Euro Membership as a Real Option Trigger:

An Empirical Study of EU15 Manufacturing Firms

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Key words: *Euro, Euro membership, Real options*

JEL Classification: *F15, G31*

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1. Introduction

Baldwin (2006a) finds that the Euro is the world's largest economic policy experiment: European nations accounting for 20% of world output, 30% of world trade and 300 million people suddenly using the same currency. The Euro was introduced on January 1, 1999, and is the single currency of the 12 EU member states that form the Euro-area (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain). Greece became the 12th Euro-area member state on January 1, 2001, when the Greek

drachma was locked vis-à-vis the Euro. The introduction of the Euro implies that the 12 Euro-area member states now have a single currency, a common interest rate and a common central bank, ECB.

Three EU member states (Denmark, Sweden, and UK) did not adopt the Euro but continue to use their national currencies. Denmark and UK decided to opt-out and not move to stage 3 of the EMU (i.e. to adopt the Euro) whereas Sweden did not fulfil all criteria for moving to stage 3 of the EMU. Together with the twelve Euro-area member states these three non-Euro member states form the EU15 (the fifteen “old” EU member states). In 2004 ten more states joined the EU (Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia,). None of these new member states have adopted the Euro.

The Euro was established in order to reach a real single market for goods and services, to eliminate foreign exchange risks and transaction costs, and to integrate financial markets (European Central Bank, 2006). In an influential paper Rose (2000) uses a gravity model to assess the separate effects of exchange rate volatility and currency union on international trade. He finds a large positive effect of a currency union on international trade and argues that “the European EMU may thus lead to a large increase in international trade, with all that that entails.” With the wisdom of hindsight Baldwin (2006a) estimates the actual effect of the Euro on trade within the Euro-area to be “something like five to ten percent on average” and without trade diversion as to the three EU15 countries that did not adopt the Euro. Baldwin questions if not “Britain, Denmark and Sweden were the clever ones from a mercantilist perspective - they got the better market access without sacrificing their main macro-policy tool”.

However, Mongelli and Vega (2006) argue that it will take considerably more time for the full effects of the Euro to unravel. The expectation is that monetary integration will contribute to the narrowing of “distances” and to a change in the incentive structure of agents (De Grauwe and Mongelli, 2005). The EMU project represents a still recent regime shift. Thus, we need indications as to the dynamics beyond the present trade statistics.

This paper confronts the challenge by looking beyond the trade statistics and analyzes to which extent the introduction of the Euro impacts on firms’ motivation to exercise real options. One measurement problem – apart from the introduction of the Euro representing a recent regime shift – is to disentangle the effects from the Euro “from other developments such as, the liberalisation of international capital movements, financial deregulation, globalization, and the advancement in information and communication technology” (Mongelli and Vega, 2006). However, the three EU15 countries that did not adopt the Euro works as a close-to-perfect control group. These three countries all have a history of EU membership (i.e. they have all shared other relevant aspects of EU membership) and they have all been exposed to “outside” developments in a more or less similar fashion as the 12 Euro countries. Thus, the purpose of the paper is to empirically investigate the relationship between the introduction of the Euro, Euro membership and the exercise of real options to find (1) the extent (if any) to which the introduction of the Euro has caused EU15 manufacturing firms to exercise real options, and (2) the extent (if any) to which such exercise of real options depends on Euro membership.

The results of the paper are based on public information and closed-end questionnaires sent to EU15 manufacturing firms (NAICS 33). The study shows that a minority of EU15 firms find that the introduction of the Euro has enabled them to exercise real options such as to establish alliances / partnerships, to enter new markets / market segments, to switch suppliers, and to generally expand in the Euro-area. However, Euro membership turns out to be a decisive factor for the exercise of real options. The study shows a clear distinction between firms based in Euro countries (“Euro firms”) and firms based in non-Euro countries (“non-Euro firms”). Euro firms are much more likely to exercise real options because of the introduction of the Euro than non-Euro firms. This conclusion holds also when controlling for firm size and sales to the Euro-area.

The results contribute to the existing literature by focusing on the potential long-term effects of the introduction of the Euro. So far the existing literature has only been able to show a fairly modest effect of the Euro in terms of trade statistics (please see Mongelli and Vega, 2006, for an overview of various quantifications). The results in this paper show that the introduction of the Euro and the effective elimination of exchange rate uncertainty and transaction costs inside the Euro-area have an important impact on Euro firms’ willingness to engage in “investments” that have potential long-term effects beyond the present trade statistics.

The paper proceeds as follows. The next section gives an overview of the recent literature on the effect of the Euro. The third section states the methodology of the study. The fourth section surveys the relationship between the introduction of the Euro, Euro membership and the exercise of real options. The fifth section tests which firm specific factors can explain the

effect of the introduction of the Euro on the exercise of real options. The last section concludes.

2. The Effect of the Euro

Rose (2000) argues that given the fact that exchange rate volatility was low before EMU, the effect of a currency union could be expected to be low. On the other hand, Rose argues, the sharing of a common currency could lead to an increase in the depth of trading relations. A very stable exchange rate may not be the same as membership of a currency union. As such, sharing a common currency is a much more serious and durable commitment than a fixed exchange rate. Rose notes that empirically, there is much more intense trade *inside* countries than *between* countries, a “home bias” in international trade. A common currency represents a serious government commitment to long-term integration. This commitment could, in turn, induce the private sector to engage in greater international trade.

Carr (1999) argues that the transition to a single currency will force managers to rethink many of their assumptions about doing business in Europe. The patchwork of national currencies has always made it hard for firms to think on the continental level. In this line of reasoning Gentz (1999), a member of the Board of Management of Daimler-Chrysler in Stuttgart, Germany, argues that by eliminating foreign exchange risks, the Euro removes an obstacle to effective business planning. In the past, fluctuating foreign exchange rates could undermine even the best-thought-out business strategies and quickly erase hard-won productivity gains. The need for pan-European perspective on products, prices, supply chains, and financing will conflict with the old model of organizing around country-specific business

units. As such, Gentz argues that a single currency should be viewed not only as a challenge but also as an opportunity.

Micco, Stein and Ordoñez (2003) note that the uncertainty and risk involved in trade transactions is reduced because a common currency eliminates bilateral nominal exchange rate volatility. While there are ways to hedge against this risk, doing so may be costly. Kenen (2003) points out, that it is not always possible to fully hedge against large, long-lasting changes in exchange rates, since producers are uncertain not only about the price they will receive for their exports, but also about the demand for their products. Thus, the producer does not know how much foreign currency he will earn, and how much he should sell in the forward market. As such, a financial transaction that was made in order to hedge against business risks may turn into a speculation because the underlying business rationale disappears. Goldberg, Benet and Cannong (2003) note that company resource allocation and strategic decisions are less hindered by foreign exchange volatility concerns after the introduction of the Euro.

Baldwin (2006a) finds that the boost to trade after the introduction of the Euro did not occur, as expected, by lowering the transaction costs for trade within the Euro-area. Had it done so, the stimulus would have been a fall in the prices of goods traded between Euro-area members relative to those traded with countries outside the currency union. Baldwin fails to find either this expected relative decline or the trade diversion it would have generated from the three countries that stayed out (UK, Sweden, and Denmark). He argues that another mechanism is at work. The introduction of the Euro has brought down the fixed cost of trading in the Euro-area. This has made it possible for firms selling products to just a few of the twelve Euro

countries to expand their market across more or all of them. This explains why the boost to trade has essentially been a one-off adjustment; and why countries that stayed out have benefited almost as much as those that joined. Baldwin, Skudelny and Taglioni (2004) observe that Europe has a high share of small firms that either do not export, or export very little. One factor that keeps them from exporting is the uncertainty involved in trade. The introduction of this Euro has reduced this uncertainty.

Mongelli and Vega (2006) argue that a single currency among partner countries precludes future competitive devaluation and thus facilitates foreign direct investment and the building of long-term relationships. Producers may be more willing to undertake large fixed costs involved with exporting toward other partner countries of the currency area. De Grauwe and Mongelli (2005) analyze the endogenous effects of monetary integration i.e. whether sharing a single currency may set in motion forces bringing countries closer together. They find that monetary integration will contribute to a narrowing of “distances” and to a change in the incentive structure of agents.

The arguments and observations in relation to the effect of the introduction of the Euro can be linked to the real options literature (see Dixit and Pindyck, 1994, and Trigeorgis, 1996, for two of the founding books on real options). Dixit (1989) shows how exchange rate uncertainty can lead to hysteresis in a firm’s entry and exit decisions. Dixit (1992) explains that if 1) an investment entails some sunk cost; 2) the economic environment has ongoing uncertainty, and information arrives gradually; and 3) the investment opportunity does not disappear if not taken immediately, then waiting has positive value and creates optimal inertia. In stock market terms a real investment opportunity resembles an American call

option. When uncertainty is reduced the value of the defer option decreases and investment is more likely.

The introduction of the Euro has eliminated exchange rate uncertainty between the twelve Euro countries. Investments that prior to the introduction of the Euro were exposed to the development of the individual exchange rates are now more likely to be undertaken because the value of waiting for new information on the development of the individual exchange rates has disappeared. Optimal inertia is now a less relevant concept and the exercise of real options is more likely.

3. Methodology of study

This study is based on public information from Amadeus and on questionnaires sent to EU15¹ firms in NAICS 33 (North American Industry Classification System). In NAICS industries are classified according to a six-digit code. The first digit of the six-digit code divides firms into nine major groups²: Our focus is on the Manufacturing group (3). Within Manufacturing NAICS divides firms into 3 groupings³ (the second digit of the six-digit code) of

¹ EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Sweden, Spain, and UK

² The nine groups: 1) Agriculture, Forestry, Fishing and Hunting; 2) Mining, Utilities, Construction; 3) Manufacturing; 4) Wholesale Trade, Retail Trade, Transportation and Warehousing; 5) Information, Finance and Insurance, Real Estate and Rental and Leasing, Professional, Scientific, and Technical Services, Management of Companies and Enterprises, Administrative and Support and Waste Management and Remediation Services; 6) Educational Services, Health Care and Social Assistance; 7) Arts, Entertainment, and Recreation, Accommodation and Food Services; 8) Other Services (except Public Administration); and 9) Public Administration.

³ The three groupings: 1) Food Manufacturing, Beverage and Tobacco Product Manufacturing, Textile Mills, Textile Product Mills, Apparel Manufacturing, Leather and Allied Product Manufacturing; 2) Wood Product Manufacturing, Paper Manufacturing, Printing and Related Support Activities, Petroleum and Coal Products Manufacturing, Chemical Manufacturing, Plastics and Rubber Products Manufacturing, Nonmetallic Mineral Product Manufacturing; 3) Primary Metal Manufacturing, Fabricated Metal Product Manufacturing, Machinery Manufacturing, Computer and Electronic Product Manufacturing, Electrical Equipment, Appliance, and

manufacturing subsectors (the third digit of the six-digit code). Our focus is on the third grouping of manufacturing sectors (3). This grouping (NAICS 33) includes: Primary Metal Manufacturing (331), Fabricated Metal Product Manufacturing (332), Machinery Manufacturing (333), Computer and Electronic Product Manufacturing (334), Electrical Equipment, Appliance, and Component Manufacturing (335), Transportation Equipment Manufacturing (336), Furniture and Related Product Manufacturing (337), Miscellaneous Manufacturing (339). Our focus group includes firms such as Electrolux (Sweden), Nokia (Finland), Renault (France), Siemens (Germany), Tomkins (UK), Vestas (Denmark) and Volkswagen (Germany).

The total number of publicly listed firms in our focus group (NAICS 33) was 598 firms. The websites of these firms were searched for useful e-mail addresses. Requests for initial contact information were sent twice with a seven-day interval to all firms with useful e-mail addresses. The purpose of this first e-mail was to establish a communication link with the firm before sending the questionnaire. 262 firms replied. The questionnaire was sent to these firms. 73 firms responded to the questionnaire reaching an overall response rate of 12.2 percent (please refer to Table 1).

* Please insert Table 1 approximately here *

In relation to geographical non-response bias, firms from Finland tended to respond significantly more than firms on average while firms from France, Greece and UK tended to respond less. Apart from these biases the sample seems to resemble the geographical

Component Manufacturing, Transportation Equipment Manufacturing, Furniture and Related Product Manufacturing, Miscellaneous Manufacturing.

dispersion of firms in the population. Dividing the firms into Euro firms and non-Euro firms, the former have a response rate of 13.9 percent while the latter have a response rate of 9.5 percent. Neither deviates significantly from the overall response rate of 12.2 percent.

The questionnaire and invitations to participate were sent in the summer of 2005 at least once and no more than four times to each of the 262 firms with whom initial contact had been established. The first request for participation was sent in June 2005 and the last request was sent a month later in July 2005. The questionnaire consisted of 35 questions for which predefined answers could be chosen by checking the appropriate boxes. The questions in the questionnaire are listed in Appendix A.

4. Euro membership and the exercise of real options

Euro membership eliminates an uncertainty in relation to the future development of exchange rates – an elimination that may trigger the exercise of real options because the value of waiting declines. Table 2 shows the effect of the introduction of the Euro on our sample firms in relation to (1) organization, (2) customers, (3) suppliers, and (4) competition.

(1) Organization refers to the effect to which the introduction of the Euro has enabled the firm to establish a formal and / or informal alliance or partnership with other firms. The uncertainty in exchange rates may have been one of the obstacles for not entering such an alliance / partnership prior to the introduction of the Euro. An example of a partnership is the agreement between Biohit Oyj, Finland, and bioMérieux, France (see Biohit Annual Report 2005). Biohit develops and manufactures laboratory devices and equipment as well as

diagnostic tests and analysis systems for use in research institutions, health care and industrial laboratories (NAICS 33). Net sales in 2005 totaled EUR 28.6 million. At the end of 2005 Biohit signed a co-operation agreement with bioMérieux which enables global deliveries of Biohit's liquid handling products and worldwide maintenance services to the bioMérieux organization.

(2) Customers refers to the effect to which the Euro has enabled the firm to enter new markets or market segments. The uncertainty in exchange rates may have been one of the obstacles for not entering new markets or market segments prior to the introduction of the Euro. An example of such an entry is Sirti S.p.A., Italy, and its expansion into a new market segment in Spain (see Sirti 2005 Annual Report). Sirti is the Italian leading firm in engineering and realization of telecommunication networks and systems (NAICS 33). Revenues from sales of goods and services reached EUR 515.7 million in 2005. Sirti acquired orders for over EUR 78 million in Spain in 2005 (19 percent higher than the previous year). Part of the increase was due to an extension of activities to telecommunications operators (Auna/Ono, Telefonica and others).

(3) Suppliers refers to the effect to which the Euro has enabled the firm to consider new suppliers. The uncertainty in exchange rates may have been one of the obstacles for not shifting suppliers prior to the introduction of the Euro. An example of a new supplier is the case of Danieli & C. Officine Meccaniche S.p.A. in Italy (see Danieli 2004/2005 Annual Report). Danieli operates in the sector for the design, construction and sale of machinery and plant for the iron and steel industry (NAICS 33) and the consolidated revenues reached EUR 1,442.5 million in 2004/2005. Danieli Hi Tech GmbH is a German subsidiary formed in

1999. Danieli Hi Tech GmbH performs commercial and design activities for the Danieli group and effectively creates sourcing of activities from Germany.

(4) Competition refers to the effect to which the Euro has created new opportunities for the firm to expand in the Euro-area. The uncertainty in exchange rates may have been one of the obstacles for not expanding prior to the introduction of the Euro. An example of an expansion is the case of Benefon Oyj, Finland. Benefon operates in the mobile phone industry (NAICS 33) and had net sales of EUR 7.6 million in 2005 (see Benefon 2005 Annual Report). Benefon's sales efforts are especially focused on customer projects in Western Europe. In 2005 a strategic decision to enter into the growing consumer personal navigation market was made. Benefon launched a new navigation device at a convention in Barcelona, Spain, in February 2006 and launched a new positioning device at an exhibition in Hannover, Germany, in March 2006.

* Please insert Table 2 approximately here *

Table 2 shows that only a minority of the firms in our sample think that the introduction of the Euro has led them to exercise real options related to organization, customers, suppliers, and competition. However, Table 2 also shows that while this minority is representing every fourth firm on average among the Euro firms, the minority among the non-Euro firms is close to non-existing.

5. Factors behind the importance of Euro membership

The last section showed that Euro firms are much more likely than non-Euro firms to find that the introduction of the Euro has caused them to consider the exercise of real options related to establishing alliances / partnerships (“organization”), entering new markets or market segments (“customers”), shifting suppliers (“suppliers”), and expanding in the Euro-area (“competition”). However, this immediate finding may be due to or at least be distorted by omitted variable bias. Thus, the purpose of this section is to analyze other firm characteristics that may explain the importance of the introduction of the Euro in relation to the exercise of real options. The size of the firm and the firm’s sale to the Euro-area are two relevant variables.

(1) The size of the firm (as measured by the logarithm of the consolidated turnover) can be argued to pull in either direction. On the one hand, small firms may find that the introduction of the Euro and its elimination of several individual currencies have reduced the difficulties in exporting to and dealing with countries in the Euro-area to such a degree that they will be more likely to exercise real options after the introduction of the Euro. On the other hand, small firms may still be unduly restricted by all the other barriers (technical, cultural, etc.) that still exist when dealing across borders. Thus, it may be the larger firms that are already to some degree engaged across borders that find that the introduction of the Euro is a trigger for the exercise of real options. Baldwin, Skudelny and Taglioni (2004) observe that Europe has a high share of small firms that either do not export, or export very little. One factor that keeps them from exporting is the uncertainty involved in trade. The introduction of the Euro has reduced this uncertainty and thus may lead small firms to exercise real options. Blanco

(2001) finds that transactions cost savings and the simplification of corporate planning due to the elimination of currency risks have stimulated cross-border sales and investment, especially by small and medium-sized enterprises.

(2) The firm's sales to the Euro-area (as measured by the firm's sales to the Euro-area divided by the firm's total sales) can also be argued to pull in either direction. The most obvious effect would be to find that the more a firm is involved in the Euro-area, the more this firm is affected by the elimination of the individual currencies and the establishment of one single currency. Whyman (2002) argues that the main impact emerging from EMU will be experienced by those firms most directly involved in the process, particularly those with a high proportion of their total output occurring within the Euro-zone. However, this effect may be at least partly offset by firms that are only involved to a small extent in the Euro-area. These firms may now find the Euro-area more attractive (in line with the findings of Baldwin, Skudelny and Taglioni above).

Descriptive statistics and correlation coefficients for the independent variables used in the following regression analysis are presented in Table 3. As shown in Panel A, the average (median) firm has a turnover of USD 4,457 million (USD 186 million) with a maximum of USD 127,253 million and a minimum of USD 0 million. The average and the median firm sell roughly speaking half of its goods in the Euro-area and half of its goods outside the Euro-area.

* Please insert Table 3 approximately here *

Panel A further distinguishes between Euro firms and non-Euro firms and shows that Euro firms are in general larger than non-Euro firms. This is true for the sample as well as for the population (population figures not listed in the table). The sample of 73 firms (population of 598 firms) has a median turnover of USD 186 million (USD 108 million). The sample of 51 Euro firms (the population of 366 Euro firms) has a median turnover of USD 246 million (USD 137 million) and the sample of 22 Non-Euro firms (the population of 232 Non-Euro firms) has a median turnover of USD 98 million (USD 79 million).

Panel A also shows that Euro firms in general sell more goods inside the Euro-area than non-Euro firms. Euro firms have on average 60% of their sales in the Euro-area while the non-Euro firms on average sell only 38% of their goods in the Euro-area. The median Euro firm is in the range of 61%-80% of sales inside the Euro-area while the median non-Euro firm is in the range of 21%-40% of sales inside the Euro-area.

Panel B shows correlation coefficients between the logarithm of turnover, an ordered variable measuring the ratio of sales in Euro-area compared to total sales, and a binary variable with 1 if the firm is based in a Euro country and 0 otherwise. The sales in Euro-area variable and the Euro firm variable show the highest absolute correlation coefficient of 0.35.

As discussed above, it is hypothesized that the firm characteristics for size, sales to Euro-area, and Euro membership can influence a firm's decision to exercise real options following the introduction of the Euro. The dependent variable in the binary regression is the exercise of real options as measured by 1 ("Yes") and 0 ("No") as described in Table 2. The dependent variable in the ordered regression is the exercise of real options as measured by the

sum of 1s and 0s for the four real options above. The following binary / ordered probit (quadratic hill climbing) regression is analyzed:

$$RO_i = \text{CONSTANT} + \lambda_1 \text{TURNOVER}_i + \lambda_2 \text{EUROSALES}_i + \lambda_3 \text{EUROFIRM} + \omega_i \quad (1)$$

where: RO_i is a binary variable for firm i with 0: “No” and 1: “Yes” for Question 5

(Organization), Question 9 (Customers), Question 23 (Suppliers), and Question 29 (Competition) respectively. In case of the ordered regression RO_i is an ordered variable (the sum of the answers for the four questions above) for firm i with 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”.

TURNOVER_i is the logarithm of turnover for firm i in 2004 or latest available year,

EUROSALES_i is sales in Euro-area / total sales for firm i as an ordered variable with

1: 0%-20%; 2: 21%-40%; 3: 41%-60%; 4: 61%-80%; and 5: 81%-100%

according to Question 3 in the questionnaire,

EUROFIRM is an indicator variable coded as a “1” if firm i is based in a Euro country or “0” otherwise,

ω_i is the error term.

Table 4 reports the results for the binary and the ordered regression analysis when the Euro firm variable is not included. In general the size variable and the sales to Euro-area variable are not significant in explaining the degree to which the introduction of the Euro has caused EU15 manufacturing (NAICS 33) firms to consider the exercise of real options in relation to specific areas (columns 2-5) or in general (column 6). Only in relation to customers (column

3) the sales to Euro-area variable is significant at the 5 percent level ($p\text{-value} = 0.0486$). The binary regression model related to customers is the only model that has an overall fit that is significant at the 10 percent level measured by the LR test statistic.

* Please insert Table 4 approximately here *

The results in Table 4 suggest that the size of a firm has no influence on the degree to which the introduction of the Euro has caused the firm to consider the exercise of real options. Table 4 further suggests that the degree to which the firm has its sales in the Euro-area only to a limited extent increases the likelihood that the firm will exercise real options. Although all the coefficients for the sales to Euro-area variable are positive, only the coefficient in the customer model is significant thus indicating that firms with a high ratio of Euro-area sales are more likely than other firms to find that the Euro has enabled them to “enter new markets or markets segments”.

Table 5 reports the results for the binary and the ordered regression analysis when the Euro firm variable is included. Figures for the binary regression analysis in relation to organization and customers are not shown since all 22 non-Euro firms in the sample answered “No” to the questions related to organization and customers (Table 2) thus creating singular covariance. In the binary models for suppliers and competition as well as the combined model the Euro firm variable is significant at the 10 percent level ($p\text{-value} = 0.0866$), 5 percent level ($p\text{-value} = 0.0198$), and 1 percent level ($p\text{-value} = 0.0016$) respectively in explaining the degree to which the firm is likely to exercise real options because of the introduction of the Euro. The size and the sales in Euro-area variables are not statistically significant in the models. The

binary regression model related to competition has an overall fit that is significant at the 5 percent level measured by the LR test statistic while the ordered regression model has an overall fit that is significant at the 1 percent level.

* Please insert Table 5 approximately here *

The results in Table 5 show that the distinction between firms based in Euro countries and firms based in one of the three non-Euro countries is important in understanding the degree to which the introduction of the Euro has caused firms to consider the exercise of real options. Although results for the binary regression on organization and customers are not available, the significance of the Euro firm variable in the binary regression on suppliers and on competition but not least the significance of the Euro firm variable (and the insignificance of the sales to Euro-area variable) in relation to the combined exercise of real options emphasizes the importance of being located in a Euro country as opposed to being located in one of the three non-Euro countries. This importance is further highlighted by the overall fit of the combined model which is significant at the 1 percent level (Table 5) as opposed to the insignificant overall fit of the combined model when the distinction between Euro firms and non-Euro firms was not included (Table 4).

Bris, Koskinen and Nilsson (2006) find that the Euro has increased investments for firms from countries that previously had weak currencies. Bris et al. categorize Finland, Italy, Ireland, Portugal and Spain as weak countries (i.e. countries with a recent currency crisis). Greece is not included in their sample. The positive effect of the Euro on investments for firms in the weak Euro-area countries is consistent with a real impact of the removal of

foreign exchange risks, since firms in these countries are ex-ante firms for which the elimination of currency risks is the most valuable.

Table 6 reports the results for the binary and the ordered regression analysis when the Euro firm variable is exchanged by two variables thus distinguishing between firms located in a strong Euro country, firms located in a weak Euro country, and firms located in a non-Euro country (default). The countries are allocated into weak Euro countries and strong Euro countries in accordance with Bris et al. above (including Greece to the weak Euro countries). As in Table 5, the figures for the binary regression analysis in relation to organization and customers are not shown due to singular covariance. In the binary models for suppliers and competition as well as the model for the combined options the strong Euro firm variable is significant at the 10 percent level (p-value = 0.0854), 10 percent level (p-value = 0.0730), and 1 percent level (p-value = 0.0077) respectively in explaining the degree to which the firm will consider the exercise of real options because of the introduction of the Euro while the similar significance levels for the weak Euro firm variable are not significant (p-value = 0.1448), significant at the 5 percent level (p-value = 0.0108), and significant at the 1 percent level (p-value = 0.0011). The size and the sales in Euro-area variables are not statistically significant in the models. The binary regression model related to competition has an overall fit that is significant at the 10 percent level measured by the LR test statistic while the ordered regression model has an overall fit that is significant at the 1 percent level.

* Please insert Table 6 approximately here *

The results in Table 6 show that the distinction between firms based in strong Euro countries and firms based in weak Euro countries is not essential. Wald coefficient tests (not shown) confirm that the coefficients for the weak and the strong Euro firm variables are significantly different from each other in neither the binary regression models nor the ordered regression model. The crucial factor seems to be whether or not the firm is based in a country that has adopted the Euro. Whether or not the Euro country in which the firm is located has a recent history of currency crises does not seem to affect the degree to which the introduction of the Euro causes the firm to consider the exercise of real options.

The results in relation to the significance of the Euro firm variable and the insignificance of the size and the sales in Euro-area variables are robust to alternative measures of the sales in Euro-area variable. The sales in Euro-area variable is a measure of the percentage of the firm's sales that goes to the Euro-area. One might argue that it is more relevant to measure the percentage of the firm's sales that is exported to the Euro-area. However, such an export variable is less significant than the present variable and does not change the overall conclusions. One might also argue that it is relevant to include a measure of the degree to which the firm is sourcing from the Euro-area. However, such an addition does not add value. By itself such a sourcing variable is not significant and the inclusion does not affect the overall conclusions.

The group of non-Euro firms comprises 15 UK firms, 6 Swedish firms and 1 Danish firm. When excluding the non-UK non-Euro firms (i.e. firms from Sweden and Denmark) from the regression analysis in Table 5, the size and the sales in Euro-area variables are not significant and the Euro firm variable stays significant (at the 1 percent level in the ordered regression

and at the 10 percent level in the two binary regression models). Thus, a competing conclusion as to the effect of the introduction of the Euro on the exercise of real options could be stated in terms of UK firms versus Euro firms rather than non-Euro firms versus Euro-firms.

6. Conclusions

This empirical study of EU15 manufacturing firms (NAICS 33) examines the impact of the introduction of the Euro on the exercise of real options. The study contributes to the existing body of literature by focusing on the potential long-term effects of the introduction of the Euro. The study shows that the introduction of the Euro has made Euro firms more inclined than non-Euro firms to exercise real options such as to establish alliances / partnerships, to enter new markets / market segments, to switch suppliers, and to generally expand in the Euro-area. Such exercise of options may not have an immediate and sizeable short-term effect on the trade statistics but may contain important long-term effects. By reaching out for strategic alliances, by targeting new markets / market segments, by restructuring their supplier network, and by generally aiming for an expansion in the Euro-area, the Euro firms may gain a competitive advantage compared to their non-Euro colleagues. As such, the study highlights an important long-term aspect of the question posed by Baldwin (2006b): “In or Out: Does it Matter?”. This study supports the notion that it matters.

The empirical evidence in the present study is restricted to manufacturing firms (NAICS 33). However, we believe that the generality of the findings can be extended to other industries in EU15 countries as we see no reason why manufacturing firms should resemble a special case.

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Appendix A: English version of the questionnaire

Introductory questions

- 1** What is the name of the company that you represent/work for?
- 2** How many years you have worked for this company?
- 0-3
 - 3-6
 - 6-9
 - 9-12
 - More than twelve

Organization

- 3** Where do you sell your products and/or services?
- 0-20% EMU
 - 21-40% EMU
 - 41-60% EMU
 - 61-80% EMU
 - 81-100% EMU
- 4** To which country/ies do you sell your products and/or services?
- 0-20% Domestic
 - 21-40% Domestic
 - 41-60% Domestic
 - 61-80% Domestic
 - 81-100% Domestic
- 5** Did the introduction of the Euro enable to you establish a formal and/or informal alliances or partnerships with other companies (to access bigger markets, to share resources or information)?
- Yes.
 - No.
- 6** If Yes then where?
- Domestically
 - Within EMU countries
 - Within EU countries, not members of the EMU
 - Others
- 7** Did the introduction of the euro enable you to consolidate or rearrange considerably some of your department(s)?
- Yes
 - No
- 8** If yes then in which department(s):
- Accounting
 - Marketing
 - Currency
 - Manufacturing
 - Sales
 - Other(s) please specify (box)

Customer

- 9** Do you consider that the Euro has enabled you to enter new markets or market segments?
- Yes
 - No
- 10** Consider the following sentence: "Our customers are more price sensitive than before the introduction of the Euro".
- Yes, I strongly agree
 - Yes, I agree
 - Uncertain
 - No, I disagree
 - No, I strongly disagree

11 Consider the following sentence: “Our customer base increased after the introduction of the Euro”?

- Yes, I strongly agree
- Yes, I agree
- Uncertain
- No, I disagree
- No, I strongly disagree

Prices and Products

12 Are you currently charging the same price for the same product/service within all EMU countries?

- Yes
- Yes but not for all products/services
- No
- Not applicable

13 Has the introduction of the Euro made it easier to compare prices in other EU member states?

- Yes
- No

14 Has your company/business benefited from this?

- Yes
- No

15 Consider the following sentence: “In isolation, the introduction of the Euro has allowed us to reduce product prices due to less currency risk in exporting within the euro-zone”.

- I strongly agree
- I agree
- Uncertain
- I disagree
- I strongly disagree

16 Do you put a mark-up on prices of goods exported to non-EMU countries because of currency fluctuations?

- Yes
- No
- Not applicable

17 Have you changed prices due to increased competition after the introduction of the Euro?

- Yes, lowered prices significantly,
- Yes, lowered prices slightly,
- No change,
- Yes, raised prices slightly,
- Yes, raised prices significantly

18 Following the introduction of the Euro, have you adjusted your prices for psychological impact (e.g. to €9.99)?

- Yes
- No

Suppliers

19 Has the introduction of the Euro caused you to change your suppliers?

- Yes, the Euro was the main reason
- Yes, the Euro was a contributing factor
- No, we have not changed suppliers

20 Where are your current suppliers located?

- 0-20% EMU
- 21-40% EMU
- 41-60% EMU
- 61-80% EMU
- 81-100% EMU

- 21 Where are your current supplier located?**
0-20% Domestic
21-40% Domestic
41-60% Domestic
61-80% Domestic
81-100% Domestic
- 22 What are your arrangements with your suppliers?**
Long-term agreements with most important suppliers,
which allow us to tailor delivery of the product or service to our needs;
Shorter-term business arrangements,
based on the best alternative in terms of price, quality or service.
Other
Not available
- 23 Did the introduction of the Euro enable you to consider new suppliers?**
Yes
No

Competition

- 24 Try to estimate the origin of the competition you face in your markets?**
National
European Monetary Union Members
European Union members, not in the EMU
Non European Union
Not applicable
- 25 Is the competition you face heavily price-focused?**
Yes, we compete primarily on price;
No, we compete both on price and quality;
No, we compete only by differentiating our products and services
from the competition.
Not applicable
- 26 Has the elimination of currency exchange costs and risks (due to the introduction of the Euro) facilitated entry of new foreign competitors in your markets?**
(This will not be true if a lot of non-currency barriers slow down the entry of new competitors in your markets. For example: regulations, language differences, cultural barriers, difficulty in installing distribution channels, technological expertise, high investments required, required knowledge of the local market.)
Yes, EMU has significantly increased foreign competition in our markets;
Yes, competition has increased in our market to a certain extent
The EMU has not changed the level of competition
No, competition has decreased in our markets to a certain extent
No, EMU has significantly decreased foreign competition in our markets.
Not applicable
- 27 Has the Euro contributed to altering the amount of sales and/or service that you export?**
Yes, a significant increase
Yes, a slight increase
No change,
Yes, slightly decrease
Yes, significantly decrease
- 28 Within which market was the greatest impact?**
European Monetary Union Members
European Union members, not in the EMU
Non European Union
- 29 Has the Euro created new opportunities for your company to expand in the Euro-Zone?**
Yes
No

30 Consider the following sentence; “The introduction of the Euro has contributed to more consolidation in your industry through mergers, acquisitions and take-overs”.

- Yes, I strongly agree
- Yes, I agree
- Uncertain
- No, I disagree
- No, I strongly disagree

Finance

31 Has the introduction of the Euro enabled your company to obtain finance from banks or other financial institutions in foreign countries?

- Yes
- No

32 Have you found it easier to raise capital?

- Yes, significant easier
- Yes, slightly easier
- No change,
- No, slight more difficult
- No, significant more difficult

33 Have you experienced lower cost of borrowing after the introduction of the Euro?

- Yes, a significant increase
- Yes, a slight increase
- No change,
- No, a slight decrease
- No, a significant decrease

34 Have you used hedging to a larger degree than what was the case before the introduction of the Euro?

- Yes, a significant more
- Yes, a slight more
- No change,
- No, slightly less
- No, significantly less

35 Overall, has your company gained overall from using the Euro?

- Yes, significantly gained
- Yes, slightly gained
- No change
- No, slightly lost
- No, significantly lost

Table 1 Response rates for sample firms by country

This table lists survey results for sample EU15 manufacturing firms (NAICS 33). Firms are classified by country. The population consists of 598 firms. 262 firms responded to an initial contact e-mail. The questionnaire (Appendix A) was sent to these 262 firms. 73 firms answered the questionnaire (overall response rate of 12.2 percent). Firms are divided into Euro firms (firms based in a Euro country) and non-Euro firms (firms based in an EU15 non-Euro country).

Country	Total number of firms	Number of replies from e-mail	Number of replies to questionnaire	Response Rate
Austria	9	6	3	33%
Belgium	11	10	4	36%
Eire	2	1	1	50%
Finland	35	26	12	34%
France	97	20	3	3%
Germany	98	52	15	15%
Greece	43	10	1	2%
Italy	29	11	6	21%
Luxembourg	2	2	0	0%
Netherlands	26	17	3	12%
Portugal	1	1	1	100%
<u>Spain</u>	<u>13</u>	<u>5</u>	<u>2</u>	<u>15%</u>
Euro firms	366	161	51	13.9%
Denmark	9	9	1	11%
Sweden	24	16	6	25%
<u>UK</u>	<u>199</u>	<u>76</u>	<u>15</u>	<u>8%</u>
Non-Euro firms	232	101	22	9.5%
All firms	598	262	73	12.2%

Table 2 Euro introduction and the exercise of real options

This table provides the survey responses from 73 firms (Table 1) to questions on the exercise of real options related to Organization (Question 5 in the Questionnaire); Customers (Question 9 in the Questionnaire); Suppliers (Question 23 in the Questionnaire); and Competition (Question 29 in the Questionnaire). The wording of the questions is shown in footnotes 1, 2, 3, and 4 respectively. Respondents were asked to respond “Yes” or “No” to each question. The number of firms is provided in each cell (the percentage in parentheses). Firms are divided into Euro firms (firms based in a Euro country) and non-Euro firms (firms based in a EU15 non-Euro country).

	Organization ¹	Customers ²	Suppliers ³	Competition ⁴
Yes	8 (16%)	13 (25%)	14 (27%)	16 (31%)
No	<u>43 (84%)</u>	<u>38 (75%)</u>	<u>37 (73%)</u>	<u>35 (69%)</u>
Euro firms	51 (100%)	51 (100%)	51 (100%)	51 (100%)
Yes	0 (0%)	0 (0%)	2 (9%)	1 (5%)
No	<u>22 (100%)</u>	<u>22 (100%)</u>	<u>20 (91%)</u>	<u>21 (95%)</u>
Non-Euro firms	22 (100%)	22 (100%)	22 (100%)	22 (100%)
Yes	8 (11%)	13 (18%)	16 (22%)	17 (23%)
No	<u>65 (89%)</u>	<u>60 (82%)</u>	<u>57 (78%)</u>	<u>56 (77%)</u>
All firms	73 (100%)	73 (100%)	73 (100%)	73 (100%)

¹ Question 5: “Did the introduction of the Euro enable to you establish a formal and/or informal alliances or partnerships with other companies (to access bigger markets, to share resources or information)?”

² Question 9: “Do you consider that the Euro has enabled you to enter new markets or market segments?”

³ Question 23: “Did the introduction of the Euro enable you to consider new suppliers?”

⁴ Question 29: “Has the Euro created new opportunities for your company to expand in the Euro-Zone?”

Table 3 Descriptive statistics and correlation coefficients of independent variables

This table provides descriptive statistics and correlation coefficients for independent variables. Panel A contains descriptive statistics and Panel B lists correlation coefficients for independent variables used in the binary probit regression analysis and in the ordered probit regression analysis. The variables are: size measured as consolidated turnover in million USD in 2004 (or latest available year), size measured as the logarithm of consolidated turnover, and sales in Euro-area measured as an ordered variable on sales to Euro-area divided by total sales according to the answers to Question 3 in the Questionnaire (Appendix A) where 1: 0%-20%; 2: 21%-40%; 3: 41%-60%; 4: 61%-80%; and 5: 81%-100%. Firms are divided into Euro firms (firms based in a Euro country) and non-Euro firms (firms based in a EU15 non-Euro country).

Panel A: Descriptive statistics

Variable	N	Mean	Median	Max.	Min.	Std. Dev.
Turnover (million USD):						
Euro firms	51	6,148	246	127,253	12	22,439
Non-Euro firms	22	537	98	6,726	0	1,434
All firms	73	4,457	186	127,253	0	18,894
Turnover (log):						
Euro firms	51	5.5	5.4	8.1	4.1	0.9
Non-Euro firms	22	4.9	5.0	6.8	1.2	1.1
All firms	73	5.3	5.3	8.1	1.2	1.0
Sales in Euro-area ¹ :						
Euro firms	51	60%	61%-80%	81-100%	0-20%	26%
Non-Euro firms	22	38%	21%-40%	81-100%	0-20%	29%
All firms	73	53%	41%-60%	81-100%	0-20%	28%

Panel B: Correlation coefficients

	Turnover (log)	Sales in Euro-area	Euro firm
Turnover (log)	1.00		
Sales in Euro-area	0.08	1.00	
Euro firm ²	0.29	0.35	1.00

¹ Based on answers to question 3 in the Questionnaire: "Where do you sell your products and/or services?". The column "Mean" (and "Std. Dev.") is calculated by translating 0-20% EMU into 10%, 21%-40% EMU into 30% and so forth. One firm did not answer this particular question. The "Sales in Euro-area" for this firm is estimated from the annual accounts.

² Firm based in a Euro country = 1. Firm based in a non-Euro country = 0.

Table 4 Regression analysis without Euro membership distinction

This table reports binary (columns 2-5) and ordered (column 6) probit estimates of the relationship between the exercise of real options and firm characteristics based on the responses of 73 firms (Table 1). P-values are listed in parentheses below the coefficients. The dependent variable in the binary regression is the exercise of real options as measured by 1 (“Yes”) and 0 (“No”) as described in Table 2. The dependent variable in the ordered regression is the exercise of real options as measured by the sum of the answers for the four questions (columns 2-5) with 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”. The independent variables are: size measured as the logarithm of consolidated turnover in 2004 (or latest available year) and sales in Euro-area measured as an ordered variable for sales to Euro-area divided by total sales according to the answers to Question 3 in the Questionnaire (Appendix A) where 1: 0%-20%; 2: 21%-40%; 3: 41%-60%; 4: 61%-80%; and 5: 81%-100%. Significance levels are indicated as follows: *** (1 percent), ** (5 percent), and * (10 percent).

	Organization ¹ (Binary)	Customers ² (Binary)	Suppliers ³ (Binary)	Competition ⁴ (Binary)	Combined ⁵ (Ordered)
Constant	-2.28 *	-1.08	-0.52	-1.47	
	(0.0627)	(0.3070)	(0.5866)	(0.1233)	
Turnover (log)	0.15	-0.15	-0.13	0.09	0.05
	(0.4357)	(0.4214)	(0.4399)	(0.5612)	(0.7357)
Sales in Euro-area	0.07	0.27 **	0.13	0.07	0.14
	(0.6370)	(0.0486)	(0.2573)	(0.5273)	(0.1765)
N	73	73	73	73	73
N=0	65	60	57	56	45
N=1	8	13	16	17	14
N=2					4
N=3					8
N=4					2
Probability (LR stat)	0.6634	0.0934 *	0.4111	0.6855	0.3771
McFaden R ²	0.0162	0.0693	0.0231	0.0095	
LR index (Pseudo-R2)					0.0120

¹ A binary variable based on Question 5: “Did the introduction of the Euro enable to you establish a formal and/or informal alliances or partnerships with other companies (to access bigger markets, to share resources or information)?”. Answers are 0: “No” and 1: “Yes”.

² A binary variable based on Question 9: “Do you consider that the Euro has enabled you to enter new markets or market segments?”. Answers are 0: “No” and 1: “Yes”.

³ A binary variable based on Question 23: “Did the introduction of the Euro enable you to consider new suppliers?”. Answers are 0: “No” and 1: “Yes”.

⁴ A binary variable based on Question 29: “Has the Euro created new opportunities for your company to expand in the Euro-Zone?”. Answers are 0: “No” and 1: “Yes”.

⁵ An ordered variable based on Question 5, Question 9, Question 23, and Question 29. Answers are 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”.

Table 5 Regression analysis with Euro membership distinction

This table reports binary (columns 2-5) and ordered (column 6) probit estimates of the relationship between the exercise of real options and firm characteristics based on the responses of 73 firms (Table 1). P-values are listed in parentheses below the coefficients. The dependent variable in the binary regression is the exercise of real options as measured by 1 (“Yes”) and 0 (“No”) as described in Table 2. The dependent variable in the ordered regression is the exercise of real options as measured by the sum of the answers for the four questions (columns 2-5) with 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”. The independent variables are: size measured as the logarithm of consolidated turnover in 2004 (or latest available year); sales in Euro-area measured as an ordered variable for sales to Euro-area divided by total sales according to the answers to Question 3 in the Questionnaire (Appendix A) where 1: 0%-20%; 2: 21%-40%; 3: 41%-60%; 4: 61%-80%; and 5: 81%-100%; and Euro firm coded as 1 if the firm is based in a Euro country and 0 otherwise. Significance levels are indicated as follows: *** (1 percent), ** (5 percent), and * (10 percent).

	Organization ¹ (Binary ⁶)	Customers ² (Binary ⁶)	Suppliers ³ (Binary)	Competition ⁴ (Binary)	Combined ⁵ (Ordered)
Constant			-0.36 (0.7130)	-1.43 (0.1716)	
Turnover (log)			-0.22 (0.2299)	-0.03 (0.8630)	-1.0 (0.5099)
Sales in Euro-area			0.04 (0.7538)	-0.05 (0.6906)	-0.01 (0.9611)
Euro firm			0.81 * (0.0866)	1.30 ** (0.0198)	1.41 *** (0.0016)
N	73	73	73	73	73
N=0	65	60	57	56	45
N=1	8	13	16	17	14
N=2					4
N=3					8
N=4					2
Probability (LR stat)			0.1685	0.0497 **	0.0030 ***
McFaden R ²			0.0657	0.0988	
LR index (Pseudo-R2)					0.0858

¹ A binary variable based on Question 5: “Did the introduction of the Euro enable to you establish a formal and/or informal alliances or partnerships with other companies (to access bigger markets, to share resources or information)?”. Answers are 0: “No” and 1: “Yes”.

² A binary variable based on Question 9: “Do you consider that the Euro has enabled you to enter new markets or market segments?”. Answers are 0: “No” and 1: “Yes”.

³ A binary variable based on Question 23: “Did the introduction of the Euro enable you to consider new suppliers?”. Answers are 0: “No” and 1: “Yes”.

⁴ A binary variable based on Question 29: “Has the Euro created new opportunities for your company to expand in the Euro-Zone?”. Answers are 0: “No” and 1: “Yes”.

⁵ An ordered variable based on Question 5, Question 9, Question 23, and Question 29. Answers are 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”.

⁶ Singular covariance since all 22 Non-Euro firms answered “No” to this question.

Table 6 Regression Analysis with strong / weak Euro membership distinction

This table reports binary (columns 2-5) and ordered (column 6) probit estimates of the relationship between the exercise of real options and firm characteristics based on the responses of 73 firms (Table 1). P-values are listed in parentheses below the coefficients. The dependent variable in the binary regression is the exercise of real options as measured by 1 (“Yes”) and 0 (“No”) as described in Table 2. The dependent variable in the ordered regression is the exercise of real options as measured by the sum of the answers for the four questions (columns 2-5) with 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”. The independent variables are: size measured as the logarithm of consolidated turnover in 2004 (or latest available year); sales in Euro-area measured as an ordered variable for sales to Euro-area divided by total sales according to the answers to Question 3 in the Questionnaire (Appendix A) where 1: 0%-20%; 2: 21%-40%; 3: 41%-60%; 4: 61%-80%; and 5: 81%-100%; strong Euro firm coded as 1 if the firm is based in a strong Euro country (Austria, Belgium, France, Germany, Luxembourg, Netherlands) and 0 otherwise; and weak Euro firm coded as 1 if the firm is based in a weak Euro country (Eire, Finland, Greece, Italy, Portugal, and Spain) and 0 otherwise. Significance levels are indicated as follows: *** (1 percent), ** (5 percent), and * (10 percent).

	Organization ¹ (Binary ⁶)	Customers ² (Binary ⁶)	Suppliers ³ (Binary)	Competition ⁴ (Binary)	Combined ⁵ (Ordered)
Constant			-0.32 (0.7525)	-1.63 (0.1315)	
Turnover (log)			-0.23 (0.2126)	0.01 (0.9670)	-0.08 (0.6046)
Sales in Euro-area			0.04 (0.7710)	-0.04 (0.7527)	0.00 (0.9844)
Strong Euro firm			0.89 * (0.0854)	1.07 * (0.0730)	1.28 *** (0.0077)
Weak Euro firm			0.75 (0.1448)	1.46 ** (0.0108)	1.52 *** (0.0011)
N	73	73	73	73	73
N=0	65	60	57	56	45
N=1	8	13	16	17	14
N=2					4
N=3					8
N=4					2
Probability (LR stat)			0.2690	0.0629 *	0.0057 ***
McFaden R ²			0.0675	0.1127	
LR index (Pseudo-R2)					0.0894

¹ A binary variable based on Question 5: “Did the introduction of the Euro enable to you establish a formal and/or informal alliances or partnerships with other companies (to access bigger markets, to share resources or information)?”. Answers are 0: “No” and 1: “Yes”.

² A binary variable based on Question 9: “Do you consider that the Euro has enabled you to enter new markets or market segments?”. Answers are 0: “No” and 1: “Yes”.

³ A binary variable based on Question 23: “Did the introduction of the Euro enable you to consider new suppliers?”. Answers are 0: “No” and 1: “Yes”.

⁴ A binary variable based on Question 29: “Has the Euro created new opportunities for your company to expand in the Euro-Zone?”. Answers are 0: “No” and 1: “Yes”.

⁵ An ordered variable based on Question 5, Question 9, Question 23, and Question 29. Answers are 0: four “No”; 1: three “No” and one “Yes”; 2: two “No” and two “Yes”; 3: three “No” and one “Yes”; and 4: four “Yes”.

⁶ Singular covariance since all 22 Non-Euro firms answered “No” to this question.