The Impact of the Euro on Investment: Sectoral Evidence

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Abstract

I find that the introduction of the Euro was associated with an increase in the growth rate of physical investment of about five percentage points. The evidence is robust to a variety of controls and robustness checks. The effect of the Euro on investment is strongest immediately following its introduction in 1999, and tapers off by 2003. The effect appears to be equally strong for countries with high and low levels of financial development. The effect is stronger in industries that depend on external finance. I find no evidence that the introduction of the Euro increased the efficiency of capital allocation.

1 Introduction

There is overwhelming evidence that European financial markets are becoming more integrated, and that a great deal of this integration has been facilitated by the common currency (for a survey see Baele et al. (2004) or Cappiello et al. (2005)). However, evidence that this integration has any real effect on resource allocation is scarce. Economists expect that financial integration will lead to more investment and to a more efficient allocation of capital. More investment is expected as a result of the lower cost of capital. More efficient allocation of capital is expected because integrated financial markets should be better at identifying investment opportunities. Financial integration is not an end in itself but rather a means to achieve higher economic growth. Greater investment and its more efficient allocation are the two principal channels through which financial integration will lead to growth. The purpose of this paper is to investigate these two channels. Specifically, I ask whether the introduction of the Euro led to more investment and to its more efficient allocation.

That financial integration will ultimately lead to growth seems to be generally accepted. A document describing financial policy of the European Commission states that "The economic benefits of European financial integration are beyond doubt."(European Commission (2005 p. 5)). As evidence, the European Commission points to two studies. The first study is London Economics (2002) which simulates the effects of the reduced cost of capital in a macro model and finds a significant increase in GDP. The key mechanism is that a lower cost of capital increases investment, which in turn increases GDP. The second study is Guiso et al (2004), who try to quantify the effect of financial integration on growth. They argue that financial integration facilitates financial development for the less financially developed countries. They draw on the large "finance and growth" literature that established a positive link between financial development and growth.[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. Guiso et al. are, however, silent on the exact channels through which financial integration affects growth.

My strategy is to look at the two channels through which financial integration is expected to lead to growth. My approach is therefore more structural than that of the two studies above. If financial integration does not lead to either more investment or to its better allocation, then there is little hope for financial integration to lead to growth through other channels. Another aspect of my strategy is to use the Euro's introduction as a one-time increase in the degree of financial integration. Financial integration is normally a gradual process, but the introduction of the Euro is

[1] Levine (2005) provides a comprehensive survey of this literature.

an event which may provide the statistical power to estimate its effects. The adoption of the common currency has eliminated exchange rate risk, lowered information barriers and increased liquidity in financial markets. Since the Euro facilitates financial integration, I ,in part, interpret its effects as the effects of financial integration.

I use panel data on 27 industries in 17 countries for ten yeas. 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, country and industry fixed effects and 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. I find that the Euro is associated with an increase in the growth rate of investment of about five percentage points. This effect is extremely robust and persists even after controlling for aggregate stock returns, changes in interest rates, GDP growth and other factors. The effect also appears to be greatest immediately following the Euro's introduction in 1999 and then gradually declines.

The impact of the Euro on investment should not be uniform across countries and across 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 that already had developed financial markets. I find that the impact of the Euro is no greater in countries with previously low levels 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. Thus, one of the main predictions of Guisso et al that the growth dividend will be larger in financially less developed countries is not supported by my findings of the Euro's effect on investment.

The impact of the Euro also varies by industry. Financial integration particularly benefits financially constrained firms or firms which depend heavily on external finance. If these characteristics vary across industries, then the Euro's impact should also vary across industries. I use a number of industry characteristics including an index of dependence on external finance, average establishment size, investment, R&D and export intensities. I find that the Euro's impact is greater in industries that depend on external finance - evidence consistent with the Euro facilitating financial development, and with the prediction of Guisso et al that financially dependent industries benefit most from financial integration.

I find no evidence that the Euro has led to a more efficient allocation of capital. I do find that investment tends to flow to industries with high multifactor and capital productivity growth. This tendency, however, does not change after the introduction of the Euro. This is inconsistent with the hypothesis that the Euro and the associated financial market integration will improve the efficiency of capital allocation.

My paper is closely related to Bris, Koskinen and Nilsson (2005) who show that after 1999, firms in Euro countries invested more than firms in non-Euro countries. The difference is that I use sectoral instead of firm-level data, and that in addition to investigating the effect of the Euro on investment, I examine the Euro's effect on the efficiency of investment. Also, while they focus on the difference between the effect of the Euro in weak and strong currency countries, I emphasize the variation of Euro's effect according to different levels of financial development and industry dependence on external finance. My results confirm those of Bris et. al. that the Euro has led to a substantial increase in investment.

Another paper on real effects of the Euro is Blanchard and Giavazzi (2002) who 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 choices of consumers and investors.

I also build on the literature documenting the financial integration in Europe and the role played by the common currency in facilitating this integration. For example, Sentana (2000) and Hardouvelis, Malliaropulos and Priestly (2000) find that financial integration leads to a lower cost of capital. It is reasonable to ask if the lower cost of capital had any real effects and spurred investment. Similarly, the boom in corporate bond issuance reported by Pagano (2004) or the reduction in underwriting fees reported by Santos and Tsatsaronis (2003) is expected to allow firms to raise more funds for investment. In addition, the competition and shifts in portfolio allocation as reported by Adam et al. (2002) p. 36-37 would lead investment to its most productive use. Whether these developments led to higher and more efficient investment is the subject of this paper.

2 Data

I use data 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. I use data on 10 Euro and 7 non-Euro countries. Of the Euro countries Ireland is excluded because it is not available in STAN, and Luxembourg is excluded because it has no data on investment. Also excluded due to insufficient investment data are New Zealand and

Japan. The list of countries and the number of observation for each country appears in table A.1 in the appendix. The industry breakdown varies across countries ranging from two to four digit detail of the ISIC rev. 3 classification. In order to form a sample of independent observations I use only non-overlapping industries. For example, if I include Transport Equipment (ISIC 34-35) I do not include Motor Vehicles (ISIC 34) because it is contained within. Since the industry detail varies across countries and across different sectors, I choose a combination of two digit industries so that I maximize the number of observations. The list of industries and the number of observations appears in table A.2 in the appendix.

The dependent variable throughout this paper is the growth rate of real gross fixed capital formation (STAN code GFCFK). [2] It includes net acquisition of new tangible (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. Table I shows the descriptive statistics of investment growth for the entire sample as well as the breakdown by Euro vs. non-Euro country and pre-Euro vs. post-Euro years. For the entire sample average investment growth was 4% per year with the median growth of 3.6%. There are 3,790 observations on investment growth in the entire sample. On average, investment grew faster in the pre-Euro years than in post-Euro years and it grew faster in Euro countries than in non-Euro countries.

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 rate 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.3.

[2] 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.

I also use a number of industry characteristics. The first is an index of dependence on external finance (RZ) as constructed by Rajan and Zingales (1998). 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 (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 11 out of 27 of my industries. The second industry characteristics 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 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*. The mean values of each industry characteristic for each industry appear in the appendix Table A.2.

Finally, I include a number of macroeconomic variables. Aggregate stock returns are logarithmic returns of the dollar MSCI price index for each country. Real GDP growth and the log of GDP per capita (in 2000 U.S. dollars) come from the *World Development Indicators*. 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).

3 Estimation

3.1 Does the Euro lead to more investment?

My goal is to measure the effect of the common currency on investment. We see in Table I that average investment growth before the Euro's introduction was *lower* than in the years after. It is possible that the high investment growth prior to 1999 was driven by the world-wide investment boom of the late 1990s and that the decline in investment afterwards had nothing to do with the Euro's introduction. Clearly, investment is in large part driven by business cycles. Also, in Table I we see that on average, investment growth in Euro countries was *lower* than in non-Euro countries. It is possible that the Euro countries typically invest less that the non-Euro countries. For example, Germany has had a 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 the 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. The panel nature of my data is ideally suited for this task. First, I include fixed year effects to control for factors that vary over time but which are common across countries (e.g. the world-wide investment boom in the late 1990s). Second, I include country fixed effects to control for factors that vary across countries but which are constant over time (e.g. the sluggish investment growth in Germany). Finally, I include industry effects to control for the fact that some industries (e.g. telecommunications) grow faster than others. The baseline specification is as follows:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \beta Euro_{j,t} + \varepsilon_{i,j,t} \tag{1}$$

where $I_{i,j,t}$ is the growth rate of investment in industry i, country j and year t, ϕ_i, ψ_j and ω_t are industry, country and year fixed effects, and *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, year and industry. If the Euro spurs investment, then β should be positive and significant. 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. This addresses the possible serial correlation in residuals that often plagues the difference in differences estimates as pointed out by Bertrand, Duflo, Mullainathan (2004).

I expand the baseline specification to control for a number of macroeconomic factors that typically appear in investment equations. First, I include lagged GDP growth to capture aggregate business cycle fluctuations as in accelerator models of investment of Clark (1979) or Acemoglu (1993). Second, I include aggregate stock market returns which serve both as a proxy for Tobin's q as well as a financial accelerator. Third, I include lagged interest rates and lagged changes in interest rates. Finally, following Bris et al. I include GDP per capita. 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 q. However, if variables such as q or cash flow vary over time and across industries but not across countries, they could be controlled for by including interactions between the industry and year dummies.[3] Therefore, I include these interactions in nearly all of the specifications in this paper. Including the interactions controls for other industry and year specific factors, e.g. the plunge in investment in telecommunications in 2002. To control for all industry and country specific factors (e.g. the surge in infrastructure investment in Greece prior to the 2004 Olympic Games) I include the interactions between industry and country dummies.[4]

Table II shows the results. The first column shows the estimates of equation (1). The estimate of β is positive and statistically significant. It shows that investment growth in countries that adopted the Euro is 6.7 percentage points higher than it would have been otherwise. Given the average value of investment growth of 4%, I regard this effect as large and economically significant. The effect is also about 4 percentage points larger than that found in Bris et. al. In specification (2) I control for the macroeconomic variables: aggregate stock returns, lagged interest rates, lagged changes in interest rates, lagged log of GDP per capita and lagged GDP growth. With these controls the magnitude of β drops somewhat but remains statistically and economically significant.

In specifications (3) and (4) I include interaction terms between the year and industry dummies. The coefficient on the Euro dummy remains statistically significant and of similar magnitude. The magnitude drops when macroeconomic controls are added, but the coefficient again remains statistically and economically significant. The inclusion of the interaction terms increases the R-squared to 0.12. In specifications (5) and (6) I include interaction terms between the industry and country dummies. The results regarding the effect of the Euro remain unchanged. The same is true when both sets of interactions are included.

In order to check if the effect of the Euro on investment is robust, I re-estimate some of the specifications from Table II using four sub-samples. The first sub-sample includes only manufacturing industries (i.e. ISIC rev. 3 codes 15 to 37). I include only the specifications with macroeconomic controls. The effect of the Euro remains highly statistically significant with a magnitude ranging from 5.3 to 9.6 percentage points. The second sub-sample is the non-manufacturing sector. The effect is again statistically significant with a magnitude of around 6.5 percentage points as shown in panel b. The third sub-sample, estimated in panel c, excludes the three non-European countries (Australia, Canada and the U.S.) from the sample. Once again, I find the effect of the Euro statistically significant and of a similar magnitude as before. Finally, in panel d I eliminate observations that fall into the top and bottom one percent of observations of investment growth. This eliminates

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

[4] I can not include the interaction between the year and country dummies as these would be perfectly collinear with the *Euro* dummy.

any outliers. The magnitude of the effect of the Euro now appears somewhat smaller - around 4.2 percentage points - but the t-statistics are much higher. Clearly, the elimination of extreme values of investment growth improved the precision of my estimates. In addition, to these four reported robustness checks I tried excluding U.K., excluding electrical equipment and telecommunications (SIC rev.3 30-33 and 64), excluding public administration, education and health (SIC rev. 3 75, 80 and 85). In all cases the effect of the Euro remains both statistically and economically significant.

3.2 Does the impact of the Euro vary over time?

I examine if the effects of the Euro are different in different years. Instead of including one *Euro* dummy as in equation (1), I include a set of five interactions between the *Euro* dummy and five dummies, each indicating one of the five post-Euro years. For example, $Euro * Year2002$ equals one for all EMU countries in 2002 and zero otherwise. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \beta_s EURO_{j,t} * \omega_s + \varepsilon_{i,j,t} \tag{2}$$

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 or without the country/industry and industry/year interaction terms. All specifications include year, country and industry dummies. It appears that the effect of the Euro is greatest immediately following its introduction in 1999. The coefficient on the $Euro * Year1999$ dummy is robustly significant and ranges in magnitude from 8.6 to 9.8 percentage points. The effect is also robustly significant in 2000, but the magnitude of the effect is somewhat smaller, ranging from 6 to 6.8 percentage points. The effects of the Euro in 2001 and in 2002 are significant at five percent when macro controls are not included, but only at ten percent when macro controls are included. In 2003, the effect of the Euro is statistically insignificant. Euro-area firms invested more than non-Euro area firms in 1999 and 2000, perhaps even in 2001 and 2002. However, by 2003 investment growth in the Euro area is no greater than in the non-Euro countries.

The gradual decline in the impact of the Euro on investment growth 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 the Euro's introduction. The immediate impact of the Euro is consistent with a rapid transformation of financial markets in the Euro countries. Perhaps the elimination of exchange rate risk and the instant emergence of booming corporate bond market spurred investment immediately following the

Euro's introduction. I find no evidence of reversals in investment. While investment growth in Euro countries slows after 1999 it never turns negative. Thus, the the Euro's initial effect on investment is permanent. If the nearly 10 percentage points larger 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 had passed.

3.3 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:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \beta_k EURO_{j,t} * \psi_k + \varepsilon_{i,j,t} \quad (3)$$

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 and France with a magnitude ranging from 9.9 to 11.8 percentage points. The effects are also strong and robust in Germany, Belgium, Spain and the Netherlands. In Portugal the effect is significant only at the 10% level when macroeconomic controls are included. The effect of the Euro is significant in Italy and Greece only when macro controls are excluded. In Finland, the effect of the Euro appears insignificant.

If the Euro facilitates financial development in the less financially developed countries, its effect should be higher in those countries. Euro countries with historically low levels of financial development should experience higher growth than countries with historically well developed financial markets. The last three columns of Table V show three measures of financial development. This data comes from Demigruc-Kunt and Levine (2001) and includes 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.[5] Comparing the estimated effects of the Euro on investment and the characteristics of the financial systems prior to the EMU, there does not appear to be a systematic relationship. If anything, the effect of the Euro appears to be smaller in countries that are less financially developed. For example, the effect of Euro is less robust

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

in Italy, Greece and Portugal all of which rank in the bottom half on all three measures of financial development.

In order to systematically investigate the variation in the Euro's impact I estimate another set of regressions. I create 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. I interact the $LowFD$ dummy with the *Euro* dummy. In addition, I interact the *Euro* dummy with each of the three specific financial development measures. Given that there are only ten EMU countries in my data, the *Euro* dummy and each of the interaction terms are highly correlated. For example, the correlation coefficient between the *Euro* dummy and the interaction between the *Euro* and accounting standards is nearly 0.99. Therefore, it may be difficult to estimate how the effect of the Euro varies with financial development measures.

The results are reported in Table VI. The first two columns show that the coefficient on the interaction between *Euro* and $LowFD$ is not statistically significant. This means that the difference between the impact of the Euro in more or less financially developed countries is not 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. However, this may be due to high colinearity rather than to the absence of structural differences. Only the interaction between *Euro* and market capitalization is statistically significant at 10 percent when country/industry and year/industry interactions are excluded. 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.

3.4 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. Similarly to the previous two subsections, I replace the *Euro* dummy with a set of 27 interactions between the *Euro* dummy and an industry dummy indicator. For example, $Euro * Agriculture$ equals one if the observation is for agriculture in years and countries in which the Euro is the official currency. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \beta_i EURO_{j,t} * \phi_i + \varepsilon_{i,j,t} \tag{4}$$

where β_i is the effect of Euro on investment in industry i.

Table VII shows the results. I present only results with the macroeconomic controls included and with or without country/industry and industry/year interaction terms. It appears that the effect of the Euro varies greatly across industries. This is especially true when I include the country/industry and industry/year interactions. Of the 27 industries, the effect is significant in 12 industries when interactions are excluded and 7 when interactions are included.[6] Looking at the specification when country/industry and industry/year interactions are included, the effect of the Euro appears particularly large in non-energy mining, machinery and equipment, electrical and optical equipment, finance, and transport and storage.

I examine the above effects in a systematic way by considering five industry characteristics: an index of industry's dependence on external finance constructed by Rajan and Zingales (1998) (RZ), 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 so that I can estimate how the Euro's impact varies with each characteristics. The baseline specification can be written as:

$$I_{i,j,t} = \phi_i + \psi_j + \omega_t + \beta EURO_{j,t} + \gamma_X EURO_{j,t} * X_{i,j} + \varepsilon_{i,j,t} \tag{5}$$

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 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.[7] 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

[6] When macroeconomic controls are excluded the number of significant industries is 16 and 9.

[7] For this reason the RZ measure is calculated using U.S. data - assuming that the financial markets in the U.S. are near frictionless.

constrained (Gertler and Gilchrist (1994)). If 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 the 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 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. The other four measures I average 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 size of an industry and its R&D intensity remain constant over time.

The results are shown in table VIII. I present only the results where country/industry and industry/year interactions, and macroeconomic controls are included. The coefficient on the interaction between $Euro$ and RZ is positive and statistically significant. This means that the effect of the Euro is greater in industries that depend on external finance. This is consistent with the Euro facilitating financial development and allowing financially depended firms to grow faster. It shows that industries in Euro countries and years with an average value of RZ of about 0.36 are expected to invest about 4.5 percentage points more than industries in non-Euro countries and years. However, the industries in Euro countries and years with a maximum value of RZ index of 0.96 are expected to grow about 12 percentage points faster. I also examine if the impact of financial dependence on the effect of the Euro is different in financially less developed countries. If the Euro primarily enhances financial markets in countries with low financial development, then financial dependence should matter more in those countries. I interact the $Euro * RZ$ term with the low financial development dummy $LowFD$. The coefficient on this (triple) interaction is statistically insignificant, suggesting that the Euro enhances investment in financially dependent industries in *all* countries - not just those that are financially less developed.

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 negative and statistically significant at 10 percent level. This suggests that the effect of the Euro is lower in export intensive industries. This is puzzling since there is evidence that Euro increased trade both within and outside of EMU countries (Micco, Stein and Ordonez (2003), Flam and Nordstrom (2003)). If the Euro increases trade it should also increase investment in export intensive industries. One possibility, suggested by Bris at al., is that a common currency eliminates the possibility of competitive depreciations and therefore export industries in weak currency countries may invest less as a result.

3.5 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, 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. [8] These approaches are non-structural but have the advantage of being simple, intuitive and transparent. In 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:

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

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 only present the results when country/industry and year/industry dummy interactions and macroeconomic controls are included. The estimated elasticities of investment with respect to multifactor and labor productivities are positive and significant at the 5% level. The elasticity with respect to value added is also positive, but significant only at the 10% level. The elasticity is insignificant with respect to labor productivity. Therefore, investment tends to flow to industries that experience high output and productivity growth. However, the coefficients on the interactions of value added and the productivity measures with the *Euro* dummy are statistically insignificant in all cases. This suggest that the tendency for investment to flow to the most productive and expanding industries is no different when the Euro is the official currency. Thus, the Euro does not appear to lead to more efficient allocation of capital. I also examine if the Euro improves investment allocation only in countries with low financial development. To do so, I interact value added and the productivity measures with the *Euro* dummy and with the $LowFD$ dummy indicating countries with low financial financial development. Again, the coefficients on this triple interaction are statistically insignificant, indicating that even in countries with previously low levels of financial development there is no change in investment efficiency when the Euro became the official currency.

[8] 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.

4 Conclusion:

I find strong 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, firms in the Euro area reduced investment growth by about five percentage points less than in other 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 and 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 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. This goes against some of the conclusions of Guiso et al. who predicted that countries with low levels of financial development would benefit most. The Euro seems to enhance investment growth in *all* Euro countries, even those with already well developed financial markets. The prediction of Guiso et al. that the Euro would benefit industries that depend on external finance is supported by my data. I find that the impact of the Euro is stronger in industries that depend on external finance.

The Euro's impact on investment may not have been due only to better workings of 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 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 no 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)). However, I find no evidence that the introduction of the Euro was associated with a tighter link between output, productivity and investment. 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.

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, 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, 2005, The Real Effects of the Euro: Evidence from Corporate Investments, *Review of Finance* forthcoming.

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

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

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.

Cappiello, Lorenzo , Philipp Hartmann, Peter Hrdahl, Arjan Kadareja and Simone Manganelli, 2005, The Impact of the Euro on Financial Markets, paper presented at the ECB conference.

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.

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.

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.

Micco, A., E. Stein, and G. Ordoez, 2003. The Currency Union Effect on Trade: Early Evidence from the European Union. Economic Policy 18:37, 315-356.

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, 2004, The European Bond Markets under EMU, *Oxford Review of Economic Policy* 20 (4), 531-549.

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

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.

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

Table I

Descriptive statistics of investment growth

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

	All Years	pre-Euro (‘93-‘98)	post-Euro (‘99-‘03)
All Countries			
Mean	0.040	0.067	0.010
Median	0.036	0.057	0.015
St.Dev.	0.205	0.231	0.168
No. Obs.	3,790	1,982	1,808
non-Euro Countries			
Mean	0.057	0.098	0.001
Median	0.051	0.081	0.014
St.Dev.	0.233	0.260	0.176
No. Obs.	1,437	825	612
Euro Countries			
Mean	0.030	0.045	0.016
Median	0.028	0.042	0.015
St.Dev.	0.185	0.204	0.163
No. Obs.	2,353	1,157	1,196

Table II
Does the Euro lead to more 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. 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 5 and 1 % levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.067**	0.057**	0.068**	0.058*	0.069**	0.058**	0.070**	0.059*
	(3.61)	(2.65)	(3.42)	(2.53)	(3.75)	(2.84)	(3.52)	(2.67)
Aggregate Stock Returns		-0.001		0.000		-0.003		-0.003
		(-0.03)		0.01		(-0.14)		(-0.11)
Lagged interest rate		-0.002		-0.002		-0.002		-0.002
		(-0.52)		(-0.44)		(-0.62)		(-0.55)
Lagged change in int. rate		-0.013**		-0.011*		-0.012**		-0.011**
		(-2.72)		(-2.54)		(-3.11)		(-2.97)
Lagged GDP per capita		-0.643**		-0.654**		-0.646**		-0.654**
		(-4.87)		(-4.55)		(-4.87)		(-4.61)
Lagged GDP Growth		0.664		0.607		0.699		0.640
		(1.03)		(0.84)		(1.12)		(0.91)
Country*Industry Dummies	No	No	Yes	Yes	No	No	Yes	Yes
Year*Industry Dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	3790	3790	3790	3790	3790	3790	3790	3790
R-squared	0.066	0.071	0.123	0.128	0.146	0.151	0.203	0.208

Table III
Does the Euro lead to more investment? Robustness

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. 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 5 and 1 % levels.

	(1)	(2)	(3)	(4)
Panel a: Manufacturing only				
Euro	0.053**	0.053**	0.054**	0.054**
	(3.04)	(2.85)	(3.02)	(2.81)
Country*Industry Dummies	No	Yes	No	Yes
Year*Industry Dummies	No	No	Yes	Yes
R-squared	0.142	0.176	0.222	0.256
N	1572	1572	1572	1572
Panel b: Non-Manufacturing only				
Euro	0.063*	0.064*	0.061*	0.063*
	(2.26)	(2.20)	(2.28)	(2.18)
Country*Industry Dummies	No	Yes	No	Yes
Year*Industry Dummies	No	No	Yes	Yes
R-squared	0.057	0.120	0.122	0.184
N	2218	2218	2218	2218
Panel c: Europe Only				
Euro	0.067*	0.069*	0.066*	0.069*
	(2.35)	(2.26)	(2.42)	(2.30)
Country*Industry Dummies	No	Yes	No	Yes
Year*Industry Dummies	No	No	Yes	Yes
R-squared	0.071	0.129	0.151	0.209
N	3240	3240	3240	3240
Panel d: Without bottom and top 1%				
Euro	0.042**	0.042**	0.043**	0.042**
	(3.93)	(3.67)	(4.15)	(3.85)
Country*Industry Dummies	No	Yes	No	Yes
Year*Industry Dummies	No	No	Yes	Yes
R-squared	0.095	0.155	0.195	0.253
N	3715	3715	3715	3715

Table IV
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 Euro is used as the official currency. All specifications include year, country and industry dummies. 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 5 and 1 % levels.

	(1)	(2)	(3)	(4)
Euro*Year 1999	0.089**	0.086**	0.098**	0.087**
	(3.04)	(3.00)	(3.23)	(3.37)
Euro*Year 2000	0.060*	0.064*	0.068*	0.060*
	(2.16)	(2.17)	(2.13)	(2.26)
Euro*Year 2001	0.062*	0.071	0.073*	0.066
	(2.36)	(1.90)	(2.56)	(1.75)
Euro*Year 2002	0.081*	0.077	0.071**	0.052
	(2.57)	(2.01)	(2.89)	(1.65)
Euro*Year 2003	-0.010	-0.005	-0.016	-0.032
	(-0.36)	(-0.17)	(-0.55)	(-1.16)
Macroeconomic Controls	No	Yes	No	Yes
Country*Industry Dummies	No	No	Yes	Yes
Year*Industry Dummies	No	No	Yes	Yes
R-squared	0.101	0.104	0.235	0.239
N	3790	3790	3790	3790

Table V
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 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 5 and 1 % levels.

	Euro's Impact				Country Characteristics		
	(1)	(2)	(3)	(4)	Market Cap.	Claims Fin. Inst.	Acc't Stand.
Euro*Austria	0.118**	0.099**	0.119**	0.100**	0.07	0.87	54
	(7.70)	(4.43)	(8.07)	(4.49)			
Euro*Belgium	0.057**	0.038*	0.063**	0.044*	0.26	0.37	61
	(3.73)	(2.14)	(3.83)	(2.23)			
Euro*Germany	0.094**	0.053*	0.095**	0.055*	0.19	0.92	62
	(6.40)	(2.10)	(6.07)	(2.01)			
Euro*Spain	0.072**	0.065*	0.076**	0.068*	0.18	0.72	64
	(4.94)	(2.20)	(4.54)	(2.14)			
Euro*Finland	0.018	0.056	0.021	0.058	0.18	0.67	77
	(1.19)	(1.73)	(1.27)	(1.70)			
Euro*France	0.118**	0.091**	0.118**	0.091**	0.20	0.91	69
	(8.06)	(3.26)	(9.86)	(3.40)			
Euro*Greece	0.047**	0.052	0.047**	0.045	0.08	0.40	55
	(3.07)	(0.99)	(3.03)	(0.88)			
Euro*Italy	0.073**	0.031	0.077**	0.031	0.12	0.51	62
	(4.75)	(1.15)	(4.39)	(1.14)			
Euro*Netherlands	0.040**	0.040**	0.044**	0.045**	0.41	1.28	64
	(2.65)	(2.66)	(2.64)	(2.63)			
Euro*Portugal	0.039*	0.046	0.042*	0.047	0.08	0.63	36
	(2.52)	(1.73)	(2.48)	(1.75)			
Macro Controls	No	Yes	No	Yes			
Country*Industry	No	No	Yes	Yes			
Year*Industry	No	No	Yes	Yes			
R-squared	0.104	0.107	0.236	0.238			
N	3790	3790	3790	3790			

Table VI
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 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 5 and 1 % levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.060**	0.062**	0.079**	0.078*	0.045	0.047	0.064	0.064
	(2.93)	(3.00)	(2.63)	(2.57)	(1.26)	(1.27)	(1.68)	(1.51)
Euro*Low FD	-0.011	-0.013						
	(-0.55)	(-0.60)						
Euro*Market Cap.			-0.110	-0.095				
			(-1.86)	(-1.50)				
Euro*Claims of Fin.					0.015	0.016		
					(0.43)	(0.43)		
Euro*Acc't Stand.							-0.000	-0.000
							(-0.23)	(-0.13)
Macro Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Industry	No	Yes	No	Yes	No	Yes	No	Yes
Year*Industry	No	Yes	No	Yes	No	Yes	No	Yes
R-squared	0.071	0.208	0.072	0.208	0.071	0.208	0.071	0.208
N	3790	3790	3790	3790	3790	3790	3790	3790

Table VII
Does the impact of the Euro vary across industries?

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. 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 are calculated using robust and country "clustered" standard errors. A * and ** indicate significance at 5 and 1 % levels.

	ISIC	β	t-stat	β	t-stat
Agriculture	1-2	0.026	3.11	-0.001	-0.04
Fishing	5	0.061	-0.45	0.208	0.83
Mining - energy	10-12	0.027	3.98	0.153	1.31
Mining - non-energy	13-14	0.039	2.70	0.151	2.77
Food and tobacco	15-16	0.025	3.62	0.070	2.80
Textiles, leather	17-19	0.028	-0.05	-0.015	-0.33
Wood	20	0.035	1.04	0.000	0.01
Paper and printing	21-22	0.034	1.78	0.059	0.83
Chemical products	23-25	0.030	1.86	0.046	1.07
Non-metal products	26	0.029	0.59	0.130	4.03
Basic metals	27-28	0.032	0.34	0.070	1.03
Machinery	29	0.031	1.69	0.099	2.71
Electrical eq't	30-33	0.039	1.31	0.151	4.31
Transport equipment	34-35	0.046	1.11	0.077	1.76
Manufacturing nec	36-37	0.029	0.42	0.047	1.30
Elec., Gas, Water	40-41	0.052	1.99	-0.008	-0.11
Construction	45	0.030	1.33	0.010	0.20
Wholesale, retail	50-52	0.024	1.95	0.013	0.48
Hotels, restaurants	55	0.029	2.16	0.095	1.89
Transport, storage	60-63	0.027	3.86	0.112	2.66
Telecommunications	64	0.037	1.76	0.087	1.73
Finance	65-67	0.038	1.36	0.113	2.32
Real estate	70-74	0.029	1.87	-0.007	-0.24
Public admin.	75	0.025	4.25	-0.028	-0.99
Education	80	0.028	2.55	-0.037	-0.62
Health	85	0.028	2.89	-0.021	-0.52
Personal services	90-93	0.025	2.95	0.099	1.79
Macro Controls		Yes		Yes	
Country*Industry		No		Yes	
Year*Industry		No		Yes	
R-squared		0.01		0.5	
N		3790		3790	

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 from Rajan and Zinglaes (1998). *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: 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 5 and 1 % levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Euro	0.009	0.011	0.048**	0.047**	0.050*	0.052*	0.092**	0.086**	0.091*	0.091*
	(0.33)	(0.40)	(3.49)	(3.40)	(2.09)	(2.06)	(7.64)	(7.37)	(2.59)	(2.42)
Euro*RZ	0.126**	0.107*								
	(2.69)	(2.02)								
Euro*RZ*Low FD		0.048								
		(1.04)								
Euro*RD			0.001	0.001						
			(0.56)	(0.56)						
Euro*RD*Low FD				0.008						
				(1.39)						
Euro*Inv					0.041	0.024				
					(0.88)	(0.37)				
Euro*Inv*Low FD						0.035				
						(0.60)				
Euro*Size							-0.000	-0.000		
							(-1.6)9	(-1.3)2		
Euro*Size*Low FD								0.001		
								(1.42)		
Euro*Exp									-0.008	-0.008
									(-1.96)	(-1.94)
Euro*Exp*Low FD										0.003
										(0.14)
R-squared	0.258	0.258	0.284	0.285	0.208	0.208	0.265	0.267	0.208	0.208
N	1572	1572	1886	1886	3790	3790	2176	2176	2341	2341

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 5 and 1 % levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Euro	0.056*	0.057*	0.046*	0.047**	0.042**	0.043**	0.043*	0.045*
	(2.47)	(2.53)	(2.51)	(2.63)	(3.15)	(3.26)	(2.24)	(2.41)
Value Added Growth	0.187	0.187						
	(1.68)	(1.67)						
Value Add.*Euro	0.136	0.167						
	(0.55)	(0.66)						
Value*Euro*LowFD		-0.246						
		(-1.02)						
Multi. Prod. Growth			0.554*	0.553*				
			(2.50)	(2.50)				
Multi. Prod.*Euro			-0.279	-0.339				
			(-0.64)	(-0.71)				
Multi.*Euro*LowFD				0.481				
				(1.08)				
Labor Prod. Growth					0.038	0.039		
					(0.38)	(0.39)		
Labor Prod.*Euro					0.248	0.278		
					(1.19)	(1.22)		
Labor*Euro*LowFD						-0.195		
						(-0.86)		
Capital Prod. Growth							0.601*	0.603*
							(2.11)	(2.12)
Cap. Prod.*Euro							-0.432	-0.456
							(-1.25)	(-1.24)
Cap.*Euro*LowFD								0.274
								(0.86)
R-squared	0.217	0.217	0.387	0.388	0.218	0.218	0.393	0.393
No. Obs.	3764	3764	1254	1254	3618	3618	1254	1254

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	96	12	8	0.072
Austria	250	25	10	0.018
Belgium	238	24	10	0.002
Canada	270	27	10	0.042
Denmark	214	27	8	0.055
Finland	269	27	10	0.036
France	198	22	9	0.030
Germany	255	27	10	-0.019
Greece	216	27	8	0.107
Italy	250	25	10	0.033
Netherlands	268	27	10	0.015
Norway	263	27	10	0.069
Portugal	184	23	8	0.035
Spain	225	25	9	0.058
Sweden	205	23	10	0.076
United Kingdom	205	27	8	0.036
United States	184	23	8	0.057
Total	3,790	27	10	0.040

Table A.2
The number of observations and industry characteristics

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.

Industry	ISIC Code	No. of Obs.	Invest. Growth	*RZ*	Inv. Intens.	Exp. Intens.	R&D Intens.	Size
Agriculture	1-2	117	0.017		0.244	0.351		2.83
Fishing	5	115	0.056		0.291	0.775		2.80
Mining - energy	10-12	112	0.006		0.323	0.321		275.31
Mining - non-energy	13-14	124	0.022		0.238	1.864		16.27
Food and tobacco	15-16	146	0.019	0.140	0.181	0.869	1.300	27.15
Textiles, leather	17-19	146	-0.005	-0.090	0.109	1.748	1.202	19.43
Wood	20	136	0.059	0.280	0.175	0.906	0.510	13.78
Paper and printing	21-22	146	0.041	0.190	0.192	0.713	1.347	22.38
Chemical products	23-25	144	0.045	0.560	0.216	1.648	9.392	39.08
Non-metal products	26	145	0.045	0.530	0.179	0.539	1.424	36.94
Basic metals	27-28	145	0.064	0.150	0.177	1.081	1.633	24.23
Machinery	29	137	0.050	0.450	0.136	1.654	5.644	41.65
Electrical eq't	30-33	137	0.057	0.960	0.170	2.200	17.925	38.88
Transport equipment	34-35	145	0.046	0.310	0.181	2.510	10.537	110.14
Manufacturing nec	36-37	145	0.044	0.470	0.116	1.091	1.205	20.51
Elec., Gas, Water	40-41	156	-0.004		0.350	0.031	0.622	233.09
Construction	45	156	0.058		0.125		0.189	9.13
Wholesale, retail	50-52	156	0.050		0.122		0.273	5.13
Hotels, restaurants	55	156	0.031		0.138		0.022	5.04
Transport, storage	60-63	116	0.054		0.330		0.302	73.36
Telecommunications	64	116	0.065		0.315		2.164	114.11
Finance	65-67	155	0.058		0.137		0.334	21.06
Real estate	70-74	156	0.050		0.367		0.889	4.40
Public admin.	75	146	0.018		0.270			
Education	80	146	0.047		0.096			6.11
Health	85	146	0.052		0.096			3.02
Personal services	90-93	145	0.035		0.230	0.010		2.36
Total		3,790	0.040	0.355	0.200	1.083	2.971	49.51

Table A.3
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	0.040	0.205	0.036	-1.998	4.828	3790
Value Added Growth	0.023	0.069	0.023	-1.218	0.703	3764
Multifactor Prod. Growth	0.010	0.059	0.005	-0.680	0.315	1254
Labor Prod. Growth	0.021	0.070	0.014	-0.937	0.638	3618
Capital Prod. Growth	-0.001	0.071	-0.004	-1.146	0.781	1254
RZ	0.355	0.265	0.310	-0.090	0.960	1572
R&D	2.971	5.518	1.000	0.000	89.100	1886
Inv	0.200	0.125	0.171	0.014	1.169	3790
Size	49.51	152.24	15.62	0.05	1689.70	2128
Exp	1.083	1.519	0.705	0.000	19.348	2341