

**THE IMPACT OF EXCHANGE RATE REGIMES ON
PRODUCTION STRUCTURES ACROSS COUNTRIES:
THE EUROPEAN CASE**

- Preliminary draft -

Christian AUBIN
Camelia ROMOCEA-TURCU

University of Poitiers, Faculty of Economics
CRIEF (Centre de Recherche sur l'Intégration Economique et Financière)
93, Avenue du Recteur Pineau
86000 Poitiers - France

Phone : +33(0)5 49 45 31 30 - Fax : +33 (0)5 49 45 41 58
christian.aubin@univ-poitiers.fr - camelia.turcu@univ-poitiers.fr

Summary :

This paper analyzes the impact of exchange rate variability on the economic specialization of countries in the EU. Two theoretical approaches can be opposed: the first one is proposed by Krugman who sees monetary integration as favoring specialization of countries in the area; while the second one, advocated by Ricci, describes specialization as a consequence of the exchange rate variability. Empirical estimations are conducted using various measures of specialization and exchange environment. The results give a mixed picture: a significant link is evidenced but its sign differs according to the type of sector desegregation. To conciliate these results with the two challenging theoretical logics, we suggest some way of explanation distinguishing between inter-industry and intra-industry specialization.

I. INTRODUCTION

Fifty years after the Rome Treaty was signed, Europe offers the best example of regional integration: EU has continued its enlargement and its economic integration deepening. To ensure that economic and social cohesion and real convergence go along with the integration process, attention should be devoted to its effect on the production and employment structures of the member countries. This paper will analyze one of these effects, namely the impact of exchange rate variability on the economic specialization of the European countries. In the EU context and the analyzed time period, the passage from a flexible exchange rate regime to a fixed one coincides with the deepening of the monetary integration and the creation of the EMU.

The new economic geography (NEG) initiated by Krugman (1991a, b) suggests that the deepening of economic integration might induce agglomeration and specialization of economic activities. These theoretical predictions seem to be confirmed by the evolution of the US states (Krugman (1993)). However the argument might be reconsidered when monetary integration is at stake. Actually, the theoretical models developed by Ricci (1997, 2006a, b) support this opposite view, as he argues that countries seem to be less specialized under fixed exchange rates than under flexible ones. These theoretical findings are confirmed by Frankel and Rose (1996). So, there are two logics that can be mainly associated to the analysis of the economic specialization evolution with respect to monetary integration: Krugman's view on the one hand and Ricci's view on the other hand.

In this paper we investigate to what extent the production structures of the EU countries have been affected by the variability of their exchange rates. In other words, we wonder if the process of monetary integration could give rise to more or less specialization of economic production structures of the member countries.

In this context, this paper offers a complementary view compared to recent work on the exchange rate effects in terms of business cycle synchronization (Belke and Heine (2001), Kalemli-Ozcan *et al.* (2001)). The first part of this study presents a brief survey of the literature about the effects on specialization of a deepening of the monetary integration, this process being related mainly to diminishing exchange rate variability. The second part of the article is devoted to the empirical analysis. Using various measures of production structure specialization in EU countries, we estimate the influence that indicators of exchange rate

regime or exchange rate variability have upon them. The results of the econometric estimations give a somewhat mixed picture: a significant impact is shown but its direction appears to differ according to the type of sector desegregation that is used. To conciliate these results with the two challenging theoretical logics, we suggest some way of explanation distinguishing between inter-industry and intra-industry specialization.

II. THEORETICAL FRAMEWORK

Since the empirical application that we propose will be based on the European case with a special concern for its monetary union, this work can be related to the general field of optimum currency areas (OCA). This theory has outlined various criteria that can be used in order to assess countries capacity to form or to join a currency union. We have chosen to focus on the criterion of productive diversification, in the spirit of Kenen (1966) who thought that “diversity in a nation product mix (... might) be more relevant than labor mobility”. Thus, if an economy is diversified at the production structure level, a negative demand shock on a good or in a sector has a relatively modest effect (Kenen (1966)). With this respect, diversified economies will more easily form a monetary union. To a certain extent, the diversification of production structures represents an application of the principle of insurance against economic fluctuations risks.

Within this framework, Frankel and Rose (1996) have shown that close trade relations lead to an increase in the intra-industry trade, thus cycles can become tightly correlated, less specific. Using data for a thirty-year period and for twenty industrialized countries, they arrived at the following conclusion: countries with strong commercial relations tend to have more narrowly correlated business cycles. Therefore, countries are able to satisfy the criteria concerning the entry in a monetary union after having advanced on their economic integration.

Within this framework, our paper, instead of trying to build a diagnosis on the optimality of a monetary union founded on its production diversity and the asymmetry of the shocks observed before the monetary union creation, takes the reverse approach and evaluates the change in production structures induced by a monetary unification. So doing, it is connected to the issue of OCA criteria endogeneisation highlighted by Frankel and Rose (1997), that is to say the possibility that the monetary union reinforces the real integration, strengthens the symmetry of shocks and therefore establishes the conditions of its success.

Frankel and Rose (1997), reversing the approach with respect to their initial paper in 1996, stress the fact that even if countries are regarded as weak candidates to the EMU, once they become members of the EMU, their trade expansion can be significant and can lead to more correlated business cycles. So, a country is more likely to satisfy the criteria for entry into the EMU ex-post than ex-ante. In the same spirit, Fidrmuc (2001) stresses that even if there are countries which can be regarded as weak candidates to the EMU, once they become members of the EMU, their trade expansion could be significant leading to more correlated business cycles. Under these conditions, a country can satisfy the criteria of entry in the UEM rather ex-post than ex-ante, the example of Austria being relevant from this point of view (Hochreiter and Winckler (1995)).

Within this framework, we can observe that economic integration leads to monetary integration in the first case, while the monetary integration leads to economic integration in the second case. Bayoumi and Eichengreen (1997) notice the symbiotic relation existing between these two forms of integration (monetary and economic). For years, this has been underlying the convergence debate between “monetarists” and “economists” about monetary integration in Europe: the former view (France and supporters) was in favour of a rapid adoption of single currency while the latter (Germany and supporters) favoured gradual adoption of a single currency.

The case for endogeneity of OCA criteria can be opposed to Krugman’s view. Considering the United States experience as a case of economic and monetary integration and then as a relevant example for the European integration, Krugman (1993) shows that the degree of production specialization in four European countries (Germany, France, Italy and United Kingdom) is lower than in the American areas¹. In Krugman’s view, this means that the weak specialization of the four European economies is the result of a less advanced European integration, which implies that economic and monetary union, considered as a deeper phase of the integration process, would lead to an increase of the European countries specialization. This suggests that monetary union could induce an increased specialization and

¹ The idea that industrial production is much more specialized in the American states than in the European countries, but Europe will become more specialized in time, due to the deepening of the European integration is also present in Krugman (1991b). Within respect to Europe, numerous studies based on production data have confirmed the increase of the manufacturing specialization (Amiti (1999), Aiginger et al. (1999), Longhi et al. (2005), Midelfart-Knarvik et al. (2000)). For example, Amiti (1999)’s study, conducted on production data belonging to 27 manufacturing industries, underlines the fact that, between 1968 and 1990, there was an increase of specialization in six European countries (Belgium, Denmark, Germany, Greece, Italy and Netherlands). Amiti (1999) also shows that between 1980 and 1990 there was a significant increase in specialization in all countries and that the use of more disaggregated data (65 industries) tends to reinforce the fact that there was a rise in manufacturing specialization in Europe.

a rise of asymmetrical shocks. Actually, Krugman (1993) supports the idea that countries integrating a monetary union would inevitably register an increase of their specialization. With this respect, he wonders whether an economic and monetary union can become less optimal from a monetary point of view, as its countries become more specialized. Thus, he suggests that an economy (or an area) would no longer fulfil the OCA criteria once it joins the currency union, which means ex-post, even if it had filled them ex-ante. Within this framework, new stabilization problems would appear and only a highly federalized system would solve them (the inexistence of such system in Europe could be a real problem).

In sum, whereas this approach suggests that integration involves a countries specialization that will go hand in hand with a greater probability of asymmetrical shocks, Frankel and Rose (1996a, 1996b) stress that monetary integration could lead to a diversification of the productive structures.

These empirical findings can be related to two theoretical approaches. Krugman's view is supported by his new economic geography models while the approach proposed by Frankel and Rose (1997) can be linked to the model developed by Ricci (1997). By integrating elements belonging to open macroeconomics, trade and location theories, these models bring new explanations to the effects of monetary unification on countries specialization and activities agglomeration.

SPECIALIZATION FAVOURED BY MONETARY INTEGRATION: KRUGMAN'S VIEW

Krugman's view is mainly reflected by the new economic geography models. Thus Krugman (1991b) shows that increased integration will lead to greater geographical concentration of industries. His model (Krugman (1991b)) is built within a framework which supposes the existence of two regions and two sectors (a traditional sector with constant returns and without transfer costs, characterized by perfect competition and an industry sector with increasing returns to scale, which produces differentiated goods, in monopolistic competition and whose sales are subject to transfer costs). This model studies the effects of integration on the increasing returns sectors' location in the presence of a mobile labour (the unique production factor of the model) which moves according to the wage differences. Within this framework, an integration deepening is expressed by lower transport costs and with this respect the lower the transport costs are, the more attractive the geographical concentration is for individual firms. The mechanism can be synthesised as follows: if countries are identical, firms will be indifferent to their location in one or another country;

however if labour is allowed to move from one country to another, there are differences that appear among countries and by consequence firms will want to locate their production in the largest markets in order to diminish all the costs related to selling at distance. In the same time the market size of a country depends on the number of people living there and their income, which in turn depends on how many jobs are in this country. Therefore, the size of a market increases as manufacturing agglomerates and manufacturing agglomerates on a market as the size of this market increases² (Baldwin *et al.* (2003) or Krugman (1991b)).

People's and industrial firms' mobility, which is at the core of this mechanism, becomes more important if transaction costs are lower and this can be the case with the deepening of the integration process. As a matter of fact, the reduction of exchange rate uncertainty or the adoption of a single currency, since it induces the reduction or the elimination of exchange risk coverage can be associated to a decrease in transaction costs between countries. On the whole, Krugman (1991b) shows, by insisting on the initial conditions, on the value of different parameters (the share of industry in the economy, the transport costs and the intensity of scale economies or the degree of product differentiation) and on the pecuniary externalities between firms and consumers, that a country will be able to attract all industry as integration progresses. So an increase of countries' manufacturing specialization should go along with the process of economic and monetary integration, expressed by a reduction of transfer costs. In other words, the introduction of a single currency reduces the transaction costs and this fall of the transaction costs is likely to release the agglomeration forces especially in the sectors with scale economies as it is underlined in Krugman's new economic geography models. Nevertheless, the role of initial conditions (a weak specialization of the countries which becomes members of a union) as well as the borders effects that still exist in Europe (Disdier and Mayer (2004)) should moderate this last effect.

SPECIALIZATION INDUCED BY EXCHANGE VARIABILITY: RICCI'S VIEW

The interaction between trade, location and monetary aspects is given a different and new theoretical view by Ricci (1997, 2006b) who develops a simplified two-country two differentiated good monetary model with international trade elements. He shows that countries tend to be more specialized under flexible exchange rates than under fixed exchange rates. The explanation is the following: in the first case, firms have incentives to locate in the

² Under these conditions, a phenomenon of "cumulative causality", already evoked by Myrdal (1957), appears.

country which is relatively specialized in the goods they produce in order to face all the same variability of exchange rates while, in the second case, all firms face the same variability of their sales regardless of their location. The explanation can be developed along several lines of arguments with the assumption that firms want to avoid the consequences that uncertainty may have upon their ability to compete with other firms.

At first, an exchange rate adjustment mechanism may be invoked under the assumption that, in a two-good two-country model, each countries export the good produced by its largest production sector. In such a case, a shock affecting positively (negatively) the large exporting sector of a country is likely to induce an appreciation (a depreciation) of the national currency; this will attenuate the positive (negative) effect of the initial shock on the exporting sector and a negative (positive) impact will be put on the other sector. Hence, due to compensating exchange rate movements, the firms in the exporting sector, assumed to be the largest one in the country, are likely to experience a lower variability of their sales.

Therefore if a firm wants to lower its sales variability, it has an incentive to be located in the country specialized in its own product. By consequence, in this situation, firms location strategies generate a cumulative movement, leading to an agglomeration of one sector in the same country and consequently to countries specialization and to an increase of shocks asymmetry. As these incentives with respect to location do not exist when exchange rates are fixed, countries will be more specialized under flexible exchanges than under fixed exchanges.

Through another simplified model which combines trade theory and neo-keynesian literature, Ricci (2006a) suggests that under flexible exchanges as compared to fixed exchanges, economic activities tend to be more concentrated and countries more specialized. This results from the fact that exchange rates variability affects firms' location choices.

On the one hand, on the demand side, if countries are different in size, as firms want to lower the exchange rate induced variability of their sales, they seek to locate on the larger market for their products. This is an obvious way to maximize the share of their sales free from exchange rate influences. On the other hand, on the supply side, to keep in line with their competitors and avoid exchange rate induced variability of their price competitiveness, firms have an incentive to locate in the country that is already specialized in their sector.

Hence, under flexible exchanges, an increase in the size of the market of a country reduces the variability of the sales of the localised firms and reinforces the tendency of the firms to be established in this country. The volatility of the exchange rate in the presence of prices rigidities will make firms prefer the country which offers the lowest sales variability

and which will be, besides, the country with the largest market. The firms movements towards this country involve two opposite effects: they increase the incentives of other firms to be established in this country whose market size is increasing but, at the same time, they reduce these incentives since firms will be in competition to attract the workers and, consequently, will have to offer increasingly higher wages. The fact that the expected profits are identical for all firms implies that at equilibrium, each firm of the largest (smallest) countries will have a more (less) important production and will pay higher (lower) wages.

Under these conditions, if firms are mobile, but labour is not, the exchange rate variability induces a stronger concentration of firms on the large markets - as it is the case in Europe - but this concentration is not infinite. If workers are mobile whereas the firms are not, and if workers prefer a less variability of their employment, they will settle in the largest country. If firms and workers are mobile at the same time, there could be a circular agglomeration mechanism similar to the backward and forward linkages specific to the economic geography theory where firms and workers tend to locate on the large markets in order to profit from a lower variability of sales and of employment respectively. These effects in terms of agglomeration appear, as specified before, because of exchange rate variability and of the market size effect in the presence of short-term prices rigidity and of the firms' exchange rate risk aversion. By identifying the effects in terms of agglomeration, Ricci (2006a) stresses that economic activities tend to be more concentrated under flexible exchanges than under fixed exchanges.

Hence, exchange rate variability acts as a centripetal force and, *ceteris paribus*, one should expect greater concentration of activities and specialization of countries under a flexible exchange rate regime. Putting it the other way, in Ricci's view, the monetary union is likely to set up the conditions of its own success, because it removes the exchange rate uncertainty responsible for greater specialization.

III. EMPIRICAL ANALYSIS

The empirical analysis that we propose will be conducted on European Union countries using available data at sector level. Our purpose is to investigate if a significant change in the specialization process can be perceived in relation to the European monetary integration process. Along this line, the paper will develop different types of comparative empirical investigations.

DATA AND MEASUREMENT

We will focus on the production structure specialization using employment data and on exports specialization, the latter being at the heart of most studies that are concerned with the European specialization. In order to investigate all these issues, we will take into consideration European data for an eleven-year period (1995-2005) and twenty European countries: ten that became members of the EMU over the analyzed period (Belgium and Luxemburg³, Germany, France, Finland, Greece, Ireland, Italy, Spain, Portugal, Netherlands) and ten EU members that were not part of the EMU : United Kingdom, Denmark and Sweden and seven new members (Slovenia, Slovakia, Estonia, Lithuania, Poland, Hungary, Czech Republic). Several EU-27 members have been excluded from our study either because they have become EU members only recently (Romania and Bulgaria) or because there were no data available for them for the given period.

Endogenous variables

Several types of indicators can be used to describe the specialization of activities⁴. As these indicators are very numerous, for simplicity reasons, we have chosen to use in this paper absolute and relative indices only.

Using sector employment data, we compute annually for each country i ($i = 1 \dots nc$), an absolute specialization index and an indicator of relative specialization. In the definition of these indices, the number of sectors or products (j) varies between 1 and ns ($j = 1 \dots ns$). These indices are constructed for two different decompositions of NACE sectors employment data: the first one covers 17 NACE branches ($ns = 17$); the second one is applied to manufacturing industry retaining the desegregation in 14 manufacturing industry NACE data ($ns = 14$).

The absolute measure of production activities specialization in country i is given by the normalized Herfindahl-Hirschmann index (NHH_i):

$$NHH_i = \frac{(\sqrt{HH_i} - \sqrt{1/ns})}{(1 - \sqrt{1/ns})} \quad \text{with} \quad HH_i = \sum_{j=1}^{ns} \left(\frac{N_{ij}}{\sum_{j=1}^{ns} N_{ij}} \right)^2$$

³ Belgium and Luxemburg are considered as one country as they formed a monetary union long before the EMU creation. Therefore, their exchange rate regime and real effective exchange rate are the same and we are considering them as the “Bleu” country as Eurostat names these two countries taken together.

⁴ See Aiginger *et al.* (1999), Longhi *et al.* (2005).

where N_{ij} = the employment of a country i in the sector j (source Eurostat)

This normalized index varies between 0 (economic activity uniformly distributed between sectors) and 1 (all the activity concentrated in a single sector). It becomes higher as a reduced number of sectors gets a large part of the total employment of the country; in other words, this index increases with the specialization of the economy.

The relative specialization of country i 's production structure is calculated using a Krugman index (K_i):

$$K_i = \frac{1}{2} \sum_{j=1}^{ns} \left(\frac{N_{ij}}{\sum_{j=1}^{ns} N_{ij}} \right) - \frac{\sum_{i=1}^{nc} N_{ij}}{\sum_{i=1}^{nc} \sum_{j=1}^{ns} N_{ij}}$$

Besides, a second set of endogenous variables is represented by two indices calculated by UNCTAD to represent the structure of exportations: an export concentration index (*CONCX*) and an export diversification relative index (*DIVX*).

The *CONCX* index can be written as a standardized Herfindahl-Hirschmann index:

$$CONCX_i = \frac{\sqrt{\sum_{j=1}^{ns} \left(\frac{X_{ij}}{\sum_{j=1}^{ns} X_{ij}} \right)^2} - \sqrt{\left(\frac{1}{ns} \right)}}{1 - \sqrt{(1/ns)}}$$

where X_{ij} = value of a country's i exports related to product j

ns = number of products (at the three-digit SITC level, Revision 3) exported by country i ; it includes only those products that are greater than 100,000 dollars or more than 0.3 per cent of the country's i total exports.

This indicator is a measure of the degree of market concentration ranking from 0 to 1. It becomes higher as a reduced number of products gets a large part of the total exports of a country. Thus, it characterizes the structure of a country's exchanges and gives an indication on its production structure and on the country's integration in the world trade.

The *DIVX* index represents the absolute deviation of a country's i share from world structure. This index that ranges from 0 to 1, reveals the difference between the trade structure of a country i and the world average. An index value closer to 1 indicates a bigger difference

from the world average, which means a greater relative specialization. The *DIVX* index can be written as follows:

$$DIVX_i = \frac{1}{2} \sum_{j=1}^{ns} \left| \frac{X_{ij}}{\sum_{j=1}^{ns} X_{ij}} - \frac{\sum_{i=1}^{nc} X_{ij}}{\sum_{i=1}^{nc} \sum_{j=1}^{ns} X_{ij}} \right|$$

This index is a modified Finger-Kreinin⁵ measure of similarity in trade, which in this situation is similar to the Krugman index.

All endogenous variables have values between 0 and 1 while the exogenous variables of the model are real numbers. In this case, estimating the model by means of OLS would lead to biased results. Therefore, we rescale the dependent variable by means of a logistic transformation in order to allow it to vary between $-\infty$ and $+\infty$ and to make all variables comparable. Each endogenous variable (*EndoV*) is rescaled as follows:

$$EndoV^* = \log \left(\frac{EndoV}{1 - EndoV} \right)$$

Exogenous variables

Theoretical models compare the effects of flexible exchanges directly with those of a monetary union (considered as an irrevocable form of fixed exchange rates) whereas in reality there are different forms of exchange rate regimes. For the sake of simplicity, we'll assume a kind of continuity in the influence of exchange environment on specialization. Two types of indicators have been used to express this exchange environment.

The variances of real effective exchange rate (*EERVAR-R*) and of nominal effective exchange rate (*EERVAR-N*) represent the first set of exogenous variables related to exchange rate variability. These are yearly variables that are constructed using monthly data for each country: for each year and country, we calculate the variance of the monthly real (nominal respectively) effective exchange rates. The higher this index, the more important the variability of real exchange rates is.

Another exchange rate variable is given by an indicator (*REGIME*) that takes into account the exchange rate arrangements' classification provided by the IMF. This indicator,

⁵ Finger-Kreinin is a relative index that compares the industrial share in total exports of a country with respect to another country (Algieri (2003)) or it can also be written as it appears in Finger et Kreinin (1979) or Chojna and Marczewski (2007) :

$FK = 100 \sum \min [(X_{ja} / \sum X_{ja}), (X_{jb} / \sum X_{jb})]$, where $X_{ja} / \sum X_{ja}$ = share of industry j in country a and $X_{jb} / \sum X_{jb}$ share of industry j in country b

constructed on the basis of exchange rate regimes declared by countries, ranks exchange rate arrangements on the basis of their degree of flexibility and the existence of formal or informal commitments to exchange rate paths (IMF (2007)). This indicator varies from 1 under fixed exchange rates to 8 under perfect flexibility (see annex).

Beside the indicators of exchange rate variability, standing for an inversed measure of monetary integration, two other variables have been introduced into the analysis in order to take into account other aspects of economic integration.

- The first one (FDI) is a measure of the openness to international flows of capital. It is represented by the sum of FDI inflows and outflows as part of the GDP.

- The second one (OPEN) is the openness degree measured by the ratio of a country's foreign trade (exports plus imports) and its GDP.

As suggested by Midelfart et al. (2000), we assume that the log-log model is superior to the linear model in terms of statistical properties, it allows for a heteroscedasticity correction and therefore the results obtained by using the logarithm are superior to those in value. Hence, all variables used in our estimations are in logarithm. These estimations are obtained by means of OLS.

RESULTS AND INTERPRETATION

The shortness of the period under analysis and the existence of fluctuations due to business cycles coupled with the fact that some countries in the panel (namely CEECs) have experienced strong changes during the period may question the robustness of econometric estimations using these data. Indeed, this kind of results should be considered with some caution. However, even though the estimations presented in tables 1 to 3 have been conducted using the rather basic OLS method, the appearance of a significant impact of the exchange indicator, whatever it is, in the various equations is worthy of note⁶.

Before turning to the interpretation of this impact, a look at tables 1 and 2 below shows that the two variables used to control for the influence of the integration process behave quite differently. In these two first sets of estimations, the indicator of trade openness (OPEN) never exhibits a coefficient significantly different from zero while the indicator of openness to foreign direct investment (FDI) has a quite significant negative influence. Hence the impact of the integration process upon the EU production structures seems to be more

⁶ Further investigations using more sophisticated econometric methods with the introduction of GLS and of time fixed effects appear to improve the results.

strongly related to long term capital movements than to trade in goods and services⁷. In this relation, a greater openness to investment leads to a lower specialization. In table 3 where the explained variables are indicators of the trade structures, the same influence appears as regards the relation of export specialization to FDI⁸.

Table 1: Specialization indices – all 17 NACE branches

Log(ExoV)	EndoV*					
	Normalized Herfindhal index (NHH-all)			Krugman index (K-all)		
Constant	-1.121 (-5.26)	-1.095 (-5.21)	-1.312 (-7.18)	-1.121 (-2.87)	-1.004 (-2.62)	-0.987 (-2.45)
EERVAR-N	0.007 (8.95)			0.003 (1.78)		
EERVAR-R		0.042 (7.61)			0.050 (4.16)	
REGIME			0.121 (11.10)			0.071 (2.66)
FDI	-0.061 (-7.34)	-0.060 (-6.83)	-0.060 (-8.52)	-0.063 (-3.62)	-0.062 (-3.67)	-0.074 (-4.38)
OPEN	-0.024 (-0.74)	-0.044 (-1.41)	-0.025 (-0.88)	-0.027 (-0.43)	-0.058 (-0.96)	-0.051 (-0.82)
Adjusted R²	0.447	0.417	0.520	0.096	0.179	0.138

Student-t statistics between parentheses. Heteroscedasticity correction (White's matrix)

Table 2: Specialization indices – manufacturing industry

Log(ExoV)	EndoV*					
	Normalized Herfindhal index (NHH-manuf)			Krugman index (K-manuf)		
Constant	-1.916 (-4.74)	-2.122 (-5.19)	-1.607 (-4.58)	0.646 (1.17)	0.348 (0.61)	1.191 (2.57)
EERVAR-N	-0.010 (-6.70)			-0.017 (-6.88)		
EERVAR-R		-0.031 (-3.28)			-0.045 (-3.15)	
REGIME			-0.175 (-8.37)			-0.281 (-9.20)
FDI	-0.081 (-4.33)	-0.072 (-3.76)	-0.089 (-5.67)	-0.242 (-9.85)	-0.220 (-8.43)	-0.248 (-12.54)
OPEN	0.059 (1.09)	0.100 (1.85)	0.069 (1.45)	0.040 (0.52)	0.083 (1.06)	0.032 (0.49)
Adjusted R²	0.216	0.147	0.321	0.450	0.362	0.526

Student-t statistics between parentheses. Heteroscedasticity correction (White's matrix)

⁷ Actually, the omission of OPEN in the equation does not modify the value and significance of the remaining variables.

⁸ Trade openness indicator has been omitted from these estimations dealing with trade structures

Table 3: Export concentration and divergence indices

Log(ExoV)	EndoV*					
	Export concentration index (CONCX)			Export divergence index (DIVX)		
Constant	-2.125 (-59.12)	-2.073 (-70.67)	-1.884 (-34.69)	-0.262 (-6.35)	-0.265 (-6.85)	-0.058 (-0.93)
EERVAR-N	-0.011 (-4.09)			-0.014 (-5.02)		
EERVAR-R		-0.085 (-5.98)			-0.099 (-6.75)	
REGIME			-0.153 (-4.52)			-0.157 (-4.68)
FDI	-0.096 (-4.10)	-0.074 (-3.68)	-0.080 (-3.60)	-0.162 (-5.59)	-0.101 (-3.69)	-0.113 (-3.61)
Adjusted R²	0.108	0.171	0.119	0.205	0.241	0.156

Student-t statistics between parentheses. Heteroscedasticity correction (White's matrix)

The main purpose of our empirical analysis is to test for the influence of exchange rate variability on the production structures in the EU. From this point of view, the estimations give quite clear-cut results. Whether we use a measure of the actual variability of the effective exchange rate (in nominal or real terms) or an index of the officially notified exchange rate regime, a significant effect is observed and these different types of exchange variables do act in the same direction for each kind of production structure indicators (explained variables). However, the direction of this significant influence varies from one equation to the other.

On the one hand, when the specialization index is built for all the 17 NACE branches, the exchange variability indicators positively affect the production specialization, measured in absolute (Herfindhal) or relative (Krugman) terms. This means that a reduction in the variability of the exchange rate is associated with a lower specialization of the production. In other words, greater fixity of the exchange rate appears to be related to greater diversification of the activities. Such a finding is in line with the conclusions of Ricci's analysis.

On the other hand, when the explained variable is a specialization index built on a desegregated data for the manufacturing industry sector, the exchange variables appear with a significantly negative coefficient. A reduction in the variability of the exchange rate is related to an increase in both the Herfindhal's and Krugman's specialization indices. A similar influence is shown when indices of the export structure are used as explained variables: a

lower exchange rate variability is associated with a greater concentration of the country exportations and a greater divergence of their structure from the world average, which can be interpreted as a greater specialization in the export activities of the country. These results give support to Krugman's view according to which more fixity, as it means stronger integration, tends to favour specialization.

The marked difference between the two sets of results deserves attention. Our sample contains countries with different levels of income whose association to the integration process differs both in its time length and in its forms. Hence, one may think that various factors related to the general process of economic integration in the EU are at work behind the observed contrasted relations. However, an interpretation can be suggested in the spirit of the theoretical analyses developed in the first part of the paper.

As a matter of fact the two sets of results can be distinguished according to the endogenous variable they use. In the first set, the Herfindhal and Krugman indices refer to specialization between sectors defined at a relatively broad level. In the second set, the same indices are defined at a more desegregated level since they concern specialization between 14 sub-sectors inside the manufacturing industry and the exportation structure indices are calculated using a large number of products (more than 200 for most of the countries, see UNCTAD Handbook of Statistics). So it may be considered that the first set of variables gives indications relative to inter-industry specialization while intra-industry specialization plays a greater role in the second one.

Besides, it can be argued that non-price competitiveness is more relevant at the intra-industry level while there is relatively more concern about prices in inter-industry competition. Hence the role of exchange rate variability via its impact on price competitiveness is likely to be relatively less pre-eminent in intra-industry specialization than in inter-industry specialization. Comparatively, the ranking of its relative role in the two types of specialization will be reversed when one consider its impact as an element of transfer costs. In other words, when inter-industry specialization is concerned, the exchange rate variability will play more as an element of price-competitiveness than as an element of transfer cost; conversely, with intra-industry specialization, its role as a transfer cost is relatively greater. Since Ricci's analysis emphasizes the role of exchange rate variability in the process of price competition while transfer costs are given more concern in Krugman's view, a tentative interpretation of the difference between our two sets of results may be proposed, combining the two theoretical approaches. The reduction of exchange rate variability induces lower

specialization between countries at the level of broadly defined sectors and, at the same time, increased specialization at a more desegregated level.

IV. CONCLUSION

Taking the EU as its empirical field of investigation, this paper intended to decide between two opposite views concerned by the effect of monetary integration, assimilated to a reduction of exchange rate variability, on the specialization of production structures. Our empirical results, while showing a significant relationship between various indicators of these variables, suggest that the two views should not be opposed but rather combined.

A lower variability in the exchange rate appears to be associated with less specialization at the inter-industry level and more specialization at the intra-industry level. This may be put together with the two roles played by the exchange rate variability as an element of transfer cost and of price competitiveness.

Such a finding and its suggested interpretation open some original perspectives in the debate about endogenous optimal currency areas and its implications, in the EU, in terms of strategies for the euro adoption process. Much work remains to be done in order to ascertain the relevance of the analysis developed in this paper; we hope our results are appealing enough to initiate further research.

References

- Aiginger K., Boenheim M., Gugler K., Pfaffermayr M., Wolfmayr-Schnitzer Y. (1999), Specialization and geographic concentration of European manufacturing, *European Commission Report*, WIFO
- Amiti M. (1999), Specialisation Patterns in Europe, *Weltwirtschaftliches Archiv*, vol. 135, pp. 573-593
- Algieri B. (2004), Trade specialization patterns : The case of Russia, *BOFIT Discussion Paper* no. 19
- Baldwin R., Forslid R., Martin P., Ottaviano G., Robert-Nicoud G. (2003), *Economic Geography and Public Policy*, Princeton University Press
- Bayoumi T., B. Eichengreen (1997), Ever closer to heaven? An optimum-currency-area index for European countries, *European Economic Review*, vol. 41 (3-5), pp. 761-770
- Belke A., Heine J. M. (2001), On the Endogeneity of an Exogenous OCA-Criterion: The Impact of Specialisation on the Synchronisation of Regional Business Cycles, *HWWA Discussion Paper*, no. 119

- Chojna J., Marczewski K. (2007), Position of exporters and foreign owned companies in economic opening in Poland in light of trade flows and business survey analyses, *INDEUNIS Papers*
- Disdier A-C., Mayer T. (2004), How Different is Eastern Europe? Structure and determinants of location choices by French firms in Eastern and Western Europe, *Journal of Comparative Economics*, vol. 32(2), pp. 280-296.
- Fidrmuc J. (2001), The Endogeneity of the Optimum Currency Area Criteria, Intraindustry Trade, and EMU Enlargement, *Licos Discussion Paper* no. 106
- Finger J.M., Kreinin M.E. (1979) A measure of 'Export Similarity' and its possible uses, *The Economic Journal*, 89, pp.905-912.
- Frankel J., Rose A. (1996a), The Endogeneity of the Optimum Currency Area Criteria, *CEPR Discussion Papers*, no. 1473, *NBER Working Paper*, no. 5700
- Frankel J., Rose A. (1996b), Economic Structure and the Decision to Adopt a Common Currency, Institute for International Economic Studies - Stockholm, *Seminar Paper*, no. 611
- Frankel J., Rose A. (1997), Is EMU More Justifiable Ex Post than Ex Ante?, *European Economic Review*, vol. 41(3-5), pp. 753-760
- Hochreiter E., Winckler G. (1995), The advantages of tying Austria's hands: The success of the hard currency strategy, *European Journal of Political Economy*, vol. 11(1), pages 83-111
- Kalemli-Ozcan S., Sorensen B.E., Yosha O. (2001), Economic integration, industrial specialization and asymmetry of macroeconomic fluctuations, *Journal of International Economics*, vol. 55, pp. 107-137
- Kenen P. (1969), The Theory of Optimum Currency Areas: An Eclectic View, dans Mundell R. & Swoboda A.K. (eds), *Monetary Problem of the International Economy*, University of Chicago Press, pp. 41-60
- Krugman P. (1991a), *Geography and trade*, Cambridge MIT Press
- Krugman P. (1991b), Increasing Returns and Economic Geography, *Journal of political economy*, vol. 99(3), pp. 483-499
- Krugman P. (1993), Lessons from Massachusetts for EMU, in Torres F. & Giavazzi F. (eds) *Adjustment and Growth in the European Monetary Union*, London: CEPR and Cambridge University Press
- Loisel O. (2005), Endogenously asymmetric demand shocks in a monetary union, *Journal of Economic Integration*, vol. 20 (4), pp. 746-770
- Longhi S., Nijkamp P., Traistaru I. (2005), Economic Integration and Manufacturing Location in EU Accession Countries, *Journal of International Business and Economy*, vol. 6(1), pp. 1-22
- Midelfart-Knarvik K.H., Overman H.G., Reding S.J., Venables A.J. (2000), The location of European industry, *Economic Papers*, vol. 142, DG ECFIN
- Midelfart-Knarvik K.H., Overman H., Venables A.J. (2000), Comparative advantage and Economic Geography: Estimating the Location of Production in the EU, *CEPR Discussion Paper*, no. 2618
- Myrdal G. (1957), *Economic theory and under-developed regions*, London, Duckworth. Trad. Française, *Théorie économique et pays sous-développés, Présence Africaine*, Paris
- Ricci L.A. (1997), Exchange Rate Regimes and Location, *IMF Working Papers*, no. 69

Ricci L.A. (2006a), Uncertainty, Flexible Exchange Rates, and Agglomeration, *Open Economies Review*, vol. 17(2), pp. 197-219

Ricci L.A. (2006b), Exchange Rates Regimes, Location and Specialization, *IMF Staff Papers*, vol. 53(1), pp. 50-62

UNCTAD (2007), *UNCTAD Handbook of Statistics*,
<http://www.unctad.org/Templates/Page.asp?intItemID=1890>

Annex

Table 4. Exchanges rate regimes (IMF classification)

<i>Exchange rate regime</i>	<i>Description</i>	<i>REGIME index value</i>
Exchange arrangements with no separate legal tender	Member countries belong to a monetary union	1
Currency board arrangements	A monetary regime based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate	2
Other conventional fixed peg arrangements	A country pegs its currency at a fixed rate to another currency or a basket of currencies, where the basket is formed from the currencies of major trading or financial partners	3
Pegged exchange rates within horizontal bands	The value of the currency is maintained within certain margins of fluctuation of at least ± 1 percent around a fixed central rate. It also includes arrangements of countries in the exchange rate mechanism (ERM) of the European Monetary Systems (EMS) replaced with the ERM II on January 1, 1999	4
Crawling pegs	The currency is adjusted periodically in small amounts at a fixed rate or in response to changes in selective quantitative indicators	5
Exchange rates within crawling bands	The currency is maintained within certain fluctuation margins of at least ± 1 percent around a central rate and the central rate is adjusted periodically at a fixed rate or in response to changes in selective quantitative indicators	6
Managed floating with no predetermined path for the exchange rate	the monetary authority attempts to influence the exchange rate without having a specific exchange rate path or target)	7
Independently floating	Exchange rate is market-determined	8

Source : IMF