

**IS THE EUROPEAN ECONOMIC AND MONETARY UNION (EMU)
DETRIMENTAL TO THE EURO-AREA FIRMS' PERFORMANCE?**

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Abstract

This thesis provides new insight into the EMU's impact on the Euro-area firms' performance, by examining the firms' accounting rates of return and financial cash flows. The impact is evaluated separately for the EMU formation and the physical Euro adoption, and over different time horizons. The existing literature does not directly examine these issues.

This study uses the regression model of the difference-in-differences approach to examine 121 Euro-area and North American firms, covering 14 sectors, over the period from 1992 to 2008.

The results indicate a positive impact of the EMU on the firms' financial cash flows, especially after the Euro adoption, which support the related literature. However, the accounting rates of return suggest a mostly negative impact. The magnitude of the impacts declines over time. The results are robust with respect to GDP as a control variable. The study also reports the EMU's impact on 4 major industrial sectors.

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List of Abbreviations

EC	:	European Commission
ECB	:	European Central Bank
EMU	:	European Economic and Monetary Union
EU	:	European Union
FDI	:	Foreign Direct Investment
GDP	:	Gross Domestic Product
IAS	:	International Accounting Standards
IMF	:	International Monetary Fund
OECD	:	Organization for Economic Cooperation and Development
USD	:	United States Dollar
WB	:	World Bank

Chapter 1: Introduction

Background and Motivation

During my career in business I found managing and reporting foreign currency transactions quite challenging. I often wondered whether currency unification, that is, a fixed exchange rate regime would benefit the firms¹. Thus I was drawn to the theories of the fixed and the floating exchange rate regimes, and their impact on the firms' performance.

The choice of an appropriate exchange rate regime is the subject of much debate. Frankel (1999) sums it up in the title of his essay "No Single Currency Regime is Right for All Countries or At All Times" (p. 1). Over the last century various exchange rate regimes were tried, that are in essence fixed or flexible exchange rates or a form of the hybrid of the two (Bordo, 2003).

The European Economic and Monetary Union (EMU) is a significant event in the evolution of the exchange rate regimes. One of the important features of the EMU is the currency union, that is, a fixed exchange rate between the member countries and a floating exchange rate with the rest of the world. Thus EMU provides a unique opportunity to empirically study the impact of a move towards the fixed exchange rate regime.

¹ It is observed that in the finance literature generally the term "firms" is used instead of corporations or companies. Hence, in this thesis the term "firms" is consistently used to mean corporations or companies.

The EMU was launched on 1st January, 1999, when the exchange rate of the currencies of the then member countries² of the EMU were irrevocably fixed, the monetary policy was unitized under the European Central Bank (ECB), and the Euro was introduced as a “virtual currency” for non-cash transactions and accounting, while the old currencies were retained for cash transactions (EC, 2012; ECB, 2012a). The Euro was physically introduced on 1st January, 2002, when the banknotes and coins were put into circulation (EC, 2012; ECB, 2012a). In this thesis 1st January, 1999, is considered as the EMU formation date and 1st January, 2002, as the Euro adoption date.

Objectives of the Thesis and Contribution to the Literature

This thesis provides new insight into the EMU’s impact on the Euro-area firms’ performance, by examining the firms’ accounting rates of return and financial cash flows. The impact is evaluated separately for the EMU formation and the physical Euro adoption, and over different time horizons. A total of 121 firms, consisting of 52 Euro-area firms and 69 North American firms³, are included in the study. The performances of the Euro-area firms and the North American firms are compared using the regression model of the difference-in-differences approach. The robustness of the results is verified for the country and business cycle effect by using gross domestic product (GDP) as a

² The then 11 member countries are Belgium, Ireland, France, Luxembourg, Austria, Germany, Italy, Portugal, Finland, Spain, and the Netherlands (ECB, 2012b).

³ In this study the North American firms include the US and the Canadian firms.

proxy⁴, henceforth, defined as a control variable. In addition, the impact of the EMU is analyzed for 4 major industrial sectors.

The existing literature that examine the impact of the EMU, discussed in the next chapter, study trade, product prices, competitiveness, productivity, costs and risks of finance, corporate valuations and investments, and financial and stock markets. The focus of the studies is mostly on the impact of the EMU formation and covers one time horizon only. Moreover, the studies do not link the impact on the factor analyzed to the firms' performance.

To the best of my knowledge, there is no published study that examines the impact of the EMU directly on the Euro-area firms' performance measured by the accounting rates of return or the financial cash flows. A study on the determinants of profitability evaluates the impact of Greek participation in the EMU and the adoption of the Euro (Asimakopoulos, Samitas, & Papadogonas, 2009). The scope of the study is however limited as the sample consists only of Greek non-financial firms listed in the Athens Stock Exchange, and the period under study restricted from 1995 to 2003. Moreover, the study evaluates only one accounting rate of return.

This thesis attempts to fill the gaps in the literature in the following ways:

⁴ GDP is used for this purpose as Beck, Demirgüç-Kunt, and Maksimovic (2005) find a significant and positive correlation between the GDP growth rate and the firm growth rate.

- i. it evaluates the impact of the EMU on the firms' financial cash flows along with the impact on the firms' accounting rates of return,
- ii. it distinguishes between the impact of the EMU formation and that of the Euro adoption,
- iii. it evaluates the impacts over different time horizons,
- iv. it uses the North American firms as a control group, and
- v. it evaluates the impact of the EMU on 4 major industrial sectors.

Structure of the Thesis

The rest of the thesis is organized as follows. Chapter 2 first discusses the theories of the exchange rate regimes and then focuses on the literature that studies the impact of the EMU. Chapter 3 describes the research design, the research questions and the methodology. Chapter 4 elaborates on the data, including the final sample selected in the study and the data cleaning process. Chapter 5 discusses the main results and the robustness of the results, compares the results of the impact of the EMU formation with that of the impact of the Euro adoption, and reports the impacts on 4 major industrial sectors. Chapter 6 summarizes and concludes the thesis.

Chapter 2: Literature Review

Section 1 of the literature review discusses the existing exchange rate regimes, the theories of fixed and floating exchange rates, and the theory of the optimum currency areas. Section 2 describes the literature that studies the impact of EMU.

Theoretical Background

Seccareccia (2003) classified the existing monetary arrangements into six broad categories as given in Table 1.

Table 1: Classification of monetary arrangements

Nationalized Money			Denationalized Money		
Independent Floating Exchange Rate	Floating Exchange Rate with Bands	Pegged Exchange Rate	Currency Board	Unilateral Policy Dollarization	Monetary Union

Note: Adapted from “Forum: dollarization is dollarization a desirable alternative to the monetary status quo? A critical evaluation of competing currency arrangements for Canada,” by M. Seccareccia, 2003, p. 92.

At “one end of the spectrum” (Seccareccia, 2003, p. 92) is the independent floating exchange rate regime wherein the exchange rates between the sovereign currencies are determined purely by the demand and supply of the currencies. In the floating exchange rate with bands, the governments intervene if the exchange rate moves beyond the pre-decided bands, while in the pegged exchange rate the governments chooses to peg the national currency to a basket of other currencies. In the denationalized monetary arrangement, a nation institutes a currency board to restrict its monetary policy, using a foreign currency to back its monetary base

(Krugman & Obstfeld, 2009, p. 646). In the case of unilateral policy dollarization the government pegs its currency to the US dollar (USD). At the other end of the monetary arrangement spectrum and denationalized money, a nation may opt for a cooperative monetary policy by forming regional currency unions, as is the case with the EMU, where the seventeen participating nations⁵ have relinquished their monetary policy to the ECB.

Currency unions imply a fixed exchange rate between the participating nations and floating exchange rate with the rest of the world. In the debate between the theories of fixed and floating exchange rate Krugman and Obstfeld (2009) provides arguments for both sides (pp. 533-537). Floating exchange rate acts as an automatic stabilizer for prices, adjusting to changes in international trade and capital flows. Moreover, as central banks do not have to use monetary policy interventions to sustain a fixed exchange rate, they can use the policy tool to maintain economic internal and external balance. However, the floating exchange rate regimes are plagued with speculation and price uncertainty. These drawbacks can be overcome in a fixed exchange rate regime, but at the cost of the exchange rate no longer acting as an automatic price stabilizer in international trade.

⁵ The seventeen participating nations as on 30th May, 2012, are Belgium, Ireland, France, Luxembourg, Austria, Slovakia, Germany, Greece, Italy, Malta, Portugal, Finland, Estonia, Spain, Cyprus, the Netherlands, and Slovenia (ECB, 2012b).

Mundell (1961), in the seminal work “A Theory of Optimum Currency Areas,” proposes an alternate flexible exchange rate system that could tackle trade imbalances without adverse impact on unemployment and inflation. He suggests that the world may be divided into optimum currency areas not based on political boundaries, but, based on the similarities in economies and factor mobility. McKinnon (1963) adds that apart from geographic factor mobility, size of the economy and openness in facilitating industry factor mobility, are other determinants of an optimum currency area. In a later study McKinnon (2002) observes that trading partner countries would benefit from a common currency regime, unless, one or more of the trading partner countries are suffering from weak domestic financial position, or there is no stable monetary standards in the rest of the world. In a further step Mundell (2005) proposes a roadmap for a single world currency, to overcome the defects of the existing flexible exchange rate system.

The EMU is a single currency area with a fixed exchange rate between the member countries and a floating exchange rate with the rest of the world. It perhaps provides an appropriate ground to gain empirical insights into the debate on the fixed and the floating exchange rate regimes, the optimum currency area theory and the call for unification of global currencies.

Applied Research

Several studies analyze the impact of EMU on trade and product prices. A few other studies examine EMU’s influence in the areas of competitiveness,

productivity, costs and risks of finance, corporate valuations and investments, and financial and stock markets. The findings of these studies provide an indirect indication of the impact of the EMU on the Euro-area firms' performance.

Micco, Stein, Ordoñez, Midelfart, and Viaene (2003) find that early indicators of EMU are increased trade, both within the EMU countries and between the EMU and the non-EMU countries. Lane (2006) reports that the EMU has increased cross-border trade, largely in finance and modestly in goods, attributable to the efficiency gained from the market integration. Fontagné, Mayer, and Ottaviano (2009) highlights the "hidden microeconomic gains" (p. 149) from the adoption of the Euro, positing that the single currency increased price transparency, and competition in the Euro-area, leading to compression of product prices. They discuss that the literature is replete with figures of trade growth as a result of EMU, ranging from 5% to 200%, and opine that a consensus growth rate could be 5%, which is lower than expectation.

In a discussion on the impact of the adoption of Euro on corporations' treasury operations, Goldberg, Danko, and Stovall (2003) observe that the product price comparability across the Euro-area nations is enhanced, leading to transparency and more competitive pricing. Corporations which earlier delegated procurements to subsidiaries in each nation could now centralize purchases and exercise greater bargaining power.

Ottaviano, Taglioni, and di Mauro (2009) find that the introduction of the Euro increased the overall competitiveness of the Euro-area firms, especially for firms in countries which are smaller, or with better access to foreign markets, or sectors in which international competition is fierce and entry barriers low. They also study the impact on productivity, in experimental situations, when some member nations exited EMU or some new members joined in. In all cases they observe that productivity increases with the association in the EMU. However, the authors caution that due to the constraints in the model, the results should be interpreted as partial effects of the Euro. Another study by Bugamelli, Schivardi, and Zizza (2008) find that the adoption of Euro led to growth in productivity, especially in country-sectors that earlier relied more on currency devaluation to gain price competitiveness.

Capstaff, Marshall, and Hutton (2007) report that, post-EMU, there is a fall in the use of foreign exchange derivatives by a sample of French firms, the drop being greater for firms with sales mostly confined to the Euro-area. However, the decline in hedging is lower in proportion to the decrease in foreign exchange exposure. Bartram and Karolyi (2006) study the impact of Euro launch on stock return volatility, market risk, and foreign exchange rate risk exposure of 3220 non-financial firms in 18 European countries, the U.S. and Japan. They find that post launch of Euro the stock return volatility of the firms increase, but there was evidence, although weak, that the volatility is

lower for the firms in the Euro-area and the firms with substantial sales or assets in Europe. Further, they observe that, post-EMU, there is a drop in the market risk exposure for multinational firms and a net decrease in the foreign exchange rate risk exposures.

Galati and Tsatsaronis (2003), in a study of the impact of EMU on Europe's financial markets, find that generally financial markets broadened and deepened with the removal of cross border transaction hurdles, especially on the borrowers side, and the European companies are able to borrow at lower rates of interest, and enjoy the benefits of an efficient pan-European payment and cash management services. Von Eije and Westerman (2002) report that liberalization and deregulation of the financial markets and the currency unification reduces the transaction and bankruptcy costs, and encourages centralization and disintermediation of cash management, which may translate into increased value of the Euro-area multinationals. Goldberg et al. (2003) observes that Euro-area nations stand to benefit substantially from the reductions in the cost of cross-border fund transfer within the EMU.

Another study by Bris, Koskinen, and Nilsson (2006) investigates the influence of the Euro on the European firm's investment rates. They observe that the common currency results in growth in the investment rates of formerly weak currency countries and financially constrained firms. However, the investment rates decreases for the formerly strong currency nations and financially unconstrained firms. They also report that the EMU makes access

to financing in Europe easier and contributes to the development of European financial market. In a subsequent study Bris et al. (2009) observes an increase in Tobin's Q-ratios by 17.1% in the Euro-area countries with previously weak currencies, which is partly attributed to the decrease in interest and equity cost. A study of the impact of EMU on foreign direct investment (FDI) shows that, post-EMU, there is an increase in inward FDI within the Euro-area by about 16%, outward FDI by approximately 11%, and inward FDI from non-member countries by about 8% (Petroulas, 2007).

Fratzscher and Stracca (2009) find that the financial markets in Italy better withstands adverse political events, after the advent of Euro. Based on a study of mergers and acquisitions in the European financial industry, Allen and Song (2005) establish that EMU aided financial integration within the Euro-area, and the financial institutions in the EMU countries became more active in initiating integration with the non-EMU partners. Another study reports that the European bond markets, post-EMU, reveal an accelerated integration of the market for Euro-area sovereign and private-sector bonds, enhancing competition and lowering the issuance and investment cost (Pagano & von Thadden, 2004). Further, an analysis of the Spanish Treasury bond market by Díaz, Merrick, and Navarro (2006) find that, post-EMU, there is a significant drop in the yield volatility and vast improvement in the pricing efficiency of the bonds.

The process of integration of the European stock markets both within Europe and with that of the U.S. and Japan became stronger since 1999, mainly due to macroeconomic convergence associated with the launch of the Euro (Kim, Moshirian, & Wu, 2005). The study finds unidirectional causality of the formation of European currency union to the stock market integration. Hardouvelis, Malliaropoulos, and Priestley (2007) suggests that EMU had a causal impact on reducing the cost of equity, as they observe that the average drop in the cost of equity for European Union (EU) nations that signed up to the single currency is larger than the remaining EU nations. The issuance of securities by corporations increased sharply to a quarterly gross average of 15.2% of Euro-area GDP, post-EMU, as compared to 8.2% during 1991-98, and a comparison of outstanding stocks issued by corporations in the Euro-area show an increase from 30% of GDP in the period of 1991-98 to 74.5% in 2005 (Lane, 2006).

The above studies suggest a mostly positive impact of the EMU on the factor under study. However, the positive impact is not linked to the firms' performance. To the best of my knowledge, there is no published study that examines the impact of the EMU directly on the Euro-area firms' performance measured by the accounting rates of return or the financial cash flows. A study on the determinants of profitability evaluates the impact of Greek participation in the EMU and the adoption of the Euro (Asimakopoulos et al., 2009). The scope of the study is however limited as the sample consists only

of Greek non-financial firms listed in the Athens Stock Exchange, and the period under study restricted from 1995 to 2003. Moreover, the study evaluates only one accounting rate of return. It finds a negative correlation between the return on assets and the Greek participation in the EMU and the adoption of the Euro.

There is a lack of studies that examine the difference between the impact of the EMU formation and the Euro adoption, or the impact of EMU over time. Moreover, to the best of my knowledge, there are no studies that evaluate the impact of the EMU on the major industrial sectors or compare the difference-in-differences between the performances of the Euro-area firms and similar North American firms. This thesis is an attempt to fill these gaps in the literature.

Chapter 3: Research Design and Methodology

Section 1 of this chapter discusses the research design. Section 2 lists the research questions. Section 3 describes the methodology.

Research Design

As mentioned in the previous chapters, this thesis studies the impact of the EMU directly on the Euro-area firms' performance. Profitability is a widely used measure of firm performance, especially when the firms under study cover a wide spectrum of industries (Covin, Slevin, & Heeley, 2001). The common profitability measures are the gross profit margin ($\frac{\text{Sales} - \text{Cost of goods sold}}{\text{Sales}}$), the operating margin ($\frac{\text{Earnings before interest and taxes}}{\text{Sales}}$), the net profit margin or return on sales ($\frac{\text{Net income}}{\text{Sales}}$), the return on assets ($\frac{\text{Net income}}{\text{Total assets}}$), and the return on equity ($\frac{\text{Net income}}{\text{Shareholders' equity}}$) (Covin et al., 2001; FTS, 2011; Ross, Westerfield, Jordan, & Roberts, 2010). In the current study the latter 4 profitability measures are analyzed⁶.

The operating margin indicates a firm's "pricing strategy and operating efficiency" (Investopedia, 2012, para. 1). The net profit margin or return on sales measures the earnings of the firm from every dollar of sales after providing for all the expenses, taxes and dividends. It is robust and correlates closely with other measures of profitability (Covin et al., 2001). The return on

⁶ The gross profit margin is excluded as the initial results are very similar to that of the operating margin.

assets looks at the profits per dollar of assets (Ross et al., 2010). It combines profitability and efficiency, and is considered “a useful overall performance indicator” (Hunton, Lippincott, & Reck, 2003, p. 169). The return on equity indicates the firms’ ability to generate returns for the shareholders investments.

The above ratios measure the firms’ accounting rates of return, which require allocation of accruals under the guidance of the accounting standards. The flexibilities in the interpretation of the accounting standards may sometimes lead to subjectivity in the accrual allocations (Sharma, 2001). Hence, the accounting rates of return may be susceptible to inconsistencies across firms. To study the impact of the EMU on the firms’ performance without these constraints the firms’ financial cash flows is analyzed.

Lee (1993) advocates the use of cash flow accounting (CFA) for the firms. He defines CFA as “a system of financial reporting...of an entity in cash terms...based on a matching of periodic cash inflows and outflows, free of credit transactions and arbitrary accounting allocations” (p. 3). Several advantages of using CFA methods of measuring firm performance is put forth (pp. 3-14), summarized below:

- i. CFA measures are relatively simple, unambiguous and avoids time lags,

- ii. CFA emphasizes on cash, which is the critical factor in the firms' ability to pay its obligations and expand, and
- iii. CFA expresses the data in the purchasing power of the period of the transaction.

Currently, the public firms report 3 indicators of the financial cash flows. They are the cash flow from operating activities, the cash flow from investing activities, and the cash flow from financing activities. The excess of the cash flow from operating activities over the cash flow from investing activities indicates the free cash flow to the firm, that is, the firms' ability to generate cash from its operating activities over and above the cash outflows required to maintain or expand its asset base. Thus free cash flow to the firm indicates not only the firms' profitability but also its sustainability and future investments capability.

The free cash flow ratio for the purposes of this study is defined as:

$$\text{Free cash flow ratio} = \frac{\text{Cash flows from operating activities} + \text{Cash flows from investing activities}}{\text{Total assets}}, \quad \text{where,}$$

Cash flow from operating activities = net income + depreciation & amortization +

/ – other non cash items in the statement of earnings + / – changes in net working capital,

and *Cash flows from investing activities* = capital expenditure or CAPEX. Compared to

the return on assets $\left(\frac{\text{Net income}}{\text{Total assets}}\right)$ the free cash flow ratio incorporates the

changes in net working capital and CAPEX, as well as depreciation and amortization.

The existing literature that studies the impact of the EMU mostly focuses on the impact of the EMU formation and for a single time horizon only, and does not examine the impact of the physical Euro adoption. This study examines the impact of the EMU formation and that of the Euro adoption, separately, over two time horizons, a shorter horizon of the first 3 years and a longer horizon of 7 years. The study uses the difference-in-differences approach, as described in the methodology (section 3.3). The difference in the means of the ratios between the Euro-area and the North American firms, in the first 3 years after the EMU formation or Euro adoption, are compared with the difference of the means of the ratios of the 3 years immediately preceding the EMU formation or Euro adoption (+/- 3 years). Similarly, the means of the ratios of the 7 years after the EMU formation or Euro adoption are compared with the means of the ratios of the 7 years preceding the EMU formation or Euro adoption (+/- 7 years).

There was a gap of 3 years between the EMU formation and the Euro adoption, that is, the physical issuance of the Euro banknotes and coins. During this period the firms and other constituents of the EMU had to manage the virtual Euro as well as the home currency, which would have consumed additional resources. It is expected that the impact of the EMU would be stronger after the adoption of the Euro.

The time horizons under study are given in Figure 1. Panel A depicts the +/- first 3 years (1996 to 1998 and 1999 to 2001) and the +/- 7 years (1992

to 1998 and 1999 to 2005) around the EMU formation. Panel B denotes the +/- first 3 years (1999 to 2001 and 2002 to 2004) and the +/- 7 years (1995 to 2001 and 2001 to 2008) around the Euro adoption. To determine whether the impacts of the EMU formation or Euro adoption are dynamic over the 2 time horizons, the Chow test is applied to the model.

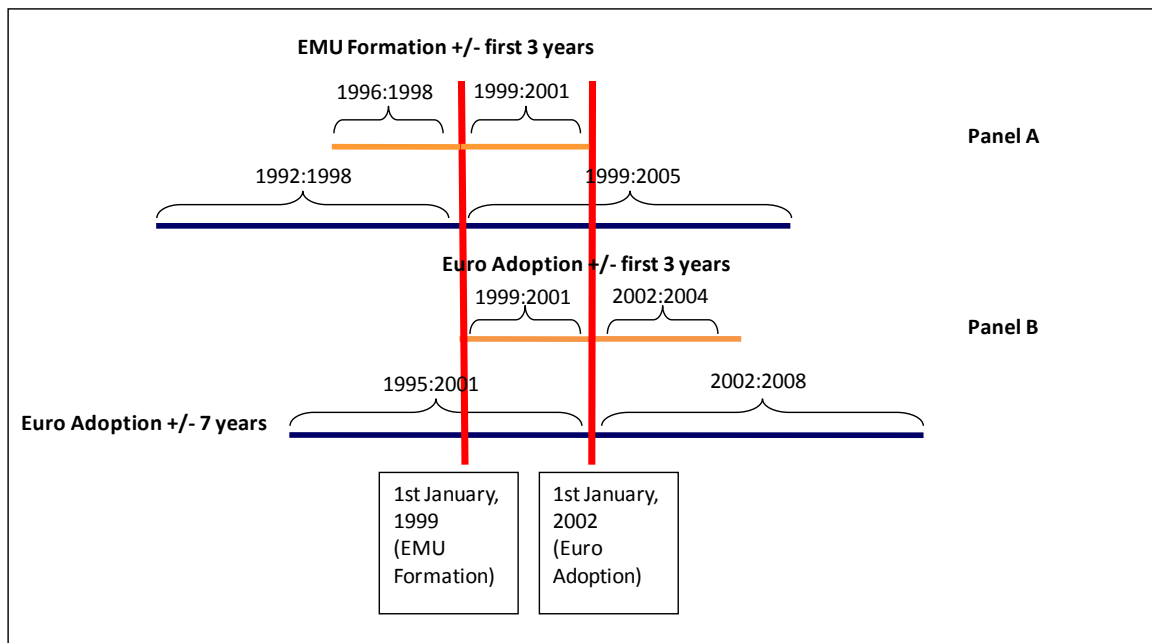


Figure 1: Time horizons under study

Research Questions

In the backdrop of the objectives of the thesis and the discussions in the previous section, the research questions are divided into three categories:

Category A: Impact measured by accounting rates of return.

Q.1: What is the impact of the EMU formation and the Euro adoption on the Euro-area firms' operating efficiency, return on sales, overall

performance, and return on shareholders' investments? Is there any change in the impacts over different time horizons?

To answer the above question the operating margin, the net profit margin, the return on assets, and the return on equity ratios are analyzed over the time horizons +/- first 3 years and +/- 7 years, around the EMU formation and the Euro adoption.

Category B: Impact measured by the financial cash flows.

Q.2: What is the impact of the EMU formation and the Euro adoption on the Euro-area firms' financial cash flows? Is there any change in the impacts over different time horizons?

To address the above question the free cash flow ratio is examined over the time horizons +/- first 3 years and +/- 7 years, around the EMU formation and the Euro adoption.

Category C: Difference in the impact of the EMU formation and Euro adoption.

Q.3: Is there any difference between the impact of the EMU formation and the Euro adoption?

Herein the results of the analysis of the accounting rates of return and the financial cash flows for the impact of the EMU formation are compared with that of the impact of the Euro adoption.

Methodology

This study uses the regression model of the difference-in-differences approach based on the methodology adopted in the Petroulas's (2007) study of the impact of EMU on FDI. Angrist and Krueger (1999) suggest that the difference-in-differences approach is apt for studies that try to gauge the impact of structural changes in the economic environment or government policy.

The basic regression model used in this study is adopted from the European Commission's counterfactual impact evaluation tools (EC, 2009). The interpretation of the model is given below:

$$Y = \alpha + \beta X_1 + \gamma X_2 + \delta X_3 + \varepsilon, \text{ each element denoting:}$$

- Y : The ratio under study, that is, the outcome variable,
- X_1 : Location dummy, 0 for the North American firms and 1 for the Euro-area firms,
- X_2 : Year dummy, 0 for the pre EMU formation period (up to 1998) and 1 for the post EMU formation period (1999 onwards),
- X_3 : Interaction between X_1 and X_2 , resulting in 0 for the pre EMU formation North American and Euro-area firms and the post EMU formation North American firms, and 1 for the post EMU formation Euro-area firms,

- α : The regression constant, representing the pre EMU formation mean of the ratio under study for the North American firms, that is, the scenario in which X_1 , X_2 and X_3 are each 0,
- β : The coefficient of the location dummy, X_1 . Thus $(\alpha + \beta)$ represents the pre EMU formation mean of the ratio under study for the Euro-area firms, that is, the scenario in which X_1 is 1, and X_2 and X_3 are each 0. $\beta > 0$ indicates that the pre EMU formation mean of the ratio under study of the Euro-area firms is greater than the pre EMU formation mean of the North American firm,
- γ : The coefficient of the year dummy, X_2 . Thus $(\alpha + \gamma)$ represents the post EMU formation mean of the variable under study for the North American firms, that is, the scenario in which X_2 is 1, and X_1 and X_3 are each 0. $\gamma > 0$ indicates that the post EMU formation mean of the ratio under study is greater than the pre EMU formation mean of the ratio for both the Euro-area and the North American firms, and
- δ : The coefficient of the interaction term, X_3 . Thus δ represents the difference-in-differences between the pre EMU formation North American and Euro-area firms' and the post EMU formation North American and Euro-area firms' means of the ratio under study. $\delta > 0$ means an improvement in the post EMU formation Euro-

area firms' performance, if a positive movement of the ratio indicates improvement. $(\alpha + \beta + \gamma + \delta)$ represents the post EMU formation mean of the variable under study for the Euro-area firms, that is, the scenario in which X_1 , X_2 and X_3 are each 1.

In the case of the Euro adoption, the year dummy, X_2 , is modified with 0 for the pre Euro adoption period (up to 2001) and 1 for the post Euro adoption period (2002 onwards). The direction of the difference-in-differences coefficient (δ), which denotes the impact of the EMU, is the main parameter of interest.

The methodology followed for the data sample selection is as follows. The study focuses on the firms with large revenues. The firms are perhaps the most important constituent of the economy, contributing 62% to the Euro-area's average total gross value-added, during the period from 1999 to 2010 (eurostat, 2011). The basic definition of gross value-added adopted by the European Commission (2009), is "...the value of output less the value of intermediate consumption and (is) a measure of the contribution to GDP made by an individual producer, industry or sector." (p. 3). From the definition it can be assumed that the higher a firm's revenue the greater would be its contribution to the gross value add. Hence, this study focuses on firms with large revenues.

First the Euro-area firms with large revenues are selected. Then North American firms in the same industrial sector with revenues in the range of the

Euro-area firms⁷ are selected as the comparison group. The details of the selection process are given in the next chapter.

⁷ The matching of the firms based on asset size is kept outside the scope of the current study.

Chapter 4: Data

The study includes a total of 121 firms, consisting of 52 Euro-area firms and 69 North American firms⁸, and covers the period from 1992 to 2008. The factors considered in the selection of the firms are given below, in the order of importance:

- i. the availability of the annual reports of the firms for the period from 1992 to 2008,
- ii. the similarity in the revenue from operations of the Euro-area and the North American firms
- iii. the size of the firms' revenue from operations, and
- iv. the consistency with which the firms featured in the lists of the largest corporations.

The firms with large revenues from operations are identified from the CNN Global 500 (CNN, 2011) and the Forbes Global 2000 (Forbes.com, 2011) lists of largest corporations. The highest ranking firms are prioritized by the number of years they appear in the annual CNN Global 500 lists⁹. From the prioritized list of firms, those firms are shortlisted whose annual reports for the

⁸ The list of the 121 firms included in the study is annexed in Appendix 1.

⁹ Out of the three sources of largest firm rankings, the annual CNN Global 500 list is selected for this exercise as it is available for the maximum period of 7 years (2005 to 2011) in the public domain.

period from 1992 to 2008 could be publicly accessed or those firms which made available the hard or soft copies of their annual reports. In the case of mergers and acquisitions or demergers, those firms are included in the study whose data could be aligned to reflect their status consistently throughout the period of the study.

The Euro-area firms are identified based on the home country assigned in the CNN Global 500 and Forbes Global 2000 lists of largest corporations. The control group of peer North American firms is selected from the firms operating in the same industrial sector as the Euro-area firms, classified by Forbes Global 2000, with revenue from operations in the similar range as that of the Euro-area firms¹⁰. To ensure similarity in the shortlisted Euro-area and North American firms' revenue from operations, a few firms from the Financial Times Euro 500 2011 (FT, 2011) list of largest firms and a few firms for which some data (4.2% of total data points), majorly during the period 1992 to 1995, were not available, are included in the final list of firms. For estimating the missing values mostly the 3-year average ratio or average growth rate is used as they yielded the best trends.

The summary of the final 121 firms is given in Table 2. The total data points per ratio is 2057 covering the study period from 1992 to 2008. The data

¹⁰ The year 2007 is chosen for matching the revenue from operations as it is the most recent normal year prior to the global financial crisis (Chor & Manova, 2010).

points across the +/- 7 year horizon is 1694 and that across the +/- 3 years horizon is 726.

Table 2: Summary of the firms included in the study

Aggregated Annual Revenue, Total Assets and Sectoral Revenues are in billion USDs

Sl.	Industrial Sector (Forbes Global 2000, 2007)	Count of Firms			Aggregated Annual Revenue (Forbes Global 2000, 2007) and Assets (Firms' Annual Reports) of the Firms			Difference in the Aggregated Annual Revenue between the Euro-area and North American Firms		Sectoral Revenue (Forbes Global 2000, 2007)	Percentage of the Sectoral Revenue Covered in the Study
		Euro- area	North America	Total	Euro- area	North America	Total Revenue	Amount	Percentage		
1	Business Support (Business Services & Supplies, and Capital Goods)	4	4	8	39	39	79	(0)	0%	937	8%
2	Chemicals	5	8	13	137	128	265	9	3%	620	43%
3	Conglomerates	3	2	5	53	54	107	(1)	-1%	861	12%
4	Construction	3	4	7	59	58	118	1	1%	773	15%
5	Consumer Durables	4	5	9	309	300	609	8	1%	1,942	31%
6	Financial Services (Banking, Diversified Financials and Insurance)	7	11	18	495	505	999	(10)	-1%	6,133	16%
7	Food Markets	2	2	4	90	98	188	(8)	-4%	754	25%
8	Household & Personal Products	2	2	4	25	26	50	(1)	-2%	352	14%
9	Media	2	2	4	32	32	64	0	0%	444	14%
10	Oil & Gas Operations	5	10	15	380	382	763	(2)	0%	3,198	24%
11	Software & Services	2	2	4	23	23	46	(1)	-1%	309	15%
12	Telecommunications Services	4	3	7	194	192	387	2	1%	1,075	36%
13	Transportation	4	4	8	121	120	241	2	1%	831	29%
14	Utilities	5	10	15	128	129	257	(1)	-1%	1,322	19%
	Total	52	69	121	2,085	2,087	4,172	(2)	0%	19,550	21%

The aggregate revenues of the Euro-area firms included in the study (USD 2,085 billion) represents 17% of the Euro-area GDP (USD 12,369 billion) (WB, 2012) for the year 2007. The 121 firms constitute 14 sectors and covers 21% of the aggregate sectoral revenues, ranging from 8% for the business support sector to 43% for the chemicals sector. 33 out of the 52 Euro-area firms (63%) and 26 out of the 69 North American firms (38%) feature in the CNN Global 500 list of largest corporations for 5 years or more, during the period of 7 years from 2005 to 2011.

The required data is collected from the annual reports of the firms. They are translated to a uniform currency, the U. S. dollar¹¹, and converted to real¹². The box-plot analysis is used to identify the outliers, location-wise (Euro-area and North America), periods-of-study-wise and industrial-sector-wise. The objectives of the outlier identification are to discover mistakes in the data entry, and to identify and remove the impact of cumulative effect of accounting changes and extraordinary items. The ratios under study are then constructed from the revised uniform currency real data.

To overcome the problems of negative and small denominators, each ratio is then Winsorized at 2.5% of the tails, separately for the pre EMU formation / Euro adoption and the post EMU formation / Euro adoption, Euro-area and North American data sets. Winsorization is found to be the strongest transformational technique in financial ratios studies to address the problems created by negative and small denominators, and data entry errors (Nenide, Pricer, & Camp, 2010)¹³. The study recommends that Winsorization of data at 5% of the tails is most effective. In this thesis the Winsorization is initially done at 5% of each tail. Subsequently, to restrict the loss of information, the

¹¹ The translation is done using the annual average exchange rate for the reported currency with the U. S. dollar. The annual average exchange rates are accessed from the International Monetary Fund's database (IMF, 2011).

¹² The conversion from nominal to real is done using the annual inflation index of consumer prices sourced from the Organization for Economic Cooperation and Development (OECD) iLibrary (OECD, 2012).

¹³ Another study "Modern Robust Statistical Methods: An Easy Way to Maximize the Accuracy and Power of Your Research" by Erceg-Hurn & Miroseovich (2008) described Winsorization as a robust technique to overcome distribution variance.

Winsorization is reduced to 2.5% of the tails. In both the scenarios the results are similar with a few exceptions.

Chapter 5: Results and Discussion

In this chapter, section 1 describes the results, separately, for the impact of the EMU formation and that for the impact of the Euro adoption, over the different time horizons, and then compares the two. Section 2 discusses the robustness of the results. Section 3 analyzes the impact of the EMU on 4 major industrial sectors.

Results

The tabulated results contain the means of the ratios under study for the pre and post EMU formation or Euro adoption, and the difference-in-differences of the means (δ). As explained in the research methodology (section 3.3), the δ is the main parameter of interest, representing the impact of the EMU formation or that of the Euro adoption. The tables contain 2 panels, each panel providing the results of one time horizon. In addition, the δ of the means is graphically plotted, for the 2 time horizons.

The discussion of the results is arranged under the first 2 categories of questions described in the research design (section 3.2), that is, the impact on the Euro-area firms' performance measured by the accounting rates of return, and that measured by the financial cash flows. The results are first discussed separately for the 2 time horizons and then the movement in the results over the 2 time horizons is analyzed.

Impact of the EMU Formation.

Table 3 presents the results of the regression for the 2 time horizons after the EMU formation. Panel 1 of the table presents the results of the first 3 years, and the panel 2 for the 7 years. Columns 1 to 4 of the table show the results of the accounting rates of return and column 5 depicts that for the financial cash flows. Figure 2 provides the graphical representation of the δ of the ratios, across the 2 time horizons.

Table 3: Results for the impact of the EMU formation

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 = 0, greater than 1998 = 1) + δ Location * Year + ϵ						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
Panel 1: + / - first 3 years (n=726)	Adjusted R squared	.056 ***	.040 ***	.002	-.002	.003
	Mean of North American firms - Pre EMU (α)	0.130	0.072	0.045	0.148	0.006
	Mean of Euro-area firms - Pre EMU ($\alpha + \beta$)	0.095	0.052	0.041	0.153	0.010
	Mean of North American firms - Post EMU ($\alpha + \gamma$)	0.129	0.069	0.042	0.142	0.007
	Difference-in-differences of the means (δ)	-0.006	0.004	-0.001	0.005	-0.015
	Mean of Euro-area firms - Post EMU ($\alpha + \beta + \gamma + \delta$)	0.088	0.053	0.037	0.152	-0.004
Panel 2: + / - 7 years (n=1694)	Adjusted R squared	.061 ***	.057 ***	.009 ***	.003 **	.004 **
	Mean of North American firms - Pre EMU (α)	0.126	0.065	0.041	0.134	0.008
	Mean of Euro-area firms - Pre EMU ($\alpha + \beta$)	0.089	0.043	0.035	0.135	0.012
	Mean of North American firms - Post EMU ($\alpha + \gamma$)	0.133	0.073	0.045	0.149	0.019
	Difference-in-differences of the means (δ)	-0.004	0.001	-0.001	-0.002	-0.005
	Mean of Euro-area firms - Post EMU ($\alpha + \beta + \gamma + \delta$)	0.092	0.052	0.038	0.148	0.018

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

Category A: Impact measured by accounting rates of return.

i. First 3 years

Column 1 of panel 1 shows that the operating margins of the North American firms ($\alpha = 13.0\%$) in the pre EMU formation are higher than that of the Euro-area firms ($\alpha + \beta = 9.5\%$). The gap increases in the post EMU formation by 0.6% ¹⁴ (δ), indicating that the EMU formation has a negative impact on the Euro-area firms' operating efficiency.

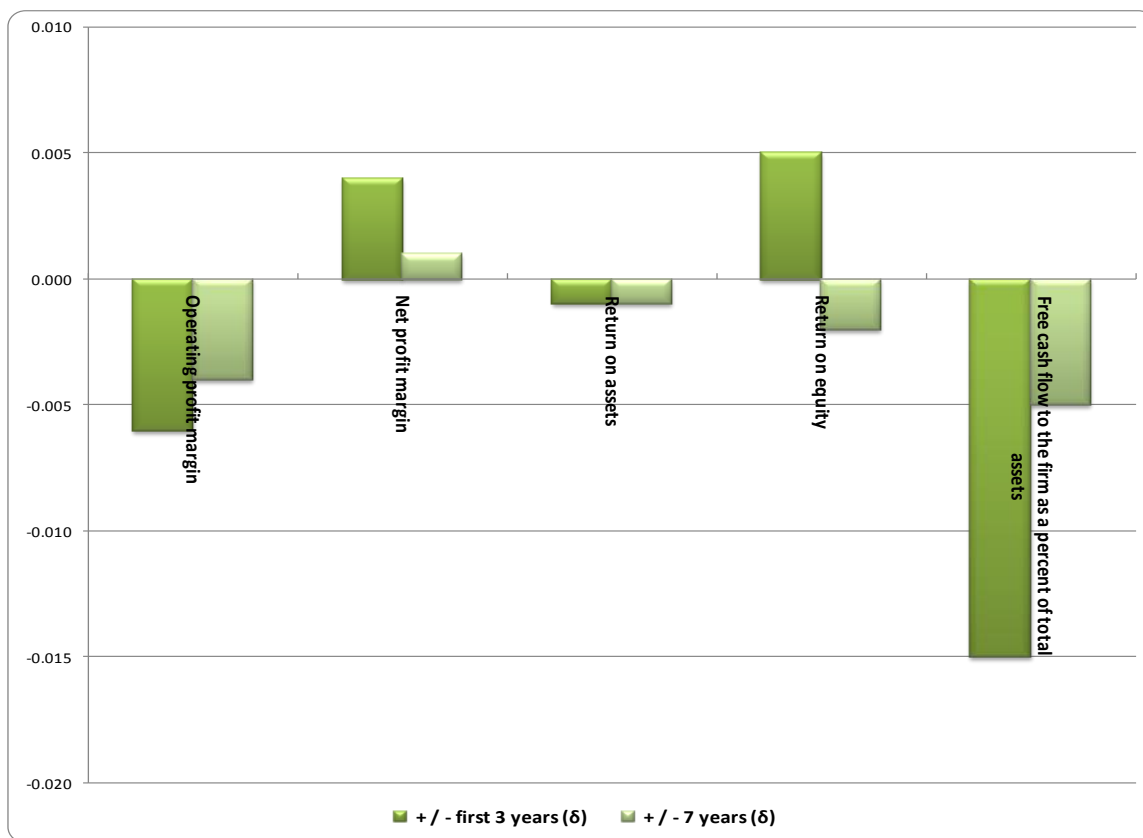


Figure 2: Difference-in-differences of the means (δ) - EMU formation

¹⁴ The percent mentioned is the difference-in-differences of the means of the ratio and not an increase / decrease percent of the ratio itself.

Column 2 of panel 1 shows that the net profit margins of the North American firms ($\alpha = 7.2\%$) in the pre EMU formation are greater than that of the Euro-area firms ($\alpha + \beta = 5.2\%$). Post EMU formation the gap reduces by 0.4% (δ), indicating a positive impact of the EMU formation on the Euro-area firms' return on sales.

Column 3 of panel 1 shows that the return on assets of the North American firms ($\alpha = 4.5\%$) in the pre EMU formation is higher than that of the Euro-area firms ($\alpha + \beta = 4.1\%$). Post EMU formation the gap increases by 0.1% (δ), indicating a negative impact of the EMU formation on the Euro-area firms' overall performance.

Column 4 of panel 1 shows that the return on equity of the North American firms ($\alpha = 14.8\%$) in the pre EMU formation is lower than that of the Euro-area firms ($\alpha + \beta = 15.3\%$). Post EMU formation the gap increases by 0.5% (δ), indicating a favorable impact of the EMU formation on the Euro-area firms' ability to generate returns for the shareholders' investments.

Thus the accounting rates of return indicate a positive impact during the 3 years after the EMU formation for return on sales and return on shareholders' investment and a negative impact for the operating efficiency and the overall performance. Next the result for the longer time horizon of 7 years is described below.

ii. 7 years

Column 1 of panel 2 shows that the operating margins of the North American firms ($\alpha = 12.6\%$) in the pre EMU formation are higher than that of the Euro-area firms ($\alpha + \beta = 8.9\%$). The gap increases in the post EMU formation by 0.4% (δ), indicating that the EMU formation has a negative impact on the Euro-area firms' operating efficiency.

Column 2 of panel 2 shows that the net profit margins of the North American firms ($\alpha = 6.5\%$) in the pre EMU formation are greater than that of the Euro-area firms ($\alpha + \beta = 4.3\%$). Post EMU formation the gap reduces by 0.1% (δ), indicating a positive impact of the EMU formation on the Euro-area firms' return on sales.

Column 3 of panel 2 shows that the return on assets of the North American firms ($\alpha = 4.1\%$) in the pre EMU formation is higher than that of the Euro-area firms ($\alpha + \beta = 3.5\%$). Post EMU formation the gap increases by 0.1% (δ), indicating a negative impact of the EMU formation on the Euro-area firms' overall performance.

Column 4 of panel 2 shows that the return on equity of the North American firms ($\alpha = 13.4\%$) in the pre EMU formation is lower than that of the Euro-area firms ($\alpha + \beta = 13.5\%$). However, post EMU formation, the return on equity of the North American firms ($\alpha + \gamma = 14.9\%$) exceed that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = 14.8\%$), indicating a negative impact of the EMU

formation on the Euro-area firms' ability to generate returns for the shareholders' investments.

Thus the accounting rates of return suggest a negative impact during the 7 years after the EMU formation except that for the return on sales.

iii. Comparison of first 3 years with 7 years

It can be seen from the δ in panel 1 and panel 2 of column 1 that the negative impact of the EMU formation on the operating margin of the Euro-area firms appears to decrease in the longer time horizon. The Chow test¹⁵, at 95% level of significance, reveals that the functions did not change significantly between the first 3 years and the next 4 years, that is, the negative impact of the EMU formation on the operating efficiency of the Euro-area firms is stable over the aggregate 7 years.

It can be seen from the δ in panel 1 and panel 2 of column 2 that the positive impact of the EMU formation on the net profit margin of the Euro-area firms appears to decrease in the longer time horizon. The Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the positive impact of the EMU formation on the Euro-area firms' return on sales is not stable over the aggregate 7 years.

¹⁵ The results of the Chow test are given in Appendix 2.

It can be seen from the δ in panel 1 and panel 2 of column 3 that the negative impact of the EMU formation on the return on assets of the Euro-area firms appears to be similar in the 2 time horizons. However, the Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the negative impact of the EMU formation on the Euro-area firms' overall performance is not stable over the aggregate 7 years.

It can be seen from the δ in panel 1 and panel 2 of column 4 that the positive impact of the EMU formation on the return on equity of the Euro-area firms turns negative in the longer time horizon. The Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the impact of the EMU formation on the Euro-area firms' return on shareholders' investment is not stable over the aggregate 7 years.

Thus it appears that the impact of the EMU formation on the accounting rates of return is mostly diminishing over time. The negative impact of the EMU formation on the return on assets seem to be supporting the finding in the study by Asimakopoulos et al. (2009). Further, the Chow tests indicate that the impact is mostly not stable.

Category B: Impact measured by the financial cash flows.

i. First 3 years

Column 5 of panel 1 shows that the free cash flow ratio of the North American firms ($\alpha = 0.6\%$) in the pre EMU formation is lower than that of the Euro-area firms ($\alpha + \beta = 1.0\%$). However, post EMU formation, the free cash flow ratios of the North American firms ($\alpha + \gamma = 0.7\%$) exceed that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = -0.4\%$), indicating a negative impact of the EMU formation on the Euro-area firms' ability to generate financial cash flows.

ii. 7 years

Column 5 of panel 2 shows that the free cash flow ratios of the North American firms ($\alpha = 0.8\%$) in the pre EMU formation are lower than that of the Euro-area firms ($\alpha + \beta = 1.2\%$). However, post EMU formation, the free cash flow ratios of the North American firms ($\alpha + \gamma = 1.9\%$) exceed that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = 1.8\%$), apparently suggesting a negative impact of the EMU formation on the Euro-area firms' ability to generate financial cash flows.

iii. Comparison of the first 3 years with 7 years

It can be seen from the δ in panel 1 and panel 2 of column 5 that the negative impact of the EMU formation on the financial cash flows of the Euro-area firms appears to decrease over time. The Chow test, at 95% level of significance, reveals a significant change in the functions between the first 3 years and the next 4 years, that is, the negative impact of the EMU formation

on the Euro-area firms' ability to generate financial cash flows is not stable over the aggregate 7 years.

The results seem to indicate a negative impact of the EMU formation on the financial cash flows and mostly negative on the accounting rates of return. The Chow tests suggest that the impact is not stable. The magnitude of the impact seems to decline over time.

Three years after the EMU formation the physical Euro was adopted. Now the impact of the Euro adoption is discussed.

Impact of the Euro Adoption.

Table 4 presents the results of the regression for the 2 time horizons around the Euro adoption. Panel 1 of the table presents the results of the first 3 years, and the panel 2 for the 7 years. Columns 1 to 4 of the table show the results of the accounting rates of return and column 5 depicts that of the financial cash flows. Figure 3 provides the graphical representation of the δ of the ratios, across the 2 time horizons.

Category A: Impact measured by accounting rates of return.

i. First 3 years

Column 1 of panel 1 shows that the operating margins of the North American firms ($\alpha = 12.7\%$) in the pre Euro adoption are higher than that of the Euro-area firms ($\alpha + \beta = 8.9\%$). The gap increases in the post Euro

adoption by 0.7% (δ), indicating that the Euro adoption has a negative impact on the Euro-area firms' operating efficiency.

Column 2 of panel 1 shows that the net profit margins of the North American firms ($\alpha = 6.9\%$) in the pre Euro adoption are greater than that of the Euro-area firms ($\alpha + \beta = 5.2\%$). Post Euro adoption the gap increases by a significant 1.4% (δ), indicating a strong negative impact of the Euro adoption on the Euro-area firms' return on sales.

Table 4: Results for the impact of the Euro adoption

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 2001 = 0, greater than 2001 = 1) + δ Location * Year + ϵ						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
Panel 1: + / - first 3 years (n=726)	Adjusted R squared	.064 ***	.054 ***	.007 **	0.001	.074 ***
	Mean of North American firms - Pre EMU (α)	0.127	0.069	0.041	0.139	0.004
	Mean of Euro-area firms - Pre EMU ($\alpha + \beta$)	0.089	0.052	0.038	0.151	-0.006
	Mean of North American firms - Post EMU ($\alpha + \gamma$)	0.134	0.075	0.042	0.148	0.028
	Difference-in-differences of the means (δ)	-0.007	-0.014 *	-0.006	-0.029 *	0.018 **
	Mean of Euro-area firms - Post EMU ($\alpha + \beta + \gamma + \delta$)	0.089	0.044	0.033	0.131	0.036
Panel 2: + / - 7 years (n=1694)	Adjusted R squared	.055 ***	.042 ***	.005 ***	.003 **	.032 ***
	Mean of North American firms - Pre EMU (α)	0.129	0.070	0.043	0.143	0.005
	Mean of Euro-area firms - Pre EMU ($\alpha + \beta$)	0.092	0.050	0.039	0.149	0.003
	Mean of North American firms - Post EMU ($\alpha + \gamma$)	0.138	0.079	0.047	0.162	0.024
	Difference-in-differences of the means (δ)	-0.001	-0.002	-0.002	-0.013	0.007
	Mean of Euro-area firms - Post EMU ($\alpha + \beta + \gamma + \delta$)	0.100	0.057	0.041	0.155	0.029

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

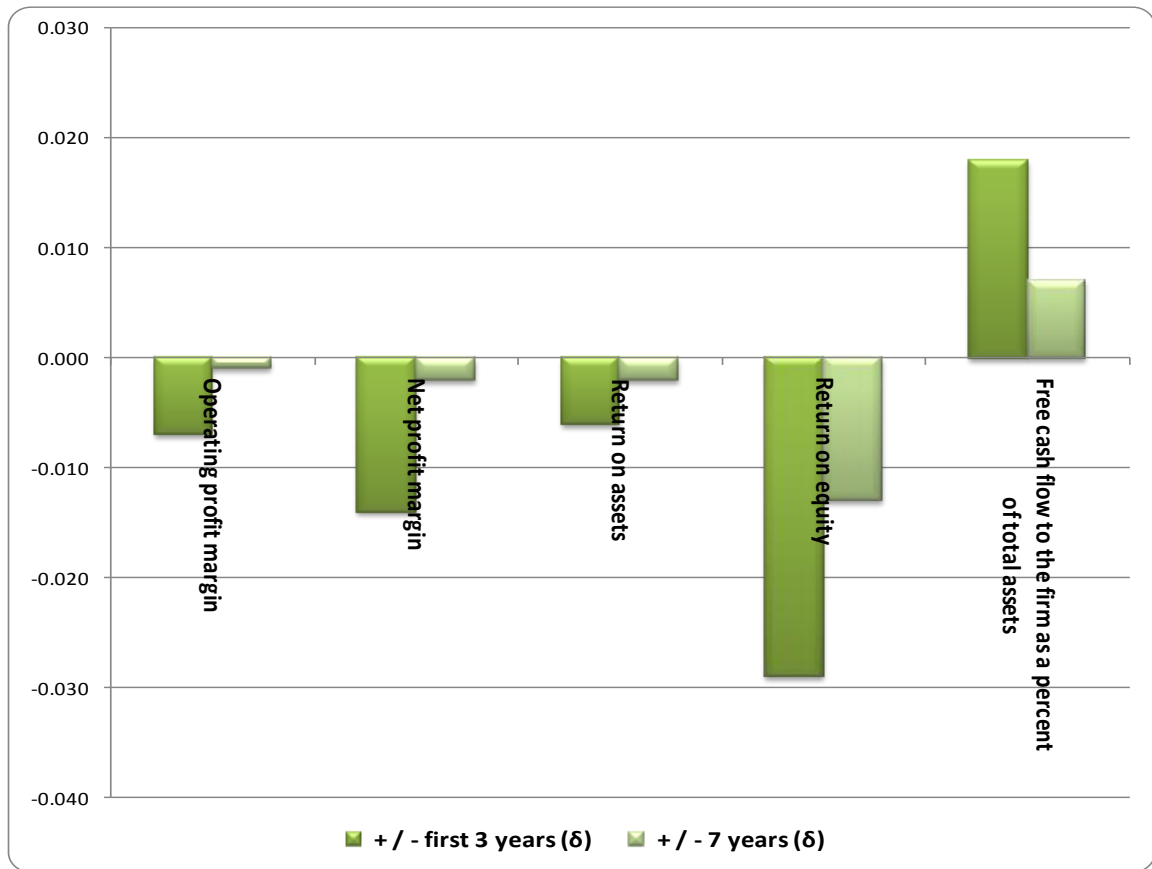


Figure 3: Difference-in-difference of the means (δ) - Euro adoption

Column 3 of panel 1 shows that the return on assets of the North American firms ($\alpha = 4.1\%$) in the pre Euro adoption is higher than that of the Euro-area firms ($\alpha + \beta = 3.8\%$). Post Euro adoption the gap increases by 0.6% (δ), indicating a negative impact of the Euro adoption on the Euro-area firms' overall performance.

Column 4 of panel 1 shows that the return on equity of the North American firms ($\alpha = 13.9\%$) in the pre Euro adoption is lower than that of the Euro-area firms ($\alpha + \beta = 15.1\%$). However, post Euro adoption, the return on equity of the North American firms ($\alpha + \gamma = 14.8\%$) exceed that of the Euro-

area firms ($\alpha + \beta + \gamma + \delta = 13.1\%$), indicating a strong negative impact of the Euro adoption on the Euro-area firms' ability to generate returns for the shareholders' investments.

Thus the accounting rates of return indicate a negative impact during the 3 years after the Euro adoption. The impact is significant for return on sales and return on shareholders' investment.

ii. 7 years

Column 1 of panel 2 shows that the North American firms ($\alpha = 12.9\%$) in the pre Euro adoption are higher than that of the Euro-area firms ($\alpha + \beta = 9.2\%$). The gap in the operating margins increases in the post Euro adoption by 0.1% (δ), indicating that the Euro adoption has a negative impact on the Euro-area firms' operating efficiency.

Column 2 of panel 2 shows that the net profit margins of the North American firms ($\alpha = 7.0\%$) in the pre Euro adoption are greater than that of the Euro-area firms ($\alpha + \beta = 5.0\%$). Post Euro adoption the gap increases by 0.2% (δ), indicating a negative impact of the Euro adoption on the Euro-area firms' return on sales.

Column 3 of panel 2 shows that the return on assets of the North American firms ($\alpha = 4.3\%$) in the pre Euro adoption are higher than that of the Euro-area firms ($\alpha + \beta = 3.9\%$). Post Euro adoption the gap increases by 0.2%

(δ), indicating a negative impact of the Euro adoption on the Euro-area firms' overall performance.

Column 4 of panel 2 shows that the return on equity of the North American firms ($\alpha = 14.3\%$) in the pre Euro adoption is lower than that of the Euro-area firms ($\alpha + \beta = 14.9\%$). However, post Euro adoption, the return on equity of the North American firms ($\alpha + \gamma = 16.2\%$) exceed that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = 15.5\%$), indicating a negative impact of the Euro adoption on the Euro-area firms' ability to generate returns for the shareholders' investments.

Thus the accounting rates of return suggest a negative impact during the 7 years after the Euro adoption.

iii. Comparison of first 3 years with 7 years

It can be seen from the δ in panel 1 and panel 2 of column 1 that the negative impact of the Euro adoption on the operating margin of the Euro-area firms appears to decrease in the longer time horizon. The Chow test¹⁶, at 95% level of significance, reveals that the functions did not change significantly between the first 3 years and the next 4 years, that is, the negative impact of the Euro adoption on the Euro-area firms' operating efficiency is stable over the aggregate 7 years.

¹⁶ The results of the Chow test are given in Appendix 3.

It can be seen from the δ in panel 1 and panel 2 of column 2 that the negative impact of the Euro adoption on the net profit margin of the Euro-area firms appears to decrease over time. The Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the negative impact of the Euro adoption on the Euro-area firms' return on sales is not stable over the aggregate 7 years.

It can be seen from the δ in panel 1 and panel 2 of column 3 that the negative impact of the Euro adoption on the return on assets of the Euro-area firms appears to decline in the longer time horizon. The Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the negative impact of the Euro adoption on the Euro-area firms' overall performance is not stable over the aggregate 7 years.

It can be seen from the δ in panel 1 and panel 2 of column 4 that the negative impact of the Euro adoption on the return on equity of the Euro-area firms decreases in the longer time horizon. The Chow test, at 95% level of significance, reveals a significant change between the first 3 years and the next 4 years, that is, the impact of the Euro adoption on the Euro-area firms' ability to generate return on shareholders' investments is not stable over the aggregate 7 years.

Thus it appears that the impact of the Euro adoption on the accounting rates of return is declining over time. The negative impact of the Euro adoption on the return on assets seem to be supporting the finding in the

study by Asimakopoulos et al. (2009). Further, the Chow tests indicate that the impact is mostly not stable.

Category B: Impact measured by the financial cash flows.

i. First 3 years

Column 5 of panel 1 shows that the free cash flow ratio of the North American firms ($\alpha = 0.4\%$) in the pre Euro adoption is higher than that of the Euro-area firms ($\alpha + \beta = -0.6\%$). Post Euro adoption, the free cash flow ratio of the North American firms ($\alpha + \gamma = 2.8\%$) drop below that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = 3.6\%$), indicating a significant positive impact of the Euro adoption on the Euro-area firms' ability to generate financial cash flows.

ii. 7 years

Column 5 of panel 2 shows that the free cash flow ratio of the North American firms ($\alpha = 0.5\%$) in the pre Euro adoption is higher than that of the Euro-area firms ($\alpha + \beta = 0.3\%$). Post Euro adoption, the free cash flow ratio of the North American firms ($\alpha + \gamma = 2.4\%$) are lower than that of the Euro-area firms ($\alpha + \beta + \gamma + \delta = 2.9\%$), suggesting a positive impact of the Euro adoption on the Euro-area firms' ability to generate financial cash flows.

iii. Comparison of the first 3 years with 7 years

It can be seen from the δ in panel 1 and panel 2 of column 5 that the positive impact of the Euro adoption on the free cash flows of the Euro-area

firms appears to decrease over time. The Chow test, at 95% level of significance, reveals a significant change in the functions between the first 3 years and the next 4 years, that is, the positive impact of the Euro adoption on the Euro-area firms' financial cash flows is not stable over the aggregate 7 years.

The results seem to indicate a positive impact of the Euro adoption on the financial cash flows. However, the accounting rates of return suggest a negative impact. The Chow tests indicate that the impact is mostly not stable. The magnitude of the impact seems to decline over time.

One of the objectives of the research is to distinguish the impact of the EMU formation and that of the Euro adoption. As described in the research design (section 3.2), the third question category is discussed below.

Category C: Difference in the impact of the EMU formation and Euro adoption.

A comparison of the difference-in-differences means (δ) indicating the impact of the EMU formation and the impact of the Euro adoption, across the different time horizons, is given in Table 5. Figure 4 graphically plots the impacts on all the ratios and across the different time horizons.

Table 5: The difference-in-differences of the means (δ) for the impacts of the EMU formation and the Euro adoption across different time horizons

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ϵ						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
EMU Formation +/- first 3 years (n=726)	Difference-in-differences of the means (δ)	-0.006	0.004	-0.001	0.005	-0.015
Euro Adoption +/- first 3 years (n=726)	Difference-in-differences of the means (δ)	-0.007	-0.014 *	-0.006	-0.029 *	0.018 **
EMU Formation +/- 7 years (n=1694)	Difference-in-differences of the means (δ)	-0.004	0.001	-0.001	-0.002	-0.005
Euro Adoption +/- 7 years (n=1694)	Difference-in-differences of the means (δ)	-0.001	-0.002	-0.002	-0.013	0.007

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

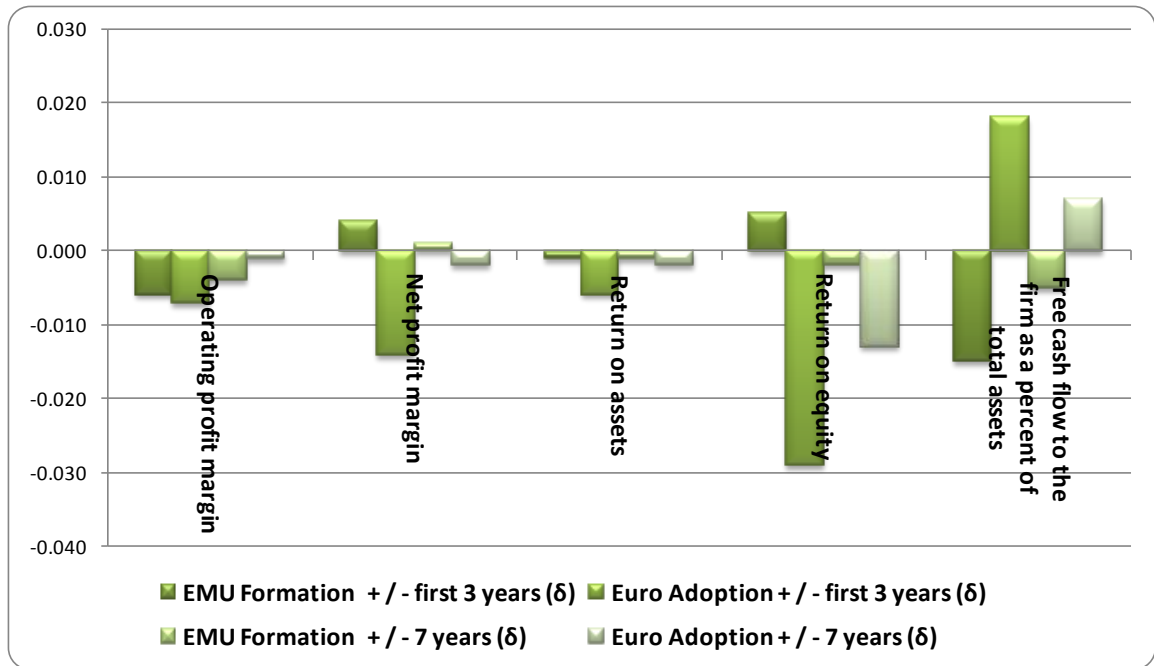


Figure 4: The difference-in-differences of the means (δ) for the impacts of the EMU formation and the Euro adoption across different time horizons

As highlighted in Table 5 the direction of the impact of the EMU formation and the Euro adoption appear to differ in the cases of net profit

margin, return on equity (+/- first 3 years), and free cash flow ratio. The impact of Euro adoption appears to be significantly positive on the financial cash flows but negative on the accounting rates of return. As explained in the research design (section 3.1), the impact of Euro adoption is expected to be stronger. The results seem to support this.

Robustness Check with GDP as a Control Variable

Beck, Demirgüç-Kunt, and Maksimovic (2005) find a significant and positive correlation between the GDP growth rate and the firms' growth rate. Hence, GDP is introduced in the model to control the country effect and the business cycle effect on the firms' performance. The current USD GDP data is retrieved from the World Bank's database (WB, 2012). For each firm-year the GDP of the home country as a ratio of the current 2010-GDP of the US is added to the model. The results are discussed separately for the impact on the results for the EMU formation and that on the results of the Euro adoption.

A. Impact on the results for the EMU formation

Table 6 compares the difference-in-differences of the means (δ) for the EMU formation, with and without the inclusion of GDP. Inclusion of GDP turns the impact of the EMU formation positive in the case of the free cash flow ratio and return on equity, over the longer time horizon. However, the impact turns negative in the case of the net profit margin for both the time horizons. The

direction of the impact remains unaltered for the other accounting rates of return.

Table 6: The difference-in-differences of the means (δ) for the impact of EMU formation with GDP

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 = 0, greater than 1998 = 1) + δ Location * Year + (ζ GDP) + ϵ						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
Panel 1: + / - first 3 years (n=726)	Difference-in-differences of the means (δ)	-0.006	0.004	-0.001	0.005	-0.015
	Difference-in-differences of the means with GDP (δ)	-0.012	-0.002	-0.003	0.003	-0.006
Panel 2: + / - 7 years (n=1694)	Difference-in-differences of the means (δ)	-0.004	0.001	-0.001	-0.002	-0.005
	Difference-in-differences of the means with GDP (δ)	-0.011	-0.003	-0.001	0.001	0.007

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

B. Impact on the results for the Euro adoption

Table 7 compares the difference-in-differences of the means (δ) for the Euro adoption, with and without the inclusion of GDP.

The direction of the results remains unaffected by the introduction of the GDP. The positive impact of the Euro adoption on the free cash flow ratio becomes significant even for the longer time horizon. The negative impact on the net profit margin becomes stronger in magnitude during the first 3 years.

Thus, out of the 20 scenarios¹⁷ the direction of the impact changes only for 3 scenarios, that is, in 17 scenarios (85%) the introduction of GDP supports the main results. This is also consistent with the finding in the study by Eiling, Gerard, & De Roon (2012) that post EMU industry effects dominated over country effects in the erstwhile less integrated countries, while the industry effects dominated in both pre and post EMU for countries with strongly linked economies.

Table 7: The difference-in-differences of the means (δ) for the impact of Euro adoption with GDP

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 2001 = 0, greater than 2001 = 1) + δ Location * Year + (ζ GDP) + ϵ						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
Panel 1: + / - first 3 years (n=726)	Difference-in-differences of the means (δ)	-0.007	-0.014 *	-0.006	-0.029 *	0.018 **
	Difference-in-differences of the means with GDP (δ)	-0.011	-0.017 **	-0.007	-0.031 *	0.021 **
Panel 2: + / - 7 years (n=1694)	Difference-in-differences of the means (δ)	-0.001	-0.002	-0.002	-0.013	0.007
	Difference-in-differences of the means with GDP (δ)	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

The introduction of GDP improved the explanatory power (adjusted R squared) of the model in 15 out of the 20 scenarios. Hence, the GDP is included in the models for subsequent discussions.

¹⁷ The 5 ratios multiplied by two time horizons multiplied by two events (EMU formation and Euro adoption).

The comparison of the impact of the EMU formation and the impact of the Euro adoption is repeated with the inclusion of the GDP. The difference-in-differences means (δ) with GDP, across the different time horizons, is given in Table 8. Figure 5 graphically plots the impacts on all the ratios and across the different time horizons.

Table 8: The difference-in-differences of the means (δ) for the impacts of the EMU formation and the Euro adoption across different time horizons with GDP

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ζ GDP + ε						
Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
		Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
EMU Formation +/- first 3 years (n=726)	Difference-in-differences of the means (δ) with GDP	-0.012	-0.002	-0.003	0.003	-0.006
Euro Adoption +/- first 3 years (n=726)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.017 **	-0.007	-0.031 *	0.021 **
EMU Formation +/- 7 years (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.003	-0.001	0.001	0.007
Euro Adoption +/- 7 years (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

Now, the direction of the impact of the EMU formation and the Euro adoption appear to become more similar as highlighted in Table 8. As explained in the research design (section 3.1), the impact of Euro adoption is expected to be stronger. The results including GDP seem to support this even more.

In the next section the impact of the EMU on 4 major sectors is analyzed to examine whether the results hold for the sectors. The same research design

and methodology is used except that the analysis is over a single time period of 7 years.

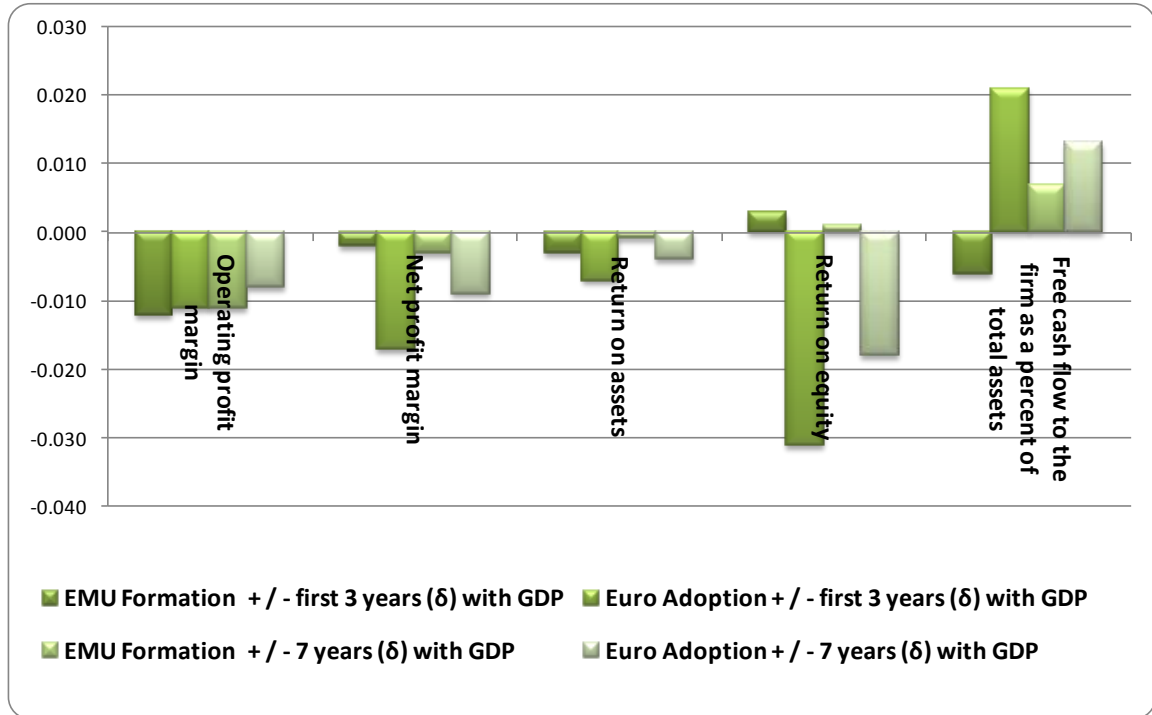


Figure 5: The difference-in-differences of the means (δ) for the impacts of the EMU formation and the Euro adoption across different time horizons with GDP

Impact of EMU on 4 Major Industrial Sectors

The 121 firms included in the study consist of 14 industrial sectors, out of which the chemicals, the financial services, the oil and gas operations, and the utilities sectors are represented by more than 10 firms each (Table 2). The impact of the EMU formation and the Euro adoption is studied for the each of these 4 sectors.

The difference-in-differences of the means (δ) of the ratios are tabulated for each of the 4 major sectors and compared with the results obtained in the study with all the sectors. The first panel in the table presents

the results of the EMU formation while the second panel shows the results of the Euro adoption. The results are also plotted graphically.

A. Chemicals sector

Table 9 shows the results of the chemicals sector and compares it with the results for all the firms and figure 6 plots the same graphically.

As highlighted in the table, there appears to be a strong positive impact of the EMU formation on the chemicals sector. The Euro adoption seems to impact the operating efficiency, return on sales, and financial cash flows positively. However, the return on assets and return on equity indicate a negative impact on the overall performance and return on shareholders' performance. The impact of the EMU formation appears to be stronger on the chemicals sector than that of the Euro adoption.

Table 9: The difference-in-differences of the means (δ) for the impact of EMU on the chemicals sector and that on all the sectors

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ζ GDP + ϵ							
Panel	Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
			Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
1	EMU Formation +/- 7 years: Chemicals sector (n=182)	Difference-in-differences of the means with GDP (δ)	0.031 *	0.037 ***	0.039 ***	0.092 **	0.025
1	EMU Formation +/- 7 years: All sector (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.003	-0.001	0.001	0.007
2	Euro Adoption +/- 7 years: Chemicals sector (n=182)	Difference-in-differences of the means with GDP (δ)	0.035 **	0.007	-0.005	-0.023	0.006
2	Euro Adoption +/- 7 years: All sectors (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

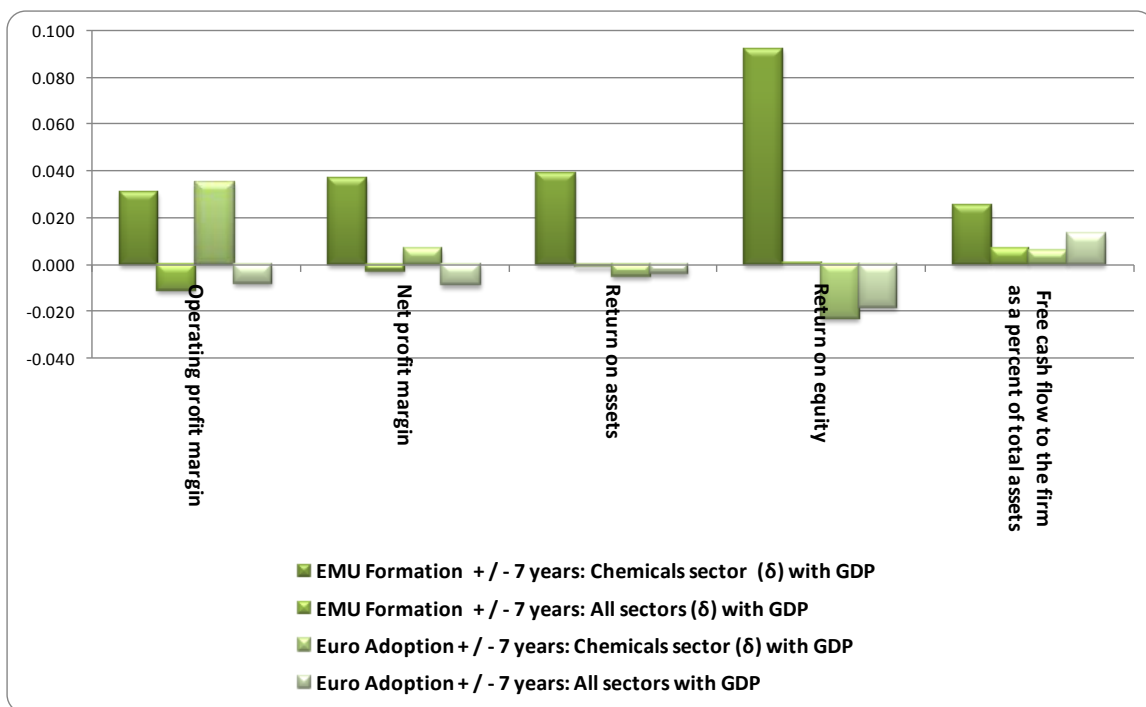


Figure 6: The difference-in-differences of the means (δ) for the impact of EMU on the chemicals sector and that on all the sectors

Out of the 4 sectors studied the chemicals sector shows the maximum exceptions to the main results for the accounting rates of return. During the period under study, the Euro-area chemicals' sector has the highest non-domestic revenue as a percent of revenue from operations of 84% as against the overall Euro-area firms' average of 57%. Perhaps this characteristic of the chemicals sector may have contributed to the exceptional results. However, this aspect is not investigated in the current study.

B. Financial services sector

Table 10 shows the results of the financial services sector and compares it with the results for all the firms and figure 7 plots the same graphically.

As highlighted in the table, the impact of EMU formation appears to be strongly positive on the financial services sectors' performance. The Euro

adoption seems to have a strong positive impact on the financial cash flows while it is mostly negative when measured by accounting rates of return. The impact of the EMU formation appears to be stronger on the financial sector than that of the Euro adoption.

Table 10: The difference-in-differences of the means (δ) for the impact of EMU on the financial services sector and that on all the sectors

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ζ GDP + ϵ							
Panel	Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
			Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
1	EMU Formation +/- 7 years: Financial Services sector (n=252)	Difference-in-differences of the means with GDP (δ)	0.013	0.019 *	0.005 **	0.016	0.019 *
1	EMU Formation +/- 7 years: All sector (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.003	-0.001	0.001	0.007
2	Euro Adoption +/- 7 years: Financial Services sector (n=252)	Difference-in-differences of the means with GDP (δ)	-0.003	-0.008	0.001	-0.017	0.038 ***
2	Euro Adoption +/- 7 years: All sectors (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

C. Oil and Gas Operations Sector

Table 11 shows the results of the oil and gas operations sector and compares it with the results for all the firms and figure 8 plots the same graphically.

As highlighted in the table, the impact of EMU formation and Euro adoption appears to be negative on the performance of the oil and gas operations sector. The impact seems to be similar to that of the results of the study with all the sectors, except for the impact on the financial cash flows.

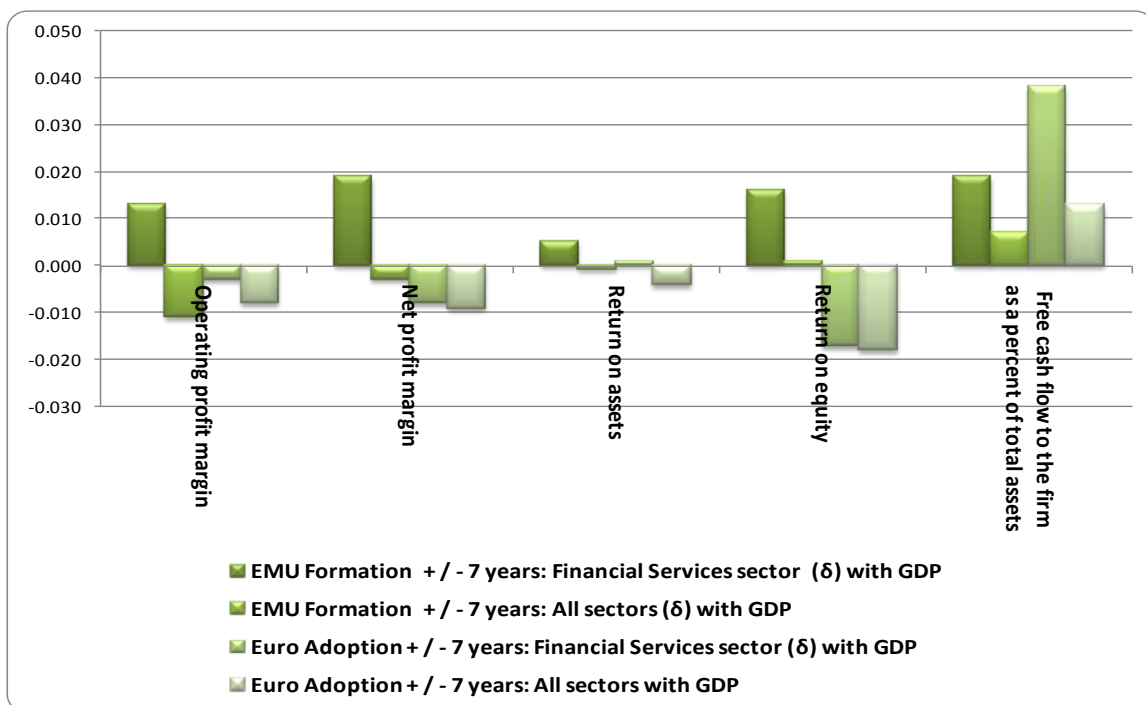


Figure 7: The difference-in-differences of the means (δ) for the impact of EMU on the financial services sector and that on all the sectors

Table 11: The difference-in-differences of the means (δ) for the impact of EMU on the oil and gas operations sector and that on all the sectors

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ζ GDP + ϵ

Panel	Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
			Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
1	EMU Formation +/- 7 years: Oil & Gas Operations sector (n=210)	Difference-in-differences of the means with GDP (δ)	-0.029	-0.017	-0.003	-0.033	0.000
1	EMU Formation +/- 7 years: All sector (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.003	-0.001	0.001	0.007
2	Euro Adoption +/- 7 years: Oil & Gas Operations sector (n=210)	Difference-in-differences of the means with GDP (δ)	-0.042	-0.046 **	-0.013	-0.050	-0.002
2	Euro Adoption +/- 7 years: All sectors (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

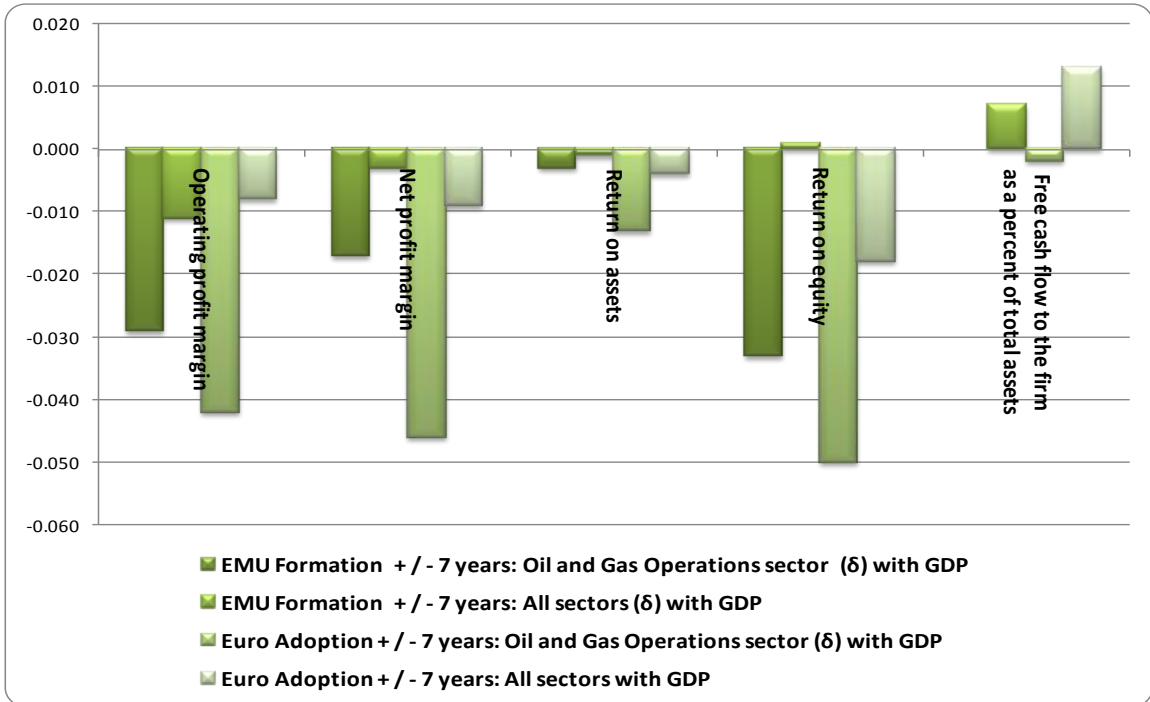


Figure 8: The difference-in-differences of the means (δ) for the impact of EMU on the oil and gas operations sector and that on all the sectors

D. Utilities Sector

Table 12 shows the results of the utilities sector and compares it with the results for all the firms and figure 9 plots the same graphically.

The results for the utilities sector indicate a positive impact of the EMU formation on the overall performance and returns on shareholders' investments. However, the impact on operating efficiency, return on sales, and financial cash flows is negative. The impact of Euro adoption is mostly positive except that on financial cash flows, which is significantly negative. The impact of EMU formation seems to be stronger.

Table 12: The difference-in-differences of the means (δ) for the impact of EMU on the utilities sector and that on all the sectors

Outcome Variable = $\alpha + \beta$ Location (North America = 0, Euro-area = 1) + γ Year (less than or equal to 1998 / 2001 = 0, greater than 1998 / 2001 = 1) + δ Location * Year + ζ GDP + ϵ

Panel	Data Set	Parameter of interest	Accounting rates of return				Financial cash flow
			Operating profit margin (1)	Net profit margin (2)	Return on assets (3)	Return on equity (4)	Free cash flow ratio (5)
1	EMU Formation +/- 7 years: Utilities sector (n=210)	Difference-in-differences of the means with GDP (δ)	-0.108 ***	-0.016	0.006	0.062 **	-0.004
1	EMU Formation +/- 7 years: All sector (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.011	-0.003	-0.001	0.001	0.007
2	Euro Adoption +/- 7 years: Utilities sector (n=210)	Difference-in-differences of the means with GDP (δ)	-0.039	0.007	0.000	0.038	-0.051 **
2	Euro Adoption +/- 7 years: All sectors (n=1694)	Difference-in-differences of the means (δ) with GDP	-0.008	-0.009	-0.004	-0.018	0.013**

*** indicates significance at 1% level of confidence, ** indicates significance at 5% level of confidence, * indicates significance at 10% level of confidence

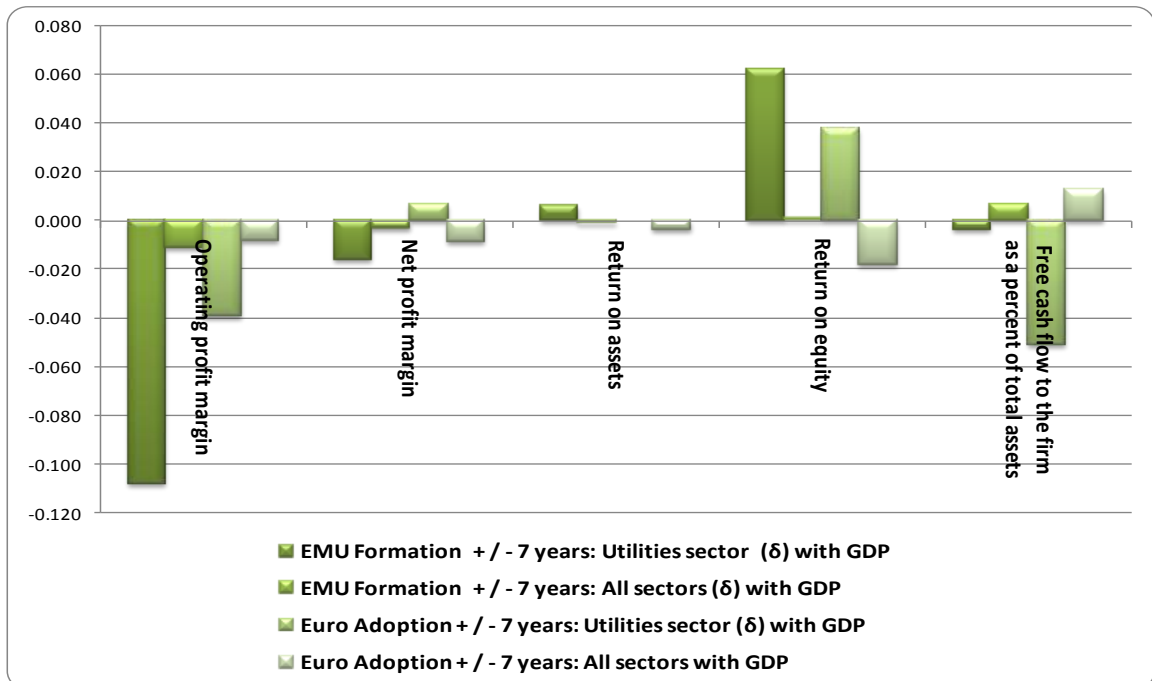


Figure 9: The difference-in-differences of the means (δ) for the impact of EMU on the utilities sector and that on all the sectors

After the chemicals sector the utilities sector exhibits the most different results compared to the main results for all the firms included in the study.

During the period under study, the Euro-area utilities sector is at the other end of the spectrum in terms of the non-domestic revenue as a percent of revenue from operations, the lowest at 14% as against the overall Euro-area firms' average of 57%. Perhaps this attribute of the utilities sector may have contributed to the exceptional results. However, this aspect is outside the scope of this study.

Chapter 6: Summary and Conclusion

This thesis provides new insight into the EMU's impact on the Euro-area firms' performance, by examining the firms' accounting rates of return and financial cash flows. The impact is evaluated separately for the EMU formation and the physical Euro adoption, and over different time horizons. The existing literature does not directly examine these issues.

This study uses the regression model of the difference-in-differences approach to examine 121 firms, consisting of 52 Euro-area firms and 69 North American firms, covering 14 sectors, over the period from 1992 to 2008.

The results indicate that:

- i. the EMU has a positive impact on the firms' financial cash flows, especially after the Euro adoption, while, the accounting rates of return suggest a mostly negative impact,
- ii. the impact of the Euro adoption on the financial cash flows and accounting rates of return is stronger in magnitude and direction than that of the EMU formation,
- iii. the impact of the EMU is mostly not stable over time and the magnitude of the impact appears to be diminishing, and

- iv. the impact of the EMU appears to be positive on the chemicals and the financial services sectors, mostly negative on the oil and gas operations sector, and varied on the utilities sector.

Furthermore, the results are robust to the inclusion of GDP as a control variable for the country and business-cycle effect.

The EMU has a positive impact on the firms' financial cash flows, which supports the related literature. The negative results of the accounting rates of return are counterintuitive to most of the existing literature. As discussed in the research design (section 3.1), the financial cash flows is an unambiguous measure as compared to the accounting rates of return. Hence, perhaps, the results of the financial cash flows are more objective.

In summary, the results of this thesis indicate that the exchange rate regimes have different ramifications on the firms' operating efficiency (operating margin), return on sales (net profit margin), overall performance (return on assets), return on shareholders' investments (return on equity) and the financial cash flows (free cash flow ratio). The accounting rates of return suggest that the EMU is detrimental to the firm, that is, currency unification or the fixed exchange rate regime has a negative impact on the firm. However, the financial cash flows, perhaps the more objective measure of performance, indicate that EMU is not detrimental to the firm. It indicates a positive impact of the currency unification or a move towards the fixed exchange rate. This finding has implications for the managers, investors and policy makers.

This study can be extended by including the asset base in the firms' selection criterion, including other structural changes in the model, and building comparison groups of the firms based on the location of assets and the source of revenues.

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Appendix 1

List of the firms included in the study

Sl.	Corporation Name	Country	Location	Industrial Sector
1	Kone	Finland	Euro-area	Business Support
2	Metso (Rauma - Valmet)	Finland	Euro-area	Business Support
3	MAN Group	Germany	Euro-area	Business Support
4	Randstad	Netherlands	Euro-area	Business Support
5	Solvay	Belgium	Euro-area	Chemicals
6	K+S	Germany	Euro-area	Chemicals
7	BASF	Germany	Euro-area	Chemicals
8	Bayer	Germany	Euro-area	Chemicals
9	Akzo Nobel	Netherlands	Euro-area	Chemicals
10	Bekaert	Belgium	Euro-area	Conglomerates
11	GEA Group	Germany	Euro-area	Conglomerates
12	Franz Haniel	Germany	Euro-area	Conglomerates
13	Vinci	France	Euro-area	Construction
14	Hochtief	Germany	Euro-area	Construction
15	Heidelberg Cement	Germany	Euro-area	Construction
16	Michelin	France	Euro-area	Consumer Durables
17	Daimler	Germany	Euro-area	Consumer Durables
18	Continental	Germany	Euro-area	Consumer Durables
19	Robert Bosch	Germany	Euro-area	Consumer Durables
20	Erste Group Bank	Austria	Euro-area	Financial Services
21	AXA	France	Euro-area	Financial Services
22	BNP Paribas	France	Euro-area	Financial Services
23	Allianz	Germany	Euro-area	Financial Services
24	Commerzbank	Germany	Euro-area	Financial Services
25	Deutsche Bank	Germany	Euro-area	Financial Services
26	Aegon	Netherlands	Euro-area	Financial Services
27	Delhaize Group	Belgium	Euro-area	Food Markets
28	Metro	Germany	Euro-area	Food Markets
29	Henkel	Germany	Euro-area	Household & Personal Products
30	Adidas	Germany	Euro-area	Household & Personal Products
31	Bertelsmann	Germany	Euro-area	Media
32	Wolters Kluwer	Netherlands	Euro-area	Media
33	ENI	Italy	Euro-area	Oil & Gas Operations
34	Repsol YPF	Spain	Euro-area	Oil & Gas Operations
35	OMV Group	Austria	Euro-area	Oil & Gas Operations
36	Total	France	Euro-area	Oil & Gas Operations
37	Technip	France	Euro-area	Oil & Gas Operations
38	Capgemini	France	Euro-area	Software & Services
39	SAP	Germany	Euro-area	Software & Services
40	Deutsche Telekom	Germany	Euro-area	Telecommunications Services
41	Telecom Italia	Italy	Euro-area	Telecommunications Services
42	Portugal Telecom	Portugal	Euro-area	Telecommunications Services
43	Telefónica	Spain	Euro-area	Telecommunications Services
44	Deutsche Post	Germany	Euro-area	Transportation
45	Lufthansa Group	Germany	Euro-area	Transportation
46	TNT	Netherlands	Euro-area	Transportation
47	Iberia	Spain	Euro-area	Transportation
48	Enel	Italy	Euro-area	Utilities
49	RWE	Germany	Euro-area	Utilities
50	Energie Baden-Württemberg	Germany	Euro-area	Utilities
51	Iberdrola	Spain	Euro-area	Utilities
52	Red Electrica De Espana	Spain	Euro-area	Utilities

Sl	Corporation Name	Country	Location	Industrial Sector
53	Automatic Data Processing	US	North America	Business Support
54	Ryder	US	North America	Business Support
55	Eaton	US	North America	Business Support
56	Cummins	US	North America	Business Support
57	Dow Chemical	US	North America	Chemicals
58	DuPont	US	North America	Chemicals
59	Eastman	US	North America	Chemicals
60	Praxiar	US	North America	Chemicals
61	Air Products and Chemicals	US	North America	Chemicals
62	PPG Industries	US	North America	Chemicals
63	Ashland	US	North America	Chemicals
64	Monsanto	US	North America	Chemicals
65	3M	US	North America	Conglomerates
66	Honeywell International	US	North America	Conglomerates
67	DR Horton	US	North America	Construction
68	MASCO Corporation	US	North America	Construction
69	Pulte	US	North America	Construction
70	Lennar	US	North America	Construction
71	Magna International	Canada	North America	Consumer Durables
72	General Motors	US	North America	Consumer Durables
73	Goodyear Tire & Rubber	US	North America	Consumer Durables
74	Johnson Controls	US	North America	Consumer Durables
75	Paccar	US	North America	Consumer Durables
76	Bank of Nova Scotia	Canada	North America	Financial Services
77	Allstate	US	North America	Financial Services
78	Berkshire Hathaway	US	North America	Financial Services
79	J.P. Morgan Chase & Co.	US	North America	Financial Services
80	MetLife	US	North America	Financial Services
81	Hartford Financial Services	US	North America	Financial Services
82	Travelers Cos.	US	North America	Financial Services
83	AFLAC	US	North America	Financial Services
84	American International Group	US	North America	Financial Services
85	Bank of New York Mellon	US	North America	Financial Services
86	Chubb Corporation	US	North America	Financial Services
87	Supervalu	US	North America	Food Markets
88	Krogers	US	North America	Food Markets
89	Kimberly-Clark	US	North America	Household & Personal Products
90	Avon International	US	North America	Household & Personal Products
91	Comcast	US	North America	Media
92	Clear Channel Communications	US	North America	Media
93	Suncor	Canada	North America	Oil & Gas Operations
94	Marathon Oil	US	North America	Oil & Gas Operations
95	Chevron	US	North America	Oil & Gas Operations
96	Occidental Petroleum	US	North America	Oil & Gas Operations
97	Murphy Oil	US	North America	Oil & Gas Operations
98	Anadarko Petroleum	US	North America	Oil & Gas Operations
99	Halliburton	US	North America	Oil & Gas Operations
100	Hess	US	North America	Oil & Gas Operations
101	Apache	US	North America	Oil & Gas Operations
102	Tesoro	US	North America	Oil & Gas Operations
103	Oracle	US	North America	Software & Services
104	First Data	US	North America	Software & Services
105	AT&T	US	North America	Telecommunications Services
106	Verizon Communications	US	North America	Telecommunications Services
107	Sprint Nextel	US	North America	Telecommunications Services
108	AMR	US	North America	Transportation
109	FedEx	US	North America	Transportation
110	United Parcel Service	US	North America	Transportation
111	Union Pacific	US	North America	Transportation
112	Dominion Resources	US	North America	Utilities
113	Southern Company	US	North America	Utilities
114	Florida Power & Light	US	North America	Utilities
115	American Electric Power	US	North America	Utilities
116	Edison International	US	North America	Utilities
117	PG & E	US	North America	Utilities
118	PSEG	US	North America	Utilities
119	AES	US	North America	Utilities
120	Energy Future Holding	US	North America	Utilities
121	Progress Energy	US	North America	Utilities

Appendix 2

Details of the Chow test for the difference in the functions of the impact of EMU formation between the first 3 years and the next 4 years

Ratios under study	Sum of Squared Residuals (A): EMU Formation +/- first 3 years	Sum of Squared Residuals (B): EMU Formation +/- next 4 years	Sum of Squared Residuals (C): EMU Formation +/- 7 years	Sum of Squared Residuals (D): (A) + (B)	Sum of Squared Residuals (E): (C) - (D)	F Ratio	Theoretical Value of F at 95% level of significance with df for numerator 4 and df for denominator 1686	Whether the periods are significantly different
Operating profit margin	3.966	5.780	9.770	9.746	0.024	1.038	2.370	not significantly different
Net profit margin	1.371	2.212	3.624	3.583	0.041	4.823	2.370	significantly different
Return on assets	0.732	1.164	1.917	1.896	0.021	4.669	2.370	significantly different
Return on equity	6.262	10.936	17.370	17.198	0.172	4.215	2.370	significantly different
Free cash flow to the firm as a percent of total assets	2.615	3.119	5.914	5.734	0.180	13.232	2.370	significantly different
n	726	968	1,694					
K	4	4	4					

Appendix 3

Details of the Chow test for the difference in the functions of the impact of Euro adoption between the first 3 years and the next 4 years

Ratios under study	Sum of Squared Residuals (A): Euro adoption +/- first 3 years	Sum of Squared Residuals (B): Euro adoption +/- next 4 years	Sum of Squared Residuals (C): Euro adoption +/- 7 years	Sum of Squared Residuals (D): (A) + (B)	Sum of Squared Residuals (E): (C) - (D)	F Ratio	Theoretical Value of F at 95% level of significance with df for numerator 4 and df for denominator 1686	Whether the periods are significantly different
Operating profit margin	4.354	6.007	10.401	10.361	0.040	1.627	2.370	not significantly different
Net profit margin	1.853	2.620	4.537	4.473	0.064	6.031	2.370	significantly different
Return on assets	0.876	1.359	2.271	2.235	0.036	6.789	2.370	significantly different
Return on equity	8.103	11.588	19.952	19.691	0.261	5.587	2.370	significantly different
Free cash flow to the firm as a percent of total assets	2.413	3.433	5.896	5.846	0.050	3.605	2.370	significantly different
n	726	968	1,694					
K	4	4	4					