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STRUCTURAL INTERDEPENDENCE
OF EUROPEAN ECONOMIES

This paper represents a simplified model which shows the consequences of structural interdependence between European countries. The model used allows us evaluate budget policies in the microeconomic and intertemporal perspectives. The analysis of structural interdependency of European countries derives from both their commercial and financial relations that tend to transmit the effects of single productive variations. It takes into consideration the actions of producers and consumers in the countries of the European Monetary Union and the conditions of equilibrium at financial markets. The representation of interdependency is placed in the framework of the two-countries model, open to the rest of the world. The overall analysis is applied to the centralised budget policy such as that in Europe, which is linked to the outside by the system of flexible exchange.

Keywords: European Monetary Union; structural interdependency; budget policy.
JEL Classification: E61; E62; E63; E66.

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СТРУКТУРНА ВЗАЄМОЗАЛЕЖНІСТЬ
ЄВРОПЕЙСЬКИХ ЕКОНОМІК

У статті представлено спрощену модель, що демонструє наслідки структурної взаємозалежності європейських економік. Дана модель дозволяє оцінити ефективність бюджетних політик країн з мікроекономічної точки зору, а також у часовій перспективі. Аналіз структурної взаємозалежності європейських країн відображає вплив виробництва на торговельні та фінансові відносини країн. При цьому має бути врахована поведінка виробників та споживачів у країнах Європейського монетарного союзу, а також явище рівноваги фінансових ринків. Взаємозалежність описано на прикладі двох країн, відкритих при цьому для решти світу. В аналізі також враховано централізовану бюджетну політику Європи з її системою гнучкого валютного обміну.

Ключові слова: Європейський монетарний союз; структурна взаємозалежність; бюджетна політика.
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СТРУКТУРНАЯ ВЗАИМОЗАВИСИМОСТЬ
ЕВРОПЕЙСКИХ ЭКОНОМИК

В статье представлена упрощенная модель, демонстрирующая последствия структурной взаимозависимости европейских экономик. Данная модель позволяет оценить эффективность бюджетных политик стран с микроэкономической точки зрения, а также во временной перспективе. Анализ структурной взаимозависимости европейских стран отображает влияние производства на торговые и финансовые отношения стран. При этом должно быть учтено поведение производителей и потребителей в странах Европейского монетарного союза, а также явление равновесия финансовых рынков. Взаимозависимость описана на примере двух стран, открытых при этом для остального мира. В анализе также учтена централизированная бюджетная политика Европы с ее системой гибкого валютного обмена.

Ключевые слова: Европейский монетарный союз; структурная взаимозависимость; бюджетная политика.

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Introduction. In the presence of a price system which is structurally interdependent, functioning of any economy influences that of the others.

In the case of European countries, their interdependency derives from both their commercial and financial relationships which tend to transmit the effects of single productive variations.

In representing this interdependency in the context of a monetary union, one can use a simplified, aggregate model of two countries open to external trade, linked by the system of flexible exchange.

Furthermore, this model allows us evaluate budget policies from the intertemporal and microeconomic perspectives.

The analysis of structural interdependency of European countries is done in the framework of a two-countries model, open to the rest of the world, following (Levin, 1983; De Bonis, 1994); and the most recent analysis by W. Godley and M. Lavoie (2007), and J. Mazier and G. Tiou-Tagba Aliti (2012). This model is used to describe the European Monetary Union (EMU). For simplicity, the region is limited to two countries, France and Italy, which are united by fixed exchange or common currency. The European Monetary Union (EMU) is relevant at the regional level but it is not important enough to influence the rest of the world, to which any nation is linked by flexible exchange.

The global supply of goods. Every country in the EMU produces a specific product. Its supply of goods is represented by a relationship between its global product and the determinants of the balanced employment rate. It is, therefore, defined by the technical relationship between production level and the levels of employment, for a given capital, in reference to the relative conditions at labour market.

In any country, labour demand depends on nominal wage rates related to the price of internal products, while supply is the calculated by dividing wage rate by consumer prices. This last value is the average in consideration of:

1) the prices for products of the first country (P), of the second country (P^*) and of the rest of the world P_R;

2) the fixed exchange rate which links the first country's currency to that of the second one, if two countries keep their national currencies. This rate (the 'Euro' in the case of Europe) is considered unitary;

3) the exchange rate (E) between the dollar and the euro (or specific European currencies).

In every country price increase of national products determines the demand for surplus labour which provokes a rise in nominal wage rates. This is followed by an increase in labour supply and a decline in demand, until a new equilibrium is obtained between nominal wage rate and higher employment rate.

A decrease in prices of other EMU countries' products or the prices of those products outside the EMU (or a fall in the exchange rate of euro), increases the purchasing power of wage earners and brings a surplus supply of labour. All this determines a decrease in the nominal wage rate and a rise in the demand for labour until once again a new balance is achieved at higher level of employment.

Respective global supplies of the first country (Y) and of the second country (Y^*) can be expressed in the following ways:

$$Y = Y(P, P*, P_R, E);$$
$$Y* = Y*(P, P*, P_R, E). \tag{1}$$

It is assumed, for simplicity, that the relationship between supply side and national price variations, of foreign prices and of the exchange rate, are the same in countries A and B.

The global demand for goods. In every European country, the demand for national products is formed by:

1. Demand by private operators measured by the difference between their demand for national and foreign goods (C) and (C^*) and their import.

2. Public demand (G) or (G^*) that is external and applies to national products.

3. Demand by non-residents which corresponds with export.

The demand in the products of country A and of country B are defined in the following way respectively:

$$Y^d = C(Y, T, r) + G + B_C(Y, Y*, Y^R, EP_R / P, P*/P); \tag{2}$$

$$Y^{d*} = C*(Y*, T*, r*) + G* + B_c*(Y, Y*, Y^R, EP_R / P*, P*/P*). \tag{3}$$

In these relationships, demands (C) and (C^*) depend on global revenues (Y) and (Y^*), on forfeited taxes (T) and (T^*) and on interest rates (r) and (r^*). As far as the sale of the commercial balance (B_c) and (B_c^*) are concerned, these are the revenue functions of the country considered by the revenues of the second country and by the rest of the world (Y^R), and by the relationship between foreign prices in national currency and national prices. For simplicity, the demand for national goods abroad reacts in the same way to variations in revenue and in the two countries' prices.

Equilibriums at Financial Markets. It is hypothesised that financial capital mobility and the sustainability of activity is perfect at the global level and that EMU does not have sufficient importance to influence interest rates in the rest of the world (rR). In this way the interest tax of country A and of country B are the same as those of the obligations in the rest of the world. This can be expressed by the following expression, overlooking prevision in the variations of exchange rates:

$$r = r* = Rr. \tag{4}$$

In the case of the two systems, A and B having two different currencies, the supply of M_A and of M_B, defined as (M) and (M^*), has internal credits (F) and (F^*) a compensation and an exchange reserve (R) and (R^*). The demand for these currencies in real terms (L) and (L^*) depends on the global revenue (Y) and (Y^*) and on interest rates (r) and (r^*).

Hence, monetary equilibrium in the two countries is defined in the following way:

$$M = F + R = PL(Y, r);$$
$$M* = F* + (R* - R) = P*L*(Y*, r*) \tag{5}$$

In relationship (5), the sum of the currency reserve of countries A and B, (R^*), is external due to the flexibility in exchange rates between external currencies of the Union; this allows us define the reserves of country B by the difference ($R^* - R$) (for a description of the relationship between two economies linked by a system of flexible exchange see (Rankin, 1990)).

If the European Central Bank (ECB) manages national currency by linking it to a fixed exchange rate, it ensures the two countries' monetary equilibriums, furnishing them with the necessary currency for a given European exchange rate. In this case, monetary equilibrium is defined by the following relationship, the term on the right indicating the distribution in the Union's supply of currency within the two countries A and B:

$$M_\mu = M + M* = PL(Y,r) + P*L*(Y*,r*). \tag{5'}$$

In the contrary case (two countries adopt the euro), there is only a single supply of the Union currency (M_μ) and the nominal demand for euro (L_μ), that depends on European interest rate (r_μ) defined on the basis of (4), of the global revenue (Y_μ); and of the average European price (P_μ). In this case, the condition of European monetary equilibrium is expressed in the following way, with the external currency supply:

$$M_\mu = P_\mu L_\mu(Y_\mu, r_\mu). \tag{6}$$

Now it is possible to analyse the budget policies of EMU members and their effects in the ambit of the EMU.

The effects of budget policies with severe prices, common currency and fixed exchange. The short-term analysis is placed in the framework of a model that describes the EMU through:

1. Equations of global product determination, defined by relationships (2) and (3) that include the equivalencies $Y = Y^d$ and $Y^* = Y^{d*}$.

2. Condition (6) of EMU monetary equilibrium that is characterised by currency and unique interest rates.

A rise in public expenditure in country A encourages national production. The rise in revenue brings an increase in country A's demand, as much for goods produced in country A as for those produced in country B with effects in production therefore for both.

The increase in production in the European context influences a rise in the import of goods e.g. from the United States, which would lead to the euro depreciation in relation to USD. However, the borrowing used to finance country's A expansive policy effectuates a temporary rise in European interest rates, which brings a flow of capital and Euro appreciation that overcompensates for the depreciation generated by commercial deficit due to perfect mobility of capital. The drop in European exchange rate reduces European countries' competitiveness. This instigates a negative effect on European demand for goods that lessens the positive influence of the initial expansive policy on country A's production, which overcompensates for positive effects of higher purchasing rate in country A on the production of country B.

The rise in public expenditure (G) or (G^*), financed by borrowing in one EMU country, therefore brings about:

1. A growth in national production $(\partial Y / \partial G, \partial Y * / \partial G* > 0)$.

2. A negative external flooding effect on the global product of country B $(\partial Y * / \partial G, \partial Y / \partial G* < 0)$. This effect compensates for the positive influence of expansive policy on the national product $\partial Y_t / \partial G$, which allows monetary equilibrium (6) to be achieved at an unaltered interest rate.

3. An appreciation of the euro in relation to foreign currencies to the EMU ($\partial E / \partial G, \partial E / \partial G* < 0$).

4. A deterioration of commercial sale of the EMU as a consequence of the decline in the euro exchange rate.

Effects with an intra-European fixed exchange rate. We will now go on to consider the hypothesis in which two European countries (A and B) have monetary autonomy and are tied to each other by fixed exchange rates (see the model by (Bryson, 1994)). Analysis of the effects of budget expansion in country A is positioned in a model formed by two equations of global product determination (2) and (3) and by the conditions of monetary equilibrium determined by (5) which include (4).

The effects of an increase in public spending in country A on other European countries can be represented by imagining two graphs in IS-LM, in which the lines IS (A) and IS* (B) represent relationships (2) and (3) that include $Y = Y^d$ and $Y* = Y^{d*}$ and the lines LM and LM* (B) correspond with the conditions defined by (5).

The increase in public spending of country A, that translates into a shift of IS (A) to the right, individuates national production. The rise in import into country A that follows also encourages production in country B; this then has a positive effect on country B that, in its turn, exercises an ultimate positive effect on country A. This development in commercial trade between the two EMU countries causes a deterioration in commercial sale of country A towards country B, that brings a depreciation in the currency of A in relation to the currency of B.

This effect is more compensatory to the appreciation of country A's currency, which derives from the influx of capital that brings a rise in country A's interest rate, caused by the process of public borrowing. Direct interventions to maintain a stable exchange rate between the two currencies of A and B bring a rise in the reserve and in the monetary mass of A and a reduction in the two in B. Such measures translate into a shift to the right of LM (A) and to the left of LM* (B).

As for the measure in which country A's budget expansion causes a transitory rise in the EMU's interest rate, this determines, moreover, a flow of external capital to the EMU and appreciation of European currencies. The following is a negative effect of the demand for goods of countries A and B; this lessens the initial positive initial effect on Y(A) and overcompensates for that exercised on Y*(B).

An increase in public spending G and G*, financed by borrowing in one of the EMU countries therefore brings about:

1. A growth in the national product of country A and a drop in that of B.

2. An appreciation of European currency.

3. A rise in the reserve in country A ($\partial R / \partial G, \partial R * / \partial G* > 0$) and fall in the reserve in country B ($\partial R * / \partial G, \partial R / \partial G* < 0$).

The importance of these effects will be less in the case in which the growth in public expenditure should be financed through tax withdrawal due to the suppressive effect of this demand.

Similar results can be obtained in the framework of a model built around relationships (2), (3), (4) and (5') for European countries that have given up their monetary autonomies. However, in this case, monetary equilibrium is ensured by ECB and not by the variation of reserves.

Effects in the presence of flexible prices. Let us now analyse the effects of a country's budget policy on price levels and on the EMU activities and the diffusion of these effects through different component countries (for a discussion see (Frankel and Razin, 1987)).

In the case of process flexibility, the EMU can be described by the following relationships that determine the average price and the European global product, for example, the European exchange rate of the euro:

1. Global supply in goods that is the result of aggregation of the relationships defined by (1).

2. A demand for goods that comes from the aggregation of relationships (2) and (3).

3. The condition of European monetary equilibrium (2).

Surplus demand for goods induced by an increase in public expenditure in country A determines a growth in the level of European prices, due to the growth in goods supply in the EMU. A new equilibrium is reached for higher production, higher prices and weaker net exportat.

The loan used to finance public spending brings about a transitory increase in European interest rates; this brings the appreciation of euro. A growth in goods supply in the EMU and a reduction in exports follow.

Considering these effects together, budget expansion effectuates:

1. A fall in the level of European prices, as the rise in supply of goods is superior to the net growth in demand.

2. A rise in European global product.

3. Appreciation of euro in relation to internal currencies.

The stimulant effect on European production of budget expansive policy can be discussed in the case in which the goods of all 3 together (countries A, B and the rest of the world) can be considered perfectly sustained; this includes achieving the condition of *purchasing power parity*. In this case, budget expansion does not influence employment but produces instead a rise in inflation, as in the preceding single-country model.

Effects on the different components of the EMU. To complete the analysis we need to add two relationships of which one corresponds with the difference between the conditions of equilibrium of markets and products. These relationships allow us specify the following effects exercised by expansion in country A on the two components A and B:

1. Such expansion brings a growth in the global product in A, which is minimized by the negative influence of decline in export to the rest of the world.

2. It can determine a rise or fall of the global product in B. In effect, this induces the appreciation of euro in relation to the currencies outside the EMU, it produces a growth in the global supply of goods and a reduction in demand. However, surplus supply that follows on can be partially absorbed or more than compensated for by the rise in demand on the part of A for goods produced in B.

3. It exercises an indeterminate effect on the country's prices, as it can bring about a supply or a surplus demand for goods, relieving its negative effect on net export.

4. It reduces the prices in B because it causes a drop in A that induces a surplus supply of goods, even if demand is stimulated in B, this reduction is more significant than that which A will eventually suffer.

If two countries keep monetary autonomy within the system of fixed exchange, the budget expansion of country B determines, as in the case of fixed prices, a rise in the monetary mass of country A and a fall of monetary mass in country B. These effects of redistribution are nonetheless minimized by the influence of price variations on the real values of respective monetary masses (for the analysis on integration of national budget policies and of common currency policies see: Beetsma and Debrun, 2004; Correia, Nicolini and Teles, 2003; Morselli, 2014).

EMU and its budget policies in relation to the rest of the world. In the case of interdependency within two EMU countries and between these two and other economies together, the effects should be well supported by the models which include at least 3 countries, to highlight the effects of the EMU.

As far as the three-country model is concerned it tends to describe structural interdependency, it should highlight the interdependency:

1) of A and B that form a union both with distinct currencies and a single currency;

2) EMU (C) and of the third country (R), that represents the rest of the world.

It is highlighted that such a model links as an extension of a model of two countries and at fixed prices. This is formed by:

a) the equations of determination of the global products of A and of B defined as originating from relationships (2) and (3), that include the equations: $Y = Y^d$ and $Y^* = Y^d$;

b) the following relationship that determines the product of the rest of the world Y_R, and which variables are characterised by the index (R), defined on the characteristics of the rest of the world's economy:

$$Y_R = C_R(Y_R, T_R, r_R) + G_R + B_{cR}(Y, Y*, Y_R, P/EP_R, P*/EP_R); \tag{7}$$

c) the condition of parity in interest rates (4), that defined the perfect mobility of capital and the perfect substitution of financial activities;

d) the condition of monetary equilibrium of the two European countries (5) or of the monetary union (6);

e) the following equality between supply MR and demand LR of the rest of the world's currency:

$$M_R = P_R L_R = P_R L_R(Y_R, r_R). \tag{8}$$

It is assumed for simplicity that the agents of the 3 countries react in a symmetric way to the modifications of external variables.

In the context of this model, we will now analyse the effects of a European country's budget policies.

The rise in public expenditure in A grows the global product of the country, also stimulating the demand by A for the goods produced by B. An increase in the production in B is effectuated in this way. This results in an increase in European importation, which stimulates production in the third country. Furthermore, financing of public spending through borrowing increases European interest rate, which attracts capital and depreciates the currency in the third country in relation to euro or indi-

vidual European currencies. This depreciation exercises a positive effect on the third country's activity and a negative effect on A and B's activities.

The rules of international financial arbitrage re-establish the equality between European country interest rates and that of the third country at a higher level than the initial rates. This rise produces negative effects on the production of all 3 (A, B, R).

Hence, the expansion of A's budget brings a rise in European interest rates (r_U) and those of the rest of the world (r_R) and a growth in the global production within the union (Y_U) and the rest of the world (Y_R).

In the context of the monetary union, the rise in production in A stimulated by the processes of public spending and by import from the rest of the world, is slowed down by the appreciation of euro and by the growth in interest rates.

These two factors also reduce the product in country B, this effect is minimized by the positive role of purchasing by the part of A and by the rest of the world, which is an increased activity.

If politics of A is placed within a union with fixed exchange, it determines a rise in the reserve of A, to the detriment of that in B, because the borrowing which finances it produces a transitory shift in the interest rate in A in relation to that of B.

The intertemporal scenario. The analysis can also be extended to the microeconomic and intertemporal perspective. This finds reference in the model of N. Rankin (Rankin, 1990; see also Cuddington and Vinals, 1986), which illustrates the interrelations between two economies linked by flexible exchange.

Let us hypothesise that both of those taken into consideration in the model are A (the EMU) and B (the rest of the world). The EMU manages the single currency and also exercises a stabilising function on the level of activity, thanks to its own budget policy. The model specifies intemporal behaviours of the representative agents A and B that are addressed in a bi-periodic interval and defines (on these bases) the conditions of equilibrium at markets. A and B each incorporate 3 categories of operators, which are able to achieve perfect previsions: businesses, families and state.

In period (t), that represents a brief period, production is determined by demand for goods at given fixed prices and unemployment is at an insufficient level to goods demand. In period $t = 2$, that corresponds to the long period, the perfect flexibility of prices and wages ensures the equilibrium at the market of goods and of labour for supply of work which is externally determined. As far as agents like families are concerned, together with the EMU and together with B (the rest of the world), they maximise respectively the functions of intemporal utility:

$$U = U(C_t, H_t, M_t / P_2);$$
$$U* = U*(C_t^*, H_t^*, M_t^* / P_2^*);$$
$$\text{with } t = 1, 2.$$

(9)

In A and B, the utility of the *family-type U* and *U** grows with the quantity of national goods C or C^* and foreign goods H_t or H_t^*, consumed in $t = 1, 2$ and with monetary resources in real defined terms, on the basis of prices of the period $t = 2$.

Representing every relationship specified in expression (9) under the particular form of a combination of Cobb-Douglas function, we can include the influence exercised by families. This allows us complete the analysis effectuated in the framework of

models that presuppose the perfect substitution of products or the absence of links between specialist goods produced in A or in B.

Every *family-type* is assumed to have an intertemporal constraint, on the basis of which its consumption of national and imported goods and desired monetary income cannot exceed the resources V and V^*, placed in the two periods. These resources are freed from monetary income held back at the start of $t = 1$, that is defined as (M_0/P_1) and (M_0^*/P_1^*) and from the sum of the net revenues actually imposed on the basis of factor α or α^*. Hence: $Y_1 - T_1 + a(Y_2 - T_2)$ or $Y_1^* - T_1^* + a(Y_2^* - T_2^*)$.

State and its budget constraints. State can finance its spending (G_1 or G_1^*) through taxation (T_1 or T_1^*) and with loans in the first period, and only with taxation T_2 and T_2^* in the second period. Its decisions are assumed to have intertemporal constraints, on the basis of which the actual values of public expenditure have to be equal to taxation values. Taking into account the value of taxation in the definition of constraints, the families' resources V and V^* can be defined in the following manner:

$$V = Y_1 - G_1 + a(Y_2 - G_2) + M_0 / P_1; \tag{10}$$

$$V^* = Y_1^* - G_1^* + a^*(Y_2^* - G_2^*) + M_0^* / P_1^*. \tag{11}$$

The content of these constraints shows the presence of a *Ricardian equivalence*, on the basis of which a variation in public expenditure exercises the same effects that are financed by taxation as well as by borrowing.

Market equilibriums. The model defines, for each one of the groups of countries, the conditions of equality between demand and supply of goods for each period and the conditions of equilibrium at the financial markets.

As far as the products market is concerned in the period $t = 1$, the global product is determined in each of them by the demand by private residents C_1 and C_1^* by state (G_1 and G_1^*) and by non residents (H_1^* or H_1) according to the following relationships:

$$Y_1 = C_1(V, P_2 / P_1, E_{R1}) + G_1 + E_{R1}, H_1^*(V^*, P_2^* / P_1^*, E_{R1}); \tag{12}$$

$$Y_1^* = C_1^*(V^*, P_2^* / P_1^*, E_{R1}) + G_1^* + H_1^* / E_{R1}(V, P_2 / P_1, E_{R1}). \tag{13}$$

At the time $t = 2$ the perfect flexibility of prices and wages assures the equality between the global demand and supply of goods, the demand of each country and the presence of the natural tax of unemployment:

$$Y_2 = C_2(V, P_2 / P_1, E_{R2}) + G_2 + E_{R2}, H_2^*(V^*, P_2^* / P_1^*, E_{R2}); \tag{14}$$

$$Y_2^* = C_2^*(V^*, P_2^* / P_1^*, E_{R2}) + G_2^* + H_2^* / E_{R2}(V, P_2 / P_1, E_{R2}). \tag{15}$$

Private demand for goods that determines the relationship from (12) to (15) are defined on the basis of families' optimisation programmes, that define the functions of utility, taking into account the principle of substitution between goods and budget constraints.

These functions depend on the resources available, on the effects of intertemporal substitution determined by the variations of (P_2/P_1) or (P_2^*/P_1^*) and of the real exchange rate $E_{Rt} = E_t P_t^* / P_t$. Economic activity of the two countries influences external equilibrium. However, every equilibrium at the time $t = 1$ must be compensated by an opposite effect at the time $t = 2$.

In each country monetary equilibrium is achieved through a supply of surplus currency and with a demand for currency that depends on the resources (V) and (V^*) and on the nominal interest rate (r) or (r^*). Dividing the condition of equilibrium of a period by that of the second period, one obtains a relationship that acts as a nominal interest rate of each country. This depends exclusively on the relationship between monetary masses at the time $t = 1, 2$. At financial markets, the perfect mobility of capital ensures the achievement of equality in interest rates.

This condition guaranteed by the system of international arbitrage is defined by matching the real interest rate of the EMU $[r - (P_2 - P_1) / P_1]$ and the current taxation in the rest of the world $[r^* - (P_2^* - P_1^*) / P_1^*]$ corrected through the variation perfectly anticipated by the real exchange rate $(E_{R2} - E_{R1}) / E_{R1}$:

$$[r - (P_2 - P_1)/P_1] = [r^* - (P_2^* - P_1^*)P_1^*] + (E_{R2} - E_{R1})/E_{R1}. \tag{16}$$

The model determines the values of EMU products and the rest of the world (considered unitarily) at the time $t = 1$, that of their prices at the time $t = 2$, exchange rates and commercial sales in the two periods.

Budget policy. The analysis is concentrated on the effects of a short-term increase of the EMU' current public expenditure and on the anticipated and permanent expansion of budget.

As far as the effects of a transitory expansion are concerned, an increase contingent on public expenditure in the ambit of the EMU at the time $t = 1$ $(\partial G_1 > 0, \partial G_2 = 0)$ exercises the same effects whatever the non-monetary nature of its finance, following the presence of *Ricardian equivalence* (Ricardo, 1951).

This stimulates production in the EMU at the time $t = 1$, on the basis of (12), from the moment that brings an increase in resources (V). However, the latter is completely compensated for by conforming to relationship (10), by the decrease derived from the immediate worsening of taxation which is applied to financing the expenditure or in any case by their future destined increase to resist the service on the debt contracted at the time $t = 1$. From the moment that the budget policy leaves the value of family resources and the relative value of the monetary mass of the two periods unaltered, it does not influence the import of goods or the EMU nominal interest rate. The exchange rate of time therefore remains constant $t = 1$.

Furthermore, from the moment when there is no action in response to private demand for national and imported products in the time $t = 2$, no effect is produced on the prices and on the components of foreign sale. This ensures the exchange rate stability.

The transitory rise in public expenditure in the EMU at the time $t = 1$, therefore, only influences European global product inducing a multiplicator unitary effect $(\partial Y_1 / \partial G_1 = 1)$. Its efficiency is therefore independent from the products' degree of substitution. If the increase in public expenditure decided at the time $t = 1$ is also maintained in time $t = 2$ $(\partial G_1, \partial G_2 > 0)$, this exercises effects which correspond to the combination of relative decisions to the transitory rise and to the anticipated increase in public expenditure.

The process of anticipation itself therefore should also be analysed in its effects: It is supposed that families in the ambit of the EMU perfectly anticipate at time $t = 1$ an expansion of public expenditure in the following period $\partial G_1 = 0, \partial G_2 > 0$. From

the moment when families understand that such an expansion can only be financed through added taxation, they can foresee a reduction of their available resources; this determines a decrease in their demand for products from Europe or outside it, as much as in time $t = 1$ as at time $t = 2$.

Considering these reductions in private demand and the rise in EMU public expenditure in the period $t = 2$, families of the EMU foresee, moreover, an increase in European prices P_2 and a reduction in prices P_2^* (non-European). This means a fall in the real exchange rate at the time $t = 2$, for a given nominal exchange rate. These price variations at time $t = 2$ cause effects of intertemporal substitution in as much as the prices at the time of $t = 1$ remain fixed.

In effect, a rise of P_2/P_1 brings about on the basis of the relationship from (12) to (15), a rise in the European demand for European and non-European products at the time $t = 1$ and a reduction in the same demand at the time $t = 2$. The same goes for the reduction of prices P_2^* in relation to P_1, this produces a reduction in demand from outside Europe for products at the time $t = 1$, and a growth at the time $t = 2$. To these effects of intertemporal substitution can be added the effects of temporal substitution. In fact, at the time $t = 1$, the anticipated rise of European prices P_2 and the anticipated fall of non-European P_2^* determine on the basis of (16) a reduction in real interest rate in Europe in relation to non-European tax. This induces an influx of capital and a rise in both nominal and real exchange rates. Therefore, the demand for European goods increases and the demand for non-European goods diminishes at the time $t = 1$. Furthermore, from the moment when European export increases and import reduces, the commercial sale of the EMU improves. At the time $t = 2$, the predicted real exchange rate diminishes for a nominal rate given, in the measure in which the anticipated prices outside Europe reduce, until European prices rise. Therefore, the demand from outside Europe grows to the detriment of that in Europe.

In summary, budget expansion anticipated in Europe exercises the following effects:

1. A rise in nominal and real exchange rates at time $t = 1$.

2. An anticipated fall in real exchange rate at time $t = 2$.

3. A rise in European activity in $t = 1$, that derives from the effects of temporal and intertemporal substitution lessened by a negative effect on assets induced by the fall of (V).

4. A fall in the non-European global product in $t = 1$ owing to the substitution effects.

5. An improvement in European commercial sale at $t = 1$.

Putting together these results with those following in the case of a transitory budget expansion, one can define the effects of a permanent rise in European public expenditure $(\partial G_1, \partial G_2 > 0)$. The latter exercises more significant effects on European global product in $t = 1$ and the same effects on other variables produced by an anticipated budget expansion.

Externalities on non-European product are negative, while they would be positive in a two-country model such as that of R. Mundell (1963) and J. Fleming (1962; see also the model by Muet, 1998).

Conclusion. The aggregate models shown here, extending to 2–3 countries, allow us illustrate the consequences of growing structural interdependency between European countries in a simplified way. These consequences can be summarised as follows: it reduces the multiplicator effects of national budget expansion, something which can be verified in the results obtained in the preceding analyses compared to those arising from the analyses conducted in the first part; this implies that a rise in public expenditure in one country produces positive externality on the activity of the others, in turn increasing the demand for their goods and produces negative externality due to a rise in international interest rates and an appreciation in the exchange rate between European currencies and those from outside the union.

The overall analysis is completed from the microeconomic perspective, that is applied to a centralised budget policy such as that in Europe, which is linked to the outside by the system of flexible exchange. This approach allows us include the case of Ricardian equivalency and to show the repercussions they can have on the degree of product substitution in both economies, in both positive and negative values, the effects of flooding on budget policies of one country towards another. It is precisely these effects of flooding, which are at the base for strategic choices made between interdependent countries.

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