

**FOREIGN DIRECT INVESTMENT AND TRADE IN THE EU:
ARE THEY COMPLEMENTARY OR SUBSTITUTE IN BUSINESS
CYCLES FLUCTUATIONS?**

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Abstract

Strong empirical evidence indicates the particular relevance of the phenomenon of foreign direct investment (FDI) and a widening stream of the literature is pointing out the importance of including the study of FDI in international economics analysis and, in particular, in the analysis of economic integration. In order to shed some light on the relationship between trade, foreign direct investment and the correlation of production fluctuations, we undertake an empirical investigation applying our analysis to three-digit industry level data for the manufacturing sector in Italy. The empirical results obtained indicate that the degree of Italian sector openness, measured both in term of trade flows and FDI consistence, is relevant for the level of correlation between production growth rates of Italy and the other European countries.

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1. Introduction

Strong empirical evidence indicates the particular relevance of the phenomenon of foreign direct investment (FDI)¹. The past decade has seen a remarkable transformation in trade and direct investment flows, characterised by a particularly rapid growth of FDI. During the 1980s, FDI from OECD countries increased fourfold and grew much more rapidly than domestic capital formation, GDP, or world trade. Over the period 1983-89, the outflows of FDI grew at an annual rate of approximately 2 per cent, more than twice as fast as the previous decade and three times faster than the growth of world exports and the growth of world output. According to the UNCTAD (1999) report, foreign affiliate sales of goods and services in internal and foreign markets in 1998 were about 11 trillion dollars. In the same year world export was about 7 trillion dollars. The indication that international production, in general, is now more important than international trade in delivering goods and services to foreign market appears thus to be manifest. Most countries are, indeed, undertaking an intensified effort to attract direct investment and multinational companies are emerging from the developing countries as well as the developed economies. This implies that FDI is likely to become the dominant method for international economic integration and that multinational firms will produce an increasing share of world output.

As a consequence, a widening stream of the literature is pointing out the importance of including the study of FDI and multinational enterprises in international economics analysis and, in particular, in the analysis of economic integration. According to Sanna-Randaccio (1996), “the major effects of economic integration are due to foreign direct investment which lead to industrial restructuring” (p. 30). A complete picture of the extent and sources of international linkages requires, then, a full understanding of the relationship between trade in goods and trade in factors.

As it is pointed out by Goldberg and Klein (1999), the amount of international trade undertaken by a country is often considered as a proxy for its degree of openness, but the focusing on trade may be misleading when international capital flows are significant. The study of international linkages among different countries requires, therefore, the analysis of both trade and FDI. Furthermore, the predominant conclusion reached by the international economics literature indicates the existence of a

¹ Foreign direct investment indicates both cross-border mergers and acquisitions of existing firms and a greenfield investment. Multinational corporations are the main source of FDI. The two expressions will be used indifferently in the paper.

complementary relation between trade and FDI. However, despite their importance, empirical and theoretical research on trade has largely ignored the role played by multinational enterprises.

In particular, increased international trade, integration of financial markets and global capital flows are recognised by the literature on business cycle as the main cause of the increasing synchronisation of economic fluctuations in the major countries of the world economy². In a world characterised by economies increasingly integrated, the analysis of economic fluctuations in a context of open economy is, indeed, the natural evolution of the literature on business cycles.

Given the recognised complementarity between trade flows and FDI, an important extension of the analysis developed in the literature on business cycle in open economy could be the introduction of a measure of FDI in order to investigate the effect of both trade flows and the presence of multinational enterprises on fluctuations synchronisation. The literature on the degree of integration created by close international trade links could be, then, further developed by considering the effect of globally connected industrial structures in relation to the degree of economic fluctuations synchronisation. However, when discussed only on theoretical grounds it is not clear whether integration leads to more synchronous or to more asynchronous business cycle. The effects of economic integration on international correlation of economic fluctuations appear to depend on the degree of specialisation induced by free trade flows and on the internal characteristics of multinational enterprises.

Following the analysis developed by Frankel and Rose (1997), where the author empirically analyse the effect of trade on business cycles fluctuations, we undertake an empirical investigation in order to shed some light on the relationship between trade, foreign direct investment and the correlation of production fluctuations. We apply our analysis to three-digit industry level data for the manufacturing sector.

The paper is organised as follows. In Section 2 we present some illustrative stylised facts on FDI. In Sections 3 and 5 we undertake an empirical investigation in order to shed some light on the relationship between trade, foreign direct investment and the correlation of production fluctuations. Section 4 explains the kind of variables we estimate in order to capture the weight of multinational firms in the production structure. Some comments on the empirical results obtained are presented in Section 6 and Section 7 concludes.

² Among others, important recent works on this subject are the paper by Artis and Zhang (1995) Baxter and Crucini (1995), Baxter and Stockman (1989), Berk (1997), Dellas (1986), Canova and Dellas (1993), Canova and Marrinan (1998), Elliott and Fatás (1996), Frankel and Rose (1997), Prasad (1999), Prasad and Gable (1997). See Segre (2000) for a brief review of this literature.

2. Some stylised facts

Empirical evidence suggests that the net effect of European economic integration has been to increase the flow of foreign investment to individual member countries. Since 1980 the importance of FDI stocks to the EU as a share of GDP has risen significantly. Following Dunning (1997a), an examination of direct investment data for the period 1957-85 reveals that FDI inflows in European member countries rose quite substantially. Investment from non-European countries represented the majority of foreign investment in the EU, in particular FDI from the United States were remarkable. The responsiveness of US FDI to market growth appears to be greater for EU countries than for non-EU countries. However, statistics on new capital outflows for 1984-97 suggest that the relative importance of US FDI has been diminishing. There has been an overall decline in the US share from 63 per cent of EU inflows in 1994 to 19 per cent in 1992, passing through the level of just 4 per cent in 1990. From 1993 onwards, the share of US FDI in the EU has been stable around 43 per cent on average.

In the last two decades the general increase in the importance of FDI to the EU is particularly evident. While the ratio of FDI inward stock to GDP since 1980 has generally grown world-wide, in the European Union it has grown even faster, most markedly in the period 1985 to 1990, and it has remained higher than the value of most developed countries. This reflects the relevance of the phenomenon of FDI in the EU economy.

The IMP and the general process of regional integration in the EU have been reflected in a rapid growth in intra-EU FDI. The intra-EU FDI increased, from 25 per cent of the total inward stock in 1980, to 40 per cent by 1988. The proportion of the aggregate stock of world FDI located in the EU – both deriving from non-EU investing firms and from EU investing firms - have risen from 31 per cent in 1985 to 39 per cent by 1995. In general, FDI appears to be likely to have more pronounced effects on the EU economy than on other economies around the world, especially developed countries. In 1998 the European Union was the largest source of FDI, registering 386 billion dollars in outflows. In contrast to the sharp increase both in intra- and extra-EU FDI in the late 1980s and early 1990s, which resulted from anticipation of the IMP, steps towards European monetary union have so far had only little impact on FDI. Flows to members of the EMU increased only slightly more than those to non-members in 1998, and the share of EMU members in total FDI inflows to the EU was still lower than in 1996.

Belgium and the Netherlands were the country attracting the highest level of FDI flows between 1983 and 1997. However, in the last period considered in the table,

Greece and Sweden emerged as important destination of FDI flows. On the contrary, Italy and Germany, over the all period, were the less involved economies in the process of internationalisation of production through FDI. EU economy as a whole, since the period 1989-91, registers a level of FDI inflows as a percentage of GDP higher than the United States, suggesting, again, the importance of FDI for the EU-economy.

The analysis of recent Eurostat data on FDI flows highlights the particular position of United Kingdom. This economy attracted a remarkable level of FDI flows between 1997 and 1998, passing from 23 billions of ecu to 49 billions of ecu in 1998, a level more than twice higher. The Netherlands and France emerge as well as important destination for FDI flows, that in 1998 where, respectively, 28 and 25 billions of ecu.

In particular, during the period 1983-1997, the Netherlands was the country investing abroad the highest level of FDI/GDP. Sweden and United Kingdom are, respectively, the second and the third investor abroad. The lowest level of FDI outflows came from Austria and Portugal. Following Rondi e Sembenelli (1998), the analysis of the top 100 EU owned companies over years 1987-1993, that is the IMP implementation period, further confirms the previously presented evidences. A general acceleration of multinational activity is found by the authors, that conclude that multinational activity became a particularly profitable way of serving foreign market as the completion of IMP proceeded. Moreover, it is shown that German, Belgian and Italian companies achieved the most pronounced increases in foreign penetration within the EU.

Italian economy is characterised by a minor level of FDI flows than the other EU countries, particularly low for FDI inflows. Since 1996 FDI outflows grew substantially, from 9.000 billion lire to 19.000 in 1998, through 17.500 billion lire in 1997. At the end of 1998 the FDI outward stock was 273.000 billion lire and the FDI inward stock was 174.000 billion lire (Banca d'Italia, 1999).

In OECD economies, a large share of FDI goes to manufacturing compared with the weight of manufacturing. According to OECD (1996), in most countries the international investment stock in manufacturing was around 30-45 per cent of the total, reaching the level of 50 per cent for some countries. This compares with less than 30 per cent of manufacturing in GDP³. A large share of foreign investment continues to go to the primary sector, particularly into petroleum and extractive industries, although this share declined rapidly during 1980s with decreasing commodity prices.

³ As previously underlined, Japan is the major exception. The Japanese economy is characterised by a stock of outward investment in manufacturing is a little lower than the share of manufacturing in Japan's GDP.

Foreign ownership has a particular sectoral distribution and it is especially present in high-technology industries. In most countries the computer, chemical, pharmaceutical, automobile and electronics industries have the highest share of foreign ownership. The exceptions are the United States and Japan. The United States are characterised by the presence of resource-intensive process industries which need to be located near to markets⁴ and which are prominent amongst industries with extensive foreign ownership. In Japan foreign investment is low in all industries.

Different sectors adopt a wide range of strategies for international expansion. Nevertheless it is possible to identify common features among distinct groups of sectors. Following the study by OECD (1996), in science-based industries⁵ the principal mode of expansion is based on the internalisation of firm-specific advantages so that foreign investment is high and foreign affiliates have a large share of sales in host markets. International trade in these industries is largely intra-firm because of the specialised characteristics of inputs. In particular, pharmaceuticals industry appears to be more market-oriented in international collaboration and is more intensive in international investment. Among the scale-intensive industries, motor vehicles and consumers electronics have been a pattern of expansion more trade-oriented, with high and increasing levels of intra-regional trade in components, FDI has been less important in the past, except for the US economy, but has increased rapidly. Both industries are highly concentrated, so mergers and acquisitions have been less exploited compared with pharmaceuticals.

3. An econometric analysis of the relationship between openness and production fluctuations

The degree of integration created by close international trade links and globally connected industrial structures can be examined in relation to the degree of economic fluctuations synchronisation. However, when discussed only on theoretical grounds it is not clear whether integration leads to more synchronous or to more asynchronous business cycle. The effects of economic integration for international correlation of business cycles depend on the degree of economic sectoral specialisation induced by free trade flows. In an economically integrated area, increased trade results in greater specialisation if most trade is inter-industry. As Krugman (1993) points out, “a reduction in transactions costs between two regions, whether these costs take the form

⁴ These industries are mainly cement, glass, chemicals, and metal refining.

⁵ Pharmaceutical, computer, and to a lesser extent semiconductors.

of transportation expenses, tariffs, or disparities in regulation, will make more likely that any given degree of external economies will be sufficient to lead to geographical concentration of an industry” (p. 245). Then, the reduction of transaction costs brought about by integration processes would lead to diverging industrial structures among regions and, therefore, to an increasing degree of specialisation of regions. On the contrary, an increase in intra-industry trade is associated with a low degree of specialisation. In an economic system characterised by imperfect competition and economies of scale there should be the tendency towards more convergence of the manufacturing production structure.

The effects of economic integration on the level of correlation of business cycles between countries depend on the degree of specialisation induced by integration itself. The occurrence and the incidence of country- and industry-specific shocks, that induce economic fluctuations, are linked to the degree of specialisation and therefore to the type of trade prevailing in the economic system of a country. Moreover, even when asymmetric shocks predominate, a higher degree of trade flows could transmit business cycle fluctuations across countries. Within this framework, Frankel and Rose (1996) underline that “the net effect on business cycles coherence depends on the relative variance of aggregate and industry-specific shocks. If the former are larger than the latter, then we would expect closer trade integration in more synchronized business cycles” (p. 9). The matter, however, can only be resolved empirically.

Moreover, such problem becomes even more critical when the role of multinational companies in promoting integration is incorporated in the analysis. The effects of economic integration for international correlation of business cycles depends on the degree of specialisation induced by free trade flows and on the internal characteristics of multinational enterprises. The recent developments of the literature on international trade have considered international industrial organisation themes in order to set up new models fitting the main stylised facts of the last decades. However, a theoretical framework introducing the role of multinational firms in the analysis of the problem of asymmetric shocks has not yet been developed. It is particularly difficult to identify any a priori expectation on the effects of a strong presence of multinational firms for the correlation of business cycles at the industry level.

Following the analysis developed by Frankel and Rose (1996, 1997) in the next sections we, undertake an empirical investigation in order to shed some light on the relationship between trade and foreign direct investment and the correlation of production fluctuations.

3.1 The correspondence between trade and FDI

The general analysis of FDI flows indicates the trends followed by economies in term of globalisation. However, even if empirical research on multinationals and FDI has focused mainly on flows of foreign investment, FDI flows only broadly indicate the position of a country as regards as the presence of multinational firms in the production structure. First of all because of the fact that FDI flows include investment in the service sector. Moreover, because the measures of FDI are based on the current account values and are then inadequate to give the exact measure of the degree of multinational's operations in the economy.

Following Brainard (1993, 1997), the comparison between FDI and trade is a conceptual mismatch, when one considers FDI in term of flows. In general the literature on trade and FDI does not address the relationship between exporting and producing abroad as alternative modes of foreign-market penetration. The analogue to trade is, indeed, multinational sales. The extent of firms' multinational operations has to be measured by looking at a variable referring to the weight of FDI in the economy. It is essential to consider the real degree of multinationality characterising the production structure of the country.

Moreover, the use of data referring to the importance of multinational activities, even when recognised to be of crucial relevance to understanding a given phenomenon, is even more difficult because of the lack of adequate database. FDI statistics are only published at a very aggregate level. Therefore, the existing measures of FDI stock are actually based on the current account values, and are not able to give the true indication of the weight and consequences of multinationals' operations. Alternatively, where firm-level studies have been attempted, they have usually been confined to only the very largest conglomerates firms, using crude and over-aggregate industrial breakdowns. Inevitably therefore, industry-level characteristics have tended to play relatively minor roles in the analysis. In the next sections we present an attempt to overcome the above expressed difficulties for the analysis of FDI phenomenon.

3.2 An equation for trade, FDI and production fluctuations comovement

In order to address the issue of the internationalisation of the production structure, we undertake an empirical analysis of the relationship between trade, FDI and production fluctuations. We adopt a particular measure of FDI, that we call "FDI consistence", as it will be explained in the section below. The development of a precise theoretical model behind the econometric representation, is, however, beyond the scope of this paper and should be the subject of future research.

In particular, our investigation applies the model developed by Frankel and Rose (1997) for the analysis of macroeconomic variables, such as real GDP, industrial production, total employment, and the unemployment rate, to the patterns of production in the manufacturing sector. In order to analyse empirically the relation between trade and the presence of multinational enterprises in a country production structure, we concentrate our analysis on the correlation of production growth rate in EU countries, by industry⁶. For this kind of investigation the main characteristic to be accounted for are illustrated by the following relations.

Let: $y_{s,i} = \log (Y_{s,i})_t$ and $y_{s,j} = \log (Y_{s,j})_t$;

the reduced-form regression to be estimated takes the form:

$$Corr(\Delta y_{s,i}, \Delta y_{s,j}) = \mathbf{b}_0 + \mathbf{b}_1 TRADE_{s,ij} + \mathbf{b}_2 MNE_{s,ij} + \mathbf{w}_{s,ij}$$

where: s indicates different manufacturing sectors, $\mathbf{D}_{y_{s,i}}$, $\mathbf{D}_{y_{s,j}}$ represent the growth rate of output by sector s , respectively, for country i and for country j , over the period of time $t = 1, \dots, T$; $TRADE$ represents an index of industry openness through bilateral trade flows over the period of time $t = 1, \dots, T$; and MNE represents an index of economy openness through the presence of multinational enterprises.

In this equation the correlation of production growth rates in countries i and j as endogenous variable and ε represents the myriad influences on bilateral activity correlations beyond the influences of international trade⁷. β_0 and β_1 are the regression coefficients to be estimated.

4. Variables description

In the following three sections, the variables computed for the econometric specification of the regression are presented.

⁶ A precise measure of business cycle correlation is not feasible in the present research, given the fact we use annual data and relatively short time series. For the same reasons, papers following Stockman (1988) considered correlations of growth rates. Moreover, the paper by Helg *et al.* (1995) indicates that the pattern of quarterly growth rate correlations of industrial production for European countries is quite similar to that obtained from business cycle innovations computed from a VAR model.

⁷ We assume that the exogenous variables and ε , which represents the influence of all the omitted variables, have separate and additive influence on the endogenous variable.

4.1 Dependent variable

The variable denominated CORR represents the endogenous variable of the relation that we are investigating. The variable CORR indicates the correlation coefficient calculated between annual production growth rates of Italy and Europe⁸ for each manufacturing industry, during the period 1985-1996. The correlation index is calculated for each three-digit manufacturing industry following the NACE Rev.1 nomenclature. Data are derived from the DEBA database, and refer to production excluding VAT in 1990 prices, expressed in ecu.

4.2 The FDI-consistence variable

The kind of data we use is an important point to be underlined, given the fact that the literature on FDI, in general, has often missed the true role played by multinational activity. Our estimates of the degree of industry multinationality provide an adequate measure of the importance of multinational enterprises in the production structure. We measure the level of industry multinationality for each three-digit industry within the manufacturing sectors as the production⁹ of multinational enterprises. A firm is considered to be part of a multinational enterprise when it represents plants¹⁰ located in Italy and owned for more than 50 per cent by a foreign firm. This is the case of passive multinationality. Moreover, Italian firms owning plants located abroad are indicated as multinational enterprises and represent active multinationality. The data we use were estimated in collaboration with CERIS-CNR of Turin. Data refer to year 1993.

For our empirical investigation we refer to consistence of foreign direct investment in the sense that we are aiming at measuring the significance of the presence of multinationals in the economy. We define the degree of multinationality for each industry as the sum of the shares of output produced by multinational enterprises out of the total output produced by all the firms constituent the industry. For reasons of data availability, the index can be precisely only calculated for each industry five leading¹¹ firms.

⁸ Production of Europe covers fifteen EU member states. We obviously calculate correlation between Italy and Europe, excluding the Italian share of production from values of production of Europe.

⁹ Firm's production is measured as the value of sales of goods classified in the three digit industry produced by the various plants of the multinational firm. We assume that the effect of stock is negligible.

¹⁰ Since we indicate as production of the firm the value of sales of the goods, classified at the three digit level, which are produced by the plants of the firm, we do not distinguish between the concept of firm and the concept of plant. Production of the firm in a industry refers only to the value of goods belonging to that industry and produced by the firm.

¹¹ We define a firm as 'leading' in an industry if it is one of the five largest Italian producer in that industry.

We then calculated two different indices of industry multinationality for Italy, indicated as MNE and MNEITA. The first index refers to the consistence of foreign affiliates located in Italy. It is computed referring to production in Italy of foreign-owned firms in each industry and represents Italian passive multinationality. The second index refers to Italian firms that went multinational – it represents Italian active multinationality - and it is estimated considering the production in Italy of such firms in each industry. We estimate and aggregate both the indices across the top five leading firms. Formally:

$$MNE = \frac{\sum_{n=1}^5 y_n^m}{\sum_{n=1}^5 y_n}$$

where y^m represents the value of sales of multinational firms. MNE index is obtained by considering sales of foreign-owned firms located in Italy. Analogously, the index MNEITA is obtained by considering sales of Italian firms that are multinational.

We then adjust the obtained indices including the non-top five firms. Since we don't have precise information on multinationality within the non-top five firms, the adjustment is made by building an upper and lower estimate for multinationality in each industry:

Upper estimate (UE) assumes that multinationality within non-top five firms is identical to that within top five. In general, this will be an overestimate since we would expect non-top five firms to be less multinational than the market leaders. Such upper estimate is identical to that for the top five for both the indices MNE and MNEITA:

$$UE = MNE$$

$$UEITA = MNEITA$$

Lower estimate (LE) assumes that no non-top five firms is multinational. Clearly, this will always underestimate aggregate industry multinationality if any non-top five firms are multinational. The lower estimate is calculated by relating the multinationals market share within top five to the total output of the industry, then:

$$LE = \frac{\sum_{n=1}^5 y_n^m}{\sum_{n=1}^N y_n}$$

where, again, y^m represents the value of sales of multinational firms considered, respectively, as foreign-owned firms located in Italy for the MNE index, and as Italian firms that are multinational for the index MNEITA.

Since there is no way of knowing which of these estimates is more accurate, we derive the adjusted index by considering the arithmetic midpoint of the two. We can be reasonably certain that the true industry value will lie somewhere in between of the two estimates and the range is small for most industries. Moreover all the results are robust to whichever set of estimates is used. We then compute the index indicated as MNEC as follows:

$$MNEC = \frac{UE + LE}{2}$$

The index MNEITAC is obtained by considering the values for Italian firms that are multinational in the same way.

4.3 *The trade variables*

We measure the degree of sector openness by computing trade intensity for each three-digit manufacturing industry. On trade variables, DEBA database provides information only over the years 1988-1996. We consider estimates of intra- and extra-European imports and exports of Italy over this period. To be consistent with the data used for the construction of the endogenous variable, we converted this data in constant prices based on 1990. We then calculated two trade variables for each industry, which were computed as follows. TRADEI variable is the average over the years 1988-96 of the sum of export and import of Italy vs. European countries divided by Italian production. TRADEE variable is the average over the years 1988-96 of the sum of export and import of Italy vs. non-European countries divided by Italian production.

In formal terms the two trade variables are computed as follows.

$$TRADEI_i^s = average \left[\frac{EXP_{I,IE}^s + IMP_{I,IE}^s}{Y_i^s} \right]$$

$$TRADEE_i^s = average \left[\frac{EXP_{I,EE}^s + IMP_{I,EE}^s}{Y_i^s} \right]$$

where EXP indicates exports and IMP indicates imports in each industry s , respectively, in the first expression, from Italy to the aggregate of the other European member states, and, in the second expression, from Italy to non-European countries. Y represents Italian production in each industry s and it is introduced in order to standardise indices to the dimension of the industry.

5. Estimated equation

The actual estimated equation, derives from strong data constraint inducing the exclusion of the bilateral structure from the model. We, then, estimate an equation for Italy versus the aggregate of the rest of EU member states. Moreover, for the MNE variable we face an additional constraint. As it has been shown in the previous section more in details, we can measure directly the values for the variable MNE only for year 1993. However, this seems not to represent a strong limit for the empirical analysis undertaken, given the fact that values in 1993 represent approximately average levels of the period 1985-1996 on the basis of comparable data presented in Cominotti and Mariotti (1990, 1994,1997).

We conduct our analysis with ordinary least squares. The results obtained from the OLS estimation procedure are robust to the particular structure of the endogenous variable, which has a support limited between -1 and 1 . Both an algebraic

transformation¹² in order to extend the support from $-\infty$ to $+\infty$ and the estimation of a double censored Tobit model confirmed the OLS estimation results. The equation we estimate is a cross-section taking the following form:

$$\text{Corr}(\Delta y_I^s, \Delta y_E^s) = \mathbf{b}_0 + \mathbf{b}_1 \text{TRADEI}_I^s + \mathbf{b}_2 \text{TRADEE}_I^s + \mathbf{b}_3 \text{MNE}_I^s + \mathbf{w}^s$$

$$s = 1, \dots, 85$$

where: s indicates the sector; $\mathbf{D}y_I$, $\mathbf{D}y_E$ represent the growth rate of output by sector s , respectively, for Italy and for the aggregate of the EU countries; TRADEI and TRADEE are the explanatory variables of the previously estimated equation; and MNE represents the index of Italian economy openness through the presence of multinational enterprises.

The degree of openness of Italian economy through FDI can be divided following the definitions of active and passive multinationality. Indices MNE and MNEITA are, therefore, considered among the explanatory variables. Moreover, the results obtained for the indices MNE and MNEITA are robust to whichever set of estimated is used, as it results from the estimated coefficients on MNEC and MNEITAC . The results obtained from OLS estimation of the previous equation are summarised in Table 1 reported below.

¹² Let $\text{CORR} = y = 2x - 1$, where $0 \leq x \leq 1$, then $f(x) = y/2 + 1/2$ s.t. $-\infty \leq x \leq +\infty$ can be solved by referring to the inverse of the logistic function.

Table 1 - OLS Estimates of b

<i>Explanatory variables</i>	<i>Specifications</i>				
	(I)	(II)	(III)	(IV)	(V)
Constant	0.300 (3.50)*	0.354 (5.53)*	0.368 (5.77)*	0.229 (3.22)*	0.229 (3.22)*
TRADEI	0.384 (2.04)*	0.473 (2.72)*	0.489 (2.86)*	0.264 (1.55) ^o	0.264 (1.55) ^o
TRADEE	-0.656 (-2.94)*	-0.761 (-3.75)*	-0.786 (-3.92)*	-0.519 (-2.54)*	-0.519 (-2.54)*
MNE	-0.223 (-1.46)	-0.286 (-2.11)*			
MNEC			-0.683 (-2.56)*		
MNEITA	0.153 (1.15)			0.245 (2.08)*	
MNEITAC					0.491 (2.08)*
<i>R-Squared</i>	<i>0.198</i>	<i>0.173</i>	<i>0.194</i>	<i>0.174</i>	<i>0.174</i>

Left-hand side variable is the correlation of production growth rates by industry defined at three digit level in Italy and Europe, over the period 1985-96. T-statistics are reported in brackets. * indicates significance level at the 5% level. ^o indicates significance level at the 15% level.

The empirical results obtained indicate that the degree of the Italian sectors' openness is relevant for the level of correlation between production growth rates of Italy and production growth rates of the aggregate of the other European countries. When Italian industries are more open with the rest of Europe through trade, these industries are characterised by more correlated production fluctuations¹³. The introduction of the role of FDI consistence in the estimation procedure seems to have some additional explicative power. In specification (I), however, the introduction of both MNE and

¹³ See Segre (2000) for a more detailed discussion on the effects of trade on business cycles correlation.

MNEITA variables implies non significant estimated coefficient. This is probably due to multicollinearity problem between the two variables. When the estimation is undertaken in two distinct equations, one including MNE variable and the other including MNEITA variable, estimated coefficients for MNE and MNEITA are significant and have opposite sign. In specification (II) and (III) are presented results obtained for the equation including the measure of FDI consistence of foreign affiliates in Italy. The estimated coefficients for both MNE and MNEC variables are significant and have negative sign. In specification (IV) and (V) are presented results obtained for the equation including the measure of FDI consistence of Italian multinational firms. The estimated coefficients for both MNEITA and MNEITAC variables are significant and have positive sign.

Moreover, the MNE variable has been divided in two variables by considering the country of origin of the parent company with plants in Italy. When the distinction between European and non-European home countries was made, the associated empirical results do not significantly differ from the results obtained by considering the whole MNE variable. Therefore, in our empirical experiment, the distinction between EU and non-EU FDI consistence does not have any additional explicative power, differently from the obtained results for trade.

A similar distinction is, on the contrary, not feasible when we consider MNEITA variable. It is impossible to distinguish between Italian firms with foreign affiliates either in the EU member states or in extra-EU countries. For only five industries it is possible to identify the presence of either EU or non-EU multinationals, and the use of dummy variables in order to capture any different behaviour in such industries is not significant.

6. Some comments on the empirical results

The empirical investigation of the relationship between trade, FDI and the correlation of business cycles was an attempt to shed some light on the role, if any, of multinational enterprises in promoting integration. Given the nature of the experiment undertaken, the obtained results have to be considered only broadly suggestive rather than conclusive.

The empirical results obtained indicate that the degree of the Italian sectors' openness is relevant for the level of correlation between production growth rates of Italy and production growth rates of Europe. When Italian industries are more open with the rest of Europe through trade, these industries are characterised by more correlated

production fluctuations. When the estimation is undertaken in two distinct equations, one including MNE variable and the other including MNEITA variable, the results obtained seem to indicate an interesting phenomenon under way in the Italian economy. In the estimation procedure with the MNE variable, the sign of MNE is negative and significant. On the contrary, in the estimation procedure with the MNEITA variable, the sign of MNEITA is positive and significant. The main findings of our empirical investigation indicate that a stronger presence of multinational enterprises – when measured as passive multinationality in Italy - is related to more asynchronous sectoral production fluctuations. In those sectors where the consistence of FDI is higher in Italy, Italian production growth rates and European production growth rates are less correlated. On the contrary, a stronger presence of active multinationality in related to more correlated Italian production growth rates and European production growth rates.

The negative sign of the estimated coefficient on MNE variable could reflect that passive multinationality in Italy is characterised by a peculiar situation of weakness in hi-tech sectors. In the last decade, Italian hi-tech sectors have followed an increasing different trend compared to other EU countries, where hi-tech sectors have been strategic elements. Another element explaining the negative relation between production correlation and FDI consistence could be the possibility that foreign affiliates in Italy are not integrated with the parent company activities. However, many other factors could be behind this negative relation, and this might be the subject of future research.

The positive sign of the coefficient on MNEITA variable could reflect the fact that Italian multinational enterprises follows an integrated strategies between parent company and foreign affiliates. In this sense, the paper by Sanna-Randaccio (1999) shows that inwards FDI, while being always positive for the host country consumers, can have an ambiguous effect on local producers' R&D and profits. Therefore, the paper warns against those who invoke policies for attracting FDI in all settings. From the model developed by Sanna-Randaccio, based on endogenous R&D, emerges that the likelihood that host country welfare increases is linked to the R&D intensity of the sector. Our results appear to be consistent with this position and highlight the possibility that Italian multinational firms follow production strategies that are more integrated than those adopted by foreign companies with their Italian affiliates.

7. Conclusion

Strong empirical evidence indicates the remarkable relevance of the phenomenon of FDI. As a consequence, a widening stream of the literature is pointing out the

importance of including the study of FDI and multinational enterprises in international economics analysis and, in particular, in the analysis of economic integration. A complete picture of the extent and sources of international linkages requires, indeed, a full understanding of the relationship between trade in goods and trade in factors and, therefore, the analysis of both trade and FDI. However, despite their importance, empirical and theoretical research on trade has largely ignored the role played by multinational enterprises.

In particular, the degree of integration created by close international trade links and globally connected industrial structures could be examined in relation to the degree of economic fluctuations synchronisation. However, when discussed only on theoretical grounds it is not clear whether increasing integration – in general represented in the literature by increasing trade flows - leads to more synchronous or to more asynchronous business cycle. Moreover, such problem becomes even more critical when the role of multinational companies in promoting integration is incorporated in the analysis. It is particularly difficult to identify any a priori expectation on the effects of a strong presence of multinational firms for the correlation of business cycles at the industry level. We, then, undertook an empirical investigation in order to shed some light on the relationship between trade and foreign direct investment and the correlation of production fluctuations.

When OLS estimation is undertaken in two distinct equations, one including the MNE variable and the other including the MNEITA variable, the results obtained seem to indicate an interesting phenomenon under way in the Italian economy. A stronger presence of foreign affiliates is associated with more asynchronous sectoral production fluctuations. On the contrary, a stronger presence of active multinationality is associated with production growth rates more correlated between Italy and the other European countries. Although obtained results are only broadly suggestive rather than conclusive, they seem to highlight the possibility that Italian multinational firms follow production strategies that are more integrated than those adopted by foreign companies with their Italian affiliates. This could be the sign that, in the long run, a policy promoting Italian foreign penetration, and not only attracting foreign investment, could be important for the involvement of Italian economy in the global process of world economy integration.

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