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The Single Currency's Effects on Eurozone Sectoral Trade: Winners and Losers?

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Abstract

In this paper we study the effect of the single currency across industries for euro area members. This analysis may help to shed light on the main factors influencing the euro effect on trade flows. We intend to verify whether these factors are specific to individual sectors and/or countries or common to the entire euro area. We use a dynamic specification of an augmented gravity equation. Following the most recent econometric literature, we apply the "System GMM" dynamic panel data estimator of Blundell and Bond to avoid inconsistency and biases in the estimates, and introduce controls for heterogeneity.

Aggregate sector results average out country-level behaviours that, on their turn, are affected by different (unobserved) responses of firms, endowed with diverse production costs, to the enhancing and dampening impacts due to the euro. Due to this reason, the cancelling out at aggregate level of heterogenous behaviours induces an aggregation bias. So it is not surprising that when moving from sector to sector/country analysis the picture becomes much more variegated, with the emergence of a whole range of winners and losers among industries in the different nation.

Our empirical results are in line with theoretical framework we assumed as reference that considers the possibility of both stimulative and dampening effects coming from trade integration and points out the fact that sector exports impacts are the aggregation results of firm-level heterogenous behaviours.

JEL: F14, F15, F4, F33, C33

Keywords: International trade; currency unions; gravity models; dynamic panel data; Blundell-Bond estimates

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1 Introduction

Empirical analysis on the first few years of existence of the euro has generally reported a modest, although statistically significant, effect. This evidence does not completely fit with the assumption that important reductions in transaction costs would ensue from the replacement of many currencies with one single money. The limited impact may depend, inter alia, on the fact that the euro came at the very end of a long-term path of European integration, adding (maybe) little to a process that has had its main drivers in several former economic policy decisions (e.g. the common market, the EMS, the Single Market). Yet other factors, working below the surface of aggregate behavior and affecting the pervasiveness of the influence of the single currency across products and industries, may have contributed to shape the modest pro-trade impact.

Analysis of sectoral variation of the euro effect may hence help shed some light on factors conditioning the single currency influence on trade flows. Despite its relevance, this issue has received scant attention to date. In this paper, we address this rather uninvestigated area, studying the trade-consequences of the single currency across industries of Euro area members. In line with a consolidated tradition in the analysis of the euro's trade impact, the aim of the study is mainly empirical: we intend to verify whether the euro effect is much differentiated across industries and economies, or whether some common features are detectable for the entire Euro area. Although our work is essentially empirical, nevertheless we need to refer to some theory as a guide for intepretation. We do it assuming as reference a framework that considers the possibility of both stimulative and dampening effects coming from trade integration and points out the fact that sector exports impacts are the aggregation results of firm-level heterogenous behaviours. Given this structure in the background, empirical findings at sector/country level may hint at the mechanisms driving trade put in place by the single currency inception.[1]

The paper is organized as follows. The second and the third sections conduct a critical survey of the most recent empirical literature and describe the theoretical framework. The fourth and the fifth sections provide a description of the empirical strategy and of the dataset. The sixth and the seventh sections present the estimation results at sector and country level. Conclusions follow.

2 Recent Empirical Literature on the Euro's Sectoral Trade Effects

Analysis on the euro effect on trade has been generally performed at aggregate level.[2] Empirical studies that estimate the euro effect at sector level are still very scarce. However, in both approaches (aggregated and sectoral) the main empirical findings highlight a positive and statistically significant effects of euro adoption on bilateral

[1] It is worth to underline that this paper limits its analysis at the success of the euro adoption in terms of trade volumes only and does not analyze the potentially pro-competitive impact on prices and increased consumer welfare. Furthermore the empirical analysis is run for the manufacturing sectors given the not availability of homogeneous disaggregated data on service sector.

[2] See for example de Nardis and Vicarelli (2003) and Micco et al. (2003).

trade in EMU countries. All the empirical studies use panel data methodology, instead of pooled cross sectional data, to emphasize the time dimension in the estimation of trade flow determinants in gravity models.[3]

In this section we focus on the studies using sectoral data. Existing studies on sectoral euro effect usually use static models: to best of our knowledge, only one work uses dynamic models[4] (Table 1).

Table 1: Euro's Effect on Trade, Sectoral Data

	Authors	Empirical Strategy	Main findings-sample period
Static models	Flam and Nordstrom (2003)	Fixed effect panel data estimator, 1 digit ISIC rev.3 sectors. Gravity model Dep variable: bilateral exports, 1 digit ISIC rev.3 sectors Exchange rate as regressor in the gravity equation. 14 EU countries (excluding Greece)	Sample period 1995–2002. Intra area euro effect aggregate 15%, increase of trade with non members of 7%; euro effect not widespread across sectors, ranging between 7–50%.
	Baldwin et al. (2005)	Fixed effect panel data. Gravity model Dep variable: bilateral imports, ISIC 2 and 3 digit 18 OECD countries	Sample period 1988–2003. Intra area euro effect aggregate 70–112%, euro effect not widespread across sectors, ranging between 40–177%.
	Flam and Nordstrom (2006)	Fixed effect panel data estimator Gravity model Dep variable: bilateral exports. 6 digit level HS product categories 20 OECD countries	Sample period 1999–2005. euro increased intra area trade by 26% and trade between the eurozone and outsiders by 12% in 2002–2005 compared to 1995–1998. The effects are concentrated in semi-finished and finished products, industries with highly processed products
Dynamic models	Fernandes (2006)	A dynamic panel data System GMM estimator , Gravity model. for 25 two digit ISIC rev.3 sectors Dep variable: bilateral exports. 23 OECD countries.	Sample period 1988–2003 Intra area euro effect aggregate 2.8%, euro effect not widespread across sectors, ranging between 7–23%.

[3] The gravity model has been used extensively in the empirical and theoretical literature to explain bilateral trade (Anderson 1979, Deardorff 1998 and Helpman and Krugman 1985, Evenett and Keller 2002 and Baldwin 2006).

[4] Theory and a large body of empirical work support the hypothesis that trade is a dynamic process and that estimating static equations may produce upward biased estimates (see de Nardis at al. 2008). The rationale for considering dynamics in trade is the existence of sunk costs borne by exporters to set up distribution and service networks in the partner country. This sticky behaviour seems all the more important in the EMU case, where trade relationships between countries are affected not only by past investments in export-oriented infrastructure, but also by the accumulation of invisible assets such as political, cultural and geographical factors characterizing the area and influencing the commercial transactions taking place within it.

All such studies (in spite of different time spans, countries samples and empirical strategies) report that the euro effect is not widespread among sectors and among country/sectors. Baldwin et al. (2005) show a correlation between the size of the "Rose Effect"[5] (the adoption of a common currency) and the presence of what they call ICIR sectors (Imperfect Competition and Increasing Return Sectors). Ranking the sectors analyzed in a decreasing order, at the bottom of the list (lower "Rose Effect") they find agriculture, as well mining and quarrying; at the top, (higher "Rose Effect") various types of machinery and highly differentiated consumer goods (such as food products, beverages and tobacco). This result suggests that these sector characteristics may be related to the size of the effects on trade due to the adoption of a common currency. The rationale behind this heterogeneous euro effect among sectors is explained by Baldwin (2006) in light of two elements of the "new-new trade theory": the fixed costs of entering a new market and differences in firms' marginal production costs.

In line with these findings, also Flam and Nordstrom underline that sectors without a "Rose effect" tend to be those marked by fairly homogeneous products. The results set out in their 2003 paper, which are obtained from quite aggregate dataset (1 digit ISIC rev.3 sectors), are confirmed also at a highly disaggregated level (6 digit level HS product categories: Flam and Nordstrom 2006). In this latter work, the authors estimate currency union effects at different stages of processing and for different industries, finding evidence of a positive effect for semi-finished and finished products and for industries characterised by highly processed products, which are those that require relatively high fixed costs for distribution and marketing.

3 Theoretical Framework

Sectoral exports are aggregation of foreign sales of heterogenous firms; as such, they reflect the average outcome of a range of different individual behaviours. To gain insights on sector-export responses to the euro introduction it is, hence, useful to refer to a theoretical framework that makes such an aggregation explicit. Among the models of international trade with heterogenous firms, the one by Melitz and Ottaviano (2005) offers ample scope for hypoteses testing. It is similar to the model by Melitz (2003), adopted by Baldwin and Di Nino (2006) to study the euro effect, but with non-CES consumers' preferences and a linear demand function. In this setting, exports of a firm locatad in county o and selling to a destination market d, indicated by $\exp_{o,d}$, are given by

$$\exp_{o,d} = \frac{L_d}{4\gamma}\left[\left(c_d\right)^2 - \left(\tau_{o,d}c\right)^2\right], \tag{1}$$

where L_d is the dimension of the destination market; $\gamma > 0$ is a parameter indexing degree of horizontal differentiation between varieties, assumed equal across markets; $\tau_{o,d} \geq 1$ is per unit transport cost incurred by the firm in transferring goods from o to d; c is the firm's marginal cost drawn from a random distribution $G(c)$, having

[5] The "Rose Effect" refers to the large body of empirical literature about the effect of currency unions on trade started with Rose (2000). For a survey see Rose and Stanley (2005).

positive support on $[0, c_m]$; $c_d(< c_m)$ is the cutoff marginal cost the firm faces when selling in country d; this cost threshold is equal to the maximum price feasible in the destination market, $P_{\max}$, at which product demand sets to zero. The maximum price is an indicator of toughness of competition in market d: since it is rising with the average price of competing varieties, P_d^*, and decreasing with the number of competitors, N_d^*, that is[6]

$$c_d = P_{\max} = F(P_d^*; N_d^*), \quad \text{with} \quad F'_{P_d^*} > 0; F'_{N_d^*} < 0. \tag{2}$$

Aggregating individual export sales over the set of exporters selling varieties from o to d, with marginal cost $c \le c_d$, one gets the bilateral sectoral export flow from country o to destination market d

$$EXP_{o,d} = N_o \int_0^{(\bar{a}_d/\tau_{o,d})} \exp_{o,d} dG(c); \tag{3}$$

with N_o = number of entrant exporters (from o to d).

Assuming a Pareto parametrization for the marginal cost distribution, $G(c) = (c/c_m)^k$ with $k \ge 0$ as shape parameter, former expression is solved as follows

$$EXP_{o,d} = \varphi N_o L_d (c_d)^{k+2} (c_m)^{-k} (\tau_{o,d})^{-k}; \quad \text{with} \quad \varphi = \frac{1}{2\gamma(k+2)}, \tag{4}$$

where sectoral exports from o to d are the outcome of aggregation over a subset of heterogenous firms (those whose marginal cost is lower than the cutoff level); interestingly, expression for bilateral sectoral exports assume a gravity-like form as sales form o to d depend positively on the size of destination country, L_d, and on the number of origin-country exporters, N_o, and negatively on the transport costs/trade barriers index, $\tau_{o,d}$.[7]

Assuming symmetric trade costs ($\tau_{o,d} = \tau_{d,o} = \tau$), in free entry equilibrium (with expected profits driven to zero) the cutoff marginal cost in the destination market is

$$c_d = \left(K \frac{\gamma F_{entry}}{L_d} \frac{1}{1+\tau^{-k}} \right)^{\frac{1}{k+2}}, \text{ with } F_{entry} = \text{fixed entry cost and } K = k^2 + 3k + 2. \tag{5}$$

Former expressions highlight that a fall in trade costs $\tau_{o,d}$, e.g. determined by the adoption of a common currency between the two countries, stimulates sectoral bilateral trade (equation (4)). Yet, more integration means also tougher competition in destination markets (c_d reduces as τ drops in equation (5)), leading to an increase in the number of competing varieties. This exerts dampening effects on bilateral sectoral export volumes. Competition becomes even fiercer when trade integration is accompanied by a decline of entry costs in destination markets (c_d reduces as F_{entry} falls

6 $P_{\max} = (\alpha\gamma + \eta P_d)/(\gamma + \eta N_d)$, where α and η are parameters measuring substitution degree between differentiated varieties and the homogenous good.

7 In terms of gravity variables, the product between the size of the destination country and the number of entrant exporters from the origin country proxies the “mass” affecting bilateral trade.

in (5)). If reduction of cost cutoff c_d is large enough, firm selection consequent to lower tansaction and fixed entry costs may even entail the exiting of some less efficient exporters. Toughness of competition may be however mitigated by the degree of horizontal product differentiation, measured by γ, which varies sector by sector. Heterogenous firms, endowed with diverse marginal costs, are differently exposed to these opposite effects; predominance in the population of firms of the supportive or of the dampening influences hence affects the aggregate export outcome at sector level.

Given this framework, some general indications can be derived about what one should expect to draw from empirical analysis. They can be described as follows:

(i) When considering aggregate sectoral exports, pro-trade effect should emerge only in the sectors where benefiting euro-area firms prevail on unaffected producers. At aggregate sector level, there is no reason to expect significant negative competitive effects, since compensation is at work: if there are losers among the euro-area producers, there are simmetrically winners in the same area.

(ii) When considering country-sector exports, pro-trade impacts should emerge only in the country/sectors where benefiting firms prevail on unaffected or negatively affected producers. At a country level, the dampening effects, due to tougher competition, would emerge in the countries/sectors where negatively affected firms prevail on the benefited and unaffected ones; hence at country-sector level winners and losers may be detected.

(iii) Given the role of horizontal differentiation in mitigating degree of competition, positive pro-trade effects of the euro should prevail in sectors where there is imperfect competition and goods are more differentiated.

4 Empirical Strategy and Equation

In our empirical strategy, we refer to the theoretical underpinnings highlighted in former section in estimating a gravity equation for sectoral bilateral trade volumes. Moreover in accordance with the recent findings in the literature, we introduce dynamics into a panel data model. This raises well known econometric problems: if trade is a static process, the fixed-effect estimator is consistent for a finite time dimension T and a infinite number of country-pairs N; but if trade is a dynamic process, the transformation needed to eliminate the country-pair fixed effects produces a correlation between the lagged dependent variable and the transformed error term that renders the least square estimator biased and not consistent. To avoid the inconsistency problem, Arellano and Bond (1991) suggested transforming the model into first differences and run it using the Hansen two-step GMM estimator.[8]

However, the first-differenced GMM estimator performs poorly in terms of precision if it is applied to short panels (along the T dimension) including highly persistent time series. Lagged levels of time series with near unit root properties are in

[8] They show that the two key properties of the first differencing transformation – eliminating the time-invariant individual effects while not introducing disturbances for periods earlier than period t-1 into the transformed error term – can be obtained using any alternative transformation (i.e. forward orthogonal deviations).

fact weak instruments for subsequent first-differences.[9] Since bilateral exports between industrialized countries are expected to be persistent, due to sunk exports costs, one may expect this to affect the estimates.[10]

Arellano and Bover (1995), describe how, if the original equations in levels are added to the system of first-differenced equations, additional moment conditions may increase efficiency ("System GMM" estimator). This estimator has been refined by Blundell and Bond (1998).

The System GMM estimator has several advantages with respect to Arellano and Bond's estimator. First differencing the equation removes fixed effects but also the time invariant regressors in the specification. If these regressors are of interest, the resulting loss of information may be a serious inconvenience. Owing to the relatively short time-span data available and the relevance of "persistence" effects in bilateral trade relationships, the "System GMM" estimator seemed to be the right choice for our purposes. The application of this methodology in a gravity context is quite new:[11] as far as we know , only one study has applied it to investigate the euro effect on trade.[12] We introduced into the dynamic gravity equation three sets of variables: i) gravity variables, ii) controls for heterogeneity, iii) controls for other factors affecting bilateral trade.

(i) ***Standard gravity variables.*** Bilateral distance, as a proxy of transport (and fixed-entry) costs, and the sum of importer and exporter's value added as proxies of the "mass".

(ii) ***Controls for heterogeneity and bias***. Following Baltagi, Egger and Pfaffermayr (2003) we introduce fixed effects for importing and exporting countries and time. Differently from these authors, we did not control for country-pair effects (i.e. the interaction effect between they exporting and importing country picking up unobserved characteristics of country-pairs) because this kind of variable would have included the impact of the euro effect that we wanted to control by a specific dummy. As suggested by Rose and van Wincoop (2001), controlling for exporter and importer effects enabled us to proxy the multilateral "trade resistance index"[13]

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[9] More in general, a IV approach is a way to solve the endogeneity problem. See Anderson and Van Wincoop (2003).

[10] For an exhaustive survey of GMM estimators, see Roodman(2006).

[11] See De Benedictis and Vicarelli (2005); De Benedictis, De Santis and Vicarelli (2005).

[12] See Fernandes (2006).

[13] Anderson and van Wincoop (2003) developed a theoretical gravity equation by using a CES utility function. Their basic gravity model is subject to:

$$x_{ij} = \frac{y_i y_j}{y^W}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \qquad P_j^{1-\sigma} = \sum_i P_i^{\sigma-1}\theta_i t_{ij}^{1-\sigma} \forall j$$

where y_W is the world income, $\theta_i = y_i/y_W$ country i's world income share, and trade cost t_{ij} is a function of border effect b_{ij} and distance d_{ij}; $b_{ij} = 1$ if there are no border barriers between country i and j; otherwise it equals one plus the tariff equivalent of the border barriers between two countries. The model states that trade between country i and j is determined by the share of the multiplier of both countries' incomes to the world income, as well as trade cost adjusted for the price indexes in both countries. The price index in country j is a function of the price indexes, income shares, and the trade costs of all countries. Price indexes are needed to build a multilateral resistance index. Several methods have been implemented in the empirical literature to proxy these trade resistance terms. The one most widely used seems to be the inclusion of country specific dummies This method has the advantage of capturing unobserved price (see Anderson and van Wincoop (2003)), obtaining a specification of a gravity equation that can be interpreted as a reduced form of a model of trade with micro foundations.

(iii) ***Controls for other factors affecting bilateral trade in EMU***. In the specific case of EMU, there are political, institutional and monetary factors that may have affected bilateral trade flows. After 1992, thanks to the European Monetary System and the convergence process leading to the adoption of the single currency, volatility of the exchange rate among European countries diminished. We controlled for this by introducing a measure of volatility into our equation. It seemed important to distinguish this aspect from a "Currency Union" effect that should capture a structural change (i.e. ERM crisis in 1992–1993) in the markets expectations, due to the fact that a common currency is an irrevocably fixed commitment on exchange rate regime. The introduction of the euro has been the last step of this integration process; we controlled for "EU membership"[14] in order to "isolate" this effect on exports by introducing a specific dummy. Indeed, we control for exchange rate movements introducing an index of (bilateral) real exchange rate.

The equation was as follows:

$$Ln\ Expsect_{ijt} = b1\ ln(Expsect_{ijt-n}) + b2\ ln(SumVAsect_{ijt}) + b3\ lnDist_{ij} + b4\ vol_{ijt} + b5\ ReR_{ijt} + b6\ dueuro_{ijt} + b7\ duEU_{ijt} + b8\ \alpha_i + b9\ \beta_j + b10\ \tau \quad (6)$$

where:

ln =	the natural logarithm, *i* is the exporting country, *j* is the importing country and *t* is the year, *n* is a lag structure for the dependent variable;
$Expsect_{ijt}$ =	exports in volume from country *i* to country *j* for 25 sectors ISIC two digit rev. 3;
$SumVAsect_{ijt}$ =	the sum of value added at constant term for 25 sectors ISIC two digit rev. 3 of the exporting and importing countries, a proxy of the "mass" in gravity models;
$Dist_{ij}$ =	bilateral distance between capital cities, expressed in kilometers;
$dueuro_{ijt}$ =	Dummy euro: assumes value 1 for bilateral trade among Eurozone countries from 1999, 0 otherwise, in the case of Greece the dummy assumes value 1 starting from 2001;
$duEU_{ijt}$ =	Dummy European Union membership: assumes value 1 for bilateral trade among European Union countries, taking into account the enlargement process of EU (Austria, Finland and Sweden entered in 1995), 0 otherwise;[15]

effects to produce consistent estimates of parameters. Feenstra (2004) shows that the inclusion of these dummies generates largely the same results as those obtained by Anderson and Van Wincoop (2003). Our empirical strategy took up these suggestions; however, we are aware that this choice excludes the partially time-varying character of the Multilateral Trade Resistance Index and that it can determine some bias (see for example Marques and Spies 2006 and for a survey on this topic see Baldwin 2006).

[14] From the late 1950s to the mid-1990s, the European trade integration process were mainly related to the abolition of internal tariffs with a view to the completion and widening of the Single European Market.

[15] We consider EU membership instead of other "institutional" variables (i.e. Single Market 1993) because EU membership implies the obligation of a Member State to transpose into national law directives (for example to implement the Single Market) issued by the EU Commission.

vol_{ijt} =	is the nominal exchange rate volatility;
ReR_{ijt} =	is the bilateral real exchange rate. We adopt the following specification: $ReR=ePi/Pj$ where e is the nominal bilateral exchange rate and Pi and Pj are respectively the production price indexes in the exporting and importing countries.
α_i=	exporting country dummy: assumes value 1 if export flows are from exporter country *i* to each one of the importing country *j*, 0 otherwise;
β_j =	importing country dummy: assumes value 1 if export flows are from each one of the exporter countries *i* to the importing country *j*, 0 otherwise;
τ =	annual dummies: assumes value 1 for time *t*, 0 otherwise.

We expected bilateral export flows to be positively influenced by:

(i) The lagged endogenous variable. Countries trading heavily with each other were expected to continue to trade, thus reflecting the effects of entrance and exit barriers due to sunk costs;
(ii) The “mass”. In gravity models trade flows are positively influenced by the “mass” proxied by the sum of GDP or value added;
(iii) The introduction of euro. This dummy proxied the “pure trade effects” and was expected to have had a positive impact on Eurozone trade flows, in line with recent literature;
(iv) The “EU membership” effect. Countries joining EU should have benefited from European trade integration process.

We expected bilateral export flows to be negatively influenced by:

(i) Distance. According to the standard gravity model, bilateral distance is a proxy for transport costs and cultural proximity between two countries;
(ii) Exchange rate volatility. Reducing exchange rate volatility should promote bilateral trade reducing risks and uncertainty.
(iii) Real exchange rate. A relative increase in the exporting country prices might negatively affect the export flows.

5 Data Description

The pool of the economies that we considered in the estimates consisted of 23 developed countries: 13 EU members (Ireland and Luxembourg were not included in the pool due to the lack of homogeneous data)[16], and 10 OECD countries: Korea, Czech Republic, Australia, Canada, Japan, New Zealand, Norway, Mexico, Switzerland and United States. The sample period was 1988–2004 according to data availability.

[16] In this paper we deflate nominal bilateral export by value added implicit deflators taken from OECD STAN BTD, a more accurate measure than US CPI commonly used in empirical literature. However, this data bank does not provide value added implicit deflators for Ireland. Data for Belgium and Luxembourg are aggregated.

Table 2: Data Source

Variable	Source	Sample
Bilateral exports in current terms	OECD STAN-BTD	1988–2004
Value added	STAN industry	1988–2004
Bilateral nominal exchange rate	IMF-IFS	1988–2004
CPI, PPI	IMF-IFS, OECD-MEI	1988–2004
Distance	http://www.cepii.fr	1988–2004
Free Trade Agreement	European Commission and WTO	1988–2004
Bilateral real exchange rate	IMF-IFS	1988–2004

We considered 13 exporting European countries and 23 importing industrialized countries (13 EU + 10 OECD).[17] Bilateral exports data in dollars terms, current prices, were taken from OECD STAN-BTD, and value added from the STAN-Industry data base; both variables were deflated by value added implicit deflators.

We tested five different measures of exchange rate volatility; the variable we used was measured by the standard deviation of the first difference of monthly natural logarithms of the bilateral nominal exchange rate at the current year t . Data were taken by monthly average exchange rates from IMF-IFS.

6 A Sectoral Analysis in a Dynamic Setting

Owing to the large number of regressions made, we report the estimate results of equation (6) for each of the 25 ISIC 2 digit sectors in the appendix. Both the specification of the model and the econometric strategy proved to fit well.

Estimates were robust to the standard tests. AR(1) and AR(2) tests showed the consistency of the GMM estimator and the inconsistency of the OLS. Hence, by introducing dynamics, the proper estimation method was the former one. The Hansen test of over-identifying restrictions showed that the hypothesis that all moment restrictions would be satisfied for the dynamic specification was not rejected.[18]

In general, gravity standard variables showed high statistical significance and the expected sign: there was a positive correlation with the mass and a negative one with distance. We also found a high statistical significance of the 1 period lagged dependent

[17] We organised our pool of countries in two different groups: 13 EU exporting countries and 23 importing countries (13 EU+10 OECD countries). Exporting countries are only EU members: Eurozone countries plus the three EU countries that are not in the EMU (UK, Sweden and Denmark). By this way, we can calculate the euro effect on intra-trade only with respect these latter, being the reference countries we are interested in. To be precise, we calculate how much trade flows among Eurozone countries are different from i) average flows between Denmark, Sweden and UK ii) trade between these three countries and Eurozone countries iii) trade between Eurozone countries and all the importing countries in the sample; iv) trade between Eurozone countries.

[18] Arellano and Bond (1991) propose a test of the hypothesis of no second-order serial correlation in the disturbances of the first differenced equation. This is a necessary condition for the valid instrumentation. A test for the hypothesis of no first order–order serial correlation is also reported: the rejection of the null hypothesis (i.e. the presence of first-order serial correlation) indicates the inconsistency of the OLS estimator.

variable coefficient; the magnitude of the “ persistence effect” seemed in line with the results in the literature. A decrease in exchange rate volatility and in the bilateral real exchange rate promoted bilateral trade; the “EU membership” effect had a positive impact on trade flows among EU15 countries.

In this section and in the next we focus on the impact of the euro on sectoral exports, looking at the sign and magnitude of the Euro dummy coefficient. The euro trade effect was estimated for each sector considering the EU members as a group of exporting countries. In this case, the coefficient of the dummy euro quantified the (average) sectoral effect of euro adoption with respect to EU partners that did not joint the common currency.

The estimates results (Table 3) highlight that the euro effect is not uniformly distributed among sectors. Only in 10 industrial sectors out of 25 is there a positive and significant impact of the euro on exports flows (at least at 10% significance level). However, as expected on the grounds of the theoretical framework, no sector is charaterised by a statistically significant negative influence: this would reflect the fact that (unobserved) firm-level positive and negative effects tend to cancel out when aggregating across nations.

As for the magnitude of the coefficient, dynamic specification of the gravity equation allows to capture the short-run effect exerted on sectoral trade by adoption of the euro. The short run effect is indeed small and heterogeneous among sectors.

One may reasonably assume that, in general, it takes several years for a currency union to have a significant trade enhancing effect. Yet, there is no clear indication in the existing literature about the lapse of time necessary for a single currency to exert its steady state effects. According to some authors (Bun and Klaassen, 2002b), in seven years only half of the whole long run effect is apparent (incidentally, in our sample the euro has been in existence for six years). But the period necessary to detect the “regime” effect may be even longer: according to some estimates (Glick and Rose, 2002), it can take more than thirty years to discern the full long run impact on trade of a reversed process, that is, the dissolution of a monetary union between a pair of countries.

Leaving aside the issue of the length of time required to approach the long run, we can nonetheless use the parameter of the lagged dependent variable to compute the change in sectoral trade implied by the short run impact of the euro obtained in our results, letting time grow larger and larger.[19] We can correctly compare the long term coefficent obtained by this way with existing sectoral results in empirical literature, computed using static model. Our estimate results, shown in last column of Table 3, are still small by the standards proposed in the literature on euro’s effect on sectoral trade.

Assuming as reference an industry classification à la Pavitt, a positive effect was detected in four sectors characterised by scale economies (transport, radio tv and communication equipment, pulp-paper and printing, metal products), one sector characterised by high technology (electrical and optical instruments), one specialised supply sector (transport equipment).

[19] We obtained estimates of long-run effects simply by applying the following transformation: long run $\overline{B2}$ = B2/(1-B1), where B2 is the parameter of the EURO dummy and B1 is the vector of coefficients of the lagged dependent variable. The test of the significance of the Ho B2 = 0 are in the Appendix.

Table 3: Sectoral Estimates Results

ISIC 2 digits		Industry description	Dummy euro Short term coefficient	t	Dummy euro Long term coefficient[a]
01_05		Agriculture, hunting, forestry and fishing	–0.02	0.37	
10_14		Mining and quarrying	–0.15	1.72	.
15_16		Food products beverages and tobacco	0.04	1.61	
17_19		Textiles, textile products, leather and footwear	–0.05	1.49	
	20	Wood and wood and cork products	0.02	0.27	
21_22		**Pulp, paper, paper products, printing and publishing**	**0.07**	**2.09**	**0.11**
23_25		Chemical, rubber, plastics and fuel products	0.03	0.94	
	23	Coke, refined petroleum products and nuclear fuel	0.05	0.31	
	24	Chemical and chemical products	0.01	0.55	
	25	Rubber and plastic products	–0.01	–0.47	
	26	Other non metallic mineral products	–0.02	0.64	
27_28		**Basic metals and fabricated metal products**	**0.10**	**4.07**	**0.16**
	27	**Basic metals**	**0.13**	**3.29**	**0.19**
	28	Fabricated metal products except machinery and equipment	0.01	0.14	
29_33		**Machinery and equipment**	**0.06**	**2.65**	**0.09**
	29	**Machinery and equipment nec**	**0.05**	**2.02**	**0.08**
30_33		**Electrical and optical equipment**	**0.07**	**1.95**	**0.09**
	30	Office accounting and computing machinery	0.07	0.81	
	31	Electrical machinery and apparatus nec	–0.14	0.34	
	32	**Radio tv and communication equipment**	**0.13**	**2.02**	**0.20**
	33	**Medical precision and optical instruments**	**0.09**	**2.70**	**0.13**
34_35		**Transport equipment**	**0.13**	**2.27**	**0.24**
	34	**Motor vehicles**	**0.09**	**2.03**	**0.13**
	35	Other transport equipment	–0.01	0.11	
36_37		Manufacturing nec	–0.04	1.10	

Sectors in bold are those with a euro effect positive and significant for the entire set of EU countries.

[a]We performed an F test for the statistical significance of the long run coefficient (see in the Appendix).

In general, even if a two-digit classification is still very aggregate, it is possible to point out that most of the sectors exhibiting a positive euro effect are those characterised by increasing returns to scale, imperfect competition and product differentiation.

These results seem to reflect the empirical findings reported in section 2 and are in line with the theoretical *a-priori* discussed in section 3 predicting prevalence of positive effects in imperfectly competitive sectors in which varieties are more differentiated (due to a soothing of an otherwise tougher competition). Comparing with previous sectoral studies, our estimates of the euro effect are, on one hand, lower , probably because of the dynamic specification of our model correcting for some bias, and on the other hand, more homogeneous across sectors. According to our long run effect estimates, the intra-EMU pro-trade impact of the euro ranged between 8.3% (machinery and equipment nec) and 27.1% (transport equipment[20]). In Flam and Nordstrom (2006) and in Baldwin et al (2005), for instance, the magnitude of the Euro effect varied respectively between 16% for wood products and 62% for transport equipment and between 40% to 177%[21]. With respect to our short run coefficients, our results seem lower than those of Fernandes (2006); this is probably affected by differences in the pool of countries considered and a slightly different time span.[22]

7 A Country/Sector Analysis

Aggregate results conceal the fact that in EMU countries there were, at the date of the euro introduction, both “more” and “less” productive firms. These firms were differently affected by the single-currency effect, depending on how far away were their marginal production costs from the cutoff cost (made more stringent by the euro inception). Predominance of either kind of firms determined the sector/country euro effect. Due to this reason, when we move from sector to sector/country analysis, a whole picture of winners and loosers emerges. Table 4 reports the same industrial sectors as Table 3 in order to compare them with the evidence found at sector/country level.[23] We have re-ordered these sectors according to whether statistically significant impacts were detected at aggregate level or not. The last two columns of the table show countries for which a statistically significant euro effect has been found in those sectors.

What stands out from the table is the confirmation of an aggregation bias due to the fact that aggregate results average out quite different sector-country outcomes, affected, in their turn, by firm-behaviour heterogeneity. The sectors where a postive significant influence was detected at aggregate level (those where product differentiation matters) subtend winners and loosers at country level. According to this evidence, while winners in these sectors are quite widespread across EMU countries, losers are rather concentrated in a few nations, being located predominantly in France and Finland. Yet this not the end of the story about winners and losers, since both these categories of exporters may be found also in the sectors for which no signficant impact was singled out at aggregate level. Actually, the picture in these sectors is even more variegated.

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[20] Since, for instance, the long run coefficient of the dummy euro in the transport equipment sector is 0.24, the variation of exports induced by euro adoption (Dueuro = 1) with respect to the case of non-adoption (Dueuro = 0), is given, other things being equal, by $[(\exp 0.24*1/\exp 0.24*0)-1]*100=27.1\%$.

[21] Flam and Nordtrom (2006), introduce two different dummies: a dummy for exports within the eurozone in 1999–2001 and a dummy for exports in 2002–2005. We report results of this second dummy (see Table A6 in Flam and Nordstrom 2006). To be noted is that these authors consider a wider group of exporting countries (20 OECD countries), while we consider 13 EU countries only. Furthermore, we would point out that, in our estimates, different sectors show a positive and statistical significance euro effect with respect to those in Flam and Nordstrom. In particular, we find no statistically significant effects in chemicals, rubber and plastics.

[22] In Fernandes (2006) there are no differences between importing and exporting countries, while we consider two different group of importing and exporting countries (see note 14). Indeed, we include more countries in the estimates: Finland and Belgium both in the exporting and importing country group, Canada, Korea, Mexico, Czech Republic in the importing country group. Finally we add one year to the time span.

[23] Table A1 in the Appendix presents the coefficients of the euro dummy for each country/sector.

Table 4: The Country/Sector Euro Effect[a]

ISIC 2 digits		Industry description	Dummy euro positive and significant	Dummy euro negative and significant
21_22		**Pulp, paper, paper products, printing and publishing**	**The Netherlands**	
27_28		**Basic metals and fabricated metals products**	**Greece and Portugal,**	
	27	**Basic metals**	**Austria, the Netherlands, Spain**	**France, Finland**
29_33		**Machinery and equipment**		**Finland**
	29	**Machinery and equipment nec**	**Belgium**	
30_33		**Electrical and optical equipment**	**Germany, Belgium, the Netherlands, Spain**	**France, Finland**
	32	**Radio tv and comunnication equipment**	**Austria, Germany, Spain**	**France**
	33	**Medical precision and optical instruments**	**Greeece, Spain**	
34_35		**Transport equipment**	**Spain**	
	34	**Motor vehicles**	**Italy, France, Greece, Spain**	**Finland**
01_05		Agriculture, hunting, forestry and fishing	France, Spain	Finland, Germany, The Netherlands
10_14		Mining and quarrying		Spain
15_16		Food products beverages and tobacco	Germany, The Netherlands	
17_19		Textiles, textile products, leather and footwear		Finland, Italy
	20	Wood and wood and cork products	The Netherlands	
23_25		Chemicals, rubber, plastics and fuel products	Spain, Portugal	France, Germany
	23	Coke, refined petroleum products and nuclear fuel	Austria	
	24	Chemical and chemical products	Belgium, Spain	
	25	Rubber and plastic products		Belgium, France
	26	Other non metallic mineral products		
	30	Office accounting and computing machinery	Austria, Germany	France
	31	Electrical machinery and apparatus nec	Greece	Finland
	35	Other transport equipment	Italy	
36_37		Manufacturing nec		Italy

[a]Sectors in bold are those with a euro effect positive and significant at aggregate level; the other sectors are those with no significant effect at aggregate level.

Lower part of Table 4 indicates that positive intra-EMU trade effects of the single currency were identifyable at a country level in a much wider range of sectors, including those where varieties are less differentiated (e.g. agriculture). However, these positive influences were opposed to the negative ones in other nations, so that also in the unaffected sectors at aggregate level, there are country-level winners and losers. Contrary to the former case, loosers are widespread across nations, ranging from Germany (agriculture, chemicals) to France (Rubber and plastics, computing machinery), Italy (textile, other manufacturing), Netherlands (agriculture), Spain (mining), Belgium (runner and plastics) and Finland (agriculture, textile, electrical machinery).

Considering all the sectors (both those positively affected and those unaffected by the euro introduction at aggregate level), in a few of them (textile, rubber and plastics, machinery and equipment, manufacturing nec) are detectable only country-level negative impacts.

When we reshuffle sector/country results presented in Table 4 on the basis of a classification "*à la* Pavitt", the general picture turns more in line with the findings obtained at aggregate level (Table 5): the pro trade effects for the majority of the

Table 5: The Country/Sector Euro Effect in a Classification "à la Pavitt"[a]

SITC 2 digits	Industry description	Dummy euro positive and significant	Dummy euro negative and significant
		Traditional sectors	
01_05	Agriculture, hunting, forestry and fishing	France, Spain	Finland, Germany, The Netherlands
10_14	Mining and quarrying		Spain
15_16	Food products beverages and tobacco	Germany, The Netherlands	
17_19	Textiles, textile products, leather and footwear		Finland, Italy
25	Rubber and plastic products		Belgium, France
27	**Basic metals**	**Austria, the Netherlands, Spain**	**France, Finland**
36_37	Manufacturing nec		Italy
		Scale intensive sectors	
20	Wood and wood and cork products	The Netherlands	
21_22	**Pulp, paper, paper products, printing and publishing**	**The Netherlands**	
23	Coke, refined petroleum products and nuclear fuel	Austria	
26	Other non metallic mineral products		
27_28	**Basic metals and fabricated metals products**	**Greece and Portugal,**	
31	Electrical machinery and apparatus nec	Greeece	Finland
32	**Radio tv and comunnication equipment**	**Austria, Germany, Spain**	**France**
34_35	**Transport equipment**	**Spain**	
34	**Motor vehicles**	**Italy, France, Greece, Spain**	**Finland**
		Specialised suppliers	
29_33	**Machinery and equipment**		**Finland**
29	**Machinery and equipment nec**	**Belgium**	
35	Other transport equipment	Italy	
		Science Based	
23_25	Chemical, rubber, plastics and fuel products	Spain, Portugal	France, Germany
24	Chemicals and chemical products	Belgium, Spain	
30_33	**Electrical and optical equipment**	**Germany, Belgium, the Netherlands, Spain**	**France, Finland**
30	Office accounting and computing machinery	Austria, Germany	France
33	**Medical precision and optical instruments**	**Greece, Spain**	

* Sectors in bold are those with a euro effect positive and significant for the entire set of EU countries.

countries, though diffused across industries, are mainly concentrated in sectors where horizontal product differentiation matters (scale intensive, specialized suppliers and science based sectors).

Finally, leaving aside sector specificity, these results may provide a general view on the country distribution of winners and losers (Table 6). It comes out that small and medium-sized economies were those that benefited the most from the euro introduction: in Spain, Netherlands, Austria, Greece, Belgium and Portugal the number of sectors where the single currency impacted positively exceeds the number of sectors where negative effects were identified. Quite as an exception, Germany fits into this group. On the opposite side, this evidence indicates that Italy and, particularly, France and Finland were the less benefited, in terms of balance between winning and losing sectors. A common feature shared by all countries is constituted by the large majority of sectors where the euro had no statistically significant influence.

Table 6: Country/Sector Euro Effect: Number of Sectors with Positive, Negative and No Impact

	Positive effects	Negative effects	No effect
Spain	8	1	16
The Netherlands	5	1	19
Austria	4	0	21
Greece	4	0	21
Germany	4	2	19
Belgium	3	1	21
Portugal	2	0	23
Italy	2	2	21
France	2	6	17
Finland	0	7	18

8 Conclusions

Empirical literature has reported a modest pro trade effect deriving from the euro introduction in 1999. Analysis has been usually conducted at the aggregate level, with respect to both trade flows (total exports and/or imports flows) and country aggregates (Eurozone as a whole).

To gain better understanding of the main factors influencing the single currency effect on trade flows, it is of some help to use a sectoral analysis. We did it adopting as reference a theoretical framework that, on one side, makes explicit the fact that sector exports are the aggregation outcome of foreign sales of heterogenous firms and, on the other side, highlight the possibility that the single currency may have both enhancing (thanks to lower trade costs) and dampening (due to tighter competition) influences on the exports of a nation. We performed the empirical analysis in a dynamic setting to take account of the persistence phenomena that characterize bilateral trade relations between industrialized countries. Aggregate-sector estimates show that the euro effect was not uniformly distributed among sectors: only in 11 industrial sectors out of 25 there was a positive and significant impact of the euro on export flows. Particularly, most of these sectors are those characterized by imperfect competition, increasing returns to scale and horizontal product differentiation.

These results seem consistent with other findings in the empirical literature and with the prediction of the theory, pointing to a mitigation effect of variety differentiation on toughness of competition. What differs with respect to earlier sectoral studies is the magnitude of the positive euro effect, which is lower and less widespread among industries. We believe that our dynamic specification fitted this phenomenon better.

Yet, aggregate sector results average out country-level behaviours that, on their turn, are affected by different (unobserved) responses of firms, endowed with diverse production costs, to the enhancing and dampening impacts of the euro. Due to this reason, the cancelling out at aggregate level of heterogenous behaviours induces an aggregation bias. So it is not surprising that when moving from sector to sector/country analysis the picture becomes much more variegated, with the emergence of a whole range of winners and lossers among industries in the different nations. However identification of benefited/hampered sectors is mainly an empirical matter, depending on the predominance in each industry and in each nation of either expanding or contracting exporting firms. Despite the increase of heterogeneity, some salient points could nonetheless be singled out from country-level analysis: 1) the majority of sectors displayed no significant effect of the euro introduction at country level (confirming the aggregate result); 2) although the single-currency pro-trade impact was pretty much diffused across all sectors of member countries, it resulted mainly concentrated in industries where product differentiation matters (in line with the aggregate outcome); 3) small and medium-sized countries plus the European core-economy, Germany, were those where the number of sectors whose exports benefited from the euro was larger than the number of sectors that registered a dampening effect; 4) in couple of large economies and in a smaller one (Italy, France and Finland) the benefits of the trade impact of the euro on sector exports, at this level of analysis, were quite limited or even absent.

Appendix 1

Table A1: Estimates Sector/Country

	Industry description	Austria		Belgio		Finlandia		Francia		Germania		Grecia	
		Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
01_05	Agriculture, hunting, forestry and fishing	0.13	0.99	–0.08	0.66	**–0.38**	**–2.91**	**0.16**	**1.79**	**–0.17**	**–1.87**	0.09	0.68
10_14	Mining and quarrying	–0.09	0.48	–0.05	0.21	0.01	0.07			–0.13	0.72	–0.09	0.80
15_16	**Food products beverages and tobacco**	0.07	0.72	0.06	0.94	**–0.17**	**1.91**	–0.04	0.96	**0.12**	**2.25**	–0.04	0.49
17_19	Textiles, textile products, leather and footwear	–0.04	0.78	0.08	0.25	**–0.14**	**2.14**	–0.10	1.56	–0.00	0.04	**0.13**	**1.61**
20	Wood and wood and cork products	0.02	0.10	0.04	0.06	0.02	0.12	–0.16	1.07	0.02	0.12	–0.27	0.71
21_22	**Pulp, paper, paper products, printing and publishing**	0.11	1.28	0.00	0.37	–0.000	0.05	–0.07	1.14	0.08	1.51	0.08	0.70
23_25	Chemicals, rubber, plastics and fuel products	–0.04	0.79	0.20	1.39	–0.08	0.86	**–0.11**	**–1.80**	**–0.15**	**–1.90**	–0.11	1.02
23	Coke, refined petroleum products and nuclear fuel	**0.95**	**3.79**	0.22	1.27	–0.2	0.39	–0.23	1.12	–0.23	0.87	–1.25	1.46
24	Chemical and chemical products	–0.01	0.13	**0.11**	**2.06**	–0.07	1.22	**–0.05**	**–1.75**	–0.22	0.68	–0.08	0.64
25	Rubber and plastic products	–0.02	0.56	**–0.10**	**–2.18**	0.07	1.19	**–0.12**	**–2.75**	–0.07	1.47	0.15	1.16
26	Other non metallic mineral products	–0.02	0.23	0.05	1.00	0.12	1.33	–0.05	0.82	–0.05	0.87	**–0.24**	**1.69**
27_28	**Basic metals and fabricated metals products**	0.02	0.31	–0.04	0.74	–0.03	0.33	0.00	0.05	–0.05	0.88	**0.27**	**2.48**
27	**Basic metals**	0.01	1.54			0.07	0.79	0.04	0.78	–0.04	–0.76	**0.21**	**1.99**
28	Fabricated metal products except machinery and equipment	0.02	0.38			–0.03	–0.41	–0.02	–0.36	–0.01	0.13	0.09	0.69
29_33	Machinery and equipment	**0.08**	**1.98**			**–0.07**	**–1.75**	**–0.09**	**2.61**	0.03	0.59	0.10	0.96
29	Machinery and equipment nec	0.06	1.21	**0.25**	**3.34**	**–0.11**	**–1.86**	–0.04	1.05	–0.07	–1.52	0.15	0.96
30_33	**Electrical and optical equipment**	0.06	1.32	**0.18**	**3.30**	**–0.14**	**–3.46**	**–0.13**	**–3.16**	**0.06**	**1.77**	–0.12	–1.28
30	Office accounting and computing machinery	**0.50**	**4.02**			–0.19	–1.05	**–0.33**	**–3.00**	**0.33**	**2.96**	–0.13	–0.44
31	Electrical machinery and apparatus nec	0.05	0.96			**–0.31**	**–4.56**	–0.02	0.34	0.00	0.06	**0.27**	**1.85**
32	**Radio tv and comunnication equipment**	**0.26**	**2.23**			0.22	1.51	**–0.33**	**3.0**	**0.22**	**2.28**	–0.37	–1.21
33	**Medical precision and optical instruments**	0.02	0.32			–0.03	–0.78	0.03	0.64	0.00	0.01	**0.37**	**2.56**
34_35	**Transport equipment**	0.06	0.69			–0.16	–1.47	0.14	1.50	0.04	0.37	0.30	1.43
34	**Motor vehicles**	–0.02	–0.22			**–0.25**	**–2.69**	**0.18**	**2.43**	–0.01	–0.14	**0.49**	**3.16**
35	Other transport equipment	0.14	0.80			–0.41	–1.11	0.09	0.43	0.01	0.05	–0.43	–1.00
36_37	Manufacturing nec	0.06	0.78			–0.04	–0.40	–0.11	–1.31	0.07	0.99	–0.09	–0.74

Table A1 continued

	Industry description	Italia		Olanda		Portogallo		Spagna	
		Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
01_05	Agriculture, hunting, forestry and fishing	0.06	0.77	**–0.21**	**2.63**	0.05	0.39	**0.30**	**2.71**
10_14	Mining and quarrying	–0.23	1.37	0.10	0.50			**–0.33**	**2.29**
15_16	**Food products beverages and tobacco**	0.00	0.02	**0.10**	**2.41**	0.10	1.26	0.05	1.51
17_19	Textiles, textile products, leather and footwear	**–0.15**	**2.72**	**0.07**	**1.59**	0.04	0.4	–0.02	0.32
20	Wood and wood and cork products			**0.27**	**2.27**			–0.05	0.32
21_22	**Pulp, paper, paper products, printing and publishing**			**0.09**	**1.68**			0.06	0.46
23_25	Chemicals, rubber, plastics and fuel products	0.06	1.01	0.01	0.20	**0.17**	**2.01**	**0.17**	**2.68**
23	**Coke, refined petroleum products and nuclear fuel**	**–0.12**	**0.34**	0.27	1.33			0.27	1.15
24	Chemical and chemical products	**0.08**	**1.57**	0.03	1.10			**0.10**	**1.78**
25	Rubber and plastic products	0.02	1.03	0.03	0.66			0.05	1.00
26	Other non metallic mineral products	–0.06	1.10	0.04	0.78	–0.00	0.04	0.02	0.23
27_28	**Basic metals and fabricated metals products**	0.08	1.61	0.03	0.67	**0.28**	**2.68**	0.08	1.51
27	**Basic metals**	**0.10**	**1.75**	**0.08**	**1.75**			0.08	1.16
28	Fabricated metal products except machinery and equipment	0.05	1.0	**–0.09**	**–1.63**			0.60	0.71
29_33	Machinery and equipment	0.02	0.40	**0.13**	**3.3**	0.03	0.38	**0.14**	**3.02**
29	Machinery and equipment nec	0.00	0.03	–0.00	0.19			0.06	0.84
30_33	**Electrical and optical equipment**	–0.02	0.43	**0.13**	**3.90**	–0.02	–0.25	**0.14**	**2.72**
30	Office accounting and computing machinery	–0.11	–0.67	–	–	–	–	0.03	1.35
31	Electrical machinery and apparatus nec	–	–	–	–	–	–	0.11	1.37
32	**Radio tv and comunnication equipment**	–	–	–	–	–	–	**0.43**	**3.4**
33	Medical precision and optical instruments	0.01	0.15	–	–	–	–	**0.17**	**1.80**
34_35	Transport equipment	0.22	2.32	–0.03	–0.38	–	–	**0.25**	**1.65**
34	**Motor vehicles**	**0.08**	**1.94**	–	–	–	–	**0.15**	**1.89**
35	**Other transport equipment**	**0.21**	**1.93**	–	–	–	–	0.28	1.40
36_37	**Manufacturing nec**	**–0.12**	**2.06**	–	–	–	–	0.05	0.67

Appendix 2

Sectoral estimates

```
Sector 01_05
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      3659
Time variable : time                             Number of groups   =       285
Number of instruments = 261                      Obs per group: min =         1
F(56, 285)    =   5501.53                                       avg =     12.84
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK01_05 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK01_05 |
         L1. |   .5563564   .0445842    12.48   0.000     .4686004    .6441124
     dueuro1 |  -.0186244   .0502452    -0.37   0.711    -.1175233    .0802744
     lReR    |  -.0427621   .0223715    -1.91   0.057    -.0867965    .0012722
        dueu |    .253976   .0900563     2.82   0.005     .0767162    .4312359
        vol1 |  -.2533348   .1885855    -1.34   0.180     -.624532    .1178623
       ldist |  -.7025445   .0890976    -7.89   0.000    -.8779173   -.5271717
 SumVA01_05  |  -.1293157   .2049538    -0.63   0.529    -.5327309    .2740996
    Alpha_i      yes
    Beta_j       yes
    Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.33  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.86  Pr > z =  0.063
Hansen test of overid. restrictions: chi2(205)  = 228.21  Prob > chi2 =  0.128
```

```
Sector 10_14
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      2780
Time variable : time                             Number of groups   =       219
Number of instruments = 194                      Obs per group: min =         1
F(52, 219)    =   1914.61                                       avg =     12.69
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK10_14 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK10_14 |
         L1. |   .5052496   .0554133     9.12   0.000      .396038    .6144612
     dueuro1 |  -.1537626   .0896263    -1.72   0.088    -.3304031    .0228779
     lReR    |   .0083641   .0396591     0.21   0.833    -.0697981    .0865264
        dueu |  -.2270209   .1008088    -2.25   0.025    -.4257005   -.0283414
        vol1 |  -.0222257   .1767489    -0.13   0.900    -.3705722    .3261208
       ldist |  -1.074637   .1632935    -6.58   0.000    -1.396465   -.7528095
 SumVA10_14  |   .0253639   .1048421     0.24   0.809    -.1812648    .2319925
      Alpha_i     yes
      Beta_j      yes
      Tau          yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.48  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.72  Pr > z =  0.086
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(142)  = 171.44  Prob > chi2 =  0.047

Long term coefficient test
HP0  _b[dueuro1]/(1-_b[l.lexpK10_14]) = 0

             F(1, 219) =        3.08
              Prob > F =        0.0805
```

```
Sector 15_16
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      3424
Time variable : time                             Number of groups   =       286
Number of instruments = 261                      Obs per group: min =         5
F(56, 286)    =  33531.28                                       avg =     11.97
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK15_16 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK15_16 |
         L1. |   .6628005   .0466757    14.20   0.000     .5709291    .7546718
     dueuro1 |    .041318   .0256148     1.61   0.108    -.0090993    .0917354
     lReR    |  -.0184017   .0100685    -1.83   0.069    -.0382194    .0014161
        dueu |   .1107465   .0436397     2.54   0.012     .0248508    .1966422
        vol1 |   -.043243   .0903665    -0.48   0.633    -.2211107    .1346247
       ldist |  -.4479891   .0694051    -6.45   0.000    -.5845987   -.3113795
 SumVA15_16  |   .0592027   .0832093     0.71   0.477    -.1045775     .222983
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

----------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.11  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.31  Pr > z =  0.190
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(205)  = 249.99  Prob > chi2 =  0.017

Long term coefficient test
Hp0  _b[dueuro1]/(1-_b[l.lexpK15_16]) = 0

             F(1, 286) =        2.95
              Prob > F =        0.0867
```

```
Sector 17_19
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      3008
Time variable : time                             Number of groups   =       261
Number of instruments = 260                      Obs per group: min =         1
F(55, 261)    =  39528.35                                       avg =     11.52
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK17_19 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK17_19 |
         L1. |   .7274711    .045656    15.93   0.000       .63757    .8173722
     dueuro1 |  -.0466712   .0286994    -1.63   0.105    -.1031831    .0098407
     lReR    |  -.0162103   .0144563    -1.12   0.263    -.0446761    .0122555
        dueu |   .0010154   .0301975     0.03   0.973    -.0584464    .0604772
        vol1 |  -.0843574   .0744554    -1.13   0.258    -.2309672    .0622524
       ldist |  -.3555947   .0665332    -5.34   0.000    -.4866049   -.2245846
 SumVA17_19  |    .229142   .0774292     2.96   0.003     .0766765    .3816075
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.71  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.39  Pr > z =  0.696
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(205)  = 239.46  Prob > chi2 =  0.050

Long term coefficient test
HP0  _b[dueuro1]/(1-_b[l.lexpK17_19]) = 0

             F(1, 261) =        2.39
 Prob > F =        0.1234
```

```
Sector 20
------------------------------------------------------------------------------
Group variable: cod                                Number of obs      =      1377
Time variable : time                               Number of groups   =       142
Number of instruments = 144                        Obs per group: min =         1
F(47, 142)    =      8.46                                         avg =      9.70
Prob > F      =     0.000                                         max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK20 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK20 |
         L1. |       .452   .0809919     5.58   0.000     .2918943    .6121056
     dueuro1 |   .0205199   .0758299     0.27   0.787    -.1293816    .1704213
     lReR    |  -.0869558   .0345622    -2.52   0.013    -.1552787   -.0186329
        dueu |  -.1948627   .1321902    -1.47   0.143    -.4561777    .0664523
        vol1 |  -.4357962   .3300796    -1.32   0.189    -1.088301    .2167088
       ldist |  -.6908465   .1652221    -4.18   0.000    -1.017459   -.3642337
    SumVA20  |   .6419977   .3097951     2.07   0.040     .0295913    1.254404
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.25  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.62  Pr > z =  0.105
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   = 111.92  Prob > chi2 =  0.143
```

```
Sector 21_22
------------------------------------------------------------------------------
Group variable: cod                                Number of obs      =      1432
Time variable : time                               Number of groups   =       144
Number of instruments = 145                        Obs per group: min =         1
F(48, 144)    =     26.61                                         avg =      9.94
Prob > F      =     0.000                                         max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK21_22 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK21_22 |
         L1. |   .6486452   .0503153    12.89   0.000     .5491933    .7480972
     dueuro1 |   .0723922   .0346969     2.09   0.039     .0038113    .1409731
     lReR    |  -.0208856   .0145414    -1.44   0.153    -.0496278    .0078565
        dueu |  -.0509999   .0537639    -0.95   0.344    -.1572682    .0552684
        vol1 |  -.2225252   .1296355    -1.72   0.088    -.4787595     .033709
       ldist |  -.3425284   .0682136    -5.02   0.000    -.4773577   -.2076992
 SumVA21_22  |   .1400326   .0563249     2.49   0.014     .0287022     .251363
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.27  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.18  Pr > z =  0.237
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   = 116.11  Prob > chi2 =  0.090

Long term coefficient test

HP0  _b[dueuro1]/(1-_b[l.lexpK21_22]) = 0

             F(1, 144) =        4.40
              Prob > F =        0.0376
```

```
Sector 23_25
------------------------------------------------------------------------------
Group variable: cod                               Number of obs      =      3009
Time variable : time                              Number of groups   =       263
Number of instruments = 261                       Obs per group: min =         1
F(56, 263)    =  24292.51                                        avg =     11.44
Prob > F      =     0.000                                        max =        15
------------------------------------------------------------------------------
             |              Robust
  lexpK23_25 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK23_25 |
         L1. |   .5550064   .0483166    11.49   0.000     .4598698    .6501429
     dueuro1 |   .0314894   .0333814     0.94   0.346    -.0342394    .0972182
     lReR    |  -.0038479   .0114522    -0.34   0.737    -.0263976    .0187018
        dueu |  -.0564633   .0439188    -1.29   0.200    -.1429404    .0300138
        vol1 |  -.0522849   .1016521    -0.51   0.607    -.2524403    .1478706
       ldist |   -.522988    .074686    -7.00   0.000    -.6700467   -.3759294
 SumVA23_25  |   .0003604   .0563928     0.01   0.995    -.1106784    .1113992
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.91  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.87  Pr > z =  0.062
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(205)  = 231.76  Prob > chi2 =  0.097
```

```
Sector 23
------------------------------------------------------------------------------
Group variable: cod                               Number of obs      =      1879
Time variable : time                              Number of groups   =       185
Number of instruments = 147                       Obs per group: min =         1
F(50, 185)    =   2365.21                                        avg =     10.16
Prob > F      =     0.000                                        max =        15
------------------------------------------------------------------------------
             |              Robust
     lexpK23 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK23 |
         L1. |   .4167569   .1179232     3.53   0.001     .1841097    .6494041
     dueuro1 |   .0447957   .1459045     0.31   0.759    -.2430549    .3326463
     lReR    |   .0295246   .0482062     0.61   0.541    -.0655799    .1246292
        dueu |  -.1950667   .2041213    -0.96   0.341    -.5977715    .2076381
        vol1 |  -.1548557   .4058599    -0.38   0.703    -.9555646    .6458532
       ldist |  -.9898666   .2761841    -3.58   0.000    -1.534742   -.4449913
    SumVA23  |  -.4122085     .18891    -2.18   0.030    -.7849032   -.0395137
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.86  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.28  Pr > z =  0.781
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   = 119.88  Prob > chi2 =  0.058
  (Robust, but can be weakened by many instruments.)
```

```
Sector 24
------------------------------------------------------------------------------
Group variable: cod                               Number of obs      =      1814
Time variable : time                              Number of groups   =       179
Number of instruments = 176                       Obs per group: min =         1
F(50, 179)    = 282161.96                                        avg =     10.13
Prob > F      =     0.000                                        max =        15
------------------------------------------------------------------------------
             |              Robust
     lexpK24 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK24 |
         L1. |   .8222065   .0580066    14.17   0.000     .7077417    .9366712
     dueuro1 |   .0136017   .0245932     0.55   0.581    -.0349282    .0621317
     lReR    |  -.0096682   .0079704    -1.21   0.227    -.0253962    .0060598
        dueu |  -.0430795    .034977    -1.23   0.220    -.1120999    .0259408
        vol1 |  -.0829933   .0714679    -1.16   0.247    -.2240213    .0580347
       ldist |  -.1585253   .0747124    -2.12   0.035    -.3059556    -.011095
    SumVA24  |   .0371159    .029261     1.27   0.206    -.0206249    .0948568
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.91  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.94  Pr > z =  0.349
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(126)  = 152.62  Prob > chi2 =  0.053
```

```
Sector 25
------------------------------------------------------------------------------
Group variable: cod                               Number of obs      =      2348
Time variable : time                              Number of groups   =       231
Number of instruments = 214                       Obs per group: min =         1
F(54, 231)    =  61738.23                                        avg =     10.16
Prob > F      =     0.000                                        max =        15
------------------------------------------------------------------------------
             |              Robust
     lexpK25 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK25 |
         L1. |   .7422958   .0595396    12.47   0.000     .6249858    .8596058
     dueuro1 |  -.0111434   .0235161    -0.47   0.636    -.0574768      .03519
     lReR    |  -.0245976    .012225    -2.01   0.045    -.0486843   -.0005109
        dueu |   .0279768   .0339889     0.82   0.411     -.038991    .0949446
        vol1 |  -.1280158   .0899431    -1.42   0.156    -.3052294    .0491978
       ldist |  -.3263448   .0765496    -4.26   0.000    -.4771695   -.1755202
    SumVA25  |    .142192   .0580754     2.45   0.015     .0277668    .2566173
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.12  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.53  Pr > z =  0.599
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(160)  = 191.30  Prob > chi2 =  0.046
```

```
Sector 26
------------------------------------------------------------------------------
Group variable: cod                             Number of obs      =      3053
Time variable : time                            Number of groups   =       263
Number of instruments = 261                     Obs per group: min =         1
F(56, 263)    =  20792.84                                      avg =     11.61
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK26 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK26 |
         L1. |   .6315598   .0585807    10.78   0.000     .5162129    .7469068
     dueuro1 |  -.0199812   .0311284    -0.64   0.521    -.0812737    .0413114
     lReR    |  -.0281122   .0144526    -1.95   0.053    -.0565697    .0003453
        dueu |  -.1082478   .0485802    -2.23   0.027    -.2039035   -.0125921
        vol1 |  -.2651155   .0961127    -2.76   0.006    -.4543638   -.0758672
       ldist |   -.507195   .0868433    -5.84   0.000    -.6781917   -.3361983
    SumVA26  |   .2836396   .0599251     4.73   0.000     .1656455    .4016337
    duexpaut |   6.169317   1.317743     4.68   0.000     3.574647    8.763986
      Alpha_i      yes
      Beta_j       yes
      Tau          yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.58  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.23  Pr > z =  0.817
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(205)  = 231.17  Prob > chi2 =  0.101
```

```
Sector 27_28
------------------------------------------------------------------------------
Group variable: cod                             Number of obs      =      3068
Time variable : time                            Number of groups   =       274
Number of instruments = 261                     Obs per group: min =         1
F(56, 274)    =  31947.56                                      avg =     11.20
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK27_28 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK27_28 |
         L1. |   .6156951   .0346482    17.77   0.000     .5474845    .6839057
     dueuro1 |   .1006812   .0261019     3.86   0.000     .0492954     .152067
     lReR    |  -.0303704   .0121382    -2.50   0.013    -.0542665   -.0064744
        dueu |  -.0474396   .0322355    -1.47   0.142    -.1109004    .0160212
        vol1 |  -.1294368   .0749084    -1.73   0.085     -.276906    .0180323
       ldist |   -.480879   .0623193    -7.72   0.000    -.6035644   -.3581935
 SumVA27_28  |   .2355991   .0974429     2.42   0.016     .0437671     .427431
      Alpha_i      yes
      Beta_j       yes
      Tau          yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.52  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.41  Pr > z =  0.681
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(205)  = 231.04  Prob > chi2 =  0.102

Long term coefficient test
HO=0   _b[dueuro1]/(1-_b[l.lexpK27_28]) = 0

             F(1, 274) =       16.21
              Prob > F =        0.0001
```

```
Sector 27
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      2030
Time variable : time                             Number of groups   =       209
Number of instruments = 182                      Obs per group: min =         1
F(52, 209)    =  29681.60                                       avg =      9.71
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK27 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK27 |
         L1. |     .68368   .0510577    13.39   0.000      .583026    .7843341
     dueuro1 |    .125477   .0380887     3.29   0.001     .0503897    .2005642
     lReR    |  -.0236101   .0194131    -1.22   0.225    -.0618806    .0146605
        dueu |  -.0735556    .044245    -1.66   0.098    -.1607794    .0136681
        vol1 |  -.1183105   .1438297    -0.82   0.412    -.4018535    .1652325
       ldist |  -.4202317    .085183    -4.93   0.000    -.5881598   -.2523037
    SumVA27  |   .0375431   .1294672     0.29   0.772    -.2176859    .2927721
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.18  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.70  Pr > z =  0.481
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(130)  = 156.85  Prob > chi2 =  0.054

Long term coefficient test
HO=0   _b[dueuro1]/(1-_b[l.lexpK27) = 0

              F(1, 209) =       14.17
              Prob > F =        0.0002
```

```
Sector 28
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      1817
Time variable : time                             Number of groups   =       188
Number of instruments = 181                      Obs per group: min =         2
F(51, 188)    =     22.50                                       avg =      9.66
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK28 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK28 |
         L1. |   .6558707   .0410819    15.96   0.000     .5748299    .7369115
     dueuro1 |   .0044494   .0323935     0.14   0.891    -.0594521    .0683509
     lReR    |  -.0290627   .0162664    -1.79   0.076    -.0611508    .0030253
        dueu |  -.0745092   .0438173    -1.70   0.091    -.1609458    .0119275
        vol1 |  -.1288926   .0897374    -1.44   0.153    -.3059142    .0481289
       ldist |  -.5201272   .0700999    -7.42   0.000    -.6584106   -.3818438
    SumVA28  |   .2630043   .1074418     2.45   0.015      .051058    .4749507
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.20  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.86  Pr > z =  0.063
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(130)  = 145.20  Prob > chi2 =  0.171
```

```
Sector 29_33
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      2380
Time variable : time                             Number of groups   =       217
Number of instruments = 213                      Obs per group: min =         2
F(53, 217)    =     37.10                                       avg =     10.97
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK29_33 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK29_33 |
         L1. |   .7510274   .0511791    14.67   0.000     .6501556    .8518993
     dueuro1 |   .0646547    .024391     2.65   0.009     .0165811    .1127284
     lReR    |  -.0090007   .0136778    -0.66   0.511    -.0359589    .0179576
        dueu |   .0343121   .0279728     1.23   0.221     -.020821    .0894452
        vol1 |  -.1802077   .1039693    -1.73   0.084    -.3851267    .0247113
       ldist |  -.2438779   .0545396    -4.47   0.000    -.3513731   -.1363828
 SumVA29_33  |  -.0191589   .0731282    -0.26   0.794    -.1632914    .1249736
      Alpha_i       yes
      Beta_j        yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.07  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.24  Pr > z =  0.216
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(160)  = 189.59  Prob > chi2 =  0.055

Long term coefficient test
HO=0   _b[dueuro1]/(1-_b[l.lexpK29_33]) = 0

             F(1, 217) =        7.00
              Prob > F =        0.0087
```

```
Sector 29
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      2112
Time variable : time                             Number of groups   =       207
Number of instruments = 182                      Obs per group: min =         1
F(52, 207)    =  54864.85                                       avg =     10.20
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK29 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK29 |
         L1. |   .6313032   .0655331     9.63   0.000     .5021053     .760501
     dueuro1 |   .0504315   .0249699     2.02   0.045     .0012036    .0996593
     lReR    |  -.0091948    .013626    -0.67   0.501    -.0360584    .0176687
        dueu |   .0196003   .0352304     0.56   0.579    -.0498561    .0890567
        vol1 |  -.1400555    .103633    -1.35   0.178    -.3443671     .064256
       ldist |  -.3267604   .0673357    -4.85   0.000    -.4595122   -.1940087
    SumVA29  |  -.0344603    .058441    -0.59   0.556    -.1496762    .0807555
      Alpha_i       yes
      Beta_j        yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.47  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.99  Pr > z =  0.320
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(130)  = 155.18  Prob > chi2 =  0.065

Long term coefficient test
HO=0   _b[dueuro1]/(1-_b[l.lexpK29]) = 0

             F(1, 207) =        4.45
              Prob > F =        0.0361
```

```
Sector 30_33
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      2464
Time variable : time                             Number of groups   =       237
Number of instruments = 214                      Obs per group: min =         1
F(54, 237)    = 186773.96                                       avg =     10.40
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK30_33 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK30_33 |
         L1. |   .8215978    .043725    18.79   0.000     .7354586    .9077371
     dueuro1 |     .06512   .0333801     1.95   0.052    -.0006397    .1308796
     lReR    |  -.0170943   .0167609    -1.02   0.309    -.0501136    .0159251
        dueu |   .0488899   .0295643     1.65   0.100    -.0093525    .1071323
        vol1 |  -.2301283   .1355764    -1.70   0.091    -.4972171    .0369604
       ldist |  -.1271703   .0356581    -3.57   0.000    -.1974177   -.0569229
 SumVA30_33  |   .0915951   .0547484     1.67   0.096    -.0162606    .1994507
      Alphai       yes
      Betaj        yes
      Tau           yes
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -4.76  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.56  Pr > z =  0.575
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(160)  = 188.42  Prob > chi2 =  0.062

Long term coefficient test
H0=0  _b[dueuro1]/(1-_b[l.lexpK30_33]) = 0

             F(1, 237) =        3.06
              Prob > F =        0.0817
```

```
Sector 30
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      1609
Time variable : time                             Number of groups   =       171
Number of instruments = 180                      Obs per group: min =         1
F(50, 171)    =   9804.34                                       avg =      9.41
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK30 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK30 |
         L1. |   .5305189   .0518867    10.22   0.000     .4280979    .6329399
     dueuro1 |   .0720323   .0893788     0.81   0.421    -.1043955    .2484602
     lReR    |   -.056345   .0361858    -1.56   0.121    -.1277733    .0150834
        dueu |  -.2187553   .1144652    -1.91   0.058     -.444702    .0071915
        vol1 |  -.4284383   .3556736    -1.20   0.230    -1.130514    .2736379
       ldist |   -.584569   .1006077    -5.81   0.000    -.7831619   -.3859762
    SumVA30 |  -.0464147   .0754541    -0.62   0.539    -.1953562    .1025267
      Alphai       yes
      Betaj        yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -6.08  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.97  Pr > z =  0.334
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(130)  = 148.69  Prob > chi2 =  0.125
```

Sector 31

Group variable: cod	Number of obs = 1474
Time variable : time	Number of groups = 154
Number of instruments = 146	Obs per group: min = 2
F(49, 154) = 24.21	avg = 9.57
Prob > F = 0.000	max = 15

lexpK31	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lexpK31						
L1.	.6946685	.0540753	12.85	0.000	.5878434	.8014937
dueuro1	-.0140863	.0414821	-0.34	0.735	-.0960338	.0678611
lReR	-.0036826	.0193921	-0.19	0.850	-.0419914	.0346262
dueu	-.0692766	.0518076	-1.34	0.183	-.1716218	.0330687
vol1	-.0490607	.1397013	-0.35	0.726	-.3250389	.2269175
ldist	-.3526119	.0759278	-4.64	0.000	-.5026063	-.2026174
SumVA31	-.0152775	.0283369	-0.54	0.591	-.0712566	.0407017
$Alpha_i$	yes					
$Beta_j$	yes					
Tau	yes					

Arellano-Bond test for AR(1) in first differences: z = -4.40 Pr > z = 0.000
Arellano-Bond test for AR(2) in first differences: z = -1.21 Pr > z = 0.226

Hansen test of overid. restrictions: chi2(97) = 117.07 Prob > chi2 = 0.081

Sector 32

Group variable: cod	Number of obs = 1439
Time variable : time	Number of groups = 154
Number of instruments = 155	Obs per group: min = 1
F(49, 154) = 11.01	avg = 9.34
Prob > F = 0.000	max = 15

lexpK32	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lexpK32						
L1.	.5966956	.0948279	6.29	0.000	.4093642	.7840271
dueuro1	.1260603	.0625482	2.02	0.046	.002497	.2496235
lReR	-.0909561	.0487196	-1.87	0.064	-.187201	.0052888
dueu	.0034404	.0698523	0.05	0.961	-.1345521	.1414328
vol1	-.54402	.4324872	-1.26	0.210	-1.398393	.3103533
ldist	-.367733	.1077239	-3.41	0.001	-.5805403	-.1549258
SumVA32	.0126648	.0729462	0.17	0.862	-.1314396	.1567692
$Alpha_i$	yes					
$Beta_j$	yes					
Tau	yes					

Arellano-Bond test for AR(1) in first differences: z = -4.28 Pr > z = 0.000
Arellano-Bond test for AR(2) in first differences: z = 0.01 Pr > z = 0.994

Hansen test of overid. restrictions: chi2(106) = 115.77 Prob > chi2 = 0.243

Long term coefficient test

H0=0 _b[dueuro1]/(1-_b[l.lexpK32]) = 0

F(1, 154) = 3.45
Prob > F = 0.0650

```
Sector 33
------------------------------------------------------------------------------
Group variable: cod                             Number of obs      =      1392
Time variable : time                            Number of groups   =       151
Number of instruments = 142                     Obs per group: min =         1
F(48, 151)    =     13.95                                      avg =      9.22
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK33 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK33 |
         L1. |   .6762842   .0888622     7.61   0.000     .5007104    .8518581
     dueuro1 |   .0895122   .0331847     2.70   0.008     .0239458    .1550786
     lReR    |  -.0289514   .0178063    -1.63   0.106     -.064133    .0062303
        dueu |  -.0842498   .0432072    -1.95   0.053    -.1696185     .001119
        vol1 |  -.4682037   .2077993    -2.25   0.026    -.8787734    -.057634
       ldist |   -.338158   .1052902    -3.21   0.002    -.5461902   -.1301259
    SumVA33  |  -.1183421   .0956299    -1.24   0.218    -.3072876    .0706033
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.39  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =  -0.39  Pr > z =  0.696
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(94)   = 107.74  Prob > chi2 =  0.157

Long term coefficient test
  H0=0 _b[dueuro1]/(1-_b[l.lexpK33]) = 0

             F(1, 151) =        5.82
              Prob > F =        0.0170
```

```
Sector 34_35
------------------------------------------------------------------------------
Group variable: cod                             Number of obs      =      1800
Time variable : time                            Number of groups   =       177
Number of instruments = 147                     Obs per group: min =         2
F(50, 177)    =      9.72                                      avg =     10.17
Prob > F      =     0.000                                      max =        15
------------------------------------------------------------------------------
             |               Robust
  lexpK34_35 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  lexpK34_35 |
         L1. |   .5474853   .1096152     4.99   0.000     .3311644    .7638062
     dueuro1 |    .134133   .0589983     2.27   0.024     .0177025    .2505636
     lReR    |  -.0325592   .0280624    -1.16   0.248    -.0879392    .0228209
        dueu |  -.0881853   .0880208    -1.00   0.318    -.2618906    .0855201
        vol1 |  -.4426145    .218748    -2.02   0.045    -.8743044   -.0109247
       ldist |  -.4866773   .1392186    -3.50   0.001    -.7614193   -.2119354
 SumVA34_35  |   .1264526   .1440875     0.88   0.381    -.1578979    .4108031
      Alpha_i      yes
      Beta_j       yes
      Tau           yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.42  Pr > z =  0.001
Arellano-Bond test for AR(2) in first differences: z =  -0.27  Pr > z =  0.789
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   = 112.34  Prob > chi2 =  0.137

Long term coefficent test
H0=0  _b[dueuro1]/(1-_b[l.lexpK34_35]) = 0

             F(1, 177) =        4.70
              Prob > F =        0.0315
```

```
Sector 34
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      1943
Time variable : time                             Number of groups   =       192
Number of instruments = 149                      Obs per group: min =         1
F(52, 192)    = 111346.37                                       avg =     10.12
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK34 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK34 |
         L1. |   .7130738   .0668753    10.66   0.000     .5811692    .8449784
     dueuro1 |   .0911124   .0448035     2.03   0.043      .002742    .1794828
     lReR    |  -.0500458   .0208456    -2.40   0.017    -.0911615   -.0089301
        dueu |  -.0722063   .0572658    -1.26   0.209    -.1851571    .0407446
        vol1 |  -.5440304   .2225059    -2.45   0.015    -.9829003   -.1051605
       ldist |  -.3752151   .0909736    -4.12   0.000    -.5546512   -.1957791
    SumVA34  |   .0011346   .1126137     0.01   0.992    -.2209842    .2232534
      Alpha_i      yes
      Beta_j       yes
      Tau          yes

------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.13  Pr > z =  0.002
Arellano-Bond test for AR(2) in first differences: z =   1.17  Pr > z =  0.242
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   = 116.86  Prob > chi2 =  0.083


Long term coefficent tesr
 H0=0  _b[dueuro1]/(1-_b[l.lexpK34]) = 0

             F(1, 192) =        4.85
              Prob > F =        0.0288
```

```
Sector 35
------------------------------------------------------------------------------
Group variable: cod                              Number of obs      =      1782
Time variable : time                             Number of groups   =       180
Number of instruments = 148                      Obs per group: min =         1
F(51, 180)    =      8.19                                       avg =      9.90
Prob > F      =     0.000                                       max =        15
------------------------------------------------------------------------------
             |               Robust
     lexpK35 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lexpK35 |
         L1. |   .3655726   .0764875     4.78   0.000     .2146452    .5165001
     dueuro1 |  -.0132823   .1242853    -0.11   0.915    -.2585258    .2319613
     lReR    |     -.1139   .0622594    -1.83   0.069     -.236752    .0089521
        dueu |   -.371509   .1922578    -1.93   0.055     -.750878      .00786
        vol1 |  -.5353148   .4483392    -1.19   0.234    -1.419992    .3493619
       ldist |  -.7669301    .141905    -5.40   0.000    -1.046941   -.4869188
    SumVA35  |   .3906799   .1561207     2.50   0.013     .0826178    .6987421
      Alpha_i      yes
      Beta_j       yes
      Tau          yes
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -5.40  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.33  Pr > z =  0.742
------------------------------------------------------------------------------
Hansen test of overid. restrictions: chi2(97)   =  88.67  Prob > chi2 =  0.715
```

Sector 36_37

Group variable: cod		Number of obs	= 1930
Time variable : time		Number of groups	= 200
Number of instruments = 149		Obs per group: min	= 1
F(52, 200)	= 20497.90	avg	= 9.65
Prob > F	= 0.000	max	= 15

lexpK36_37	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
lexpK36_37						
L1.	.6208955	.0642725	9.66	0.000	.4941568	.7476342
dueuro1	-.0423854	.0384104	-1.10	0.271	-.1181266	.0333559
lReR	-.0535295	.0206432	-2.59	0.010	-.0942357	-.0128232
dueu	-.0958173	.0577432	-1.66	0.099	-.2096809	.0180464
vol1	-.1819876	.1640435	-1.11	0.269	-.5054644	.1414891
ldist	-.5636127	.1043495	-5.40	0.000	-.7693792	-.3578462
SumVA36_37	.0038612	.0134958	0.29	0.775	-.0227512	.0304735
$Alpha_i$	yes					
$Beta_j$	yes					
Tau	yes					

Arellano-Bond test for AR(1) in first differences: z = -5.83 Pr > z = 0.000
Arellano-Bond test for AR(2) in first differences: z = -1.93 Pr > z = 0.054

Hansen test of overid. restrictions: chi2(97) = 111.98 Prob > chi2 = 0.142

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