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" On the Dynamics of Exports and FDI: The Spanish Internationalization Process"

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Abstract

This paper provides further insights into the dynamics of exports and outward foreign direct investment (FDI) flows in Spain from a time-series approach. The contribution of the paper is twofold: i) the existence of either substitution or a complementary relationship between Spanish outward investments and exports is empirically tested using a multivariate cointegrated model (VECM). The evolution in exchange flows (1993-2008) and country-specific variables (such as world demand - including Spain's main recently growing foreign markets - for trade flows and the relative price of exports in order to proxy new global competitors) are taken into account for the first time. And ii) the growth in the trade of services in recent decades leads us to test a specific causality relationship by disaggregating between goods and services flows. Our results provide evidence of a positive (Granger) causality relationship running from FDI to exports of goods (stronger) and to exports of services (weaker) in the long run, the complementarity relation of which is consistent with vertical FDI strategies. In the short run, however, only exports of goods are affected (positively) by FDIs.

JEL classification:. F21, F40
Keywords**:** Foreign Direct Investment, Exports, Granger-Causality.

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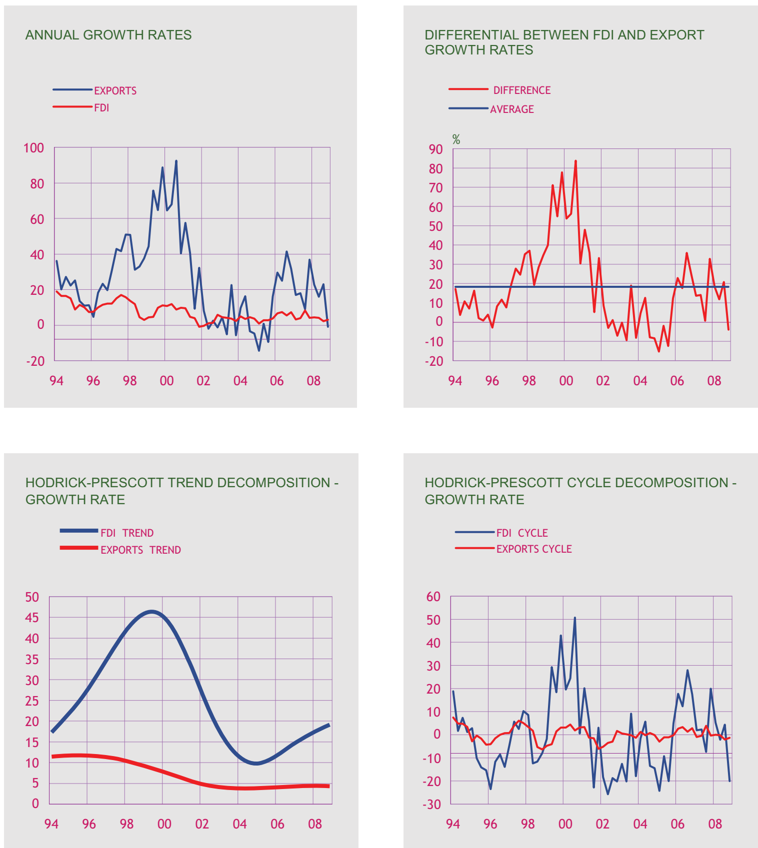
1. Introduction

In recent years more and more companies have started to trade on international markets [1]. At the same time, the internationalization of developed economies has taken a new direction through outward foreign direct investment (FDI)[2]. This dramatic increase in the exchange of goods and services – within a progressive liberalization of international economic relations – has generated considerable interest in the dynamics of trade and investments. In particular, FDI has grown at a remarkable rate since 1980. This surge has occurred worldwide, but it has been especially dramatic in Spain. The country's outward FDI flows have, in fact, recently outpaced world FDI transactions, most notably in the second half of the nineties when Spanish firms began to internationalize[3].

SPANISH EXPORTS AND OUTWARD FOREIGN INVESTMENT BUSINESS CYCLES CHART 1



SOURCE: Bank of Spain .

Initially a net importer, Spain's outflows have steadily increased and become more active, so that now the country is a net capital exporter. According to Bank of Spain data, over the last few years Spanish exports have increased at an average annual rate of 7.3 per cent, whereas outward FDI has grown by 25.6 per cent (See Chart 1). Indeed,

[1] See Helpman (2006) for a comprehensive survey of the trade and FDI literature.
[2] See Graham & Krugman (1993) and Markusen & Venables (1998).
[3] See Gordo, Martin & Tello (2008).

between 1993 and 2008 Spanish FDI outflows recorded higher growth rates than its exports of goods and services. This raises the question as to the extent to which such a trend might have negative impacts on domestic activity and employment. Thus, focusing on whether these foreign investment flows represent a substitution or complement for exports (disaggregated in goods and services) might yield illuminating results.

Yet, although exports and outward foreign direct investment in Spain have experienced marked growth in recent years, extremely little work has been undertaken in the latest empirical FDI literature to test such linkages in Spain. Moreover, the internationalization of Spanish services (to the detriment of goods) has been steadily gaining ground during the last fifteen years, demanding that further light be shed on the nature and the character of these specific investment flows as well[4].

In this line, exports and outward FDI have usually been treated theoretically as alternative modes of supplying foreign markets, with FDI representing a substitute for the home country's exports[5]. Conversely, international firms that seek better access to their potential market and who invest abroad can establish a complementary relationship with their exports[6]. Likewise, from a traditional understanding of foreign investments, trade in goods can be considered a perfect substitute[7], while FDI is considered in terms of capital mobility. In other words, if FDI entails moving production capacity and employment to other countries (for reasons of lower transport costs), outward FDI will probably be accompanied by lower export levels from the home to the host country[8]. Thus, an empirical study needs to examine the Spanish case since it is not possible to determine how these magnitudes might be related by simply examining the theoretical arguments.

Although previous findings in the empirical literature are not entirely contradictory, additional research is needed given the mixed nature of results. From an international perspective, Lipsey and Weiss (1981, 1984) described a positive causal relationship between trade flows and FDI disaggregated by industry. Blomström *et al.* (1988) showed a similar relationship for Sweden and the U.S., while Yamawaki (1991) focused solely on Japanese firms located in the U.S. Pfaffermayer (1994, 1996) reported similar evidence for Austrian manufacturing exports, while Barrel and Pain (1997) examined a wider range of European countries. For the Spanish case, Bajo-Rubio & López-Pueyo (1998) studied the relationship in manufacturing sectors and Dritsaki *et al.* (2004) provided evidence of the causal relationship for Greece. By contrast, Svensson (1996) reported a predominantly negative relationship between the foreign production of Swedish firms and the home country's exports.

[4] See Cuadrado-Roura & Visitin (2008) for more details on the Spanish internationalisation of services through investment procedures.
[5] In this case, FDI might have no beneficial effects on domestic employment and production. FDI is said to be a substitute (complement) for exports since an exogenous increase in FDI produces a decrease (increase) in exports from this country.
[6] In this case, FDI might improve the production capacity and might lead to the generation of employment in the domestic country.
[7] Even in models of perfect competition there is no room for multi-plant production, whether vertical or horizontal.
[8] For more details see Alguacil & Orts (2002).

Contrary to recent trends in international applied research, few empirical studies have examined Spanish FDI outflows and exports from an aggregate perspective. The few exceptions are Caballero *et al.* (1989), Doménech & Taguas (1997), Alguacil & Orts (1998, 2002) and Bajo-Rubio & Montero-Muñoz (1999). The first and third studies report evidence of a substitution relationship between outward FDI and exports in Spain, while the others found evidence of a positive relationship[9]. However, none of them takes into account the recent evolution in Spain's international exchange flows, considers country-specific variables or distinguishes between goods and services. Hence, there is no categorical econometric evidence regarding the causal relationship between FDI and exports in Spain[10]. Furthermore, the differences in data and methodology make it difficult to compare these results directly and, even at a more aggregate level, the differences remain[11]. One exception, however, is the recent descriptive study by Martin & Rodriguez (2009) using discrete choice data for Spanish firms. They report higher levels of exports among Spain's national firms that also invest abroad but further insights remain to be tested within an econometrics framework.

This paper aims to fill this gap by investigating the dynamic relationship between Spain's outward FDI and exports (in real terms) for the period 1993.I-2008.IV. A substitution or complementary relationship is empirically tested by applying a multivariate cointegrated model. In this sense, a Vector Error Correction Model (VECM) has been estimated for the first time taking into account country-specific variables such as world demand (including Spain's most recent and main foreign markets) in order to proxy trade flows, and price-competitive variables in order to capture the effect of new global competitors.

The empirical results provide evidence that in addition to the absence of a short-run relationship for services (though not for goods), there exists a positive long-run causal relationship between FDI and exports for both services and goods. The velocity of adjustment to the equilibrium is slower for services than goods and the former behave with much less sensitivity to domestic income changes (contrary to flows of goods, whose behaviour is more closely in line with findings in the literature).

The remainder of the paper is organised as follows. Section 2 reviews the relevant theoretical literature emphasizing those approaches that consider causal relationships in trade and FDI. Section 3 discusses the empirical model and the variables employed, while section 4 outlines the estimation method. Section 5 describes the data and provides a brief overview of the Spanish export and FDI cycles. Section 6 highlights the main empirical results and section 7 concludes.

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[9] See Alguacil, Bajo, Montero & Orts (1999) for a compilation of their respective findings.
[10] Applying a cointegration model García, Gordo & Martínez-Martín (2008) and García, Gordo, Martínez-Martín & Tello (2009) find no empirical relationship between exports of goods and foreign direct investment.
[11] A detailed discussion can be found in Blomström & Kikko (1994).

2. Theoretical Issues

Several related studies consider foreign direct investment (FDI) as a key element in the internationalization strategy of Multinational Enterprises (MNEs). However, the relationship between exports and investment flows remains unclear.

On the exports side, the relationship is quite ambiguous: firstly, investments abroad may represent a means of directly accessing markets previously supplied by exports, and this may have a negative impact on the latter. However, it is equally possible that MNEs invest in those markets that offer them cost or location advantages, in an attempt to use them as export-platforms to third countries[12]. In this case, exports and foreign investment undoubtedly present a positive relation.

From a traditional perspective, the relationship between exports and foreign direct investment has been questioned. Foreign investment and trade in goods and services are considered perfect substitutes[13], while FDI is considered in terms of capital factor mobility. In this sense, factor mobility, induced by differences in factor prices between regions, would eliminate price differentials in both goods and factor markets, thus removing the basis for trade. In turn, these trade impediments would enhance factor movements and so, conversely, exports and FDI would represent alternative ways of becoming involved in foreign markets. However, this result is clearly highly dependent on the specific assumptions that are made (Schmitz & Helmberger, 1970). Thus, according to the literature, foreign investment represents the international activity of multinational firms. Such investment, in addition to the location advantages stressed in the traditional approach, tends to be relevant in industries characterised by scale economies and/or imperfect competition. From this perspective, international investment flows might also be seen as a way of expanding a domestic firm's control over other markets, improving access and enhancing their sales facilities. Consequently, outward FDI may eventually result in a higher level of exports from the home to the host country.

In recent years more and more companies have started to trade on international markets. In so doing, they can choose between two main strategies for serving foreign markets and participating in the global economy. The most traditional mode is to ship (export) their production to foreign markets; the other strategy is to engage in horizontal FDI and to duplicate an existing production facility in a foreign country and, thus, serve foreign demand locally.

Earlier research has found some evidence for a substitution relationship, although equally evidence has been presented in support of a complementary relationship between exports and foreign production[14]. Brainard (1997) analyses the location decision of multinational companies by examining the trade-off between proximity to customers and the concentration of their production stages in achieving scale

[12] As has recently been demonstrated in an empirical analysis by Martínez-Martín, J. (2009) based on a model of third-country effects for the Spanish case.
[13] The traditional trend (Mundell, 1957), in the context of the two-good, two-factor, two-country Heckscher-Ohlin trade model, was that the respective movements of goods and factors were substitutes.
[14] Head & Ries (2004) summarize earlier research and provide arguments for both possible relationships.

economies. This resulted in the application of a knowledge-capital model as analyzed by Markusen & Venables (2000) and Markusen (2002). Recent research has tended to focus on productivity differences as determinants of preferred strategies, in models that incorporate heterogeneous firms. More productive firms prefer to implement FDI strategies to serve their foreign markets, while the less productive firms prefer to trade their goods[15]. In such models this decision is also explained in terms of the trade-off between fixed plant set-up costs and variable transportation costs, the latter including trade costs. The FDI (export) strategy generates higher (lower) fixed costs, but lower (higher) variable costs.

Helpman *et al.* (2004) stress that only the most productive firms can afford the additional fixed costs from duplicating a plant and can benefit from a reduction in their variable costs. By contrast, less productive firms have to rely on export strategies and accept the higher variable costs associated with the need to trade. Thus, they propose that more productive companies will tend to substitute their exports with FDI.

It is clear, therefore, that the decision to undertake an FDI project is by no means straightforward and that economic theory needs to link all concepts associated with firm and country consistently. The knowledge-capital model of FDI, which has become the "workhorse" of MNE theory, represents such an attempt, particularly as regards its formulation of the FDI location decision.

The first attempt to tackle the question was made by Markusen (1984) and Helpman (1984). MNE general equilibrium theory has suggested two very distinct reasons underlying the decision to engage in FDI: either to access markets in the face of trade frictions (*Horizontal FDI*) or to access low wages (or lower factor endowment costs) for part of the production process (*Vertical FDI*). More recently, a number of papers have begun to describe more complicated patterns of FDI. For instance, a logical possibility is *export platform FDI* (Ekholm, Forslid & Markusen, 2003, and Bergstrand & Egger, 2004) where an MNE places FDI in a host country to serve as a production platform for exports to a group of (neighbouring) host countries.

Thus, this paper seeks to examine the decision taken by firms as to how to serve foreign markets. As discussed above, distant markets, with their higher transportation costs, may be served by subsidiaries abroad, while closer markets are perhaps best served by exports. Theoretically, outward FDI and exports may act as substitutes or complements of each other, but while the interdependence of both modes has been widely discussed in trade literature, no conclusions can be drawn regarding the relationship by relying solely on theoretical arguments. Therefore, an empirical estimation using a VECM in a cointegrated framework seeks to shed some light on this matter.

[15] See Melitz (2003) and Helpman, Melitz & Yeaple (2004).

3. Empirical Model

In order to determine whether FDI may be seen as a substitute or complement of exports, we adopt Sims (1980) approach and formulate a vector autoregressive (VAR) system[16]. However, we face two problems in analysing this causal relationship: first, the selection of the optimal lag length for the vector autoregressive VAR model; and, second, the identification of the long-term relationships between the variables considered in the system.

In the case of the optimal lag length, two opposing views have been expressed. On the one hand, an over-parameterised model results in insignificant and inefficient parameters[17]. Yet, at the same time, it is well known that a shorter lag length might produce serially correlated errors. To tackle this issue, the lag structure is determined by using Perron & Qu's modified information criterion for cointegration tests based on a VAR approximation[18].

In line with the related empirical literature, the coherence of the VARs was duly considered once the optimum lag length had been selected for both models (i.e. goods and services)[19]. Thus, the next step involves testing the multivariate cointegration of the variables included in the model using Johansen's (1987) and Johansen and Joselius's (1992) techniques.

Likewise, in addition to short- and long-run causality testing using the traditional Wald *t*-test, the impulse response analysis described by Sims (1988) was employed. In addition to this variance decomposition, the impulse response function plots completed the causal analysis between outward FDI and exports herein.

In order to test the recent relationship between foreign investment and exports, aggregate data for both series from the Spanish economy are employed, in real terms, covering the period 1993.I-2008.IV[20]. There are three main determinants associated with the two exchange flows: i) a proxy for foreign demand (wd) related to the level of income in the importing region; ii) the relative prices (compet); and, iii) the domestic pressure of demand proxied by the Gross Value Added (vab). See section (5) for an exhaustive explanation of how the variables were constructed.

The importance of all the variables in relation to exports has been broadly dealt with in trade literature[21]. However, in order to proxy world income as a determinant variable, country-specific series for Spain were included in the dynamic model (*wd*). Recent global competitors for Spain's exchange flows (including China and India) played their

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[16] Its main advantage is that initially all the variables are considered endogenous so as to avoid restrictions caused by false identifications.
[17] For detailed guidelines see Canova (1995).
[18] For further econometric details see Qu & Perron (2007)
[19] For empirical results see section (6).
[20] Recall that the methodological shift in the preparation of the Spanish balance of payments from 1993 onwards yields a cut-of point that proves difficult to handle from a time-series approach, hindering the joint analysis of trade and capital movements data before and after 1992.
[21] See, for instance, Goldstein and Kahn's (1985) seminal paper.

role in the weighted growth of Spain's export market variable. In this setting, the relative prices of Spanish exports might govern the empirical study of just how much the competitiveness of Spanish goods and services has varied over time (*compet*). The variable is based on the ratio of Spanish prices to those of the weighted countries (competitors), all of them adjusted by the nominal effective exchange rate. In order to proxy home country demand the Gross Value Added of the Spanish economy was used for (*vab*).

The expected effect of an eventual depreciation in the real relative price (*compet*) might generate an advantage for goods and services produced at home. Likewise, it is also expected that a growth in world income (*wd*) would lead to a greater level of domestic sales being made to these foreign host countries. By contrast, a rise in the country's own demand would probably have a negative impact on exports, given the existence of an anti-cyclical component. However, the influence of all these variables on FDI appears to be slightly less obvious.

In line with theoretical arguments, a five-variable vector autoregressive model is estimated by including relevant variables such as outward foreign direct investment (*fdi*), exports (*exp*), domestic income (*vab*), world demand (*wd*) and competitiveness (*compet*), all expressed in natural logs (See Model [1]). At first all variables are symmetrically and endogenously considered[22]:

Vector Autoregressive Model

$$\begin{bmatrix} fdi_t \\ \exp_t \\ vab \\ wd_t \\ compet_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} fdi_{t-1} \\ \exp_{t-1} \\ vab_{t-1} \\ wd_{t-1} \\ compet_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} fdi_{t-2} \\ \exp_{t-2} \\ vab_{t-2} \\ wd_{t-2} \\ compet_{t-2} \end{bmatrix} + \ldots + A_s \begin{bmatrix} fdi_{t-s} \\ \exp_{t-s} \\ vab_{t-s} \\ wd_{t-s} \\ compet_{t-s} \end{bmatrix} + \mu_t \quad (1)$$

Thus, before identifying any long-term relation, it is necessary to verify that all variables are integrated of order one in levels[23]. For this purpose, several tests for unit roots were run, including Augmented Dickey Fuller - ADF (1979, 1981), Phillips and Perron - PP (1988), and Ng and Perron (2001). One advantage of the PP test over the ADF test is that the former is robust to general forms of heteroskedasticity in the error term μ_t. However, the more recent Ng and Perron (2001) test yields higher levels of statistical power. Taking this collective view of the stationary results, greater reliance can be placed on the M statistics from the Ng and Perron test results.

Having examined the stationary results of each time series[24], the next step is to determine whether a cointegration relationship exists between the variables under

[22] All series are quarterly levels and seasonally adjusted.
[23] Given that this is a necessary, although not a sufficient, condition for cointegration. In some cases, such cointegration may exist with other values of "d".
[24] See section (6) for empirical results.

examination. For the sake of simplicity, this step investigates whether the stochastic trend in the examined variables, which contain unit roots, have a long term relationship.

Under such a setting all variables have a unit root and the same order of integration, and then the likelihood ratio test is used to find out the number of cointegrating vectors. Therefore, if there is one, or more than one, cointegrating vector, the long-run combination among the variables might be found, even though they may drift apart in the short run.

The results of Johansen's maximum eigenvalue test (λ_{max}) and trace test (λ_{trace}) for the presence of long-term relationships are reported in section (6). No linear trend, a linear trend and a quadratic trend inclusion options were tested in levels. Hence, the potential presence of cointegrating vectors may imply that there exists a significant cointegrating relationship connecting all the variables and we may conclude that there is a long-run relationship among the variables being studied.

Consequently, and following the Granger Representation Theorem, an error correction mechanism (ECM) is added to each equation of the first differentiated VAR model so that it will be possible, in what follows, to separate the long-run relationship between the economic variables from their short-run responses[25].

The cointegration between two or more variables is sufficient to demonstrate the presence of causality in at least one direction (Granger, 1986). Thus, having ensured the stationarity and the cointegrating vector of the series embodied in the dynamic model, Granger causality will require the inclusion of an ECM in the stationary model to capture the short-run deviation of series from their long-run equilibrium path. By using the VECM two sources of causality can be detected: first, the traditional channel of causality through the F-statistics of the lagged explanatory variables which demonstrates short term causal effects; and, second, an additional channel is implied through the significance of the lagged error correction term which represents the long-run causality. Interpretation of the cointegration vector coefficient may yield evidence on the long-run relationship between exports and FDI. In this sense, the application of a VECM allows us not only to test such a significant relationship, but also to identify the direction of the causality, as well as distinguishing between the short-run and the long-run Granger causality discussed above.

[25] With cointegrated series or order one, an ECM has to be included in the differentiated model in order to capture the equilibrium relationship between the cointegrated variables in their dynamic behaviour, according to the Granger Representation Theorem.

4. Estimation of Vector Error Correction Model

In spite of the fact that the cointegration analysis demonstrates that all five variables are tied together by a long-run equilibrium relationship, it tells us nothing about the direction of the Granger causality. This information can be obtained however by analysing the results from a VECM estimation.

The non-stationarity in levels of the embodied series means we need to keep the system estimation within a cointegrated framework - a methodology based on the existence or otherwise of a long-run relationship between the dependent and the independent variables. The construction of an error correction mechanism, whereby short- and long-run dynamics are compiled in a single equation, is statistically unavoidable.

Likewise, in determining the order of the VAR model, a system with a lag-length of five and six for services and goods, i.e. a VAR (5) and a VAR (6), respectively, were opted for by means of Perron & Qu (2007) tests.

Taking this as our point of departure, and based on the recently obtained VECM estimations, we sought to test claims of a negative causal relationship. This would provide evidence consistent with the presence of outward foreign investment flows generated primarily by *horizontal* expansion FDI strategies. A positive causal relationship, by contrast, would provide evidence of location decisions motivated by patterns of *vertical* integration.

Following Johansen's (1988) and Johansen and Joselius's (1992) seminal papers, and according to the results previously obtained in from the model selection and cointegration analyses, the corresponding VECM can be written as follows:

$$\Delta fdi_t = \alpha_{10} + \sum_{s=1}^{5}\alpha_{11}(s)\Delta fdi_{t-s} + \sum_{s=1}^{5}\alpha_{12}(s)\Delta \exp_{t-s} + \sum_{s=1}^{5}\alpha_{13}(s)\Delta vab_{t-s} + \sum_{s=0}^{5}\alpha_{14}(s)\Delta wd_{t-s} + \sum_{s=0}^{5}\alpha_{15}(\alpha)\Delta compet_{t-s} + \gamma_1 ECM_{t-1} + \varepsilon_{1t}$$

$$\Delta \exp_t = \alpha_{20} + \sum_{s=1}^{5}\alpha_{21}(s)\Delta fdi_{t-s} + \sum_{s=1}^{5}\alpha_{22}(s)\Delta \exp_{t-s} + \sum_{s=1}^{5}\alpha_{23}(s)\Delta vab_{t-s} + \sum_{s=0}^{5}\alpha_{24}(s)\Delta wd_{t-s} + \sum_{s=0}^{5}\alpha_{25}(\alpha)\Delta compet_{t-s} + \gamma_2 ECM_{t-1} + \varepsilon_{2t}$$

$$\Delta vab_t = \alpha_{30} + \sum_{s=1}^{5}\alpha_{31}(s)\Delta fdi_{t-s} + \sum_{s=1}^{5}\alpha_{32}(s)\Delta \exp_{t-s} + \sum_{s=1}^{5}\alpha_{33}(s)\Delta vab_{t-s} + \sum_{s=0}^{5}\alpha_{34}(s)\Delta wd_{t-s} + \sum_{s=0}^{5}\alpha_{35}(\alpha)\Delta compet_{t-s} + \gamma_3 ECM_{t-1} + \varepsilon_{3t} \quad (2)$$

Where $\alpha_{i,j}, \gamma_i$ (i=1,2,3 and j=1,2,3,4,5) are all parameters and ε_i (i=1,2,3) are white noise disturbances. ECM_{t-1} is the error correction term generated from the cointegrated regression from the Johansen multivariable process. Δ denotes first differences required to induce stationarity for the corresponding variables and the estimated coefficients $\alpha_{i,j}$

(i=1,2,3 and j=1,2,3,4,5) indicate the short-run causal effects, shown by the F-test of the explanatory variables whereas the coefficient γ_i (i=1,2,3) measures the long-run causal relationship implied through the significance of the t-statistics. The relevant error correction term is to be included to avoid misspecification and omission of important constraints. The lag structure is determined by using Perron & Qu (2007) criteria.

5. Data

In this analysis, aggregated data of exchange flows are employed in real terms for the more recent period 1993.I to 2008.IV. The outward foreign direct investment (fdi_t) series was originally obtained from the Bank of Spain and represents the gross payment for Spanish investments abroad[26], net of disinvestment in real terms using the Spanish gross fixed capital formation (GFCF) deflator provided again by the Bank of Spain. Data regarding Spain's FDI are expressed in millions of euros as a stock variable. Since a proper disaggregation between goods and services has been obtained, the series for equal concepts from the *Registro de Inversiones Exteriores* (RIE) were employed to compute the percentage distribution between the two types of exchange flow. Once such weights had been obtained, the aggregated series was transformed into FDI in services and FDI in goods[27].

Spanish exports (exp_t) of goods and services are obtained from the Quarterly National Accounts (CNTR) base 2000 published by the *Instituto Nacional de Estadística* (INE).

The determinants embodied in the model are world demand (wd_t), relative prices ($compet_t$) and domestic pressure of demand (vab_t). For the Spanish exports of goods, for instance, the variable proxying foreign demand comprises the growth in Spain's exports markets, constructed from the sum of the growth in import volumes of goods and services for Spain's customers weighted by their participation in Spain's exports of goods. This series is computed as an index and is expressed in levels (base=100). The demand variable has been quantitatively computed as follows:

$$DEX_t = \sum_1^n \alpha_{it-1} MBS_{it}$$

Where α_{it-1} is the participation in year t-1 of country i in the value of Spain's exports. Thus, MBS_{it} becomes the growth in volume of imports of the goods and services in country i. The statistical sources used are, for the weighting scheme, the data base *Direction of Trade Statistics* (DOTS) from the IMF, and in the case of import volumes of goods and services the National Accounts from Eurostat, OECD and the IMF.

Additionally, the variable that captures the competitiveness of Spanish goods reflects the prices of Spanish outward exchange flows relative to the prices of Spain's competitors around the world, corrected by the exchange rate. The prices of Spain's competitors are computed by means of the prices of Spain's exports of goods charged to the main exporter countries, and weighted by their participation - corrected by third markets - in Spanish exports oriented to each region considered. Competitors' prices in national currency are converted to euros by means of the nominal effective exchange rate, constructed from the bilateral rates of each single currency to the euro, and weighted by its importance as mentioned above. The prices of Spanish exports and

[26] These data can be consulted at www.bde.es

[27] From the National Accounting Economic Activity (CNAE), activities from section 41 onwards were considered "services" flows, and "goods" otherwise.

those from the rest of the world are proxied by the units value index (IVUs) of exports of goods from the Spanish *Ministerio de Economía*.

The relative prices variable has been quantitatively computed as follows:

$$COMP_t = TCEN_t * \left[\frac{\frac{P0}{Pt}}{\prod_1^n \left[\frac{Pi0}{Pit} \right]^{wi}} \right]$$

$$TCEN_t = 100 * \left[\frac{ei0}{eit} \right]^{wi}$$

Where *wi* is the weight of currency *i* in year 2000, reflecting the participation of each country in Spain's exports as well as the degree of competitiveness in third countries; likewise, *ei0* and *eit* are the bilateral exchange rates of the euro over currency *i* for the base period and period *t*, respectively. *Pi* and *Pit* are the IVUs of exports of country *i* at base period and at *t*, respectively. As for the data sources, for Spain base 2000 IVUs is employed from the *Ministerio de Economía*. The IVUs for the other countries, as well as the series employed for the weighting scheme, are taken from the IMF. The exchange rates are published by the Bank of Spain.

The variable capturing exports of services is constructed as the sum of the real GDP growth presented by each of Spain's main customers, weighted by its relative importance in the country's exports of services. The variable has been quantitatively computed as follows:

$$DEXS_t = \sum_1^n \beta_i \, PIB_{it}$$

Where β_i is the participation of country *i* in the value of Spain's exports of services in the period 2003-2004 and PIB_{it} is the real GDP growth of country *i*. The statistical sources employed for the weighting scheme are OECD, while Eurostat, OECD and the IMF were consulted for the GDP series.

The variable proxying the relative prices of the exports of services is computed as the ratio between the prices of Spanish exports of services and their competitors' prices, obtained using a weighted geometric average of the prices fixed by the leading exporter countries (where the weighting scheme is based on the participation of each country in the world's exports of services). This is then converted to euros by means of a nominal effective exchange rate constructed by taking these weights into account[28]. The prices of Spanish exports of services are proxied by the deflator of exports of services published in the CNTR by the INE, while for all other countries the deflator of exports of goods and services are taken from Eurostat, OECD and the IMF.

[28] The weighting scheme is computed using data on exports of services disaggregated by UN member states.

The variable capturing domestic demand pressure in the Spanish case is the volume index of Spanish Gross Value Added (*vab*), obtained from the CNTR published by Spain's INE.

Finally, it should be mentioned that all quarterly series have eventually been seasonally adjusted. All computations taken with non-seasonally adjusted series provide similar, yet even weaker, results. The effects, therefore, on unit root tests and cointegration relationships are limited. Thus, the variables embodied in the model are expressed in natural logs[29].

EXCHANGE CYCLE DYNAMICS

From the beginning of the nineties to the present day, there has been a slightly positive, albeit clear, correlation between the growth rates in Spanish exports and the country's outward foreign investment flows. This evolution has been emphasized more recently according to the Hodrick-Prescott cyclical decomposition of the series reported in Graph 1.

First, the volatility of the FDI growth rate has been clearly greater than that of exports, while the latter's persistence has been less marked. Hence, the differential between the two variables presented a decreasing trend in periods of deceleration. See Table 1 (Business Cycle Dynamics).

Table 1. Busines Cycles Dynamics

Annual Growth Rates - FDI and FDI

	1993-2000		2001-2008		1993-2008	
	FDI	X	FDI	X	FDI	X
1 Volatility	5.47	0.17	2.95	0.05	5.64	0.23
2 Long Run Volatility	1.70	0.03	2.80	0.03	2.62	0.08
3 Persistence (2) / (1)	0.31	0.15	0.95	0.49	0.46	0.33

Correlations between FDI and Exports

	1993-2000	2001-2008	1993-2008
T-8	-0.12	0.05	0.54
T-6	-0.42	0.03	0.46
T-4	-0.50	0.05	0.30
T-2	-0.34	0.30	0.23
T	-0.07	0.43	0.24
T+2	0.01	-0.07	0.32
T+4	-0.16	-0.20	0.41
T+6	-0.20	-0.16	0.31
T+8	-0.09	-0.17	0.07

Source: Banco de España.

Secondly, by decomposing the growth rate of each variable between the trend and cycle using the Hodrick-Prescott filter, we see that both series present a similar trend, albeit that different scales apply. On the other hand, lag synchronisation in the cycle between

[29] See Appendix 1 for the descriptive statistics of the variables.

exports and outward foreign investment is clearly visible. Likewise, if we examine the cyclical component, we see that both series seem to follow a similar path, although they show lower levels of volatility after 2000. The highest correlation between both cycles is contemporaneous during the last decade, while from 1993 to 2008 lower levels of synchronisation in terms of correlation are observed, presenting lags of approximately two years.

Given the strong correlation between exports and FDI abroad, a simple econometric model will be estimated in this setting within a cointegration framework. The results of the estimated model, shown in section 6, highlight the greater degree of economic dependence of exports with respect to foreign investments abroad than vice versa.

6. Empirical Results

Assuming the model is correctly specified, we turn our attention to Granger non-causality testing. However, we first focus on the earlier results needed to build such a model.

Following the Dickey and Pantula (1987) approach, the null hypothesis of a second unit root (and higher orders of integration) was tested and rejected. Thus, on the basis of Tables 2A and 2B (following page) and according to the Ng-Perron test results, the null hypothesis of non-stationarity cannot be rejected in most of the cases considered (i.e. including a drift, a drift and a trend or none of them). This implies that most of the variables have a stochastic trend at levels. However, after differencing the variables (denoted with Δ), the results of the unit root tests suggest stationary behaviour for all the series. In other words, the time series data are first-difference stationary.

Table 2A. Unit Root Tests

Services	**Ng-Perron statistic**		***Goods***	**Ng-Perron statistic**	
	MZa [1]	*MZa [2]*		*MZa [1]*	*MZa [2]*
Levels			**Levels**		
fdi	3.48	-19.48	*fdi*	-5.05	-25.20
exp	0.78	-6.29	*exp*	1.64	-6.72
Wdemand	-11.28	-571.08	*Wdemand*	-27.04	-207.39
Compet	-1.99	-4.35	*Compet*	-3.77	-5.59
VABs	-129.73	-1.39	*VABs*	-0.18	-7.25
First Differences			**First Differences**		
fdi	-75.11	-85.81	*fdi*	-69.47	-73.68
exp	-5.78	-28.83	*exp*	-29.40	-30.75
Wdemand	-266.67	-15.36	*Wdemand*	-0.05	-18.14
Compet	1.30	-0.15	*Compet*	-2.26	-30.06
VABs	-8.97	-30.14	*VABs*	-6.45	-11.02
Critical Values			**Critical Values**		
1% level	-13.80	-23.80	1% level	-13.80	-23.80
5% level	-8.10	-17.30	5% level	-8.10	-17.30
10% level	-5.70	-14.20	10% level	-5.70	-14.20

Notes: Spectral estimation method (AR, GLS-Detrended). [1] model statistics with intercept, and [2] refers to model with drift and trend.

The Johansen procedure testing for cointegration was the next step taken. The results obtained suggest that it is possible to accept the hypothesis that a single cointegrating vector is present in the model, since the null of no cointegration is rejected at all levels of confidence.

Evidence from Tables 3A and 3B confirms that the number of statistically significant cointegration vectors based on a model with linear trends is equal to three for trace statistics and one cointegrating vector for maximal eigenvalue in terms of goods flows and two for both statistics in terms of services.

Table 2B. Unit Root Tests

Services	**Aug Dickey-Fuller statistic**			**Phillips-Perron statistic**		
	τ_τ *[1]*	τ_μ *[2]*	τ *[3]*	$Z(t_{\tilde{\alpha}})$ *[1]*	$Z(t_{\alpha^*})$ *[2]*	$Z(t_{\hat{\alpha}})$ *[3]*
Levels						
fdi	-3.71	1.08	2.14	-3.60	-1.14	1.01
exp	-1.32	-0.83	4.09	-1.81	-0.72	4.20
Wdemand	-1.74	-1.26	0.87	-2.21	-1.31	6.59
Compet	-2.25	-1.23	1.50	-5.39	-2.64	0.54
VABs	-1.26	3.35	15.05	-1.24	3.51	15.13
First Differences						
fdi	-9.98	-9.67	-9.29	-11.86	-10.86	-10.14
exp	-10.48	-10.53	-2.04	-10.22	-10.20	-8.33
Wdemand	-1.72	-1.75	-1.42	-7.81	-7.76	-4.47
Compet	-3.15	-3.35	-2.91	-11.64	-11.32	-10.15
VABs	-8.28	-2.96	-0.76	-8.28	-7.22	-2.44
Critical Values						
1% level	-4.11	-3.54	-2.60	-4.11	-3.54	-2.60
5% level	-3.48	-2.91	-1.95	-3.48	-2.91	-1.95
10% level	-3.17	-2.59	-1.61	-3.17	-2.59	-1.61

Goods	**Aug Dickey-Fuller statistic**			**Phillips-Perron statistic**		
	τ_τ *[1]*	τ_μ *[2]*	τ *[3]*	$Z(t_{\tilde{\alpha}})$ *[1]*	$Z(t_{\alpha^*})$ *[2]*	$Z(t_{\hat{\alpha}})$ *[3]*
Levels						
fdi	-4.85	-4.04	-1.20	-5.02	-4.12	-2.40
exp	-2.33	-1.32	5.56	-2.21	-1.72	5.52
Wdemand	-3.32	-0.75	1.29	-2.16	-0.19	5.20
Compet	-2.95	-1.49	0.10	-2.90	-1.49	0.15
VABs	1.36	-2.11	1.36	0.72	-1.80	2.98
First Differences						
fdi	-9.90	-9.93	-10.02	-12.75	-12.81	-12.93
exp	-8.31	-8.15	-2.36	-8.42	-8.15	-5.43
Wdemand	-2.43	-2.72	-1.44	-3.89	-4.14	-2.37
Compet	-10.22	-10.03	-10.09	-10.66	-10.12	-10.12
VABs	-6.29	-2.92	-2.37	-6.36	-5.73	-4.54
Critical Values						
1% level	-4.11	-3.54	-2.60	-4.11	-3.54	-2.60
5% level	-3.48	-2.91	-1.95	-3.48	-2.91	-1.95
10% level	-3.17	-2.59	-1.61	-3.17	-2.59	-1.61

Notes: [1], [2]and [3] refers to the model statitistics with drift and trend, with drift and without either drift or trend, respectively. The optimal lag used for the Augmented Dickey-Fuller tests and the truncation parameter used for Phillips-Perron tests was selected using the formula $m = ent\left[4(T/100)^{1/4}\right]$ suggested by Schwert (1989). Critical values are taken from Fuller (1976), Dickey and Fuller (1981) and Mackinnon (1991) .

This implies that there exists a significant cointegrating relationship connecting all the variables and we can conclude that there is a long-run relationship between the variables under study.

Once the VECM has been estimated, Granger non-causality may help us to differentiate short- and long-run causality between variables (Engle and Granger, 1987). From this point of view, causality can be derived from: (a) the χ^2-*test* of the joint significance of the lags of other variables (Wald test); and (b) the significance of the lagged ECM (t-test).

Table 3A. Johansen's test for multivariate cointegrating vector VAR(5). Services

Model 1. With no linear trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Results
r=0	r>0	102.83	59.46	66.52	60.06	30.04	35.17	None **	None **
r≤1	r>1	42.77	39.89	45.58	20.96	23.80	28.82	At most 1 *	At most 1
r≤2	r>2	21.81	24.31	29.75	13.98	17.89	22.99	At most 2	At most 2
r≤3	r>3	7.83	12.53	16.31	5.98	11.44	15.69	At most 3	At most 3
r≤4	r>4	1.85	3.84	6.51	1.85	3.84	6.51	At most 4	At most 4

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Model 2. With linear trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Results
r=0	r>0	125.21	68.52	76.07	57.12	33.46	38.77	None **	None **
r≤1	r>1	68.09	47.21	54.46	38.23	27.07	32.24	At most 1 **	At most 1 **
r≤2	r>2	29.86	29.68	35.65	18.19	20.97	25.52	At most 2 *	At most 2
r≤3	r>3	11.67	15.41	20.04	11.19	14.07	18.63	At most 3	At most 3
r≤4	r>4	0.48	3.76	6.65	0.48	3.76	6.65	At most 4	At most 4

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Model 3. With quadratic trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Results
r=0	r>0	154.88	77.74	85.78	53.77	36.41	41.58	None **	None **
r≤1	r>1	101.11	54.64	61.24	44.69	30.33	35.68	At most 1 **	At most 1 **
r≤2	r>2	56.43	34.55	40.49	34.53	23.78	28.83	At most 2 **	At most 2 **
r≤3	r>3	21.90	18.17	23.46	15.04	16.87	21.47	At most 3 *	At most 3
r≤4	r>4	6.85	3.74	6.40	6.85	3.74	6.40	At most 4 **	At most 4 **

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Table 3B. Johansen's test for multivariate cointegrating vector VAR(6). Goods

Model 1. With no linear trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Res
r=0	r>0	127.70	59.46	66.52	60.85	30.04	35.17	None **	None **
r?1	r>1	66.85	39.89	45.58	33.00	23.80	28.82	At most 1 **	At most 1 **
r?2	r>2	33.84	24.31	29.75	17.56	17.89	22.99	At most 2 **	At most 2
r?3	r>3	16.28	12.53	16.31	11.84	11.44	15.69	At most 3 *	At most 3 *
r?4	r>4	4.44	3.84	6.51	4.44	3.84	6.51	At most 4 *	At most 4 *

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Model 2. With linear trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Res
r=0	r>0	132.32	68.52	76.07	60.21	33.46	38.77	None **	None **
r?1	r>1	72.12	47.21	54.46	31.79	27.07	32.24	At most 1 **	At most 1 *
r?2	r>2	40.32	29.68	35.65	21.41	20.97	25.52	At most 2 **	At most 2 *
r?3	r>3	18.91	15.41	20.04	14.59	14.07	18.63	At most 3 *	At most 3 *
r?4	r>4	4.32	3.76	6.65	4.32	3.76	6.65	At most 4 *	At most 4 *

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Model 3. With quadratic trends in the levels of the data

Ho	H1	Trace Statistics	Critical Value 5%	Critical Value 1%	Max Eigenvalue Statistics	Critical Value 5%	Critical Value 1%	Trace Results	Max Eig Res
r=0	r>0	137.01	77.74	85.78	59.88	36.41	41.58	None **	None **
r?1	r>1	77.13	54.64	61.24	36.37	30.33	35.68	At most 1 **	At most 1 **
r?2	r>2	40.76	34.55	40.49	25.02	23.78	28.83	At most 2 **	At most 2 *
r?3	r>3	15.74	18.17	23.46	14.08	16.87	21.47	At most 3	At most 3
r?4	r>4	1.65	3.74	6.40	1.65	3.74	6.40	At most 4	At most 4

**(*) denotes rejection of the hypothesis at the 5%(1%) significance level

Table 4 reports the empirical results once temporal Granger causality has been tested. Since our main concern is with the relationship between *fdi* and *exp*, only the results for these two equations are reported, although the outcomes shown have been obtained by jointly estimating with *gdp* following the procedure described in the literature.

In terms of a short-run Granger causality relationship, the results obtained reveal the presence of a short-term causal relationship going from *vab*, *wd* and competitiveness to exports of goods, whereas neither of the variables seems to play a significant role in explaining the dynamics of exports of services (as shown by the insignificance, at all levels, of the χ^2-test of the lags of the differentiated variables). However, with regard to the FDI equation, it can be observed that exports of goods and world demand appear to be the main determinants of the short-term variations in this variable.

Table 4. Dynamic Multivariate Causality Analysis through Vector Error Correction modeling (VECM)

Temporal Granger-causality tests on VECM.

	Source of Causation Short Run										ECM	
Services	Δfdi		Δexp		Δvab		Δwd		$\Delta compet$		ε_{t-1}	
	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	t	γ_i
(1) Δfdi	-	-	3.37	-9.45	1.86	-11.11	3.75	165.97	2.50	2.36	[0.17]	2.11
(2) Δexp	2.97	0.06	-	-	4.75	0.75	4.44	-8.04	3.74	0.55	[-1.38]*	-0.56
Goods	Δfdi		Δexp		Δvab		Δwd		$\Delta compet$		ε_{t-1}	
	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	$\chi^2(4)$	$\sum coeff.$	t	γ_i
(1) Δfdi	-	-	16.66***	31.73	4.79	14.35	11.96**	-28.82	2.07	-2.46	[-0.72]	-2.81
(2) Δexp	3.85	0.03	-	-	10.59*	2.20	27.36***	-1.12	12.78***	1.61	[-2.21]**	-0.14

Notes: *,**,*** denotes significance at the 10%, 5% and 1%, respectively. VECM for Services includes a time trend from 1993.

An inspection of the results of the long-run causality tests (Table 4) shows that changes in exports are a function of the level of disequilibrium of the cointegrating relationship. By contrast, the results do not yield the same conclusions in terms of variations in foreign investment. As we observe, the ECM coefficient is statistically significant in the export equation, but not in the FDI equation. Moreover, the exchange of goods is statistically much compared to the long-run relationship from fdi to export of services, which is somewhat weaker.

To sum up, the existence of a causal relationship running from *fdi* to *exp* has been empirically provided; however, it should be stressed that no evidence exits of either short- or long-run causality from exports to *fdi*[30].

Within a multivariate cointegration framework, it is useful to examine the post-sample effects of shocks to the variables in the system[31]. For a more in-depth study and to analyse the dynamic properties of the model, when a cointegration relationship is also present among the variables, the impulse response function and the variance decomposition of the different variables can be estimated by solving back to the model in levels from the final VECM estimates. The impulse response functions allow us to observe the response paths of each variable to shocks in the other variables, while taking into account the short-run adjustment to long-run disequilibrium in dependence.

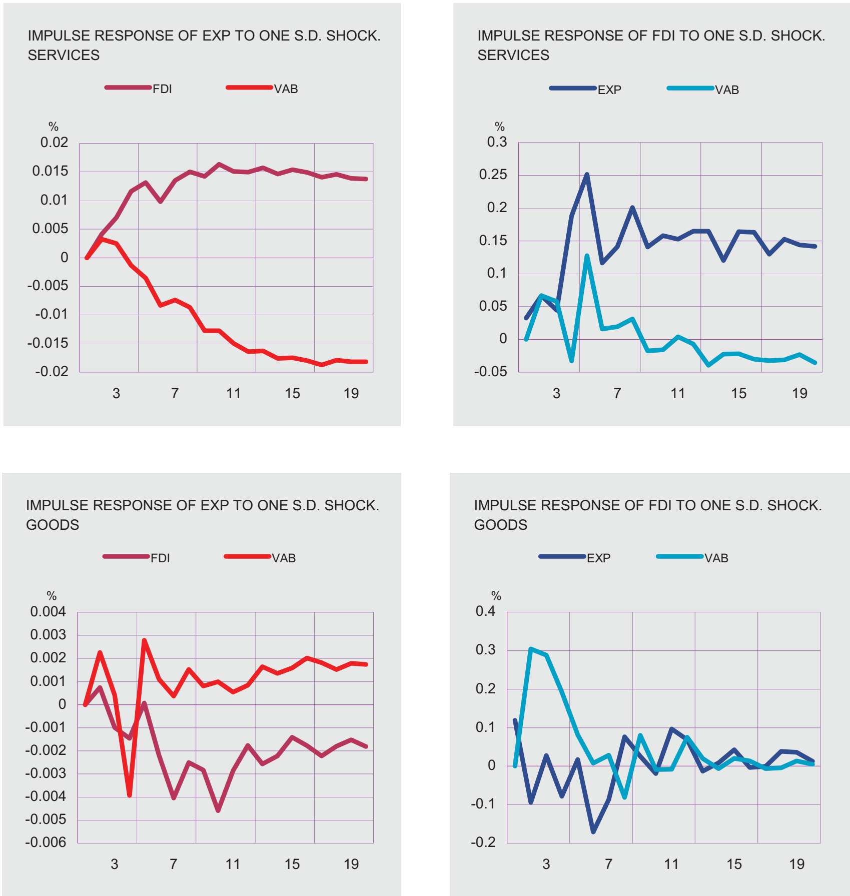
The impulse response functions, whereby the behaviour of exports to shocks in *fdi* and *gdp* is recorded, are treated separately for goods and services (see Chart 2). The first (third) plot indicates the positive effect of an exogenous increase in *fdi* on exports of

[30] The estimated model guarantees the usual assumptions, including no autocorrelation and residual normality, within a cointegration framework.
[31] See Mellander *et al.* (1992).

services (and goods). This largely agrees with our previous outcome in the ECM estimate, where the long-run, positive relationship between FDI and exports was significant for both types of flow. Moreover, on inspecting these graphs, it would seem that the negative influence of domestic income on both export types is confirmed. Note that for both flows the response of *exp* to shocks in *gdp* is negative after a short period. Moreover, an interesting "overshooting" effect is observed during a brief period of two quarters for flows of goods when a shock in domestic income occurs. In addition, a very slightly negative response by exports of goods should be taken into account whenever shocks in FDI (of goods) occur. Finally, according to the ECM estimates, the velocity of adjustment for flows of services is slower than that recorded for flows of goods. Likewise, compared to earlier empirical results, the long-run equilibrium adjustment to recent Spanish flows seems to be slower than before.

The second and fourth graphs show the response paths of *fdi* to a shock in exports and domestic income. A graphical examination from plotting the dynamic behaviour of *fdi* reflects the greater impact of this variable (especially on flows of goods). FDI responds positively in the initial periods following a shock in both exports and *gdp* but, in the case of services, an increase in the *gdp* series seems to have a negative impact on *fdi* in the latter part of the sample. By contrast, foreign investment in goods responds negatively in the initial period following a shock in exports, but then responds positively and negatively before eventually returning to its pre-shock level.

IMPULSE RESPONSE FUNCTIONS CHART 2
Disaggregation by components



SOURCE: Banco de España.

The figures presented in Table 5 show the presence of a relatively rapid adjustment going from *fdi* to *exp*. If we observe the forecast error variance after two years, we see that approximately 25% of the shock in exports of services is explained by innovations in *fdi* on services, and that this remains constant for up to five years. After two years, less than 7% of the forecast error variance of exports in services is due, however, to changes in domestic income. On the other hand, as the findings based on the VECM estimate show, exports of services appear to play a significant role in explaining the variance in *fdi*. After a two year horizon, the quantitative impact of a variation on exports of services is approximately 30%. Two years later, these percentages have risen to 42%.

Table 5. Variance Decomposition

Services Percentage of forecast variance explained by innovations in:

	t	σ	*exp*	*fdi*	*vab*
Variance decomposition of:					
exp	1	0.02	100	0.00	0.00
	4	0.04	84.41	14.26	1.32
	8	0.06	69.25	24.36	6.39
	12	0.08	58.32	26.31	15.37
	16	0.10	50.72	26.93	22.35
	20	0.12	46.43	26.49	27.08
fdi	1	0.55	0.35	99.65	0.00
	4	0.62	11.07	86.63	2.29
	8	0.78	29.27	66.38	4.35
	12	0.88	35.65	60.80	3.54
	16	0.96	39.78	56.91	3.31
	20	1.04	42.05	54.72	3.23

Goods Percentage of forecast variance explained by innovations in:

	t	σ	*exp*	*fdi*	*vab*
Variance decomposition of:					
exp	1	0.02	100	0.00	0.00
	4	0.04	98.13	0.28	1.59
	8	0.04	96.71	1.61	1.67
	12	0.05	95.60	2.95	1.44
	16	0.05	95.25	3.12	1.63
	20	0.06	94.85	3.28	1.86
fdi	1	0.90	1.78	98.22	0.00
	4	1.13	2.36	80.92	16.73
	8	1.18	5.28	78.30	16.42
	12	1.19	6.20	76.97	16.83
	16	1.19	6.33	76.83	16.84
	20	1.20	6.51	76.69	16.80

Notes: Figures of *exp, fdi* and *vab* refers to the variance decomposition of an orthogonal one S.D. shock, *t* indicates the forecast horizon in quarters and σ denotes the forecast variance.

The results reported for flows of goods are in line with those in the literature. In this sense, after five years the forecast error variance explained by innovations in *fdi* (goods), when a shock in the exports of goods occurs, is less than 4%. Likewise, after five years less than 2% of the forecast error variance of exports of goods is due to changes in domestic income. Yet, by contrast, exports of goods do not appear to play a significant role in explaining the variance in *fdi* (goods). After five years, the quantitative impact remains below 7%. Finally, although the within sample results show this variable to be relatively unexplained by domestic income, the post-sample dynamic variance decomposition shows that a substantial part of the variance of the forecast error in *fdi* is explained by *vab* (after five years, 17% approx.).

7. Conclusions

This paper has undertaken a review of decisions taken by firms as to how they can best serve foreign markets. Distant markets, with their associated higher transport costs, can be served by subsidiaries abroad, while closer markets can be served by exports. Theoretically, therefore, outward FDI and exports can act as either substitutes or complements, but although the interdependence of both modes has been widely discussed in trade literature, no conclusion regarding the relationship can be drawn by relying exclusively on theoretical fundamentals. According to traditional trade models, foreign investment and exports can be considered perfect substitutes. However, this would seem to contrast with recent developments in trade theory and industrial organization, where the volume of trade and the emergence of MNEs may be positive or negatively related. Moreover, localisation models eventually play a key role since advantages of membership justify not only the emergence of MNEs, but also the different forms of expansion adopted within firms.

Seen from this perspective, FDI can be considered a substitute for trade in goods and services whenever foreign production is driven primarily by *horizontal* expansion (i.e. where affiliates replicate the parent company's production activity). This horizontal pattern for investment flows tends to be considered the contrary of *vertical* expansion decisions (i.e. expansions within the multinational enterprise) or of those that lead to the establishment of distributional assets in local markets. Thus, as is highlighted in the literature, some MNEs may find it profitable to disperse several stages of their production or distribution process internationally, with the aim of matching factor requirements more effectively with a country's resources, or of establishing distributional networks within host countries so that they can meet demand requirements more closely and increase their market share (i.e. export-platform motivations). In this latter case, a complementary relationship between foreign investment and exports would be expected.

Working with this hypothesis, a multivariate cointegrated model (VECM) has, therefore, been estimated in order to test the (Granger) causality relationship both in the short and the long run between exports and outward FDI. In this sense, the recent evolution in exchange flows (1993-2008) and country-specific variables (such as world demand - including Spain's main and recently growing foreign markets - for trade flows and the relative prices of exports in order to proxy new global competitors) have been taken into account for the first time.

Our results provide evidence of a positive (Granger) causality relationship running from FDI to the export of goods (stronger) and the export of services (weaker) in the long run, in which the complementary relation is consistent with vertical FDI strategies. By contrast, in the short run only goods exports are affected (positively) by FDI.

Likewise, by differentiating between goods and service flows, a number of highly illuminating results have been obtained. When estimating a VECM, the speed of adjustment of services to the long-term equilibrium tends to be slower than that presented by goods; however, in contrast with related findings in the literature, they behave with much less sensitivity to domestic income changes and the long-term relationship has been shown by empirical tests to be statistically weaker. Finally, the post-sample test has shed more specific light on the results for goods - yielding conclusions that are more closely in line with those published elsewhere given that Spanish exchange flows in the eighties were comprised primarily of goods.

To conclude, the empirical analysis undertaken here presents evidence to show that outward FDI and exports act as complements. As such, any discussion of the negative impact of investment flows on domestic production activity would seem to be quite removed from economic reality. However, the incorporation of more fully disaggregated data would be a useful extension to the literature since it should reveal different behaviour patterns by industry.

Appendix 1: Data Descriptive Statistics

Table A1. Descriptive Statistics

	Xgoods	FDIgoods	WDGoods	Cpgoods	VABGoods
Mean	30,496.4	54,475.8	99.4	119.4	28,826.1
Median	32,251.1	28,857.8	101.2	118.5	30,295.8
Maximum	44,238.0	227,119.6	152.8	132.1	33,420.5
Minimum	13,898.1	1,631.5	53.7	109.5	22,622.8
Std. Dev.	8,796.9	58,809.9	29.4	6.5	3,558.2
Skewness	-0.27	1.33	0.21	0.41	-0.47
Kurtosis	1.94	3.84	1.98	2.11	1.71
Jarque-Bera	3.76	20.15	3.28	3.86	6.76
Probability	0.15	0.00	0.19	0.15	0.03
Observations	64	62	64	64	64

Notes: X=exports, WD=World Demand, CP=Competitivity, VAB=Gross value added

	Xservices	FDIServices	WDServices	CPServices	VABServices
Mean	13,374.3	105,048.9	116.2	114.5	97,430.8
Median	14,688.1	62,715.7	118.2	112.2	96,807.1
Maximum	19,055.1	390,458.1	138.1	142.4	128,119.7
Minimum	7,405.0	125.1	93.1	93.4	74,148.6
Std. Dev.	3,519.1	100,682.0	13.5	14.2	16,349.0
Skewness	-0.24	1.08	-0.05	0.37	0.33
Kurtosis	1.85	3.51	1.83	2.00	1.88
Jarque-Bera	4.12	12.68	3.68	4.14	4.47
Probability	0.13	0.00	0.16	0.13	0.11
Observations	64	62	64	64	64

Notes: X=exports, WD=World Demand, CP=Competitivity, VAB=Gross value added

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