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The Impact of the European Economic and Monetary Union on the Stability of the Greek Economy

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Abstract

This paper addresses the issue of how the stability of the Greek economy will be affected by Greece's accession to the European Economic and Monetary Union (EMU). The theoretical basis for most of the discussion of this issue to date is found in the theory of optimum currency areas (OCA), which identifies the nature of economic disturbances as key to whether currency unions provide a net benefit. We use vector autoregression to identify the nature of the disturbances that the Greek economy has experienced in the past, and add such disturbances to stochastic simulations of a structural macroeconomic model of the Greek economy, part of a larger model of the European economy known as QUEST II. The main conclusion is that the EMU will make output slightly more stable in the Greek economy. Therefore, the Greek economy will reap the efficiency gains of the common currency without suffering significantly from the elimination of its monetary sovereignty.

JEL classification: *F33; F42;F47*

Keywords: *EMU, Greek Economy, optimum currency areas, economic stability.*

1. Introduction

This paper addresses the issue of how the stability of the Greek economy will be affected by Greece's accession to the European Economic and Monetary Union (EMU). Participating in the EMU implies in particular that nominal exchange rates among the currencies of the country members are irrevocably fixed – irrevocably because the currencies are replaced by the common European currency, the Euro. As a consequence, monetary policy

is conducted for all EMU countries by the European Central Bank (ECB) rather than for each country by its own central bank. National monetary sovereignty is abandoned. The monetary authorities of each member country lose control over nominal exchange rate manipulation and control over a policy lever that could otherwise be used to respond to country-specific disturbances. Since there will be some form of adjustment to any disturbance, through some combination of price or output movements, the question that arises is what the adjustment process looks like when nominal exchange rates are fixed. The cost of abandoning national monetary sovereignty depends, among other things, on whether the adjustment mechanism is as prompt and effective without fluctuations in nominal exchange rates. In this paper, we investigate and evaluate the adjustment mechanisms for the Greek economy under both flexible exchange rates and a common currency.

The theoretical basis for most of the discussion of this issue to date is found in the theory of optimum currency areas (OCA). It provides insights about the benefits and costs for a country participating in a monetary union and the mechanisms necessary for the economy to adjust in the absence of a sovereign national monetary policy. So far, the debate in the literature regarding the EMU has focussed on whether the EMU countries would constitute an optimum currency area or whether instead they would be better off to keep separate currencies[1]. Following up this approach, economists have examined whether the countries joining in the EMU have faced similar (symmetric) shocks and/or whether their responses to these shocks have been similar in order to determine how much independent adjustment would actually be required. The technique used for these exercises is mainly vector autoregression, with the related techniques of impulse response analysis and variance decomposition. Vector autoregressions involve only a limited number of variables, mainly output or (un)employment and the price level or the inflation rate, and say little about the actual adjustment processes being used. In this paper, we use vector autoregression only to identify the nature of the disturbances that the Greek economy has experienced in the past. We then use such disturbances to perform many stochastic simulations of a structural macroeconomic model of the Greek economy, part of a larger model of the European economy known as QUEST II. With this combination we are able to evaluate how the economy would adjust to the type of country-specific

[1] Empirical articles addressing the question of the viability of the EMU as an OCA include Poloz (1990), Eichengreen (1990, 1991), von Hagen and Neumann (1994), Caporale (1993), Fatas (1997), de Nardis et al. (1996), Cohen and Wyplosz (1989), Weber (1991), de Grauwe and Vanhaverbeke (1991), Bayoumi and Eichengreen (1992), Bayoumi and Thomas (1995), Funke (1997), Christodoulakis et al. (1995), Frankel and Rose (1997, 1998).

disturbances that Greece has in fact experienced in the past. The results of the stochastic simulations allow us to discuss not only issues specific to Greece, but also more general issues such as the necessity of fiscal federalism in Europe or the fiscal rules which the EMU rules impose on all EMU members.

A more specific explanation of our technique is as follows. First, we identify the kind of shocks the Greek economy has experienced by using the structural vector autoregression approach (SVAR) developed by Blanchard and Quah (1989). We estimate a bivariate structural VAR consisting of real output and the consumer price index in order to decompose aggregate macroeconomic disturbances into demand and supply shocks. Second, we subject the macroeconomic model, QUEST II, to a large set of demand and supply disturbances and compare how the Greek economy reacts under flexible exchange rates and in the EMU. The stochastic simulations of the model are the main part of the experimental work. They involve the following steps. First, sets of numbers are randomly drawn from a standard normal distribution and paired with the 'pure' shocks identified with the Blanchard and Quah approach. Second, the model is repeatedly solved for given sets of shocks, in order to yield predictions for the endogenous variables. Third, we compare these forecasts to the baseline values (found from a simulation of the model without any disturbances) and calculate a measure of variability. Finally, we compare the variability measures for the simulated values of the endogenous variables under the EMU with those under flexible exchange rates in order to shed some light to the central question of this research.

The paper is organised as follows. First, we review the theory of Optimum Currency Areas in order to identify the adjustment mechanisms that may effectively substitute for the exchange rate variability in the EMU. Second, we present the main characteristics of the QUEST II model that is used for the stochastic simulations. Third, we explain the Blanchard and Quah approach and specify the VAR system used to identify structural disturbances. Finally, we present and discuss the results of the stochastic simulations and propose some extensions for future research.

2. The Theory of Optimum Currency Areas

An optimum currency area is a geographical area in which the general means of payments is either one single currency or else several currencies whose exchange values are irrevocably pegged to one another with unlimited convertibility and fluctuate in unison against the rest of the world. 'Optimum' is defined in terms of maintaining internal and external balance. Internal balance refers to price and/or output stability and external balance in-

volves both intra-area and inter-area balance of payments equilibrium (Kawai, 1987).

The theory of Optimum Currency Areas (OCA) offers insights on the characteristics that make a currency union desirable and the adjustment mechanisms that must exist for it to be viable[2]. The benefits from participating in a currency union are mainly efficiency gains from the integration of national markets; the benefits take the form of eliminated transaction costs and eliminated exchange rate uncertainty (Grubel, 1970; Ishiyama, 1975; Gros and Thygessen, 1991 and 1992). Benefits may also take the form of increased credibility for monetary policy, in the case of high-inflation countries that join a monetary union with low-inflation countries (European Commission, 1990; de Grauwe, 1992). The costs arise mainly from the sacrifice of national monetary sovereignty. The magnitude of this sacrifice depends on the incidence of the disturbances in the union and any structural differences of the country members that affect how the economy would adjust to disturbances in a single-currency environment (Corden, 1972). Different authors have suggested different adjustment mechanisms that might be used instead of nominal exchange rate movements in restoring equilibrium. With flexible prices, equilibrium can be restored through relative price changes: prices and wages decrease in the deficit country and increase in the surplus country. When prices are inflexible, adjustment can take place through quantity changes in the form of labour and/or capital mobility and trade among participating countries. Factor mobility can moderate the pressure on relative factor prices and employment during the adjustment process (Ingram, 1959, 1960; Mundell, 1961). Trade among participating countries can help adjustment to equilibrium through income effects: in the deficit country income and import decreases lead to lower trade deficit (McKinnon, 1963).

The Optimal Currency Area literature has shown that more integrated markets across nations (financial markets, markets for inputs, goods markets) may speed up the adjustment process when exchange rates are fixed. When an imbalance of payments occurs in an integrated economy, equilibrium may be restored quickly through a combination of adjustment of financial asset holdings, changes in trade volume, migration of labour and capital, as well as relative wage and price changes.

[2] Ishiyama (1975), Tower and Willett (1976), Eichengreen (1990) and Masson and Taylor (1992) offer surveys of the theory of OCA.

3. Specification of the Model

The QUEST II is a quarterly model of linked national macroeconomic modules that is designed to analyse the economies of member countries in the European Union, their interaction with each other, and their interaction with the rest of the world, especially the United States and Japan[3].

The model is based firmly on microeconomic foundations. The behavioural equations are derived from the intertemporal maximisation of households' utility functions and of firms' profit. The multi-period nature of the maximization problem makes the model forward-looking. The supply side is explicitly modelled with a neoclassical production function. This feature of the model ensures that the long-run behaviour of the model resembles the standard neoclassical growth model in that the model reaches a steady-state growth path whose growth rate is essentially determined by the (exogenous) rate of technical progress and the growth rate of the population. This implies that economic policy will not affect the long-run steady-state growth rate, unless it changes the rate of time preference, technical progress or population growth. However, it can affect the level of output and, thereby, the growth rate of the economy in the medium term until the new steady-state income level is reached.

Stock-flow interactions are taken into consideration explicitly. The stock variables (such as physical capital, net foreign assets or government debt) are endogenously determined and adjustment takes place through wealth effects that influence the savings and investment decisions of the households, firms and governments.

The international financial linkages are strong. Assets (short and long term, private and government bonds) are assumed to be perfect substitutes across countries. Consistent modelling of international trade and financial linkages also requires that two adding-up constraints hold across all countries in the model at each instant: both trade balances and net foreign asset positions must sum to zero.

There are two major departures from the frictionless, perfectly competitive neoclassical model. First, the firms are not perfectly competitive, so they charge mark-ups over marginal cost. Second, adjustment in the labour market is sluggish because hiring and job-search are costly and wages are determined through bargaining. Because of these rigidities, involuntary unemployment persists even in the long run. The model also has several standard Keynesian features besides imperfectly flexible wages and prices, in the form of adjustment costs for investment and labour hoarding.

[3] A detailed description of the model is provided in Roeger and In't Veld (1997).

The complete QUEST II model consists of the structural models of all EU country members, the USA and Japan and the trade linkage equations (total of about 1000 equations). Because of computer memory limitations for our work, the model was edited to include only the structural models of Germany and Greece.

To emulate the conditions of the monetary union, a EMU-aggregate interest rate reaction function is used, in which the interest rate setting reacts to EMU inflation and the EMU money stock. The EMU money stock is the aggregate of all member countries' money stocks and the EMU inflation rate is defined as the weighted average of the domestic inflation rates. The weights are determined by the relative size of each EMU member.

The flexible exchange rate regime is modelled by (a) omitting the equations for the EMU aggregates described above and (b) making the Drachma/Mark exchange rate endogenously determined. The domestic authorities implement an independent monetary policy as determined by their own domestic interest rate reaction function.

A pair of 'baseline' datasets is obtained through the deterministic simulation of the models corresponding to the two exchange rate regimes. The differences between the deterministic simulations and the stochastic simulations enable us to estimate the variability of the Greek economy under the two different exchange rate policies.

4. Identification of Structural Disturbances

Stochastic simulations are driven by sets of stochastic shocks. For the simulations to be relevant, the shocks must be of the sort most likely to occur in the Greek economy. To find such shocks, we use a Structural Vector Autoregression (SVAR) with Greek historical data and restrictions on the long-run coefficients – a method introduced by Blanchard and Quah (1989).

A Vector Autoregression is a system created by making each of a set of variables dependent on its own lagged values and the lagged values of the other variables in the set. It can be thought of as a reduced form model of the economy. In a Structural VAR, the researcher is able to use the economic theory to transform the standard (reduced-form) VAR model into a system of structural equations. This is achieved either by imposing contemporaneous restrictions or by imposing long-run restrictions on the coefficients (Keating, 1992). The Blanchard and Quah (BQ) method of identifying structural disturbances utilises the latter method.

Two variables are chosen for the VAR: real output, y, and the consumer price index, p. Both series are measured in logarithms. The two variables are chosen so that the structural shocks can be classified as nominal ('demand') or real ('supply') disturbances. For a VAR model to be estimable, its

variables must be stationary around a trend or constant term. Stationarity tests indicate that real output is first-difference stationary around a trend and that the price level is first-difference stationary around a constant term (that is, both are integrated of order 1). Therefore, the VAR is estimated using the first differences of y and p (that is, output growth and inflation). The Akaike Information Criterion (AIC) and the Schwarz Criterion (SC), commonly used to measure a mixture of good fit and parsimonious model specification, indicate that the appropriate lag length for this VAR model is one period (that is, one year). At this lag length, the residuals of the VAR are serially uncorrelated.

The underlying assumption of the Blanchard-Quah method is that the reduced-form residuals of the estimated VAR equations are linear combinations of the more basic structural disturbances to just demand or supply. The task of the researcher is to decompose these reduced form shocks in order to identify the basic structural disturbances that should be used in stochastic simulations. After the VAR has been estimated, its coefficient and the residual covariance matrices are used to identify the structural disturbances. The restriction that is imposed on the long-run coefficient matrix, in order to identify the structural disturbances, is that demand disturbances have no permanent effect on output. Both kinds of shocks have permanent effects on prices but only supply shocks have permanent effects on output.

5. Stochastic Simulation Results

The stochastic simulations are similar to Monte Carlo methods in that sets of numbers are randomly drawn from a standard normal distribution set with mean zero and standard deviation one. These random numbers are used to calculate the shock terms in each simulation using the relation $e_i = \sum_j c_{ij}\varepsilon_j$, where e_i is the shock to variable *i,* c_{ij} is the coefficient indicating the contemporaneous effect for variable *i* of the structural disturbance in variable *j* (as determined by the BQ method) and ε_j is the structural disturbance in variable *j* (a random variable). Every solution of the model with a given set of shocks provides a prediction of the endogenous variables for a given time period. In this particular case, stochastic simulations were run for a period of 40 quarters and repeated 100 times.

In order to compare the impact of the two regimes, EMU and flexible exchange rates, on the stability of the Greek economy, we use the variability measure proposed by Fair (1998). This is a form of average standard deviation, derived as follows. Let y^t_j be the solution value of variable *y* for period *t* in stochastic simulation j and let y_t^* be the baseline value of variable *y* when

the economy is at steady state. The variance L_j is the mean squared percentage deviation of the solution value, y_t^j, from its base value, y_t^*, for the whole prediction period, $t=1,...,T$, for the stochastic simulation j. Measure L is the square root of the mean of variances L_j calculated across all of the J simulations:

$$L_j = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{100(y_t^j - y_t^*)}{y_t^*}\right)^2$$

$$L = \sqrt{\frac{1}{J}\sum_{j=1}^{J} L_j}$$

The results from the simulations of the model are presented in the following table. The second column reports the results from the stochastic simulations of the model corresponding to the EMU, the third column presents the results from the stochastic simulations of the flexible exchange rate model and the fourth column shows the percentage change in the volatility of each variable due to the transition from the flexible exchange rate system to the EMU. In the second or 'monetary union' column, the 'exchange rate' and 'interest rate' labels refer to the EURO/USDollar rate and the European interest rate, respectively. In the third, or 'flexible exchange rates' column, those labels refer to the Greek Drachma/US Dollar rate and the Greek interest rate, respectively. Negative signs in the fourth column indicate a decrease in the volatility of a variable due to the transition to the EMU from a flexible exchange rate system.

Stochastic Simulation Results (Standard deviation of simulated from baseline values)			
VARIABLE	CURRENCY ARRANGEMENT		
	EMU	FLEXIBLE EXCHANGE RATES	% CHANGE (due to EMU)
Gross Domestic Product	1.75	1.76	-0.43
Private Consumption	2.69	2.95	-8.92
Private Fixed Investment	2.80	2.74	2.03
Exports	0.74	0.85	-12.55
Imports	3.04	3.35	-9.41
Domestic Price Level	1.90	1.67	13.32

Real Wage Rate	2.10	2.05	2.20
Employment	0.14	0.15	-0.41
Public Deficit/GDP	1.24	1.77	-29.94
Public Debt/GDP	4.03	5.94	-32.15
Exchange Rate	0.80	2.28	-64.99
Interest Rate	0.007	0.012	-43.10

The results from the stochastic simulations indicate that in moving to monetary union the stability of Gross Domestic Output and of total employment decrease only very slightly even though each of its components, with the exception of private fixed investment, becomes significantly more stable. The domestic price level becomes more volatile. As is consistent with the predictions of the Optimal Currency Area literature, the public sector deficit and debt ratios, the (European) interest rate, and the exchange rate all are much more stable in the monetary union.

Some of the results require a bit of explanation. Imports become less volatile mainly because of the greater stability in import prices due to the much more stable exchange rates (EURO/US$). Exports are less volatile because of more stable relative prices. In the QUEST II model, export prices are determined as the weighted average of the domestic price level and competitors' prices expressed in domestic currency. The weight by which each of these two components affects export prices depends on a parameter which indicates the effects of market-strategic behaviour in export price determination; for the Greek economy, this parameter has a value of 0.68, which means that competitors' price behaviour is more important in determining export prices than the domestic price level. Competitors' prices become much more stable (due to the much more stable exchange rate), sufficiently so to more than offset greater volatility in the domestic price level.

Private investment becomes slightly more volatile. This can be attributed to the increased volatility of the real interest rate (not shown in the table). The domestic price level becomes more volatile, as expected given the increased stability in the (EURO/US$) exchange rate, in European interest rates, and in output. This result is consistent with the theory that when exchange rates (among European currencies) are fixed, domestic price movements relative to foreign prices (real exchange rate movements) are necessary for the adjustment process, as described above. This result is also consistent with the empirical evidence that European firms adjust to shocks by changing their profit margins and mark-up (European Commission, 1996).

The considerably lower variability of the deficit/GDP and debt/GDP ratios in the monetary union is a surprising result because of the fact that the public sector budget is the only stabilisation tool available to a domestic government when country-specific disturbances occur. However, this finding could be attributed to the greatly decreased volatility of debt-servicing costs due to the less volatile European interest rates.

This raises the issue of whether the guidelines regarding the domestic governments' fiscal discipline are necessary and whether they can be consistently followed. The Stability and Growth Pact (SGP) is an agreement reached by the European Council in 1997, which underlines the importance of sound government finances in strengthening the conditions for price stability and sustainable growth. It requires that member countries avoid excessive general government deficits, where 'excessive' is defined as 'in excess of 3% of GDP'. Evidence suggests that increased economic integration among the European country members leads in greater correlation in business cycles and that disturbances are more likely to be industry-specific rather than country-specific (Bayoumi and Eichengreen, 1997; Bayoumi and Thomas, 1995; Christodoulakis et al., 1995; Fatas, 1997; von Hagen and Neumann, 1994). Therefore, disturbances may be more synchronised in the EMU and greater coordination of national fiscal policies will be required to counteract them. Following this evidence and our finding above, it could be argued that fiscal stability and coordination among the country members are a result of the EMU rather than a condition and that such fiscal rules need not be imposed. Besides, deficits usually arise or increase when the growth rate of an economy decelerates or becomes negative. By imposing the kind of fiscal rules that the SGP requires (focusing on the budget deficits), the stabilisation role of a budget deficit is nullified and a vicious cycle of deficit and recession may begin.

On the other hand, empirical evidence shows that (expenditure-based) fiscal consolidation can be expansionary either through increases in aggregate consumption or through higher investment associated with expectations for lower future tax liabilities (Giudice et al., 2003).

6. Conclusion and limitations

This study has used stochastic simulations to evaluate the impact on the stability of the Greek economy of the transition from flexible exchange rates to participating in the EMU. The model used for this purpose is the multi-country model used by the European Commission called QUEST II. The disturbances are identified from a structural VAR model, following Blanchard and Quah (1989), to reflect the probable nature of future shocks to the Greek economy. The main conclusion from comparing variability of sto-

chastic solutions from the baseline, deterministic simulations, is that the EMU does not make output less stable in the Greek economy (in fact, it makes it slightly more stable). Therefore, the Greek economy may reap the efficiency gains of the common currency without suffering significantly from the elimination of its monetary sovereignty.

The conclusions above are only as good as the model which produced them. That model has several limitations that may or may not have any effect on the qualitative results. First, there is some empirical evidence that economic integration makes disturbances across countries more highly correlated than they were historically. If that is true, then our stochastic simulations are likely to have overestimated the variability of certain Greek variables. It would be difficult to estimate how the historical correlations might change in the future.

Second, the high degree of aggregation of the model does not allow us to observe relative price movements among the different Greek sectors. By introducing greater detail in the model one would be able to observe how different sectors would be affected by disturbances under the alternative exchange rate regimes. For example, the only disaggregation of output in the model is between the private and public sector. Output could be further disaggregated to define agricultural output separately from that in manufacturing in a weighted function using input-output weights. This would enable one to examine how output diversification functions as an adjustment mechanism.

Third, the model does not include labour mobility. Empirical evidence indicates that labour mobility in Europe is lower than in the USA or other currency areas. However, as the labour markets become more integrated, labour mobility will increase. To the extent that there is labour mobility among the EU country members, the variability of real wages may be lower. Labour mobility could be specified to include equations relating domestic employment to employment abroad. Net migration flows would then be a function of wage differentials between countries, the unemployment rate and a risk factor (identified as the variance of income).

Finally, the model does not include any of the fiscal restrictions imposed by the Stability and Growth Pact to the EMU country members that were described above. It would be interesting to examine the effects of the Euro system under different fiscal rules, including the requirement of a deficit/GDP ratio equal to 3%.

References

Bayoumi, T. and B. Eichengreen, 1992, Shocking Aspects of European Monetary Unification, *NBER Working Papers Series,* No. 3949.

Bayoumi, T. and B. Eichengreen, 1997, Ever Closer to Heaven? An Optimum Currency Area Index for European Countries, *European Economic Review* 41, 761-770.

Bayoumi, T. and A. Thomas, 1995, Relative Prices and Economic Adjustment in the United States and the European Union: A Real Story about EMU, *IMF Staff Papers*, 42, 108-133.

Blanchard, O.J. and D. Quah, 1989, The Dynamic Effects of Aggregate Demand and Supply Disturbances, *American Economic Review* 79, 655-673.

Bofinger, P., 1994, Is Europe an Optimum Currency Area? *CEPR Discussion Paper* No. 915.

Caporale, G.M., 1993, Is Europe an Optimum Currency Area? Symmetric versus Asymmetric Shocks in the EC, *National Institute Economic Review* 144, 95-103.

Christodoulakis, N., S. Dimelis and T. Kollintzas, 1995, Comparisons of Business Cycles in the EC: Idiosyncracies and Regularities, *Economica* 62, 1-27.

Cohen, D. and C. Wyplosz, 1989, The European Monetary Union: An Agnostic Evaluation, in: Bryant, R.A., D.A. Currie, J.A. Frenkel, P.R. Masson and R. Portes, eds., *Macroeconomic Policies in an Interdependent World*, CEPR/The Brookings Institute/ IMF, Washington, 311-337.

Corden, W. M., 1972, Monetary Integration, *Princeton Essays in International Finance*, No. 93.

De Grauwe, P., 1992, German Monetary Unification, *European Economic Review* 36, 445-453.

De Grauwe, P. and W. Vanhaverbeke, 1991, Is Europe an Optimum Currency Area? Evidence from Regional Data, *CEPR Discussion Papers,* No. 555.

De Nardis, S., A. Goglio and M. Malgarini, 1996, Regional Specialization and Shocks in Europe: Some Evidence from Regional Data, *Weltwirtschaftliches Archiv* 132, 197-214.

Eichengreen, B., 1990, One Money for Europe? Lessons from the US Currency Union, *Economic Policy* 10, 117-187.

Eichengreen, B., 1991, Is Europe an Optimum Currency Area? *NBER Working Paper Series*, No. 3579.

European Commission, 1990, One Market, One Money: An Evaluation of the Potential Benefits and Costs of Forming an Economic and Monetary Union, *European Economy* 44, 118-187.

European Commission ,1996, Economic Evaluation of the Internal Market, *European Economy, Reports and Studies* 4.

Fair, R. C. ,1998, Estimated Stabilization Costs of the EMU, *National Institute Economic Review* 4, 90-99.

Fatas, A.,1997, EMU: Countries or Regions? Lessons from the EMS Experience, *European Economic Review* 41, 743-751.

Frankel, J.A. and A.K. Rose,1997, Is EMU more Justifiable Ex Post than Ex Ante? *European Economic Review* 41, 753-760.

Frankel, J.A. and A.K. Rose ,1998, The Endogeneity of the Optimum Currency Area Criteria, *The Economic Journal* 108, 1009-1025.

Funke, M.,1997, The Nature of Shocks in Europe and in Germany, *Economica* 64, 461-469.

Giudice, G., A. Turrini and J. in't Veld (2003) Can fiscal Consolidations be Expansionary in the EU? Ex-post Evidence and Ex-ante Analysis, *European Economy*, *Economic Papers*, No. 195.

Gros, D. and N. Thygessen,1991, Towards Monetary Union in the European Community: Why and How, in: Welfens, P. J. J., ed., *European Monetary Integration: From German Dominance to EC Central Bank?* (Springer-Verlag), 95-123.

Gros, D. and N. Thygessen, 1992, *European Monetary Integration: From the European Monetary System towards Monetary Union,* Longman.

Grubel, H. G., 1970, The Theory of Optimum Currency Areas, *Canadian Journal of Economics* 3, 318-324.

Ingram, J. C., 1959, State and Regional Payments Mechanisms, *Quarterly Journal of Economics* 73, 619-632.

Ingram, J. C., 1960, Reply, *Quarterly Journal of Economics* 74, 648-52.

Ishiyama, Y., 1975, The Theory of Optimum Currency Areas: a Survey, *IMF Staff Papers* 22, 344-383.

Kawai, M., 1987, Optimum Currency Areas, in: Eatwell, J., M. Milgate and P. Newman, eds., *The New Palgrave: A Dictionary of Economic Theory and Doctrine*, Macmillan Press, 740-743.

Keating, J., 1992, Structural Approaches to Vector Autoregressions, *Federal Reserve Bank of St. Louis* September/October, 37-57.

Masson, P.R. and Taylor, M.P., 1992, *Common Currency Areas and Currency Unions: an Analysis of the Issues*, Discussion Paper No. 617, CEPR.

McKinnon, R. I. ,1963, "Optimum Currency Areas", *American Economic Review* 53, 717-724.

Mundell, R. A., 1961, A Theory of Optimum Currency Areas, *American Economic Review* 51, 657-665.

Poloz, S.S., 1990, Real Exchange Rate Adjustment Between Regions in a Common Currency Area, *mimeo*, Bank of Canada.

Roeger, W. and J. in't Veld, 1997, QUEST II: A Multi Country Business Cycle and Growth Model, European Commission DGII, *mimeo* (avail-

able on-line at http://www.europa.eu.int/comm/economy_finance/document/ecopap, No. 123).

Tower, E. and Willett, T.D., 1976, *The Theory of Optimum Currency Areas and Exchange-Rate Flexibility,* Special Studies in International Economics No. 11.

von Hagen, J. and M.J.M. Neumann ,1994, Real Exchange Rates within and between Currency Areas: How Far away is EMU?, *Review of Economics and Statistics*, 76(2), 236-244.

Weber, A.A., 1991, EMU and Asymmetries and Adjustment Problems in the EMS - Some Empirical Evidence, *European Economy* Special Edition 1, 187-207.