we include country-pair and year fixed effects (specification 5), the Euro effect becomes positive. It appears that it is hard to make a case for a strong Euro effect on market integration within Europe. Importantly, comparing Table 1 to Table 2, the EU effect is not at all impacted by the introduction of the Euro indicator.

It is quite conceivable that some of the effects ascribed to the introduction of the Euro in the literature are simply induced by EU membership. For example, while Hardouvelis et al. (2006) find that the Euro served to integrate equity markets, their model essentially employs nominal interest rate differentials to measure the degree of market integration. That the Euro zone leads to interest rate convergence is beyond dispute, but it seems best not to mix

the measurement of integration in two different asset markets. Moreover, articles studying other aspects of integration have also found that the EU generated larger effects than the Euro. For example, Engel and Rogers (2004) find no tendency for prices to converge after January 1999, but find a significant reduction in price dispersion throughout the decade of the 1990s. Goldberg and Verboven (2005) similarly document substantial price convergence in the EU's car market throughout the nineties, although absolute price differentials persist until the end of their sample in 2000. Hence, the EU, not the Euro, led to the integration of consumer markets.

Note that there may be strong *indirect* effects of the Euro that are related to the original mission of the EU. After all, the Maastricht Treaty drafted in 1991 and officially adopted in November 1993 set out a path of deregulation and rules to culminate in economic and monetary union and the eventual adoption of the Euro. It is possible that some of the EU effects we detect are related to changes only occurring in the nineties with the adoption of the Maastricht Treaty.

In our opinion, the Euro effect should measure the actual effect of the single currency, not the capital, trade, and labor market integration that may have preceded it. Nevertheless, we test two additional specifications that change the timing of the Euro effect. First, we recognize that preparations for the Euro may have been long underway and countries may have undertaken measures to limit exchange rate volatility some time before the Euro is actually adopted (for example, by creating a target zone relative to the Euro). In addition, Frankel (2005) argues that a currency union may already generate effects on trade patterns before it actually goes into effect, as soon as the negotiations convince the corporate sector it will actually happen. Fratzscher (2002) claims that European markets have only become highly integrated since 1996, and that the move to integration was in large part driven by the drive towards the Euro, and in particular the elimination of exchange rate volatility and uncertainty in the process of monetary unification. If this is the case, we can test it directly by replacing the Euro indicator by a measure inversely related to exchange rate volatility. To do so, we collect bilateral daily exchange rates for all of our countries relative to the Deutsche Mark before 1999 and relative to the Euro thereafter.[8] We use these data

[8]We do not have daily exchange rate data for Russia in 1997. The total number of observations therefore

to compute a measure of realized exchange rate volatility, σ (the square root of the sum of squared daily exchange rate changes during a year). We transform the volatility into a stability measure on a [0,1] scale by computing $1/\exp(100\sigma)$. Thus, a country with zero exchange rate volatility takes on a value of one (this will be true for all Euro countries once they adopt the Euro); a country with 12% annual volatility (roughly that of a major floating currency) would effectively receive a stability measure of zero. For a country-pair, we employ the average value of the two countries in a pair. In Panel B of Table 2, we show that the effect associated with this alternative measure based on exchange rate volatility delivers very similar qualitative findings to the binary Euro indicator. While the stability variable does indeed move up prior to the introduction of the Euro as exchange rate volatility decreases, the estimated effect is largely unchanged. Further, the introduction of this alternative indicator has little impact on the EU indicator, suggesting that the EU effect remains dominant.

In Panel C, we go one step further and bring forward the Euro indicator to 1993 for all Western European countries adopting the Euro. In other words, the new indicator variable may already anticipate the effects of monetary union once the Maastricht was officially adopted. The results suggest a slightly smaller EU effect, and a slightly stronger Euro effect, but the results of Panel A do not meaningfully change. We conclude that the EU effect on integration dominates the Euro effect.

3.3 Robustness

So far, we have documented a significantly lower earnings yield differential associated with EU membership, with the EU effect ranging from -73 to -265 basis points. This reduction in segmentation is robust to controlling for country-pair and year fixed effects and dominates the effect of Euro adoption. Here, we discuss a series of robustness checks.

In Panel A of Table 3, we address alternative ways to construct a bilateral segmentation measure based on industry valuation differentials. Above (see (1)), we defined our segmentation measure as the *value*-weighted average industry valuation differential. An industry's value is the sum of the industry's equity market capitalization across both countries in a

drops from 6,336 to 6,326.

country pair. In specifications 1 through 3, we report the EU effect when measuring bilateral segmentation as the *equally* weighted average across industries. Specifications 1 through 3 report estimates that correspond to columns 1, 4, and 6 of Table 1. To maintain comparability with the previous results, the sample and regression specification are identical except for the segmentation measure as well as the control variables related to leverage, earnings growth volatility, and return volatility having been replaced with their equally weighted counterparts. While the EU effect in columns 1 and 2 is similar to the one for the value-weighted segmentation measure, it drops to -0.2% and loses statistical significance once we add our standard controls as well as country-pair and year fixed effects.

Specifications 4 through 6 use the natural logarithm of the value-weighted segmentation measure to address its asymmetric distribution as well as potential outliers. We apply the log transformation to all 6,404 observations, including the top one percentile of observations that we drop in the construction of our main segmentation measure. We find a negative and statistically significant effect of EU membership for all specifications. Evaluated at the average segmentation level of 0.0525, the predicted absolute EU effect on SEG ranges from -60 basis points (coefficient estimate of -0.1145) to -260 basis points (coefficient estimate of -0.4932), consistent with our previous estimates.

Finally, in the last three specifications of Panel A (rows 7 through 9), we consider a segmentation measure that is constructed as in (1), but where we only include those industries that contain at least five firms in a country and year. This should improve the precision of our segmentation measure. The EU effect is again very similar to what we have documented so far. Even when including country-pair and year fixed effects (specification 9), it is still associated with a statistically significant (at the 10% level) drop in segmentation of almost 100 basis points.

In Panel B of Table 3, we examine the relationship between equity market segmentation and EU membership at the monthly frequency. Specifications 1 through 3 report results using the value-weighted measure as defined in (1), while specifications 4 through 6 report results for the equally weighted measure as discussed above. In each case, we report the EU effect for three specifications. The results are very consistent with our findings so far: EU membership is associated with a significant lower level of equity market segmentation. The

effect does become insignificant when using the equally weighted measure and both year and country-pair fixed effects.

In Table 4, we report several robustness checks on the result that the EU effect dominates the Euro effect. Panel A summarizes the effect of EU membership as well as Euro adoption when segmentation is measured in alternative ways. The pattern that emerges is similar across the different specifications. In specifications without any controls or fixed effects (rows 1, 4, and 7), we observe both significant EU and Euro adoption effects, but segmentation decreases more in the former case. Once we add country pair fixed effects (rows 2, 5, and 8), the EU effect increases in magnitude, while the Euro effect decreases in magnitude and generally turns statistically insignificant. Finally with the full set of controls (rows 3, 6, and 9), the EU effect remains negative and generally marginally significant, while the Euro effect turns positive. In Panel B, we examine both effects using monthly data, confirming the results of Panel A.

Finally, we describe the results of two additional robustness exercises. First, we replace the country-pair fixed effects by the initial segmentation level relative to the EU average. This variable has the expected positive coefficient, but the EU indicator remains economically and statistically significant. Second, the unbalanced nature of our panel data set, which grows over time as additional country-pairs are added to it, may raise concerns (see also Baldwin (2006)). We therefore also estimate our main difference-in-difference specifications (specification 6 in Table 1 and specification 5 in Table 2, Panel A) on a balanced sub-sample. The balanced sub-sample includes 116 country-pairs between 1990 and 2007. We estimate a significantly negative EU effect of -135 basis points which again is unaltered by the inclusion of a Euro-Indicator variable that itself has no effect on bilateral equity market segmentation.

3.4 Alternative estimates of the EU effect

So far, we have used country-pair fixed effects to address endogeneity concerns. In this subsection, we propose and implement an instrumental variables approach that uses a new and potentially useful instrument for EU membership, namely the distance to Brussels. Much of the momentum to start, enlarge, and expand the scope of the European Union originated

in the Benelux countries and France. The governing institutions of the European Union (EU) are not concentrated in a single capital city; they are instead mostly based across three cities (Brussels, Luxembourg, and Strasbourg). However, Brussels has become the primary EU location, hosting a seat of each major institution and now the European Council. It is possible that EU membership of a given country is negatively correlated with the distance of a country to Brussels, a clearly exogenous variable.

The procedure for EU accession is lengthy, requiring local connections and information gathering, and the negotiation process involves countless meetings, taking place, mostly, in Brussels (see e.g. Nicolaides and Boean, 1996). It is conceivable that shorter distances lead to a faster accession process. Fischer, Sahay and Gramont (1998), studying the economic distance between the Eastern European entrants and "Brussels" (their words), also mention that physical distance should matter but do not elaborate why. The sociology literature on "localism" offers a different perspective on why the distance to Brussels may promote EU accession. Berezin and Diez-Medrano (2008) argue that the decision to join the European Union also depends on popular support for EU membership in the candidate countries. They then show, using Eurobarometer data, that such local support depends negatively on the distance to Brussels, a result they interpret as driven by identification with Europe, trust towards European institutions, and confidence in the ability to influence European institutions all depending on physical distance. No instrument is perfect, of course, and while the distance to Brussels is clearly exogenous, it may still correlate with the error term in the SEG regression through indirect channels. For example, it may be correlated with the distance between two countries, which we demonstrated affects SEG. Therefore, the distance between two countries will always be included as a control variable in all IV specifications.

Since we are interested in predicting the EU membership of a country-pair and since the distance to Brussels likely differs between the two countries in a country-pair, we propose the maximum distance to Brussels for a given pair as an instrument for the EU indicator. Appendix Tables 3 and 4 contain more details on the measure. With 2,905 kilometers, Cyprus has the largest distance to Brussels in our data set. Table 5 provides evidence on the usefulness of the proposed instrument. We report the results from a linear probability

model of the following form:

$$EU_{i,j,t} = a + b_Z Z_{i,j} + b_X X_{i,j,t} + d_t + \upsilon_{i,j,t}, \tag{3}$$

where $EU_{i,j,t}$ represents the EU membership indicator, $Z_{i,j}$ the maximum distance to Brussels for country-pair i, j; $X_{i,j,t}$ represents control variables from the segmentation model and d_t year fixed effects. We consider three specifications; the first considers just the distance to Brussels as independent variable; the second adds the control variables and the third replaces the pure time series controls by year fixed effects. As expected, a longer maximum distance to Brussels is associated with a lower membership probability for a country-pair, with the coefficient similar across the specifications and highly significantly different from zero. As to the other variables, absolute differences in economic development and in financial characteristics, such as leverage and earnings growth and return volatility, lower the probability of joint EU membership. Membership is also less likely for country-pairs with at least one Eastern European country and, maybe surprisingly, with a common language. On the other hand, country pairs with more developed equity markets, as proxied for by the number of publicly traded firms, as well as, again surprisingly, country pairs that are further apart are more likely to be EU members. However, the latter effect is not statistically significant.

In addition to the coefficient estimates, we report the adjusted R^2, the *partial* R^2 that reflects the contribution of the proposed instrument, as well as the Wald statistic for the test $b_Z = 0$. As before, standard errors are robust to arbitrary correlation over time within country-pairs and across country-pairs within one year. While no critical values exist for the Wald test statistic in the presence of non-*i.i.d.* errors, Staiger and Stock (1997) suggest a value of 10 as a lower boundary to reject weak identification. Specification 1, which only has the distance to Brussels as a regressor, suggests that our instrument has substantial predictive power. Specifications 2 and 3, which represent the first stage regressions of the subsequent IV regressions, confirm that it remains highly significant even after including our controls from Table 1 as well as year fixed effects. The *partial* R^2 that captures the contribution of the distance instrument is around 5% and the Wald test statistic is always substantially larger than the approximate threshold value of 10.

Using a standard 2SLS setting, Table 6, Panel A presents the effect of EU membership using the distance to Brussels as an instrument. Specifications 1 and 2 contain the second stage results corresponding to specifications 2 and 3 of Table 5. We find that EU membership retains its negative effect on bilateral valuation differentials. Compared to the results in Table 1, the effect is more prominent, but the standard errors also increase, somewhat reducing the level of significance in the first specification. This suggests that country-pairs with higher valuation differentials are more likely to become EU members, biasing the results in Table 1 upward.[9]

These results are robust to the measurement issues explored in Table 3 (detailed results are available upon request). In addition, we explore a bivariate model which jointly estimates the probability of a country-pair being EU members, using a probit specification, and the effect of the EU membership on bilateral segmentation. Assuming that the error terms of both equations, the linear segmentation equation and the non-linear probit model for EU membership, follow a bivariate normal distribution, we estimate the model via maximum likelihood estimation. Panel B of Table 6 reports results for the bivariate model. For the membership equation (column "EU"), we report marginal effects instead of model parameters.[10] The results for the membership model are qualitatively the same as those from the linear probability model reported in Table 5. The results for the segmentation model (column "SEG") again yield similar results. Segmentation between country-pairs that are EU members is significantly lower than for non-EU pairs. The EU effect of -260 basis points is slightly less pronounced than suggested by the corresponding IV regressions. All other covariates have the expected sign.

3.5 Turkey accession?

One question of considerable debate in Europe is whether and when Turkey should join the European Union. Since Turkey started accession negotiations in 2005, scores of articles

[9]Barro and Tenreyro (2007) similarly find that the effect of currency union membership onto trade increases once they use an IV approach. Guiso, Sapienza and Zingales (2009) find that the effect of trust on bilateral trade increases in an IV regression.

[10]Marginal effects are calculated at the sample mean for continuous variables, but represent a discrete change for indicator variables.

and books have discussed the complex cultural, monetary, political, and economic factors involved. Here, we use our framework to discuss the degree of financial and economic integration of Turkey within Europe.

Before we turn to regressions, let us first discuss some simple economic development statistics. In terms of 2007 per capita GDP (measured in USD), Turkey is in the bottom decile relative to EU member countries, and the lowest ranked country among non-EU countries in our sample. How segmented is Turkey's stock market? Table 7 has some preliminary answers. The first regression has nothing but an EU indicator and a Turkey indicator. The regression demonstrates that Turkey's equity market is *less* segmented compared to other non-EU countries, on average. Its average bilateral valuation differential between 1992 and 2007 is 1.24% points lower than that of other non-EU country-pairs. Most of this difference is due to the inclusion of Eastern-European countries. But even in 2007, Turkey is the second least segmented (after Switzerland) country of the six countries in our sample that still have not joined the EU. When we control for our usual right hand side variables and year fixed effects, this coefficient is unchanged.

Taken together, Turkey is clearly not an outlier in terms of market segmentation, but perhaps that means it has little to gain from EU accession. Of course, our regression predicts an average EU effect of somewhere between 60 and 330 basis points. Unless we fully understand the channels through which the effect occurs, it is hard to predict country specific responses to EU accession and we will not venture such conjectures here. Nevertheless, the fact that Turkey is among the more integrated non-EU European countries suggests its benefits may be relatively more limited than the average. Yet, analyses of the economic benefits for Turkey of joining the EU (see e.g. Flam, 2003; Lejour and Mooij, 2005) typically conclude that the benefits for Turkey would be large relative to those of other potential entrants. Of course, we focus on equity market integration, ignoring other economic benefits of EU membership.

Finally, we can use our linear probability model to compute a theoretical probability of Turkey joining the European Union. This probability was, in 2007, 40% (without year fixed effects) and 59% (with year fixed effects). Needless to say, this computation excludes a number of political factors that may be the dominant drivers of the EU membership decision.

4 The channels of integration

That EU membership is associated with increased bilateral equity market integration, is in principle no surprise. Since its original conception in 1957, the EU has promoted the free movement of goods, services, capital, and people. While the process is far from complete, the ultimate goal of the EU is to achieve economic and financial integration. Here we explore whether we can ascribe the observed increase in effective market integration to specific channels, such as trade integration, or changes in financial market regulation, for example. The first subsection describes the economic variables we use to measure various potential channels of integration and tests whether there is indeed an "EU effect" for these variables. In the second sub-section, we then investigate whether any of these channels can explain the observed integration effects of EU membership.

Given that we have established that the direct EU effect on financial integration dominates the Euro effect, we focus on the EU effect. In fact, the related literature mostly focuses on the Euro. For example, a voluminous literature establishes that the Euro has increased bilateral bond and equity holdings (e.g. Lane, 2006; De Santis and Gérard, 2006; Coeurdacier and Martin, 2009), cross-border banking activities (Blank and Buch, 2007; Kalemli-Ozcan, Papaioannou and Peydró, 2010; Spiegel, 2009), and trade (Flam and Nordström, 2007). The one paper with a similar panel data approach to ours is Kalemli-Ozcan et al. (2010). They find that the Euro, but not EU membership, significantly increased cross-border banking activities, ascribing the effect primarily to the reduction of exchange rate volatility although increased trade and the adoption of legislative-regulatory harmonization policies in financial services, required by the EU, also played a role. However, their sample is restricted to developed countries.

4.1 The effect of EU membership on possible channels of equity market integration

EU membership must have an independent effect on the variables we propose as measures of particular integration channels. To test this, Table 8 contains two alternative specifications for each channel variable we consider. Specification 1 includes a number of country-pair

time-invariant characteristics that we introduced in the previous section: per capita GDP differences in 1980/1990; geographic proximity, measured as distance between two countries (in 1000 km), a common language indicator and an Eastern European country indicator. The alternative specification is the difference-in-difference (DID) specification with only year and country-pair fixed effects. Both specifications, of course, also include an EU indicator, which is the main variable of interest. To conserve space, we do not report the coefficients on any control variable but focus on the EU effect. We also report the estimated EU effect as a percentage of the sample mean of the dependent variable. In addition, we mention the number of observations, as various channel variables are only available for part of our sample.

4.1.1 Bilateral trade

One of the most obvious channels of integration is trade integration, a primary goal of the EU. We collect data on country-pair annual trade volume (exports plus imports) from Datastream and scale it by the average GDP of the two countries in a country-pair. We note that the effect of increased trade on valuation is perhaps not entirely obvious. Increased trade opportunities may indeed cause cash flow processes to be more correlated as business cycle transmission intensifies (Frankel and Rose, 1998), but it may also lead to more specialization. However, we control for the latter by only comparing earnings yields on an industry-by-industry basis. In addition, Aviat and Coeurdacier (2007) show that trade and financial integration are positively correlated.

Under the OLS specification, we find that country-pairs inside the European Union have a trade to GDP ratio that is 37% (0.0041) higher than the sample average of 0.0112. Under the difference-in-difference specification (DID) specification, with only year and country-pair fixed effects, the effect of EU membership on bilateral trade is economically smaller (6.7%) and loses statistical significance.

4.1.2 Financial market integration

Capital market integration should lead to similar discount rates across countries for firms with similar systematic risks, which we proxy by the industry to which a firm belongs. We

therefore look both at measures of actual cross-border investment holdings and measures of changes in regulation. Data on cross-border investments are difficult to find for our sample, but we examine several imperfect proxies. We collect data on foreign direct investment (FDI) positions by country-pair from Eurostat, available since 1994. We add the FDI position of country 1 in country 2 to the FDI position of country 2 in country 1 and scale this sum by the average GDP of the two countries. The OLS estimation yields a statistically significant EU effect of 47.5% of the sample mean. The DID estimation on the other hand results in a negative, but statistically insignificant EU effect.

In unreported results, we have also examined the effect of EU membership on bilateral portfolio holdings (using data from the IMF's Coordinated Portfolio Investment Survey, available in 1997 and annually since 2001). While the number of observations is substantially smaller, we again find a significantly positive EU effect in the OLS specification, but not in the DID estimation.

In addition, we examine direct measures of de jure openness of equity markets and the capital account. Our measure of equity openness is based upon the the market capitalization of the S&P investable relative to the S&P global indices in each country, following Bekaert (1995) and Edison and Warnock (2003). The S&P's global stock index aims at fully representing the local stock market whereas the investable index corrects for foreign ownership restrictions. A ratio of one therefore means that all of the stocks in the local market are available to foreigners. For capital account openness, we use a component of a new IMF financial reform index that characterizes the restrictions on a country's capital account, in the form of restrictions on the convertibility of the local currency, transaction taxes, or restrictions on capital flows. We calculate the bilateral average of the capital account openness index component that takes on values between zero (fully closed) and three (fully liberalized). For these measures, both the level (openness) and the absolute difference between countries, indicating (the lack of) regulatory harmonization, are important. So, we investigate both.[11]

In the simple OLS specification, we find a positive EU effect on the level of capital account

[11]Because convergence may not necessarily mean convergence to higher levels of integration, we also investigate a measure that combines both the level and the absolute difference, by investigating the average level of integration divided by the absolute difference. After dropping observations with relatively small differences, we find results that are generally consistent with the ones presented in Table 8.

openness (5.2%) and a negative effect on the absolute difference (-72.5%), both statistically significant. In the DID estimation, the EU effects are weaker (1.8% and -6.8%) and no longer statistically significant. For equity market openness (level and difference), we fail to find significant EU effects in either the OLS or DID specifications.

4.1.3 Other capital market reforms

While cross-border transactions were completely liberalized among EU member states by the end of 1992, regulatory differences across member countries have remained. It is the harmonization of regulations, including capital market regulation, that has been the focus of EU integration efforts over the last 20 years.

Even in the presence of cross-border trade and investments, differences in financial regulation across countries could lead to differences in industry valuations. To the extent that EU membership has harmonized financial regulation across member countries, EU membership should be associated with lower valuation differences. We again use the new IMF data base that covers credit and security market regulation, interest rate controls, banking regulation and supervision, capital account restrictions, and privatization for a large set of countries between 1973 and 2005. Each policy area is evaluated with respect to the amount of government control or interference and where appropriate the openness to foreigners. The different categories of financial regulation are summarized in a financial reform index that takes on values between zero (fully repressed) and 21 (fully liberalized).[12] We form bilateral averages as well as absolute differences in this financial reform index and examine whether EU membership increases financial reform/liberalization and makes countries more similar with respect to financial regulation as measured by this new index. In 2005, the average financial reform index for the European countries in our data set was 19.4, while the average absolute difference between countries was 1.8.

The results in Table 8 suggest first of all that the EU has significantly increased the index of financial reform, meaning that country-pairs that are EU members take on index values between 2.4% (DID) and 10.6% (OLS) above the sample mean. EU membership also led to

[12]See Abiad, Detragiache and Tressel (2008) for a detailed discussion of the database. For 2006 and 2007, we use the values reported for 2005.

convergence in financial regulation across member countries, estimated at -39.1% (OLS) and -8.5% (DID). However, the coefficient in the DID specification is not statistically significant.

We also investigate a number of variables that measure the potential outcome of financial market reforms. First, reforms may promote stock market development. Bekaert and Harvey (1995), Levine and Zervos (1998), and Guiso, Jappelli, Padula, Pagano, Martin and Gourinchas (2004) document that financial development actually fosters financial integration. We measure financial development using the fraction of equity market capitalization over GDP. For each country-pair, we form the equally weighted average of the two fractions as well as the absolute difference between them. We find a significant EU effect of 22.9% on financial development in the OLS specification. There is no significant effect in the DID regression. We do not observe convergence of stock marketer development post EU membership.

Financial market reforms may also have promoted the integration of money markets and caused real interest rates to converge across countries. Given that the risk-free rate is a component of the discount rate, differences in real interest rates should be associated with differences in valuations, thus possibly representing an important channel for EU membership to affect the segmentation measure. We obtain annual real interest rates from the World Bank, computed as the prime rate less current inflation as measured by the GDP deflator. For every country-pair, we calculate the absolute difference between the real interest rates. Of course, for these countries joining the Euro in 1999, nominal interest rate converged considerably (see Baele et al., 2004), but this may not necessarily lead to a full integration of real rates. The OLS and DID results suggest a modest reduction of interest rate differentials between EU members, but the effect is not statistically significant.

4.1.4 Labor, persons, and information flow

We also examine bilateral data on foreign residents and workers as well as country-pair specific (business) travel activity. Unfortunately, our data set is much more limited for these cases, and we fail to find a consistent effect of joint EU membership. Results are available upon request.

Finally, we conjecture that the EU may have promoted the flow of information across EU countries. As a proxy, we use the number of telephones (fixed and mobile) per 100

inhabitants. Again, we investigate both the level and convergence. We find the expected effects: EU membership increases the number of phones by 31% based on the OLS estimation and by 3.1% based on the DID estimation. It also leads to convergence in the number of phones across countries, reducing differences by about 22%. All these effects are statistically significant at the 5% level.

4.2 The effect of integration channels on valuation differentials

Our above results generally suggest that EU membership has the expected effect on possible channels of equity market integration. We now examine whether these channels can explain the EU effect on valuation differentials. We do so by adding these variables to our segmentation model (see equation (2)), considering again an OLS and a DID specification. Table 9 reports the results for four different combinations of channels. In addition to the channel variables listed for each case, we always include the log of the number of listed firms, the average absolute difference in leverage as well as in industry earnings growth and return volatility. In addition, the OLS specifications contain: per capita GDP differences in 1980/1990; geographic proximity, measured as distance between two countries (in 1000 km), a common language indicator, an Eastern European country indicator, the absolute difference between earning yields in Core Europe and the US as well as the average earnings yield for Core Europe.

In the first case, we only add the channel variables for which we have the full 6,336 observations available: bilateral trade as well as the average and absolute difference for equity market openness, MCAP/GDP, and telecommunication. We always show the EU effect in a regression without the channel variables to contrast how the various channels reduce the EU effect. In the OLS specification the effect falls by 41.4% from 92 basis points to 54 basis points, but it remains significant. In the DID specification the effect drops by 24.9% (or about 20 basis points), but it becomes statistically insignificant. The effects of the channel variables, which we do not report, are typically as expected with negative signs for trade for example, but not all channel effects are statistically significant.

The other cases in the table each add additional channels to those used in the first case,

which requires dropping an increasingly larger number of observations (N). In the second case, the capital account openness and financial reform index measures are added as channel variables. The EU effect is again reduced, by -17.7% (OLS) and -7.4% (DID), but remains significant in both specifications.

In the third case, we add FDI positions to the set of channel variables. The FDI effect has a surprisingly positive effect on segmentation (untabulated). Perhaps large bilateral FDI positions suggest impediments to portfolio flows. The EU effect is reduced by 33.0% (OLS) and 36.8% (DID) and becomes insignificant in both specifications.

In the last case, we add the real interest rate differential, which has a positive, but not significant effect on segmentation. Again, the EU effect becomes smaller by introducing the various channels, but remains significant in the OLS specification.

The various specifications with different sample sizes show that the proposed channels reduce the EU effect in all cases, without completely accounting for it. That is, while EU membership is associated with more cross-border trade and investment, harmonized financial regulation and greater capital account openness, as well as deeper financial development, smaller interest rate differences, and more information flow, these channels do not completely drive out the EU effect. It is possible that there is an EU effect that is larger than the "sum of the parts". Alternatively, we are simply missing a few important channels, or measurement error in the channel variables we do use prevent them from fully driving out the EU effect.

5 Conclusions

We provide a new perspective on measuring equity market integration in the EU. Our measure is essentially model free and is based on industry earnings yield differences. In an integrated market, these yields should converge. Using a large panel data set of bilateral measures of equity market segmentation, we document that earnings yield differences are between 60 and 330 basis points lower if both countries are EU members. This finding is robust to various country-pair characteristics and global market integration trends. The independent EU effect survives in an instrumental variables analysis, where we use the distance to Brussels as an instrument for EU membership. We examine several channels through which

EU membership could affect equity market integration. While we find that EU membership typically has the predicted effect on these channels of integration, they cannot fully account for the EU effect. While a number of interpretations are possible, it is conceivable that there is an independent EU effect that cannot be attributed to a particular measurable channel. The adoption of the Euro generates a much smaller integration effect that has no impact on the economically and statistically much stronger effect of EU membership.

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Table 1
Predicting Pairwise Segmentation
1980 - 2007 (N = 6,336)

	1	2	3	4	5	6
EU - Indicator	**-0.0203**	**-0.0092**	**-0.0059**	**-0.0265**	**-0.0138**	**-0.0073**
	(0.0036)	(0.0022)	(0.0020)	(0.0038)	(0.0037)	(0.0036)
Sum of Number of Listed Firms (ln)		**-0.0030**	**-0.0039**		-0.0002	-0.0002
		(0.0010)	(0.0010)		(0.0035)	(0.0032)
Abs. Diff. in Leverage		**0.0491**	**0.0576**		0.0174	0.0361
		(0.0207)	(0.0187)		(0.0302)	(0.0233)
Abs. Diff. in Ln Earnings Growth Volatility		0.0549	**0.0702**		0.0412	**0.0616**
		(0.0311)	(0.0310)		(0.0237)	(0.0217)
Abs. Diff. in Return Volatility		**0.1539**	0.1241		**0.3768**	**0.2625**
		(0.0731)	(0.0672)		(0.1234)	(0.1138)
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)		0.0000	0.0000			
		(0.0002)	(0.0002)			
Distance (in 1,000 km)		**0.0037**	**0.0042**			
		(0.0013)	(0.0012)			
Common Language Indicator		-0.0004	-0.0001			
		(0.0035)	(0.0033)			
Eastern Europe Indicator		**0.0155**	**0.0165**			
		(0.0048)	(0.0052)			
Abs. EY - Differential: Core Europe vs. USA		**1.8529**			**1.8307**	
		(0.3303)			(0.3294)	
Core Europe - Earnings Yield		-0.0754			-0.0018	
		(0.2656)			(0.2519)	
Year Fixed Effects	No	No	Yes	No	No	Yes
Country-pair Fixed Effects	No	No	No	Yes	Yes	Yes
Adj. R^2	0.07	0.19	0.26	0.25	0.34	0.40

Table 1 reports coefficient estimates and standard errors for linear regression models of pairwise segmentation. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Specifications 3 and 6 contain year fixed effects and specifications 4, 5, and 6 contain country-pair fixed effects. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 2
Pairwise Segmentation, the EU, and the Euro
1980 - 2007

Panel A: The Euro (N = 6,336)

	1	2	3	4	5
EU - Indicator	**-0.0187**	**-0.0093**	**-0.0057**	**-0.0256**	**-0.0072**
	(0.0037)	(0.0023)	(0.0020)	(0.0038)	(0.0036)
Euro - Indicator	**-0.0088**	0.0001	-0.0013	-0.0082	0.0057
	(0.0026)	(0.0018)	(0.0022)	(0.0044)	(0.0032)
Controls	No	Yes	Yes	No	Yes
Year Fixed Effects	No	No	Yes	No	Yes
Country-pair Fixed Effects	No	No	No	Yes	Yes
Adj. R^2	0.08	0.19	0.26	0.25	0.41

Panel B: Exchange Rate Stability (N = 6,236)

	1	2	3	4	5
EU - Indicator	**-0.0188**	**-0.0096**	**-0.0062**	**-0.0235**	**-0.0073**
	(0.0038)	(0.0022)	(0.0019)	(0.0042)	(0.0037)
Exchange Rate Stability Indicator	-0.0062	0.0018	0.0019	**-0.0143**	0.0064
	(0.0035)	(0.0026)	(0.0034)	(0.0060)	(0.0066)
Controls	No	Yes	Yes	No	Yes
Year Fixed Effects	No	No	Yes	No	Yes
Country-pair Fixed Effects	No	No	No	Yes	Yes
Adj. R^2	0.07	0.19	0.26	0.25	0.40

Panel C: Aniticipated Euro Introduction (N = 6,336)

	1	2	3	4	5
EU - Indicator	**-0.0172**	**-0.0086**	**-0.0054**	**-0.0242**	**-0.0074**
	(0.0036)	(0.0022)	(0.0020)	(0.0037)	(0.0036)
Euro - Indicator (starting in 1993)	**-0.0108**	-0.0030	-0.0024	**-0.0194**	0.0033
	(0.0026)	(0.0017)	(0.0018)	(0.0063)	(0.0036)
Controls	No	Yes	Yes	No	Yes
Year Fixed Effects	No	No	Yes	No	Yes
Country-pair Fixed Effects	No	No	No	Yes	Yes
Adj. R^2	0.08	0.19	0.26	0.26	0.41

Table 2 reports coefficient estimates and standard errors for linear regression models of pairwise segmentation. The *Exchange Rate Stability Indicator* is based on a transformed measure of realized volatility A country with zero exchange rate volatility (relative to the Deutsch Mark / Euro) takes on a value of one; a country with 1% monthly volatility (roughly that of a major floating currency) would effectively receive a zero. For a country-pair, we employ the average value of the two countries in a pair. The *Euro – Indicator (starting in 1993)* equals one from 1993 onwards if both countries in a country-pair introduce the Euro before 2005. For Euro adoptions in 2005 or later, the indicator is one from the year of Euro adoption onward. It is zero in all other cases. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. In each panel, specifications 2, 3 and 5 contain the same control variables as in Table 1, specifications 3 and 4 contain year fixed effects and specifications 4 and 5 contain country-pair fixed effects. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 3
Robustness of the EU Effect
1980 - 2007

Panel A: Alternative Constructions of the Segmentation Measure

No.	Segmentation Measure	EU - Indicator	Controls	Year Fixed Effects	Pair Fixed Effects	*N*	*Adj. R^2*
1	Equally Weighted	**-0.0190**	No	No	No	6,336	0.06
		(0.0044)					
2	Equally Weighted	**-0.0241**	No	No	Yes	6,336	0.34
		(0.0038)					
3	Equally Weighted	-0.0020	Yes	Yes	Yes	6,336	0.51
		(0.0036)					
4	ln (SEG)	**-0.3325**	No	No	No	6,404	0.07
		(0.0544)					
5	ln (SEG)	**-0.4621**	No	No	Yes	6,404	0.27
		(0.0643)					
6	ln (SEG)	**-0.1145**	Yes	Yes	Yes	6,404	0.43
		(0.0561)					
7	At least five Firms	**-0.0183**	No	No	No	4,491	0.04
		(0.0032)					
8	At least five Firms	**-0.0240**	No	No	Yes	4,491	0.20
		(0.0045)					
9	At least five Firms	-0.0098	Yes	Yes	Yes	4,491	0.32
		(0.0052)					

Panel B: Monthly Frequency

No.	Segmentation Measure	EU - Indicator	Controls	Year-Month Fixed Effects	Pair Fixed Effects	*N*	*Adj. R^2*
1	Value-Weighted	**-0.0217**	No	No	No	74,429	0.07
		(0.0018)					
2	Value-Weighted	**-0.0272**	No	No	Yes	74,429	0.30
		(0.0017)					
3	Value-Weighted	**-0.0059**	Yes	Yes	Yes	74,429	0.44
		(0.0021)					
5	Equally Weighted	**-0.0204**	No	No	No	74,429	0.07
		(0.0021)					
6	Equally Weighted	**-0.0246**	No	No	Yes	74,429	0.37
		(0.0018)					
7	Equally Weighted	-0.0015	Yes	Yes	Yes	74,429	0.53
		(0.0021)					

Table 3 reports coefficient estimates and standard errors for linear regression models of pairwise segmentation. Panel A examines alternative constructions of the pairwise segmentation measure: using an equally weighted average of absolute industry valuation differences, the natural log of the main segmentation measure as well as a measure for whose construction all industries with less than five firms per country and year have been excluded. Panel B provides results when measuring segmentation at the monthly frequency; right hand side variables are at the annual frequency, except for “Abs. Diff. in Ln Earnings Growth Volatility” (quarterly frequency) and “Abs. Diff. in Return Volatility” (monthly frequency). Control variables, if included, are the same as in Table 1. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year (Panel A) or year-month (Panel B) as well as across years (Panel A) or year-months (Panel B) for a given country-pair. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 4
The EU and the Euro: Robustness
1980 - 2007

Panel A: Alternative Constructions of the Segmentation Measure

No.	Segmentation Measure	EU - Indicator	Euro - Indicator	Controls	Year Fixed Effects	Pair Fixed Effects	*N*	*Adj. R^2*
1	Equally Weighted	**-0.0173**	**-0.0093**	No	No	No	6,336	0.07
		(0.0046)	(0.0038)					
2	Equally Weighted	**-0.0235**	-0.0054	No	No	Yes	6,336	0.35
		(0.0038)	(0.0050)					
3	Equally Weighted	-0.0020	0.0018	Yes	Yes	Yes	6,336	0.51
		(0.0036)	(0.0032)					
4	ln (SEG)	**-0.2989**	**-0.1918**	No	No	No	6,404	0.07
		(0.0599)	(0.0618)					
5	ln (SEG)	**-0.4429**	-0.1799	No	No	Yes	6,404	0.27
		(0.0641)	(0.0932)					
6	ln (SEG)	**-0.1133**	0.1052	Yes	Yes	Yes	6,404	0.44
		(0.0559)	(0.0652)					
7	At least five Firms	**-0.0159**	**-0.0111**	No	No	No	4,491	0.05
		(0.0037)	(0.0031)					
8	At least five Firms	**-0.0226**	**-0.0083**	No	No	Yes	4,491	0.20
		(0.0044)	(0.0041)					
9	At least five Firms	-0.0098	**0.0107**	Yes	Yes	Yes	4,491	0.32
		(0.0053)	(0.0051)					

Panel B: Monthly Frequency

No.	Segmentation Measure	EU - Indicator	Euro - Indicator	Controls	Year-Month Fixed Effects	Pair Fixed Effects	*N*	*Adj. R^2*
1	Value-Weighted	**-0.0201**	**-0.0086**	No	No	No	74,429	0.08
		(0.0019)	(0.0014)					
2	Value-Weighted	**-0.0264**	**-0.0074**	No	No	Yes	74,429	0.30
		(0.0017)	(0.0020)					
3	Value-Weighted	**-0.0059**	**0.0041**	Yes	Yes	Yes	74,429	0.44
		(0.0021)	(0.0020)					
4	Equally Weighted	**-0.0188**	**-0.0089**	No	No	No	74,429	0.07
		(0.0022)	(0.0019)					
5	Equally Weighted	**-0.0241**	**-0.0049**	No	No	Yes	74,429	0.37
		(0.0018)	(0.0023)					
6	Equally Weighted	-0.0015	0.0007	Yes	Yes	Yes	74,429	0.53
		(0.0021)	(0.0020)					

Table 4 reports coefficient estimates and standard errors for linear regression models of pairwise segmentation. Panel A examines alternative constructions of the pairwise segmentation measure: using an equally weighted average of absolute industry valuation differences, the natural log of the main segmentation measure, as well as a measure for whose construction all industries with less than five firms per country and year have been excluded. Panel B provides results when measuring segmentation at the monthly frequency; right hand side variables are at the annual frequency, except for "Abs. Diff. in Ln Earnings Growth Volatility" (quarterly frequency) and "Abs. Diff. in Return Volatility" (monthly frequency). Control variables, if included, are the same as in Table 1. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year (Panel A) or year-month (Panel B) as well as across years (Panel A) or year-months (Panel B) for a given country-pair. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 5
Predicting EU Membership
1980 - 2007 (*N* = 6,336)

	1	2	3
Distance to Brussels (in 1000 km)	**-0.1847**	**-0.1973**	**-0.2111**
	(0.0332)	(0.0278)	(0.0284)
Sum of Number of Listed Firms (ln)		**0.0405**	**0.0545**
		(0.0132)	(0.0132)
Abs. Diff. in Leverage		**-1.1737**	**-1.0416**
		(0.4290)	(0.3765)
Abs. Diff. in Ln Earnings Growth Volatility		-0.4225	**-0.5752**
		(0.2203)	(0.2170)
Abs. Diff. in Return Volatility		**-4.6979**	**-4.1564**
		(1.0159)	(1.0298)
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)		**-0.0169**	**-0.0177**
		(0.0023)	(0.0023)
Distance (in 1,000 km)		0.0459	0.0421
		(0.0240)	(0.0244)
Common Language Indicator		**-0.1896**	**-0.1956**
		(0.0883)	(0.0868)
Eastern Europe Indicator		**-0.2057**	**-0.2344**
		(0.0825)	(0.0815)
Abs. EY - Differential: Core Europe vs. USA		**-21.7800**	
		(3.7780)	
Core Europe - Earnings Yield		**5.5875**	
		(2.3478)	
Year Fixed Effects	No	No	Yes
Adj. R^2	0.06	0.30	0.36
Partial R^2	0.06	0.04	0.05
Wald test statistic for effect of instrument	30.91	50.33	55.29

Table 2 reports coefficient estimates and standard errors for linear probability models of pairwise EU membership. The dependent variable is one if both countries in a country-pair are EU members in a given year and zero otherwise. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Specification 3 contains year fixed effects. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations. The *partial* R^2 reflects the contribution of the proposed instrument and the Wald statistic refers to the test that the coefficient of the instrument is zero.

Table 6
Alternative Identifications
1980 - 2007 (*N* = 6,336)

Panel A: Instrumental Variable Regression

	1	2
EU - Indicator	-0.0324	**-0.0333**
	(0.0173)	(0.0167)
Sum of Number of Listed Firms (ln)	-0.0019	-0.0021
	(0.0014)	(0.0015)
Abs. Diff. in Leverage	0.0275	**0.0363**
	(0.0191)	(0.0183)
Abs. Diff. in Ln Earnings Growth Volatility	0.0417	0.0508
	(0.0288)	(0.0288)
Abs. Diff. in Return Volatility	0.0212	-0.0213
	(0.1258)	(0.1160)
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)	-0.0004	-0.0004
	(0.0004)	(0.0004)
Distance (in 1,000 km)	0.0023	0.0023
	(0.0014)	(0.0014)
Common Language Indicator	-0.0045	-0.0051
	(0.0056)	(0.0057)
Eastern Europe Indicator	**0.0102**	**0.0096**
	(0.0035)	(0.0038)
Abs. EY - Differential: Core Europe vs. USA	**1.3998**	
	(0.4096)	
Core Europe - Earnings Yield	0.0553	
	(0.2123)	
Year Fixed Effects	No	Yes

Panel B: Bivariate Model

	EU	SEG
Distance to Brussels (in 1000 km)	**-0.3077**	
	(0.0473)	
EU - Indicator		**-0.0260**
		(0.0058)
Sum of Number of Listed Firms (ln)	**0.0850**	**-0.0026**
	(0.0204)	(0.0009)
Abs. Diff. in Leverage	**-1.5946**	**0.0420**
	(0.5974)	(0.0136)
Abs. Diff. in Ln Earnings Growth Volatility	**-0.8475**	0.0560
	(0.3526)	(0.0297)
Abs. Diff. in Return Volatility	**-6.7615**	0.0178
	(1.5696)	(0.0678)
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)	**-0.0282**	-0.0003
	(0.0044)	(0.0002)
Distance (in 1,000 km)	**0.0789**	**0.0028**
	(0.0338)	(0.0009)
Common Language Indicator	**-0.2286**	-0.0037
	(0.0846)	(0.0020)
Eastern Europe Indicator	**-0.2880**	**0.0115**
	(0.1135)	(0.0032)
Year Fixed Effects		Yes

Table 6 reports coefficient estimates and standard errors for instrumental variable regressions of pairwise segmentation (Panel A) and for a bivariate model of pairwise EU membership (column “EU”) and segmentation (column “SEG”). In Panel B, estimates for EU membership (column “EU”) represent marginal effects from a probit model that is jointly estimated with the segmentation equation. Marginal effects are calculated at the sample mean for continuous variables, but represent a discrete change for indicator variables. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Specification 2 of Panel A contains year fixed effects. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 7
EU and Turkey: Segmentation
1992 - 2007 (N = 5,429)

	1	2
EU - Indicator	**-0.0243**	**-0.0081**
	(0.0046)	(0.0022)
Turkey Indicator	**-0.0124**	**-0.0124**
	(0.0046)	(0.0044)
Sum of number of listed firms (ln)		**-0.0032**
		(0.0010)
Abs. Diff. in Leverage		**0.0545**
		(0.0197)
Abs. Diff. in Ln Earnings Growth Volatility		**0.0722**
		(0.0349)
Abs. Diff. in Return Volatility		**0.2316**
		(0.0802)
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)		0.0000
		(0.0002)
Distance (in 1,000 km)		**0.0043**
		(0.0013)
Common Language Indicator		0.0040
		(0.0033)
Eastern Europe Indicator		**0.0158**
		(0.0049)
Year Fixed Effects	No	Yes
Adj. R^2	0.10	0.23

Table 7 reports coefficient estimates and standard errors for linear regression models of pairwise segmentation between 1992 and 2007. The Turkey Indicator takes on values of one for country-pairs including Turkey and zero otherwise. All other variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Specification 2 contains year fixed effects. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Table 8
EU and Possible Channels of Integration
OLS and DID Estimations

		EU - Indicator		**Implied Change** (in % of sample mean)	
Channel	*N*	OLS	DID	OLS	DID
Trade					
Trade	6,336	**0.0041**	0.0008	37.0%	6.7%
		(0.0013)	(0.0005)		
Capital Markets					
FDI	4,085	**0.0059**	-0.0031	47.5%	-24.8%
		(0.0020)	(0.0017)		
Capital Account Openness: Average	4,817	**0.1468**	0.0501	5.2%	1.8%
		(0.0469)	(0.0580)		
Capital Account Openness: Difference	4,817	**-0.1897**	-0.0177	-72.5%	-6.8%
		(0.0508)	(0.0923)		
Equity Market Openness: Average	6,336	0.0270	0.0080	3.3%	1.0%
		(0.0166)	(0.0077)		
Equity Market Openness: Difference	6,336	0.0037	-0.0126	1.3%	-4.5%
		(0.0263)	(0.0121)		
Financial Reform: Average	4,817	**1.8999**	**0.4287**	10.6%	2.4%
		(0.2306)	(0.1938)		
Financial Reform: Difference	4,817	**-1.0323**	-0.2239	-39.1%	-8.5%
		(0.1805)	(0.2716)		
MCAP/GDP: Average	6,336	**0.1393**	-0.0464	22.9%	-7.6%
		(0.0372)	(0.0245)		
MCAP/GDP: Difference	6,336	0.0547	-0.0288	10.4%	-5.5%
		(0.0410)	(0.0282)		
Absolute Real Interest Differential	4,048	-0.0068	-0.0033	-18.0%	-8.8%
		(0.0036)	(0.0042)		
Information Flow					
Telecommunication: Average	6,336	**0.3031**	**0.0308**	31.0%	3.1%
		(0.0294)	(0.0114)		
Telecommunication: Difference	6,336	**-0.0632**	**-0.0613**	-22.9%	-22.3%
		(0.0170)	(0.0189)		

Table 8 reports coefficient estimates and standard errors for the effect of EU membership onto the left hand side variable listed under “Channel”. We report results from two separate estimations: Ordinary least squares regressions (OLS) and difference-in-difference estimations (DID). In addition to the EU indicator variable, we include in all OLS specifications: *Abs. Diff. in PC GDP in 1980/1990, Distance (in 1000 km), Common Language Indicator, Eastern Europe Indicator.* The DID specifications contain year and country-pair fixed effects. We also report the EU effect as a percentage of the sample means (see Appendix Table 4). All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Coefficient estimates that are statistically significant at the 5% level appear in bold. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

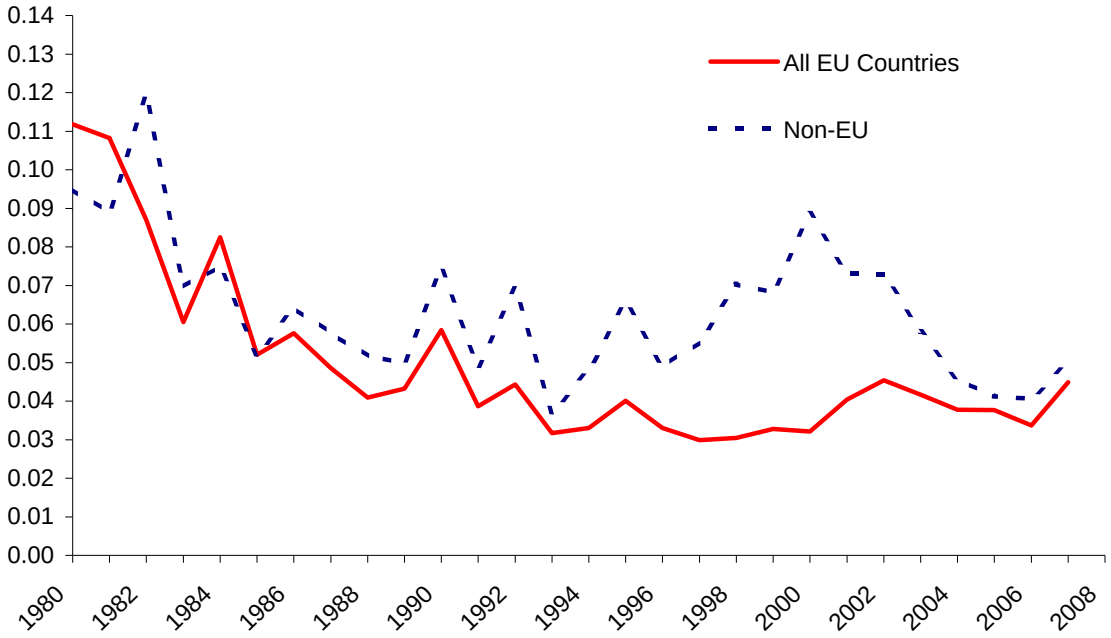
Table 9
Pairwise Segmentation and the EU: Channels
OLS and DID Estimations

No.	*N*	Estimation	EU - Indicator w/o Channels	Channels	EU - Indicator w/ Channels	Change of EU-Indicator
1	6,336	OLS	**-0.0092**	Trade, Equity Market, MCAP/GDP, Telecommunication	**-0.0054**	-41.4%
			(0.0022)		(0.0020)	
		DID	**-0.0073**		-0.0055	-24.9%
			(0.0036)		(0.0037)	
2	4,817	OLS	**-0.0128**	Trade, Equity Market, MCAP/GDP, Telecommunication, Capital Account Openness, Financial Reform	**-0.0106**	-17.7%
			(0.0021)		(0.0023)	
		DID	**-0.0095**		**-0.0088**	-7.4%
			(0.0036)		(0.0041)	
3	4,085	OLS	**-0.0057**	Trade, Equity Market, MCAP/GDP, Telecommunication, FDI	-0.0038	-33.0%
			(0.0021)		(0.0024)	
		DID	**-0.0115**		-0.0073	-36.8%
			(0.0051)		(0.0047)	
4	4,048	OLS	**-0.0139**	Trade, Equity Market, MCAP/GDP, Telecommunication, Absolute Real Interest Differential	**-0.0108**	-22.3%
			(0.0023)		(0.0022)	
		DID	-0.0080		-0.0060	-24.7%
			(0.0053)		(0.0057)	

Table 9 reports coefficient estimates and standard errors for regression models of pairwise segmentation. In each case, we report results from ordinary least squares (OLS) and difference-in-difference (DID) models. All specifications include: *Sum of Number of Listed Firms (ln), Abs. Diff. in Leverage, Abs. Diff. in Ln Earnings Growth Volatility, Abs. Diff. in Return Volatility*. The OLS specifications also include: *Abs. Diff. in PC GDP in 1980/1990, Distance (in 1000 km), Common Language Indicator, Eastern Europe Indicator, Abs. EY - Differential: Core Europe vs. USA, Core Europe - Earnings Yield.* The DID specifications also contain country-pair and year fixed effects. For each model, we first report the coefficient estimate of the EU-Indicator when the Channel variables are excluded. We then report the coefficient estimate of the EU-Indicator, when the listed Channel variables are included. Where applicable, both the average value and the absolute difference of the channel variable are included. We also report the relative change of the coefficient estimate of the EU-Indicator. All variables are defined in Appendix Table 3. All standard errors are robust to heteroskedasticity and to arbitrary correlation across country-pairs in a given year as well as across years for a given country-pair. Coefficient estimates that are statistically significant at the 5% level appear in bold. *N* denotes the number of observations.

Figure 1
Pair-wise Segmentation over Time
1980 - 2007

Panel A: EU vs. Non-EU Country Pairs



Panel B: EU vs. Non-EU Country-pairs - excluding Eastern Europe

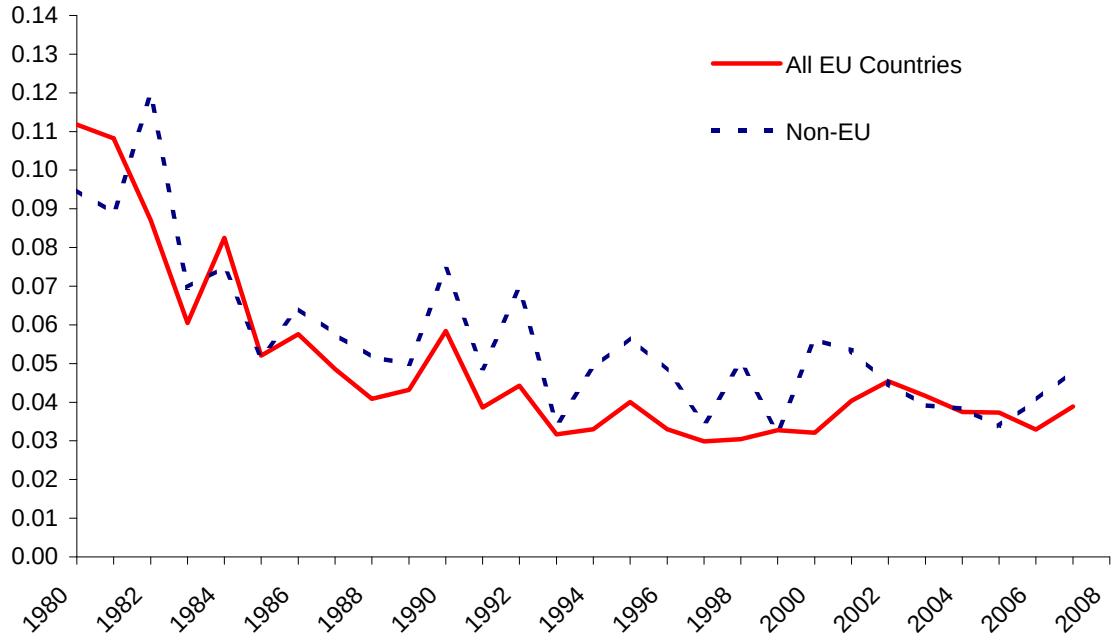
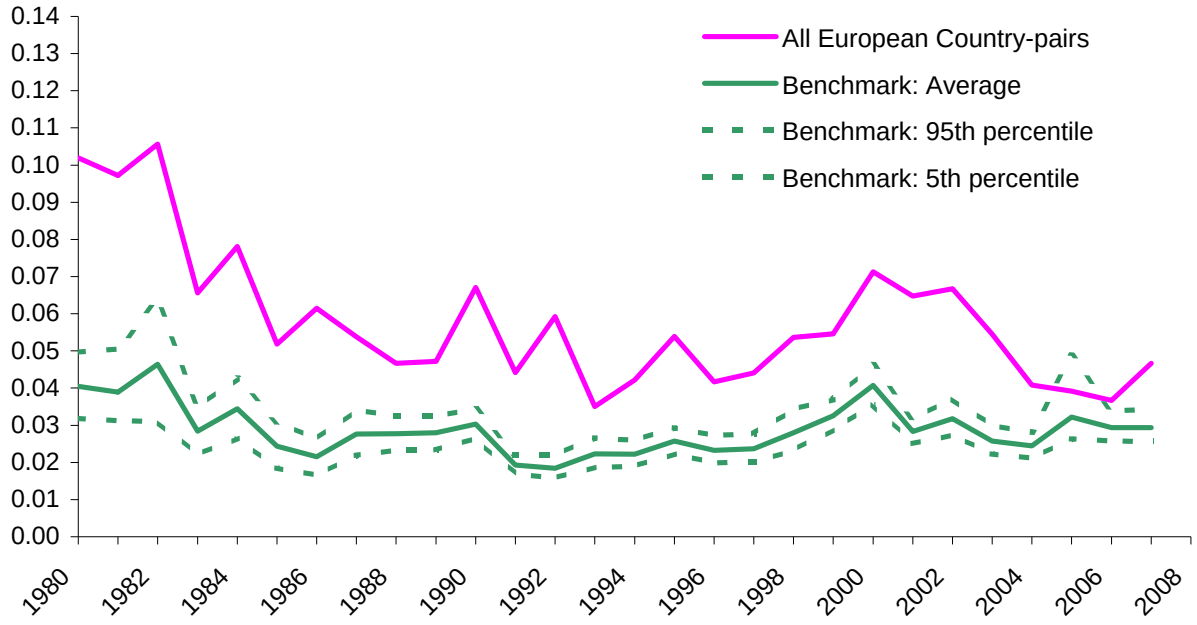
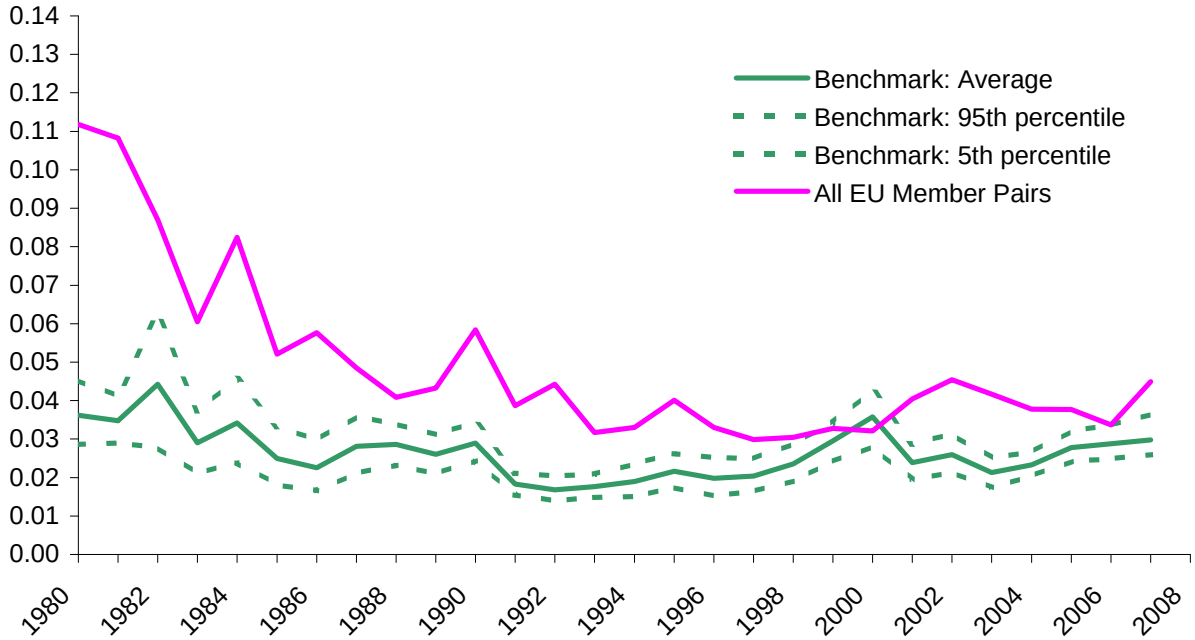


Figure 2
Benchmarking Segmentation
1980 - 2007

Panel A: All European Country Pairs



Panel B: All EU Member Pairs



Appendix Table 1

Countries, Data Coverage, EU and Euro Memberships

Country	Code	First Year	Last Year	Core Europe	Eastern European Country	First Year of Membership: EU	First Year of Membership: Euro
Austria	AUT	1980	2007			1995	1999
Belgium	BEL	1980	2007	**X**		1957	1999
Bulgaria	BGR	2003	2007		**X**	2007	-
Croatia	HRV	1999	2007		**X**	-	-
Cyprus	CYP	1995	2007			2004	-
Czech Republic	CZE	1995	2007		**X**	2004	-
Denmark	DNK	1980	2007	**X**		1973	-
Estonia	EST	2000	2007		**X**	2004	-
Finland	FIN	1989	2007			1995	1999
France	FRA	1980	2007	**X**		1957	1999
Germany	DEU	1980	2007	**X**		1957	1999
Greece	GRC	1990	2007			1981	2001
Hungary	HUN	1993	2007		**X**	2004	-
Iceland	ISL	2005	2007			-	-
Ireland	IRL	1980	2007	**X**		1973	1999
Italy	ITA	1980	2007	**X**		1957	1999
Latvia	LVA	2000	2007		**X**	2004	-
Lithuania	LTU	2001	2007		**X**	2004	-
Luxembourg	LUX	1991	2007	**X**		1957	-
Malta	MLT	2002	2007			2004	-
Netherlands	NLD	1980	2007	**X**		1957	1999
Norway	NOR	1980	2007			-	-
Poland	POL	1994	2007		**X**	2004	-
Portugal	PRT	1990	2007			1986	1999
Romania	ROM	2000	2007		**X**	2007	-
Russian Federation	RUS	1997	2007		**X**	-	-
Slovak Republic	SVK	2001	2007		**X**	2004	-
Slovenia	SVN	2001	2007		**X**	2004	2007
Spain	ESP	1988	2007			1986	1999
Sweden	SWE	1980	2007			1995	-
Switzerland	CHE	1980	2007			-	-
Turkey	TUR	1992	2007			-	-
United Kingdom	GBR	1980	2007	**X**		1973	-
Total countries	**33**			**9**	**12**	**27**	**12**
Total distinct country pairs	**528**					**351**	**66**

Appendix Table 2
List of Industries

ICB - Code	DS - Code	Industry Name
530	OILGP	Oil & Gas Producers
570	OILES	Oil Equipment & Services
580	ALTEN	Alternative Energy
1350	CHMCL	Chemicals
1730	FSTPA	Forestry & Paper
1750	INDMT	Industrial Metals & Mining
1770	MNING	Mining
2350	CNSTM	Construction & Materials
2710	AERSP	Aerospace & Defense
2720	GNIND	General Industrials
2730	ELTNC	Electronic & Electrical Equipment
2750	INDEN	Industrial Engineering
2770	INDTR	Industrial Transportation
2790	SUPSV	Support Services
3350	AUTMB	Automobiles & Parts
3530	BEVES	Beverages
3570	FOODS	Food Producers
3720	HHOLD	Household Goods & Home Construction
3740	LEISG	Leisure Goods
3760	PERSG	Personal Goods
3780	TOBAC	Tobacco
4530	HCEQS	Health Care Equipment & Services
4570	PHARM	Pharmaceuticals & Biotechnology
5330	FDRGR	Food & Drug Retailers
5370	GNRET	General Retailers
5550	MEDIA	Media
5750	TRLES	Travel & Leisure
6530	TELFL	Fixed Line Telecommunications
6570	TELMB	Mobile Telecommunications
7530	ELECT	Electricity
7570	GWMUT	Gas, Water & Multiutilities
8350	BANKS	Banks
8530	NLINS	Nonlife Insurance
8570	LFINS	Life Insurance
8730	RLISV	Real Estate Investment & Services
8770	FNSVS	Financial Services
9530	SFTCS	Software & Computer Services
9570	TECHD	Technology Hardware & Equipment

Appendix Table 3
Variable Definitions

Variable	Description
Pairwise Segmentation	Average of the absolute difference between industry earnings yields in country A and country B, weighted by the sum of the industry market capitalization in country A and country B. Source: Datastream.
EU and Euro Indicators	
EU - Indicator	Indicator equals one if both countries are members of the EU in a given year.
Euro - Indicator	Indicator equals one if both countries in a country-pair are part of the Euro area in a given year. Zero of all country-pairs before 1999.
Euro - Indicator (starting in 1993)	Indicator equals one from 1993 onwards if both countries in a country-pair have introduced the Euro before 2005. For Euro adoptions in 2005 or later, the indicator is one from the year of Euro adoption onward. The indicator is zero in all other cases.
Exchange Rate Volatility Indicator	Using daily exchange rates for the Deutsche Mark until 1998 and for the Euro afterwards, we compute a measure of the realized exchange rate volatility, σ (the square root of the sum of squared daily exchange rate changes during a year) for all countries and years (with the exception of Russin in 1997). We transform the realized volatility onto a [0,1] scale by computing 1/exp(1200 σ). Thus, a country with zero exchange rate volatility takes on a value of one; a country with 1% monthly volatility (roughly that of a major floating currency) would effectively receive a zero. For a country-pair, we employ the average value of the two countries in a pair.
Distance to Brussels (in 1000 km)	For the most important city/agglomeration (as of 2004) in every country in our data set, we obtain the distance (in thousand of kilometers) to Brussels. With the exception of Germany, the most important city is the capital city. For a country-pair, we use the maximum of the two distances as our country-pair measure of distance to Brussels. Source: CEPII.
Measure induced Controls	
Sum of number of listed firms (ln)	Natural log of the total number of listed firms in A and B used in construction of the bilateral segmentation measure. Source: Datastream.
Abs. Diff. in Leverage	We obtain annual accounting data for all public firms contained in Bureau van Dijk's OSIRIS data base. For industrial firms, we define financial leverage as the ratio of long term interest bearing debt to total assets. For financial firms, we define financial leverage as the ratio of total liabilities to total assets. Weighting each observation by total assets, we aggregate this ratio across all firms per industry, country and year. Since coverage is limited in time and across industries and countries, we use linear regressions based on country dummies, industry dummies, private credit over GDP as well as industry return volatility to predict industry leverage when leverage data are not available. We then take the absolute difference between industry leverage in country A and country B. Finally, for each country-pair and year we average this absolute leverge difference across all industries using the sum of an industry's market values in both countries as the weight.

Variable	Description
Abs. Diff. in Ln Earnings Growth Volatility	We measure industry log earnings growth volatility by calculating the five-year standard deviation of quarterly log growth rates of 12-month earnings (measured in USD) for all industries in a given country. We require at least eight quarters of data for the calculation. We then form the weighted average of the absolute difference between the industry log earnings growth volatility in country A and country B, where we use industry market values as weights.
Abs. Diff. in Return Volatility	We measure industry log return volatility by calculating the five-year standard deviation of monthly industry log returns (measured in USD) for all industries in a given country. We require at least 24 months of data for the calculation. We then form the weighted average of the absolute difference between the industry return volatility in country A and country B, where we use industry market values as weights.
Similiarity and Proximity (time-invariant)	
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)	The absolute difference in per capita GDP (measured in constant USD) between two countries in a country-pair in 1980, or if not available in 1990.
Distance (in 1,000 km)	Distance between the most important cities/agglomerations (in terms of population) in thousands of kilometers. Source: CEPII.
Common Language Indicator	Indicator equals one if the two countries in a country-pair share a common official language. Source: CEPII.
Eastern Europe Indicator	Indicator equals one if at least one of the two countries in a country-pair is an Eastern European country. See Appendix Table 1 for a list of Eastern European countries.
Time-Series Controls	
Abs. EY - Differential: Core Europe vs. USA	The average absolute difference between industry earning yields in Core Europe and the US. We obtain earnings yields for Core Europe by aggregating all industries across Core European countries. See Appendix Table1 for a list of Core European countries. Source: Datastream
Core Europe - Earnings Yield	The earning yield in Core Europe. We obtain earnings yields for Core Europe by aggregating all Core European countries. See Appendix Table1 for a list of Core European countries. Source: Datastream
Potential Channels of Integration	
Trade	Total of exports and imports between two countries in a country-pair, scaled by average GDP. Source: Datastream and WDI
FDI	Total of FDI holdings of country one in country tow plus those of country two in country one scaled by average GDP. Source: Eurostat and WDI
Capital Account Openness: Average	The average level of captial account regulation across the two countries in a country-pair. The variable takes on values between zero (closed) and three (fully liberalized). Source: IMF
Capital Account Openness: Difference	The absolute difference in the level of capital account regulation between the two countries in a country-pair. Source: IMF

Variable	Description
Equity Market Openness: Average	The average of measured equity market openness across the two countries in a country-pair. Equity market openness is measured as the ratio of the market capitalization of the constituent firms comprising the IFC Investable index to those that comprise the IFC Global index for each country. The IFC Global index, subject to some exclusion restrictions, is designed to represent the overall market portfolio for each country, whereas the IFC Investable index is designed to represent a portfolio of domestic equities that are available to foreign investors. A ratio of one means that all of the stocks are available to foreign investors. Fully segmented countries have an intensity measure of zero, and fully liberalized countries have an intensity measure of one.
Equity Market Openness: Difference	The absolute difference in equity market openness between the two countries in a country-pair.
Financial Reform: Average	The average of the financial refrom index across the two countries in a country-pair. The index takes on values between zero (fully repressed) and 21 (fully liberalized). Source: IMF
Financial Reform: Difference	The absolute difference in the financial refrom index between the two countries in a country-pair. Source: IMF
MCAP/GDP: Average	The average ratio of equity market capitalization to GDP across the two countries in a country-pair. Source: WDI
MCAP/GDP: Difference	The absolute difference in the "equity market capitalization to GDP" ratio between the two countries in a country-pair. Source: WDI
Absolute Real Interest Differential	The absolute difference between the real interest rate in the two countries in a country pair. The real interest rate is measured as the prime rate less inflation as measured by the GDP deflator. Source: WDI
Telecommunication: Average	The average of the ratio "number of fixed lines and mobile phone subscribers per 100 people" across the two countries in a country-pair. Source: WDI
Telecommunication: Difference	The absolute difference in the ratio "number of fixed lines and mobile phone subscribers per 100 people" between the two countries in a country-pair. Source: WDI

Appendix Table 4
Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Pairwise Segmentation	6,336	0.0525	0.0374	0.0000	0.3506
EU - Indicator	6,336	0.4337	0.4956	0.0000	1.0000
Euro - Indicator	6,336	0.0767	0.2661	0.0000	1.0000
Euro - Indicator (starting in 1993)	6,336	0.1316	0.3381	0.0000	1.0000
Exchange Rate Volatility Indicator	6,326	0.2936	0.3282	0.0000	1.0000
Distance to Brussels (in 1000 km)	6,336	1.4565	0.6300	0.1730	2.9050
Sum of number of listed firms (ln)	6,336	5.2742	1.2102	0.6931	7.7803
Abs. Diff. in Leverage	6,336	0.0821	0.0389	0.0010	0.4813
Abs. Diff. in Ln Earnings Growth Volatility	6,336	0.0958	0.0422	0.0008	0.3729
Abs. Diff. in Return Volatility	6,336	0.0269	0.0157	0.0001	0.1036
Abs. Diff. in PC GDP in 1980/1990 (in 1,000 USD)	6,336	8.5204	6.7427	0.0012	30.4281
Distance (in 1,000 km)	6,336	1.4133	0.7647	0.0596	4.8821
Common Language Indicator	6,336	0.0683	0.2523	0.0000	1.0000
Eastern Europe Indicator	6,336	0.4124	0.4923	0.0000	1.0000
Abs. EY - Differential: Core Europe vs. USA	6,336	0.0163	0.0070	0.0104	0.0507
Core Europe - Earnings Yield	6,336	0.0609	0.0132	0.0189	0.1043
Trade	6,336	0.0112	0.0173	0.0000	0.2030
FDI	4,085	0.0124	0.0307	-0.0122	0.6342
Capital Account Openness: Average	4,817	2.8086	0.4057	0.0000	3.0000
Capital Account Openness: Difference	4,817	0.2616	0.5811	0.0000	3.0000
Equity Market Openness: Average	6,336	0.8199	0.2666	0.0000	1.0000
Equity Market Openness: Difference	6,336	0.2815	0.4237	0.0000	1.0000
Financial Reform: Average	4,817	17.8604	2.6409	6.8750	21.0000
Financial Reform: Difference	4,817	2.6424	2.2902	0.0000	13.0000
MCAP/GDP: Average	6,336	0.6081	0.4266	0.0300	3.1808
MCAP/GDP: Difference	6,336	0.5283	0.5506	0.0000	3.2654
Absolute Real Interest Differential	4,048	0.0375	0.0341	0.0000	0.3057
Telecommunication: Average	6,336	0.9783	0.4263	0.1671	1.9050
Telecommunication: Difference	6,336	0.2756	0.2363	0.0000	1.2921