Does the Euro Lead to Investment? Industry Evidence *

Tomas Dvorak
Department of Economics
Union College
Schenectady, NY 12308

September 2006

Abstract

Using industry level data, I find that the introduction of the Euro was associated with an increase in the growth rate of physical investment. The magnitude of the effect ranges from three to five percentage points per year and is fairly robust to a variety of controls and across different sub-samples. The effect is significant during the four years following the Euro's introduction, but disappears by 2003. The effect appears to be equally strong for countries with high and low levels of financial development. The effect is not stronger in industries that depend on external finance. Only when financially dependent industries are located in countries with low financial development is the impact of the Euro stronger. I also find suggestive evidence that the introduction of the Euro increased the efficiency of capital allocation.

Key words: investment, Euro, EMU, financial integration
JEL: F36, F15, E22

*I would like to thank Luc Leaven helpful comments.

1 Introduction

There is overwhelming evidence that following the introduction of the common currency, European financial markets have became integrated (for a survey see Baele et al. (2004)). This paper investigates whether this integration had any effect on physical investment. I address the imbalance between the vast literature that documents and measures financial integration and the limited literature on the real effects of this integration. Knowing whether financial integration has any real effects is important: financial integration is not an end in itself, but rather a means to achieving higher economic growth. The purpose of this paper is to investigate two channels through which financial integration may lead to growth: higher investment and its more efficient allocation.

It seems to be generally accepted that financial integration will ultimately lead to growth. A document describing the financial policy of the European Commission states that "The economic benefits of European financial integration are beyond doubt."(European Commission (2005 p. 5)). However, evidence on this is scarce. The European Commission's statement relies on indirect evidence that comes from the very large "Finance and Growth" literature. This literature establishes the link between financial development and economic growth. To the extent that financial integration facilitates financial development, financial integration will lead to growth. This argument is used in a well cited study by Guiso et al. (2004).[1] Using a number of simulations, they find that the "growth dividend" from financial integration in Europe is substantial - especially for the currently less financially developed countries and industries that depend on external finance.[2]

My strategy is to use the introduction of the Euro as a one-time increase in the degree of financial integration. The Euro has eliminated one of the most important impediments to financial integration: exchange rate risk. In addition, it has lowered information barriers and increased liquidity. Therefore, the effects of the Euro can, at least in part, be interpreted as the effects financial integration. In general, financial integration is a slow and gradual process, the effects of which may be difficult to estimate. In contrast, the introduction of the Euro and the transformation of the financial system that followed may provide us with enough statistical power to estimate the effects of financial integration.

The evidence that the Euro has facilitated financial integration is extensive. Perhaps the most

[1] For example, in his speech evaluating the EMU Ben Bernanke cites this article.

[2] London Economics (2002) is another study that tries to quantify the benefits of financial integration. The authors assume that financial integration will lead to a lower cost of capital and then they simulate the effects of the reduced cost of capital in a macro model. They find a significant increase in GDP. The key mechanism is that a lower cost of capital increases investment, which in turn increases GDP.

dramatic transformation took place in the European bond market. This is documented in Pagano and von Thadden (2004), who note that the issuance of corporate bonds more than doubled in 1999 (the year of the Euro's introduction). In addition, they report increased liquidity in the secondary markets as well as competition in underwriting fees.[3] They also find that the European corporate bond market allowed lower quality borrowers to enter the market with almost 50% of issues only single A rated. Rajan and Zingales (2003) perform a simple panel data test and find that the Euro had "an independent effect in promoting the development of arms length markets in countries that adopted it" (Rajan and Zingales (2003, p. 157). Financial integration in equity markets means that stocks are priced according to Euro-wide risk factors rather than local risk factors. Since the Euro-wide risk factor is expected to be lower, the cost of capital falls (see Stulz (1999)). Hardouvelis, Malliaropulos and Priestly (2006) find evidence of integration among the Euro zone stock markets in the prelude to the EMU. Interestingly, they find no evidence of integration in the U.K. market. This lends support to the notion that it was the Euro that facilitated integration.[4] While the integration of the banking markets has generally been slower than in the securities market, Cabral, Dierick and Vesala (2002) and Gual (2004) report nearly full integration in wholesale banking. [5]

The evidence that the common currency has transformed capital markets in the Euro area begs the question of whether this transformation had an impact on physical investment. After all, the purpose of financial integration is a financial system that channels savings to their most productive uses at the least possible cost. It is reasonable to expect that the easy bond financing, lower cost of equity capital and more efficient banking would relax the financing constraints of many firms and make the net present value of many investment projects a positive one. Therefore, I test the hypothesis that the introduction of the Euro is associated with more physical investment and its more efficient allocation. The alternative hypothesis is that the documented financial integration is simply a side show to the real economy as in Mork, Shleifer and Vishny (1990). Perhaps the fury of activity in the corporate bond market financed mergers and acquisitions rather than physical investment. This is not necessarily inconsistent with financial integration being beneficial, but it is a different channel through which it may contribute to growth.

[3]Santos and Tsatsaronis (2003) also report a dramatic decline in bond underwriting fees.

[4]Additionally, Adjaunte and Danthine (2003) document several dimensions of equity market integration in the EMU. Using his study of the European Exchange Rate Mechanism (EMR), Sentana (2002) predicts that the elimination of exchange rate risk will substantially reduce the cost of capital in the EMU countries.

[5]Additionally, Perez Salas-Fumas and Saurina (2005) find that cross border flows in banking assets increase faster in the Euro zone than elsewhere in the world. Finally, even in retail markets, Manna (2004) finds decreasing importance of location.

The investment response to financial integration should not be uniform across countries and industries. If the Euro opens the door to large and liquid financial markets, then countries with previously low levels of financial development should benefit more than countries with already developed financial markets. Therefore, I test whether the impact of the Euro varies across different levels of financial development. Similarly, if financial integration relaxes financial constraints in industries that depend heavily on external finance, investment in these industries should respond more than in industries that do not depend on external finance. I therefore test whether the impact of the Euro varies by industry.

I use both aggregate and industry level data. The time period covers five years prior to and five years following the introduction of the Euro. It includes countries that adopted the Euro as well as those that did not. In my baseline specification I regress the growth rate of investment on time and country fixed effects and on a dummy indicating the years and countries in which the Euro was used as the official currency. The coefficient on the Euro is the difference in differences estimator of the effect of the Euro on the growth rate of investment. Using aggregate data I find suggestive evidence that the Euro is associated with an increase in the growth rate of investment. Using industry level data the evidence is much stronger and shows that the Euro is associated with an increase in the growth rate of investment of about five percentage points. This effect is fairly robust and generally persists even after controlling for aggregate stock returns, changes in interest rates, GDP growth and other factors. The effect is significant in the first four years following the Euro's introduction, but disappears in 2003.

I find that the effect of the Euro on investment does not depend on a country's level of financial development. This suggests that the Euro enhances the workings of financial markets in *all* countries - not just in those that are financially less developed. Similarly, I find that industry's level of dependence on external finance does not affect the Euro's impact. However, the impact of the Euro on investment is higher in industries that are both dependent on external finance *and* are located in countries with low initial level of financial development. In other words, dependence on external finance matters only in countries with low levels of financial development. These results are consistent with Guiso et al., who predict that financial integration will benefit financially dependent industries and countries with low levels of financial development. They are also consistent with the findings of Cleasssens and Laeven (2005) who find that higher competition in the banking industry spurs growth in financially dependent industries, and with the findings of Aghion et al (2006) that low exchange rate volatility generally increases growth in countries with low levels of financial development.

The paper contributes to the growing literature that examines the real effects of the EMU (for a recent survey see Lane (2006)). The focus of this literature has been on the Euro's effects on trade.[6] Bris, Koskinen and Nilsson (2006) is one paper that looks at the Euro's effect on investment. They use firm level data and find a positive and significant, albeit somewhat smaller, effect of the Euro on investment. De Sousa and Lochard (2005) and Barr, Breedon and Miles (2003) find that the Euro stimulated FDI within the Euro zone. However, as Barr et al. point out, more FDI does not necessarily mean more physical investment, because FDI could simply involve a change in ownership. Barr et al (2003) also look at the Euro's effects on inflation, unemployment and output. They find no significant differences between countries inside and outside of the Euro area.[7]

2 Data

My aggregate data include 11 Euro countries (all of the EMU minus Luxembourg) plus five European countries not participating in the EMU (U.K., Switzerland, Denmark, Norway and Sweden) and three non-European countries (U.S., Canada and Australia). The time period is from 1994 through 2003, i.e. five years prior to and five years after the Euro's introduction. The dependent variable in both the aggregate and industry level analyses is the growth rate of real gross fixed capital formation. The aggregate investment data are from OECD's statistics of national accounts in constant local currency. Aggregate data on real GDP growth and the log of GDP per capita (in 2000 U.S. dollars) come from the *World Development Indicators*. Aggregate real stock returns are the difference between the logarithmic return of the local currency MSCI gross return index and inflation. As long term interest rates I used 10 year government bond yields from the *International Financial Statistics* (for Canada, Austria and Norway) and Eurostat (all other countries).

The industry level data are from the STAN database published by the OECD. STAN includes annual industry level data for most of the OECD countries. The available information includes production, value added, labor input and investment. Two of the countries used in the aggregate data analysis are not included at the industry level: Ireland is missing from STAN altogether and Switzerland lacks any investment data. The list of countries and the number of observations for each appears in table A.I in the appendix. The industry breakdown varies across countries ranging

[6] See, for example, Micco, Stein and Ordonez (2003), Baldwin (2005) and Nitsch (2005).

[7] Blanchard and Giavazzi (2002) find that the link between national investment and savings has recently weakened in Europe, and especially in the EMU. This confirms that the EMU countries are becoming financially integrated, and that this integration has real effects on the choices of consumers and investors.

from two to four digit detail of the ISIC rev. 3 classification. I use only two digit industries. The coverage ranges from eight industries for Australia to 52 industries for Germany and Greece. The average country has data for 34 industries.

The industry level investment is real gross fixed capital formation (STAN code GFCFK). [8] It includes net acquisitions of new tangible assets (e.g. machinery and equipment, livestock, constructions) as well as non-tangible assets (e.g. software, mineral exploration) which are intended to be used for more than one year. It excludes acquisition of land and military outlays by government. I drop all observations that have the growth of real investment in the top and bottom 1% of the sample. This removes all outliers and leaves me with 4,794 valid observations. The average growth in industry-level real investment is about 4% - not surprisingly very similar to the average growth of aggregate investment taken from national accounts statistics.[9]

As a measure of industry output I use the growth rate of real value added (STAN code VALUK). I also calculate three measures of productivity growth. Labor productivity growth is the difference between the growth of real value added and the growth of total employment (STAN code EMPN). The second measure of productivity growth is the difference between the growth of real value and the growth of real net capital stock (STAN code NCAPK). I call this capital productivity growth. Finally, multi-factor productivity growth is the difference between the growth of real value added and the weighted average of employment and real capital stock growth. The weight on employment growth is the labor's share in value added (LABR/VALU). One minus the labor's share is the weight on the growth of real capital stock. It is important to note that the data on capital stock in STAN have many missing observations and are currently under review by the OECD. The descriptive statistics for all variables appear in the appendix Table A.II.

I also use a number of industry characteristics. The first is an index of dependence on external finance (RZ) originally constructed by Rajan and Zingales (1998) and updated by Laeven, Kroszner and Klingebiel (2005). I use the updated figures from Laeven et al. [10] It is designed to measure technological demand for external financing - it is high when an industry depends on external financing (like drugs and pharmaceuticals) and low if an industry does not require a lot of external financing

[8] The exception is Great Britain, which had missing values for real capital formation (GFCFK) but non-missing values for nominal capital formation (GFCF). I divided GFCF by the the British value added deflator of the manufacturing sector to create real capital formation GFCFK.

[9] I compare the two sources of data. The correlation coefficient between 'grand total' investment for each country from STAN and aggregate investment from national accounts is 0.96.

[10] Rajan and Zingales' orginial measures were constructed using data from the 1980s. Laeven et al. recalculate the measures using data from 1980 to 1999. The two measures are highly correlated with a correlation coefficient of 0.82.

(like tobacco). The RZ measure is available in the ISIC rev. 2 industry classification, whereas the STAN data uses ISIC rev.3 classification. In addition, RZ is available only for manufacturing. Using rev. 2 to rev. 3 concordance, I was able to match the RZ measure to 25 out of 52 of my industries. The second industry characteristic is investment intensity (Inv), calculated as the share of gross fixed capital formation in value added (GFCK/VALU in STAN codes). The third characteristic is export intensity, calculated as the share of exports in value added (EXP/VALU in STAN codes). The fourth characteristic is research and development intensity ($R\&D$), calculated as the share of R&D expenditures in value added. The R&D expenditures come from the OECD's *Science and Technology* database which uses the same industry classification as STAN. Finally, $Size$ is measured as total employment divided by the number of establishments. This comes from an older OECD database entitled *Structural Statistics for Industry and Services.*

Finally, I gather three measures of the initial level of financial development: market capitalization as a percent of GDP, claims of banks and other financial institutions as a percent of GDP and an index of accounting standards. All values are averages from 1980 to 1995 and come from Demigruc-Kunt and Levine (2001).[11] While I use these measures individually, I also collapse them into a dummy variable, $LowFD$, which is equal to one for the four countries that ranked in the bottom half on all three measures of financial development. These countries are Spain, Portugal, Greece and Italy.[12]

3 Empirical Results

3.1 Does the Euro lead to more investment? Aggregate Evidence

Before examining the industry level evidence I look at the aggregate investment data. While this does not allow me to control for industry-specific business cycle fluctuations or examine how the Euro's effect varies across industries, it is a useful first pass at trying to understand the Euro's effect on investment. Table I shows average aggregate investment growth rates for EMU and non-EMU countries before and after the Euro's introduction.[13] We see that on average, aggregate investment grew faster *before* the introduction of the Euro than afterwards. The relatively high investment

[11]These statistics have *mcap*, *privo* and *account* codes in the Demigruc-Kunt and Levine dataset.

[12]Following the example of Andrew Rose, both the aggregate and industry data as well as the estimation programs are available at the author's website.

[13]I treat 1999 as the after the Euro period even though Greece joined only in 2001. In the regression specification below, the *Euro* dummy for Greece will properly equal to one only starting in 2001.

growth prior to 1999 is driven by the world-wide boom of the late 1990s and most likely has nothing to do with the introduction of the Euro. Also in Table I we see that on average, investment growth in Euro countries was somewhat *lower* than in non-Euro countries. It is possible that the Euro countries typically grow slower than the non-Euro countries for reasons other than the common currency. For example, Germany has had low investment growth for the past decade - both before and after the Euro's introduction.

In order to measure the effect of the Euro on investment growth, we need to evaluate the change in investment growth in Euro countries *relative* to the change in the investment growth in non-Euro countries. In other words, we need a difference in differences estimator. This estimator is obtained by regression investment growth rate on country and year fixed effects. The year effects control for factors that vary over time but are common across countries (e.g. the world-wide boom in the late 1990s). The country effects control for factors that vary across countries but which are constant over time (e.g. the sluggish growth in Germany). My baseline regression can be written as follows:

$$I_{j,t} = \psi_j + \omega_t + \beta Euro_{j,t} + \varepsilon_{j,t} \quad (1)$$

where $I_{j,t}$ is the growth rate of aggregate investment in country j in year t, ψ_j and ω_t are country and year effects. $Euro$ is a dummy variable equal to one in years and countries in which the Euro is the official currency. The coefficient of interest is β. It is the difference between the expected growth rate of investment after and before the introduction of the Euro conditional on a typical investment in a given country and a given year. If the Euro spurs investment, then β should be positive and significant. I assume that the error terms $\varepsilon_{j,t}$ are independent across countries but may be correlated within countries over time. This addresses the possible serial correlation in residuals that often plagues the difference in differences estimates as pointed out by Bertrand, Duflo, Mullainathan (2004).

The results from the regression using all 19 OECD countries appear in panel a of Table II. The coefficient on the Euro dummy is always positive but never statistically significant at the 5% level. In specification 2, I include an interaction between the $Euro$ dummy and the $LowFD$ dummy which indicates countries with a low level of financial development (Italy, Portugal, Spain and Greece). I also include a number of macroeconomic controls. First, I include lagged GDP growth to capture aggregate business cycle fluctuations as in the accelerator models of investment of Clark (1979) or Acemoglu (1993).[14] Second, I include lagged real aggregate stock market returns which serve both

[14]Since the year effects pick up common business cycle fluctuations, the lagged GDP growth picks up the country

as a proxy for Tobin's q as well as a financial accelerator. Third, I include lagged interest rates. Finally, following Bris et al. I include GDP per capita. Only when the macroeconomic controls and the interaction between the $Euro$ and $LowFD$ dummies are included is the coefficient on the $Euro$ dummy statistically significant, but then only at the 10% level.

In panel b I limit my sample to European countries. The advantage of this is that the year effects will control specifically for European business cycle fluctuations rather than for OECD-wide fluctuations.[15] Once again, the coefficients on the $Euro$ dummy are positive, but statistically significant only at the 10% level when macroeconomic controls are introduced, and at the 1% level when macroeconomic controls and the interaction term between the $Euro$ and $LowFD$ dummies are introduced. In this case, the magnitude of the coefficient implies that the aggregate investment is expected to grow 2.6 percentage points faster in countries that adopted the common currency. This effect is remarkably similar to the 2.5 percentage point effect found by Bris et al. The coefficient on the interaction between the $Euro$ and $LowFD$ dummies is always statistically insignificant, suggesting that the effect of the Euro was the same in more and less financially developed countries. In summary, the aggregate data evidence that the Euro has accelerated the growth in investment is only suggestive. In the next few sections I explore the industry level data to better understand the nature of the effect of the Euro on investment.

3.2 Does the Euro lead to more investment? Industry Evidence

The industry level panel data offer several advantages over the aggregate data. First, by including the interactions between industry dummies and year dummies, I am able to control for industry specific business cycles. This is important because the different industrial structure in EMU and non-EMU countries coupled with different industry specific trends could affect the results. For example, if non-EMU countries specialize in telecommunications, the boom and bust in that industry, which roughly coincides with the introduction of the Euro, will bias the effect of the Euro upward. The interactions between industry and year dummies control for any factors that vary across industry and time but not across countries.[16] Second, I am able to include interactions between the industry

level idiosyncratic fluctuations.

[15] In addition, focusing on European countries only may dispel concerns that Australia, Canada and the U.S. may not be the right controls to estimate the effects of the Euro. Persson (2001) raises this problem in the context of estimating the effects of currency unions on trade.

[16] Another example is the textile industry. Investment growth in the textiles industry is steadily falling. If Euro countries specialize in textiles, the aggregate data may bias the effect of the Euro on investment downward.

dummies and country dummies. These interactions control all industry and country-specific factors such as the surge in infrastructure investment in Greece prior to the 2004 Olympic games. Most importantly, however, the use of industry level data allows me to investigate whether the Euro had a different impact on industries that depend on external finance. If the Euro impacts only industries that depend on external finance, aggregate data may not be able to detect a significant effect of the Euro on investment. The baseline specification for the industry level data can be written as follows:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \theta_{i,t} + \eta_{i,j} + \beta Euro_{j,t} + \varepsilon_{i,j,t} \qquad (2)$$

where $I_{i,j,t}$ is the growth rate of investment in industry i, country j and year t, ϕ_i is the industry effect, ϕ_j is the country effect, ω_t is the year effect, $\theta_{i,t}$ is the industry and year effect, and $\eta_{i,j}$ is the industry and country effect. As with the aggregate data, I assume that the error terms $\varepsilon_{i,j,t}$ are independent across countries but may be correlated within countries - across industries and over time.

As with the aggregate data, I expand the baseline specification to control for a number of macroeconomic factors. An investment equation should ideally contain balance sheet and cash flow variables. Unfortunately, STAN does not include any balance sheet data, and therefore I am unable to include cash flow, cash holdings or leverage. I am also unable to calculate industry level Tobin's q. However, if variables such as q or cash flow vary over time and across industries but not across countries, they are controlled for by the interactions between the industry and year dummies.[17] Therefore, I include these interactions in nearly all of the specifications in this paper.

Table III shows the results. The estimate of β is always positive and mostly statistically significant. Using the full sample, shown in panel a, the coefficient is always significant at the 1% level even after controlling for macroeconomic variables and introducing the interaction between the $Euro$ and $LowFD$. Using the European sample, shown in panel b, the coefficient is significant at the 1% level without macroeconomic controls and at the 5% and 10% levels when macroeconomic controls are included. The magnitude of the estimated coefficient implies that investment growth in a typical industry is about five percentage points higher following the introduction of the Euro. Given the average value of investment growth of 4%, I regard this effect as large and economically significant. The effect is also about 2.5 percentage points larger than that found in Bris et. al. The difference may be due to the fact that his firm level data includes only relatively large, publicly traded firms. If the Euro relaxes financial constraints for predominantly small firms (an effect that Bris et al. find

[17] Indeed, in their firm-level study, Bris et al. use lagged industry level q rather than firm level q.

within their sample) then the estimated impact using *aggregate* investment should be larger.

In order to check if the effect of the Euro on investment is robust, I re-estimate the specifications from Table II using four sub-samples. The first sub-sample includes only non-manufacturing industries (i.e. ISIC rev. 3 codes 15 to 37). I include the macroeconomic controls in all specifications (but omit the coefficients from the table). The statistical significance of the effect increases in both the full and Europe only samples. The magnitude of the effect decreases somewhat, now ranging from 3.6 to 4.3 percentage points. The second sub-sample is the manufacturing sector. The coefficient are always positive but remain statistically significant in only two of the eight different specifications. The third sub-sample, estimated in panels e and f, excludes the U.K. The coefficients are statistically significant at least at the 5% level in six of the eight different regressions.[18]

3.3 Does the impact of the Euro vary over time?

To investigate whether the effects of the Euro vary over time, I replace the single *Euro* dummy with a set of five interactions between the *Euro* dummy and five of the year dummies, each indicating one post-Euro year. For example, $Euro * Year2002$ equals one for all EMU countries in 2002 and zero otherwise. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \theta_{i,t} + \eta_{i,j} + \beta_s EURO_{j,t} * \omega_s + \varepsilon_{i,j,t} \tag{3}$$

where s=1999, ..., 2003; and β_s is the effect of the Euro in year s.

The results appear in Table IV. I show the results with and without the macroeconomic controls and with and without the country/industry and industry/year interaction effects. All specifications include year, country and industry dummies. It appears that the effect of the Euro is about the same in the first four years after its introduction in 1999, but completely disappears by 2003. The coefficients on the interaction between the *Euro* and year dummies are of about the same magnitude and statistical significance between 1999 and 2002. However, the coefficients on the $Euro*Year2003$ interaction are close to zero and always statistically insignificant. This pattern is consistent with the Euro improving the workings of the financial system. Firms seem to have taken advantage of relaxed financial constraints during the four years following the Euro's introduction. It is worth noting that the Euro's effect on investment is permanent - I find no evidence of reversals in investment. If faster

[18]In addition, to these reported robustness checks I tried excluding excluding public administration, education and health (SIC rev. 3 75, 80 and 85). The effect of the Euro is statistically significant at least at the 5% level for both full and Europe only samples. When electrical equipment and telecommunications are excluded (SIC rev.3 30-33 and 64) the results are significant at the 5% level for the full sample and the 5 and 10% levels with the Europe only sample.

investment growth in Euro countries was partly a result of euphoria over the common currency, the firms do not appear to have scaled back investment once the euphoria passed.[19]

3.4 Does the impact of the Euro vary across countries?

To investigate whether the effect of the Euro varies across countries, I replace the single *Euro* dummy with a set of ten interactions between the Euro dummy and the ten Euro countries. For example, $Euro * Austria$ equals one if the observation is for Austria and between 1999 and 2003. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \theta_{i,t} + \eta_{i,j} + \beta_k EURO_{j,t} * \psi_k + \varepsilon_{i,j,t} \tag{4}$$

where k indexes the 10 EMU countries and β_k is the Euro's effect in country k.

The results are presented in Table V. The effect of the Euro is statistically significant in most countries whether or not I include the macroeconomic controls or year/country/industry dummy interactions. The largest effect appears in Austria, with a magnitude ranging from 9 to 12 percentage points. The effects are also strong and robust in France, Germany, Belgium and the Netherlands. The effect of the Euro is significant in Spain, Italy and Greece only when macro controls are excluded. In Finland and Portugal, the effects of the Euro appear insignificant.

If the Euro facilitates financial development, its effects should be higher in countries that are initially less financially developed. A glance at the results suggests the opposite. The impact seems *less* robust in countries with historically low levels of financial development such as Italy, Greece, Spain and Portugal, while strong in the well developed financial markets of Germany, Belgium, the Netherlands and France. In order to systematically investigate the variation in the Euro's impact across countries, I estimate another set of regressions. I interact the *Euro* dummy with the $LowFD$ dummy, which indicates Spain, Portugal, Greece and Italy. In addition, I interact the *Euro* dummy with each of the three specific financial development measures (stock market capitalization, claims of financial institutions and accounting standards).

The results are reported in Table VI. The first column show that the coefficient on the interaction between *Euro* and $LowFD$, although negative, is not statistically significant. This means that the difference between the impact of the Euro in more or less financially developed countries is not

[19] The disappearance of the impact of the Euro on investment stands in contrast with with the Euro's effect on trade. Both Micco, Stein and Ordoñez (2003) and Flam and Nordstrom (2003) find that the Euro's positive effect on trade is greater in later years than immediately following its introduction.

statistically significant. When I interact the *Euro* dummy with the specific financial development measures, the coefficients are statistically insignificant at the 5 percent level in all cases. Therefore, I do not find evidence that the effect of the Euro varies with the level of financial development. Only the interaction between *Euro* and market capitalization is statistically significant at 10 percent. The coefficient is negative, providing suggestive evidence that the effect of the Euro is larger in countries with a low level of stock market development.

3.5 Does the impact of the Euro vary across industries?

There is ample evidence that the effects of financial development vary across firm or industry characteristics. Most notably, Rajan and Zingales (1998) show that financial development affects industries that depend on external finance. If the Euro facilitates financial development, its effects should also vary across industries. I examine if the Euro's effect varies across five industry characteristics: an index of an industry's dependence on external finance (RZ) as constructed by Rajan and Zingales (1998) and updated by Laeven, Kroszner and Klingebiel (2005); share of research and development expenditures in value added (*R&D*); share of investment in value added (Inv); size measured as employment per establishment ($Size$); and share of exports in value added (Exp). I interact these five industry characteristics with the *Euro* dummy. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \theta_{i,t} + \eta_{i,j} + \beta EURO_{j,t} + \gamma_X EURO_{j,t} * X_{i,j} + \varepsilon_{i,j,t} \quad (5)$$

where $X_{i,j}$ is the value of one of the five industry characteristics in industry i and country j, and γ_X measures how the effect of the Euro varies with industry characteristic X.

The rationale for including the RZ measure is straightforward: if the Euro improves the workings of financial markets, it should primarily help industries that depend on external finance. I include the *R&D* measure partly because it is correlated with the RZ measure and is available for more industries than RZ. Industries with the need for large R&D investment depend on financial markets to finance this investment. Of course, an industry's need for R&D does not mean that it will have high R&D expenditures, especially if external finance is unavailable. Nonetheless, I expect the Euro to spur investment in R&D intensive industries. Similarly, I also expect the Euro to spur investment in investment intensive industries as measured by Inv. I also examine if the effect of the Euro varies by size. On the one hand, it is well known that small firms tend to be financially constrained (Gertler and Gilchrist (1994)). If the Euro improves the workings of the financial market it should allow small firms which were previously financially constrained to invest more. On the other hand, Bartram and Karolyi (2004) find that the reduction in market risk following the introduction of the Euro is greatest for large firms - hence larger firms should benefit more. In addition, the financial integration spurred by the Euro has been more intense in equity and bond markets than in banking (Vives (2001) and Schoenmaker and Oosterloo (2005)). Since it is primarily large firms that tap equity and bond markets, it could again be large firms that benefit from the Euro. Therefore, how size affects the Euro's impact is ambiguous. Finally, I look at the effect of export intensity on the Euro's impact on investment. I expect export intensive industries to invest more since a common currency reduces the cost of international trade.

The RZ measure is constant over time and across countries. For example, the RZ index is the same for the basic metals industry in all countries. The assumption is that an industry's technological need for external finance does not change with time and is the same across countries. I average the other four measures over time so that they vary only across industries and countries. For example, the share of $R\&D$ expenditures in the telecommunications industry is different in Germany than in Portugal, but in each case it is constant over time. I did this in part because $Size$ and $R\&D$ expenditures have many missing values, and by averaging over time I am able to use more observations. I assume that average establishment size in an industry and its R&D intensity remain constant over the ten year period.

The results are shown in table VIII. I present only the results where country/industry and industry/year interactions and macroeconomic controls are included. As before, I estimate the coefficient using both the full and Europe only samples. The coefficient on the interaction between the $Euro$ dummy and the RZ measure of financial dependence is insignificant using both samples. This means that in general, the effect of the Euro is not greater in industries that depend on external finance. However, when I interact the $Euro * RZ$ term with the low financial development dummy $LowFD$, the coefficient on this triple interaction is positive and statistically significant using the full sample and marginally insignificant using the Europe only sample. This suggests that the Euro enhances investment in financially dependent industries but only in countries that are less financially developed. This is consistent with the Euro facilitating financial development and allowing financially dependent firms to grow faster. The magnitude of the effect is fairly small. The average value of the RZ measure is 0.05. Multiplied by the estimated coefficient of 0.1, this implies that industries in the less financially dependent countries that adopted the Euro (Italy, Portugal, Spain and Greece) are expected to invest about half a percentage point more than industries in non-Euro countries.

The coefficients on the interactions between $Euro$ and other industry characteristics are insignificant. Therefore, the Euro seems to boost investment equally in industries with various R&D and investment intensities as well as in industries with various sizes of establishments. The coefficient on the interaction between the *Euro* and export intensity *Exp* is also insignificant. This is somewhat surprising since there is evidence that the Euro increased trade both within and outside of EMU countries (Micco, Stein and Ordonez (2003), Flam and Nordstrom (2003), Baldwin (2005)). If the Euro increases trade it should also increase investment in export intensive industries. One possibility, suggested by Bris at al., is that the common currency eliminates the possibility of competitive depreciations and as a result export industries in weak currency countries may invest less.

3.6 Does the Euro lead to a more efficient allocation of capital?

Measuring the efficiency of investment allocation is difficult. Capital is allocated efficiently if its marginal product is equal across all firms. The difficulty lies in measuring the marginal product of capital and also in the presence of adjustment costs. Various approaches have been adopted in the existing literature. Abiad, Oomes and Ueda (2004) use the dispersion of Tobin's q as a measure of the efficiency of capital allocation. To the extent that q measures the marginal product of capital, a lower dispersion in q implies a more efficient allocation of capital. Galindo, Schiantarelli and Weiss (2003) measure the marginal return to capital as the ratio of sales to capital or profits to capital, and investigate if investment flows to firms with higher marginal return. Claessens and Laeven (2003) consider the efficiency of investment allocation across tangible and non-tangible assets. They find that in countries with poor property rights, firms under-invest in non-tangible assets. They emphasize the link between property rights, financing and growth. Another approach to measuring the efficiency of investment is in Chari and Henry (2004). They view investment as efficient when it takes place in firms that provide the most risk sharing benefits.

In assessing the efficiency of investment, I estimate the elasticity of investment with respect to value added and three different measures of productivity. This strategy follows that of Wurgler (2000) and Maksimovic and Phillips (2002). Wurgler calculates the elasticity of investment with respect to output in order to evaluate the efficiency of financial markets across countries. Maksimovic and Phillips calculate the elasticity of investment with respect to shipments and different productivity measures in order to evaluate the efficiency of investment allocation within conglomerates.[20] These approaches are non-structural but have the advantage of being simple, intuitive and transparent. In

[20]This approach is also similar in spirit to Fisman and Love (2004) who find that countries with well developed financial markets respond to sectoral shocks better than in less developed financial markets.

contrast, the approaches that use Tobin's q critically depend on our ability to accurately estimate q. In order to evaluate the impact of the Euro on investment efficiency, I estimate the elasticities of investment with respect to value added and productivity measures before and after the introduction of the Euro. If the Euro leads to more efficient investment, elasticities after its introduction should be higher than before. The baseline specification can be written as follows:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \theta_{i,t} + \eta_{i,j} + \beta EURO_{j,t} + \eta Q_{i,j,t} + \theta Q_{i,j,t} * EURO_{j,t} + \varepsilon_{i,j,t} \qquad (6)$$

where $Q_{i,j,t}$ is either value added growth, labor, capital or multifactor growth, η is the elasticity of investment with respect to value added growth or the three productivity measures before the Euro. The coefficient of interest is θ. It is the difference between the elasticities before and after the introduction of the Euro. If the Euro improves efficiency of investment, θ should be positive.

The results appear in table IX. I present the results with country/industry and year/industry dummy interactions and macroeconomic controls included. The estimated elasticities of investment with respect to value added is positive and significant at the 5% level. Moreover, the interaction between the *Euro* dummy and the growth of value added is also statistically significant. This suggests the elasticity has increased following the introduction of the Euro. In other words, investment flows to industries that grow, and this tendency increased after the Euro introduction. The triple interaction between the *Euro* dummy, value added growth and the $LowFD$ dummy is insignificant, suggesting that the elasticity does not increase by more in countries with previously low levels of financial development. The elasticities with respect to multifactor, labor and capital productivities are always positive, but not statistically significant. The interaction between the *Euro* dummy and labor productivity growth is significant, which is consistent with the hypothesis that after the introduction of the Euro investment tended to flow to industries with higher labor productivity growth.

4 Conclusion:

I find evidence that the introduction of the Euro is associated with a significant increase in the growth rate of physical investment. While investment growth fell everywhere after 1999, a typical industry in the Euro area reduced investment growth by about four percentage points less than in non-Euro countries. This suggests that the well documented transformation of financial markets in the EMU has real effects on resource allocation. The evidence supports the predictions that financial integration will lead to a substantial "growth dividend." This should give further impetus to financial integration efforts as outlined by the financial policy of the European Commission and the ECB. The result also suggests that higher investment growth may be expected for future members of the EMU - a factor that may be important when considering the decision of whether or when to adopt the common currency.

The effect of the Euro does not appear larger in countries with previously low levels of financial development. The Euro seems to enhance investment growth in *all* Euro countries, even those with already well developed financial markets. In general, the Euro's impact in not greater in industries that depend on external finance. Only when these industries are located in countries with low financial development is the impact of the Euro stronger.

The Euro's impact on investment may not be the result of better functioning financial markets. An alternative interpretation is that firms increased investment because they expected their earnings to grow with increased trade. While this may be part of the explanation, there are at least three strikes against it. First, I find no evidence that export-intensive industries increased their investment more than other industries. Second, I do find that in less financially developed countries, the Euro had a bigger impact in industries that depend on external finance. This suggests that the Euro's impact had something to do with financial markets rather than trade. Finally, Bris, Koskinen and Nilsson (2004) find that expected earnings of companies in the Euro area did not increase following the Euro's introduction.

I find suggestive evidence that the introduction of the Euro increased the efficiency of capital allocation. Integrated financial markets are more competitive, and hence should force financial institutions to identify and finance only the most productive investment opportunities. Indeed, there is evidence that competition in the financial sector in Europe has intensified (see for example Galati and Tsatsaronis (2003)). I find that the link between investment and output growth and between investment and labor productivity became somewhat tighter after the Euro's introduction. At the same time, it is important to note that contemporaneous output or productivity growth may not capture the true marginal product of capital. Therefore, better measures of the efficiency of capital allocation need to be used in future research.

References:

Abel, Andrew and Olivier Blanchard, 1986, The Present Value of Profits and Cyclical Movements in Investment, *Econometrica* 54, 249-274.

Abiad, Abdul, Nienke Oomes, and Kenichi Ueda, 2004, The Quality Effect: Does Financial Liberalization Improve the Allocation of Capital?, IMF Working Paper 04/112.

Adam, Klaus , Tullio Jappelli, Annamaria Menichini, Mario Padula and Marco Pagano, 2002, Analyse, Compare, and Apply Alternative Indicators and Monitoring Methodologies to Measure the Evolution of Capital Market Integration in the European Union, Centre for Studies in Economics and Finance (CSEF) working paper.

Adjounte, Kpate and Jean-Pierre Danthine, 2003, European Financial Integration and Equity Returns: A Theory-Based Assessment in Gaspar V. et al. eds. *The Transformation of the European Financial System*, ECB.

Aghion, Philippe, Philippe Bacchetta, Romain Ranciere, Kenneth Rogoff, 2006, Exchange Rate Volatility and Productivity Growth: The Role of Financial Development, working paper.

Baele, Lieven, Annalisa Ferrando, Peter Hordahl, Elizaveta Krylova and Cyril Monnet, 2004, Measuring European Financial Integration, *Oxford Review Of Economic Policy* 20(4), 509-530.

Baldwin, Richard, 2005, The Euro's Trade Effects, ECB conference paper.

Barr, David, Francis Breedon, and David Miles, 2003, Life on the Outside: Economic Conditions and Prospects Outside Euroland, *Economic Policy* 37 ,573-613.

Bartram, Shnke and Andrew Karolyi, 2005, The Impact of Foreign Exchange Rate Risk on Firm Value Evidence from the Introduction of the Euro, Working paper, Ohio State University.

Bernanke, Ben, Mark Gertler and Simon Gilchrist, 1996, The financial accelerator and the flight to quality, *The Review of Economics and Statistics* 78, 1-15.

Bertrand, Marianne, Esther Duflo and Sendhil Mullainathan, 2004, How much should I trust Difference in Diferences estimates?, *Quarterly Journal of Economics* 119(1), pp. 249-75.

Blanchard, Olivier and Francesco Giavazzi, 2002, Current Account Deficits in the Euro Area: The End of Feldstein-Horioka Puzzle?, *Brookings Papers on Economics Activity* 2, 147-186.

Bris, Arturo, Yrjö Koskinen and Mattias Nilsson, 2006, The Real Effects of the Euro: Evidence from Corporate Investments, *Review of Finance* 10(1), 1-37.

Bris, Arturo, Yrjö Koskinen and Mattias Nilsson, 2004, The Euro and Corporate Valuations, working paper.

Cabral Ines, Frank Dierick and Jukka Vesala, 2002, Banking Integration in the Euro Area, ECB Occasional Paper Series no. 6.

Claessens, Stijn and Luc Laeven, 2003, Financial Development, Property Rights, and Growth, *The Journal of Finance* 58, 2401-2436.

Claessens, Stijn, and Luc Laeven, 2005, Financial Sector Competition, Financial Dependence and Economic Growth, *Journal of European Economic Association* 3(1), 179-207.

Clark, Peter, 1979, Investment in the 1970s: Theory, Performance and Prediction, *Brookings Papers on Economic Activity*, 73-113.

Chari, Anusha and Peter Blair Henry, 2004, Is the Invisible Hand Discerning or Indiscriminate? Investment and Stock Prices in the Aftermath of Capital Account Liberalizations, working paper.

De Sousa, Jose, and Julie Lochard, 2005, Does the Single Currency Affect FDI?, working paper.

Demirguc-Kunt, Asli and Ross Levine, 2001, *Financial Structure and Economic Growth: A Cross-Country Comparison of Banks, Markets and Development*, MIT Press.

European Commission, 2005, Green Paper on Financial Services Policy (2005-2010), `http://europa.eu.int/comm/internal_market/finances/actionplan/index_en.htm`.

European Commission, 2004, EMU after five years, Special Report no. 1, Directorate-General for Economic and Financial Affairs.

Flam, Harry and Hakan Nordstrom, 2003, Trade volume effects of the euro: Aggregate and sector estimates, working paper.

Galati, Gabriele and Kostas Tsatsaronis, 2003, The impact of the euro on Europe's financial markets, *Financial Markets, Institutions and Instruments* 12, 165-222.

Galindo, Arturo, Fabio Schiantarelli and Andrew Weiss, 2003, Does financial liberalization improve the allocation of investment? Micro Evidence from Developing Countries, Boston University working paper.

Gertler, Mark and Simon, Gilchrist, 1994, Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms, *Quarterly Journal of Economics* 109, 309-340.

Gual, Jordi, 2004, The Integration of EU Banking Markets, CEPR Discussion Paper No. 4212.

Guiso, Luigi, Tullio Jappelli, Mario Padula, and Marco Pagano, 2004, Financial Market Integration and Economic Growth in the EU, *Economic Policy* 19, 523-577.

Hardouvelis, Gikas A., Dimitrios Malliaropulos and Richard Priestley, 2002, The Impact of Globalization on the Equity Cost of Capital, mimeo.

Laeven, Luc, Randall S. Kroszner and Daniela Klingebiel, 2005, Financial Crises, Financial Dependence, and Industry Growth, World Bank working paper.

Lane, Philip, 2006, The Real Effects of EMU, forthcoming in the *Journal of Economic Perspectives.*

Levine, Ross, 2005, Finance and Growth in *Handbook of Handbook Of Economic Growth* Philippe Aghion and Steven Durlauf Eds.

London Economics, 2002, Quantification of the Macroeconomic Impact of Integration of EU Financial Markets, available in the EU Commission web-site.

Love, Inessa and Raymond Fisman, 2004, Financial Development and Intersectoral Allocation: A New Approach, *The Journal of Finance* 59, 2785-2807.

Maksimovic, Vojislav and Gordon Phillips, 2002, Do Conglomerate Firms Allocate Resources Inefficiently across Industries? Theory and Evidence, *Journal of Finance* 57, 721-767.

Manna, Michele, 2004, Developing Statistical Indicators of the Integration of the Euro Area Banking System, European Central Bank working paper no. 300.

Micco, Alejandro, Ernesto Stein, and Guillermo Ordonez, 2003. The Currency Union Effect on Trade: Early Evidence from the European Union, *Economic Policy* 18, 315-356.

Mork, Randall, Andrei Shleifer and Robert Vishny, 1990, The Stock Market and Investment: Is the Market a Sideshow?, *Brookings Papers on Economic Activity* 2, 157-215.

Nitsch, Volcker, 2005, Currency Union Entries and Trade, in *Globalization of Capital Markets and Monetary Policy* edited by Jens Hlscher and Horst Tomann, Palgrave Macmillan, 2005.

Oliner, Stephen, Glenn Rudebusch and Daniel Sichel, 1995, New and old models of business investment: A comparison of forecasting performance, *Journal of Money, Credit and Banking* 27, 806-826.

Pagano, Marco, and Ernst-Ludwig Von Thadden, 2004, The European Bond Markets under EMU, *Oxford Review of Economic Policy* 20 (4), 531-549.

Perez, Daniel, Vincente Salas-Fumas, Jesus Saurina, 2005, Banking Integration in Europe, Bank of Spain Working Paper no. 519.

Persson, Torsten, 2001, Currency Union and Trade: How Large is the Treatment Effect?, *Economic Policy* 33 433-462.

Rajan, Raghuram G. and Luigi Zingales, 1998, Financial Dependence and Growth, *The American Economic Review* 88, 559-586.

Rajan, Raghuram G. and Luigi Zingales, 2003, Banks and Markets: The Changing Character of European Finance in *The Transformation of the European Financial System*, Victor Gaspar, Philip Hartmann and Olaf Sleijpen (eds.), Frankfurt, European Central Bank.

Santos, Joao, and Kostas Tsatsaronis, 2003 The Cost of Barriers to Entry: Evidence from the Market for Corporate Bond Underwriting, Federal Reserve Bank of New York and Bank for International Settlements, working paper.

Sentana, Enrique, 2002, Did EMS reduce the cost of capital?, *The Economic Journal* 112, 786-809.

Schoenmaker, Dirk and Sander Oosterloo, 2005, Financial Supervision in an Integrating Europe: Measuring Cross-Border Externalities, *International Finance* 8, 1-27.

Stulz, Rene, 1999, Globalization of Equity Markets and the Cost of Capital, NBER Working Paper 7021.

Vives, Xavier, 2001, Restructuring Financial Regulation in the European Monetary Union, *Journal of Financial Services Research* 19, 57-82.

Wurgler, Jeffrey, 2000, Financial markets and the allocation of capital, *Journal of Financial Economics* 58, 187-214.

Table I

Aggregate investment growth before and after the Euro

Aggregate investment growth is the annual growth rate of real aggregate gross fixed capital formation. The non-Euro countries are Australia, Canada, Denmark, Sweden, the United Kingdom and the United States. The Euro countries include Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal and Switzerland.

	All Years	pre-Euro ('93-'98)	post-Euro ('99-'03)
All Countries			
Mean	0.041	0.058	0.025
Median	0.042	0.055	0.029
St.Dev.	0.049	0.045	0.047
No. Obs.	190	95	95
non-Euro Countries			
Mean	0.043	0.066	0.020
Median	0.045	0.064	0.014
St.Dev.	0.048	0.038	0.046
No. Obs.	80	40	40
Euro Countries			
Mean	0.040	0.052	0.028
Median	0.039	0.041	0.035
St.Dev.	0.049	0.048	0.048
No. Obs.	110	55	55

Table II
Does the Euro lead to more investment? Aggregate Evidence

The dependent variable is the growth rate of aggregate real investment 1994-2003. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. *LowFD* is a dummy variable that equals one for Greece, Italy, Spain, and Portugal. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at the 10, 5 and 1 % levels.

	Panel a: Full Sample				**Panel b:** Europe Only			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.018	0.012	0.009	0.016*	0.028	0.022	0.019*	0.026***
	1.12	0.67	0.98	2.02	1.71	1.14	2.00	3.97
Euro*LowFD		0.016		-0.020		0.017		-0.022
		0.60		-0.98		0.60		-1.02
Lagged interest rate			-0.005***	-0.006***			-0.004***	-0.006***
			-4.34	-6.78			-2.95	-5.58
Lagged log of GDP per capita			-0.220***	-0.234***			-0.227***	-0.245***
			-8.86	-7.80			-9.92	-8.14
Lagged GDP growth			1.330***	1.335***			1.430***	1.441***
			5.20	5.35			4.70	4.83
Lagged real stock return			0.042	0.038			0.021	0.017
			1.63	1.53			1.08	0.91
Country effects	yes	yes	yes	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes	yes	yes	yes
R-squared	0.442	0.445	0.586	0.590	0.541	0.546	0.682	0.687
Number of observations	190	190	190	190	160	160	160	160

Table III
Does the Euro lead to more investment? Industry Evidence

The dependent variable is the growth rate of aggregate real investment 1994-2003. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at the 10, 5 and 1 % levels.

	Panel a: Full Sample				**Panel b:** Europe Only			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.051***	0.053***	0.048***	0.050***	0.050**	0.053**	0.043*	0.045*
	3.42	3.36	2.98	2.91	2.52	2.59	1.93	1.93
Lagged interest rate	0.002	0.002	0.002	0.002	0.004*	0.004	0.005*	0.005*
	0.73	0.69	0.76	0.66	1.79	1.67	1.80	1.70
Lagged log of GDP per capita	-0.554***	-0.533**	-0.513***	-0.506**	-0.624***	-0.599***	-0.588***	-0.580***
	-2.76	-2.53	-2.84	-2.59	-3.31	-3.02	-3.66	-3.34
Lagged GDP growth	1.160**	1.147**	1.312**	1.310**	1.467**	1.436**	1.694**	1.670**
	2.39	2.34	2.61	2.60	2.28	2.21	2.64	2.59
Lagged real stock return	0.022	0.025	0.020	0.022	0.017	0.021	0.015	0.018
	0.67	0.74	0.60	0.66	0.49	0.56	0.45	0.50
Country*Industry effects	no	yes	no	yes	no	yes	no	yes
Year*Industry effects	no	no	yes	yes	no	no	yes	yes
R-squared	0.086	0.155	0.210	0.278	0.088	0.160	0.223	0.292
Number of observations	4794	4794	4794	4794	4138	4138	4138	4138

Table IV
Does the Euro lead to more investment? Robustness Check

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. All specifications include year, country and industry fixed effects. Macroeconomic controls include aggregate stock returns, lagged GDP growth, lagged interest rates, lagged change in interest rates and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at the 10, 5 and 1 % levels.

	Panel b: Full Sample, Non-Manuf.				**Panel b:** Europe Only, Non-Manuf.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.043***	0.043***	0.042***	0.041***	0.042***	0.043***	0.037***	0.036***
	4.31	4.28	4.40	4.23	2.72	2.79	2.67	2.69
R-squared	0.089	0.171	0.193	0.271	0.090	0.177	0.207	0.288
Number of obs.	2744	2744	2744	2744	2340	2340	2340	2340
	Panel c: Full Sample, Manuf.				**Panel d:** Europe Only, Manuf.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.061**	0.065**	0.055	0.058	0.057	0.062	0.049	0.053
	2.16	2.15	1.72	1.73	1.51	1.56	1.13	1.17
R-squared	0.105	0.159	0.238	0.291	0.108	0.162	0.248	0.301
Number of obs.	2050	2050	2050	2050	1798	1798	1798	1798
	Panel e: Full Sample ex U.K.				**Panel f:** Europe Only ex U.K.			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.053***	0.054***	0.050***	0.051***	0.053**	0.055**	0.045*	0.045
	3.33	3.22	2.92	2.88	2.44	2.44	1.78	1.75
R-squared	0.086	0.156	0.216	0.284	0.089	0.161	0.231	0.300
Number of obs.	4476	4476	4476	4476	3820	3820	3820	3820
Country*Industry Dummies	No	Yes	No	Yes	No	Yes	No	Yes
Year*Industry Dummies	No	No	Yes	Yes	No	No	Yes	Yes

Table V
Does the impact of the Euro vary over time?

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. All specifications include year, country and industry dummies. Macroeconomic controls include lagged real aggregate stock returns, lagged GDP growth, lagged interest rates and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at the 10, 5 and 1 % levels.

	Panel a: Full Sample				**Panel b:** Europe Only			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro*Year 1999	0.067*	0.054*	0.067*	0.049*	0.091**	0.069*	0.082*	0.055
	1.94	1.82	1.99	1.83	2.38	2.02	2.06	1.58
Euro*Year 2000	0.082**	0.075*	0.082**	0.069**	0.087**	0.066*	0.087*	0.062
	2.30	2.06	2.20	2.21	2.15	1.59	2.05	1.68
Euro*Year 2001	0.054**	0.051*	0.058**	0.046	0.035	0.025	0.036	0.019
	2.22	1.72	2.14	1.40	1.37	0.78	1.33	0.53
Euro*Year 2002	0.055***	0.052**	0.057***	0.044*	0.051**	0.051*	0.050*	0.041
	3.17	2.66	2.91	1.96	2.09	2.02	1.90	1.46
Euro*Year 2003	-0.003	0.007	-0.001	0.002	-0.001	-0.006	-0.011	-0.019
	-0.12	0.24	-0.05	0.08	-0.02	-0.16	-0.32	-0.51
Macroeconomic Controls	No	Yes	No	Yes	No	Yes	No	Yes
Country*Industry	No	No	Yes	Yes	No	No	Yes	Yes
Year*Industry	No	No	Yes	Yes	No	No	Yes	Yes
R-squared	0.126	0.128	0.309	0.313	0.124	0.127	0.319	0.324
Number of observations	4794	4794	4794	4794	4138	4138	4138	4138

Table VI
Does the impact of the Euro vary across countries?

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. All specifications include year, country and industry fixed effects. Macroeconomic controls include lagged aggregate stock returns, lagged GDP growth, lagged interest rates, and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A * and ** indicate significance at the 10, 5 and 1 % levels.

	Panel a: Full Sample			**Panel b:** Europe Only		
	(1)	(2)	(3)	(1)	(2)	(3)
Euro*Austria	0.111***	0.117***	0.102***	0.090***	0.121***	0.092***
	7.93	7.24	6.57	6.64	6.08	4.41
Euro*Belgium	0.060***	0.050***	0.037**	0.067***	0.055***	0.029
	4.21	3.54	2.57	3.75	3.05	1.74
Euro*Germany	0.086***	0.089***	0.067***	0.093***	0.093***	0.053***
	6.69	6.75	4.21	5.68	5.82	3.51
Euro*Spain	0.064***	0.048***	0.032	0.070***	0.052***	0.033
	4.96	3.82	1.75	4.32	3.08	1.14
Euro*Finland	0.011	0.014	0.026	0.019	0.019	0.035
	0.80	0.83	0.91	1.05	0.86	0.76
Euro*France	0.110***	0.106***	0.079***	0.116***	0.107***	0.063***
	8.44	8.90	4.28	7.10	7.20	2.95
Euro*Greece	0.060***	0.067***	0.048	0.062***	0.067***	0.057
	4.93	5.27	1.58	3.93	3.87	1.45
Euro*Italy	0.056***	0.045***	0.019	0.063***	0.049***	0.018
	3.97	3.14	0.96	3.57	2.62	0.96
Euro*Netherlands	0.032**	0.035**	0.032***	0.038**	0.037*	0.025
	2.42	2.29	2.80	2.30	1.85	1.34
Euro*Portugal	-0.002	-0.024	-0.016	0.003	-0.021	-0.009
	-0.15	-1.58	-0.91	0.17	-1.04	-0.37
Macro Controls	No	No	Yes	No	No	Yes
Country*Industry	No	Yes	Yes	No	Yes	Yes
Year*Industry	No	Yes	Yes	No	Yes	Yes
R-squared	0.130	0.313	0.314	0.128	0.323	0.325
N	4794	4794	4794	4138	4138	4138

Table VII
Does the impact of the Euro vary by financial development?

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which the Euro is used as the official currency. *LowFD* is a dummy variable that equals one for Greece, Italy, Spain, and Portugal. All specifications include country, year and industry fixed effects and the interactions between industry and year effects, and industry and country effects. Each specification also includes macroeconomic controls: lagged real aggregate stock returns, lagged GDP growth, lagged interest rates, and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A * and ** indicate significance at the 10, 5 and 1 % levels.

	Panel a: Full Sample				**Panel b:** Europe Only			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Euro	0.055***	0.073**	0.040	0.087	0.049**	0.069**	0.047	0.076
	3.33	2.52	1.26	0.98	2.14	2.15	1.34	0.93
Euro*LowFD	-0.027				-0.018			
	-1.75				-1.21			
Euro*Market cap.		-0.124				-0.137*		
		-1.40				-1.79		
Euro*Claims of fin.			0.012				-0.003	
			0.37				-0.09	
Euro*Acc't Stand.				-0.001				-0.001
				-0.46				-0.42
Macroeconomic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year*Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.278	0.278	0.278	0.278	0.292	0.293	0.292	0.292
Number of obs.	4794	4794	4794	4794	4138	4138	4138	4138

Table VIII
Does the impact of the Euro vary by industry characteristics?

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which Euro is used as the official currency. *RZ* is a measure of industry dependence on external finance constructed as in Rajan and Zinglaes (1998) by Laeven, Kroszner and Kleingebiel (2005). *RD*, *Inv* and *Exp* are the shares of R&D expenditures, investment and exports in value added. *LowFD* is a dummy variable that equals one for Greece, Italy, Spain, and Portugal. All specifications include country, year and industry fixed effects and the interactions between industry and year effects, and industry and country effects. Each specification also includes macroeconomic controls: lagged real aggregate real stock returns, lagged GDP growth, lagged interest rates and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at 10, 5 and 1 % levels.

Panel a: Full sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.056*	0.056*	0.068***	0.066***	0.061**	0.060**	0.084***	0.068**
	1.83	1.81	3.14	3.02	2.18	2.20	4.15	2.59
Euro*RZ	0.035	0.004						
	0.67	0.09						
Euro*RZ*LowFD		0.102**						
		2.25						
Euro*RD			-0.001	-0.000				
			-0.33	-0.21				
Euro*RD*LowFD				0.006				
				0.91				
Euro*Inv					-0.042	-0.039		
					-0.75	-0.77		
Euro*Inv*LowFD						-0.009		
						-0.12		
Euro*Size							-0.000	
							-0.42	
Euro*Size*LowFD							-0.000	
							-1.16	
Euro*Exp*LowFD								-0.003
								-0.48
Euro*Exp*LowFD								0.012
								0.74
R-Squared	0.283	0.284	0.373	0.373	0.278	0.278	0.355	0.278
Number of obs.	1654	1654	1679	1679	4719	4719	2688	2646

(Table VIII con'd) **Panel b:** Europe only								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.048	0.049	0.062***	0.057***	0.052	0.052	0.084***	0.064*
	1.14	1.14	3.17	2.99	1.53	1.55	4.15	1.76
Euro*RZ	0.033	0.008						
	0.73	0.17						
Euro*RZ*LowFD		0.079						
		1.69						
Euro*RD			0.000	0.001				
			0.35	0.87				
Euro*RD*LowFD				0.011***				
				2.61				
Euro*Inv					-0.027	-0.031		
					-0.47	-0.60		
Euro*Inv*LowFD						0.009		
						0.14		
Euro*Size							-0.000	
							-0.42	
Euro*Size*LowFD							-0.000	
							-1.16	
Euro*Exp								-0.003
								-0.49
Euro*Exp*LowFD								0.011
								0.87
R-squared	0.293	0.293	0.395	0.396	0.293	0.293	0.355	0.286
Number of obs.	1438	1438	1462	1462	4133	4133	2688	2332

Table IX
Does the Euro lead to more efficient investment?

The dependent variable is the growth rate of real investment. *Euro* is a dummy variable equal to one for years and countries in which Euro is used as the official currency. *LowFD* is a dummy variable that equals one for Greece, Italy, Spain, and Portugal. All specifications include country, year and industry fixed effects and the interactions between industry and year effects, and industry and country effects. Each specification also includes macroeconomic controls: aggregate stock returns, lagged GDP growth, lagged interest rates, lagged change in interest rates and per capita GDP. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A *, ** and *** indicate significance at 10, 5 and 1 % levels.

Panel a: Full sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.045**	0.045**	0.043	0.044*	0.051***	0.050***	0.040	0.041
	2.58	2.55	1.68	1.78	2.63	2.63	1.48	1.54
Value Added	0.196**	0.196**						
	2.18	2.18						
Value Add.*Euro	0.146**	0.176**						
	2.17	2.00						
Value*Euro*LowFD		-0.210						
		-1.09						
Multi. Prod.			0.210	0.209				
			1.68	1.65				
Multi. Prod.*Euro			0.024	0.002				
			0.17	0.02				
Multi.*Euro*LowFD				0.276				
				0.71				
Labor Prod.					0.091	0.091		
					1.19	1.19		
Labor Prod.*Euro					0.151**	0.175*		
					2.06	1.82		
Labor*Euro*LowFD						-0.096		
						-0.57		
Capital Prod.							0.237	0.238
							1.55	1.56
Cap. Prod.*Euro							-0.028	-0.036
							-0.22	-0.28
Cap.*Euro*LowFD								0.120
								0.34
R-squared	0.293	0.293	0.574	0.575	0.292	0.292	0.577	0.577
No. Obs.	4540	4540	1281	1281	4359	4359	1283	1283

(Table IX con'd) **Panel b:** Europe only								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.039	0.039	0.043	0.044*	0.043	0.043	0.040	0.041
	1.70	1.68	1.68	1.78	1.80	1.79	1.48	1.54
Value Added	0.210**	0.209**						
	2.21	2.21						
Value Add.*Euro	0.156**	0.184**						
	2.15	2.01						
Value*Euro*LowFD		-0.203						
		-1.05						
Multi. Prod.			0.210	0.209				
			1.68	1.65				
Multi. Prod.*Euro			0.024	0.002				
			0.17	0.02				
Multi.*Euro*LowFD				0.276				
				0.71				
Labor Prod.					0.112	0.112		
					1.41	1.41		
Labor Prod.*Euro					0.144*	0.168		
					1.89	1.69		
Labor*Euro*LowFD						-0.098		
						-0.57		
Capital Prod.							0.237	0.238
							1.55	1.56
Cap. Prod.*Euro							-0.028	-0.036
							-0.22	-0.28
Cap.*Euro*LowFD								0.120
								0.34
R-squared	0.310	0.310	0.574	0.575	0.308	0.308	0.577	0.577
No. Obs.	3962	3962	1281	1281	3805	3805	1283	1283

Table A.1
The number of observations and investment by country

The number of observations is the number of non-missing observations for investment growth. The number of industries is the number of industries for which the country has at least one observation. The number of years is the number of years for which the country has at least one observation.

Country	No. of Observations	No. of Industries	No. of Years	Investment Growth
Australia	64	8	8	0.066
Austria	490	50	10	0.035
Belgium	167	17	10	-0.003
Canada	352	36	10	0.057
Denmark	245	34	8	0.077
Finland	467	49	10	0.049
France	168	19	9	0.033
Germany	474	52	10	-0.000
Greece	404	52	8	0.102
Italy	180	18	10	0.038
Netherlands	333	36	10	0.035
Norway	426	47	10	0.066
Portugal	126	16	8	0.038
Spain	171	19	9	0.059
Sweden	169	20	10	0.043
United Kingdom	318	44	8	0.033
United States	240	30	8	0.051
Total	4,794	52	10	0.046

Table A.2
Descriptive statistics

Investment growth is the growth of real gross fixed capital formation (STAN code GFCFK). Value added growth is the growth of value added (STAN code VALUK). Multifactor productivity growth is is the difference between the growth of real value added and the weighted average of employment and real capital stock growth. The weight on employment growth is the labor's share in value added (LABR/VALU). One minus the labor's share is the weight on the growth of real capital stock. Labor productivity growth is the difference between the growth of real value added and the growth of total employment (STAN code EMPN). Capital productivity growth is the difference between the growth of real value and the growth rate of real net capital stock (STAN code NCAPK). *RZ* is the index of dependence on external finance as constructed by Rajan and Zingales (1998). *R&D* is research and development intensity, calculated as share of R&D expenditures in value added. *Inv* is investment intensity, calculated as share of gross fixed capital formation in value added (GFCK/VALU in STAN codes). *Size* is total employment divided by the number of establishments. *Exp* is export intensity, calculated as the share of exports in value added (EXP/VALU in STAN codes).

Variable	Mean	St.Dev.	Median	Min	Max	No.Obs.
Investment Growth	0.046	0.205	0.040	-0.739	0.837	4794
Value Added Growth	0.030	0.102	0.024	-1.218	1.511	4540
Multifactor Prod. Growth	0.014	0.105	0.005	-0.680	1.415	1281
Labor Prod. Growth	0.025	0.105	0.014	-0.937	1.377	4359
Capital Prod. Growth	0.004	0.115	-0.005	-1.146	1.560	1283
RZ	0.082	0.370	-0.040	-1.140	0.720	1654
R&D	6.160	9.319	2.300	0.000	89.100	1679
Inv	0.218	0.189	0.167	0.003	2.063	4719
Size	70.67	202.21	18.02	0.83	2938.80	2668
Exp	1.309	1.945	0.919	0.000	19.348	2646