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Why Macroeconomic coordination may not be possible in a Monetary Union?

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Why Macroeconomic coordination

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Abstract

Macroeconomic policy coordination in a monetary union seems to work, when it is in the self-interest of the individual countries to do (individual rationality) what is also good for the currency area as a whole (group rationality). We explore the possibility of coordination, first in the context of the conventional theory using a two country model operating in decentralized framework. We find that coordination of macroeconomic policies fails, because of the revealed preference of the creditor countries to hoard their surpluses. We then explore the same problem in a cooperative framework, modeling the monetary union as an n-person cooperative game. This game does not possess a core and therefore any agreement by the set of all concerned countries to coordinate macroeconomic policies can be challenged by any subcoalition. Failure to coordinate macroeconomic policies in a monetary union means that the process of adjustment is asymmetric rather than symmetric (the cost of adjustment is entirely born by the debtor countries), a fact that renders its survival problematic.

Keywords: Currency areas, dynamics of economic integration, stability equilibrium conditions.

JEL Classification: C 62, E 32, F 15

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1. Introduction

Modern theory of OCA provides a framework for the workings of an optimum currency area[1]. The theory asks under what conditions a country would prefer macroeconomic independence that comes along with an independent currency (and perhaps with flexible exchange rates) or it prefers the benefits of a fixed exchange rate system and perhaps of a common currency. A country enjoys the benefits of a common currency if it is satisfies a number of criteria (factor mobility, price flexibility, etc) that reduce the cost of sacrificing its exchange rate as a policy instrument. What the OCA theory *essentially states*, is that when a region is subjected to an asymmetric shock, the *adjustment process* requires either the factors of production to move or the real exchange rate to adjust or a combination to the two. Otherwise, regional concentrations of unemployment will be inevitable (De Grauwe and Vanhaverbeke, 1993). Thus, if factor mobility fails to restore equilibrium following an asymmetric shock, real exchange rates have to adjust. And since in a monetary union nominal exchange rates are fixed, this means that *nominal prices* have to change.

But beyond stating that changes in nominal prices are needed to restore equilibrium, the modern OCA theory *does not explain*, (i) how this *adjustment mechanism* works, i.e., *what* are the monetary consequences of the price changes and, more importantly, (ii) what are the necessary conditions for its effectiveness. *The effectiveness of such an adjustment mechanism* is important *for the stability* of a monetary union, since if it proves to be ineffective, the negative effects caused by asymmetric shocks will remain (or as De Grauwe and Vanhaverbeke put it, "regional concentrations of unemployment will be inevitable"); and these disequilibria may undermine the *stability* of the currency area. Thus, the criteria proposed by the received OCA theory for a successful monetary union may not constitute a *safe policy guide*, if its *existing adjustment mechanism fails* to restore equilibrium following an asymmetric shock. ***Effectiveness of the adjustment mechanism*** implies that the members of the monetary union adhere to the "*rules of the game*", requiring that the member country with a surplus in its *current account* should have an expanding money supply, while the country with a deficit in its current account should have a contracting money supply. That is, effectiveness of the adjustment mechanism requires *coordination* of macroeconomic policies of the member countries. However, the facts of experience

show that macroeconomic policy coordination *fails*, because the *surplus countries* are reluctant to adjust (Eichengreen, 2012; Feldstein, 2013). But if the deficit countries are forced to reduce their spending without a compensating spending increase by the surplus countries, then the *net result* will be a *deflationary* bias that may *destabilize* the currency area.

In this paper we show that macroeconomic policy coordination fails, because it is not in the self- interest of each member of the currency area taken individually (*individual rationality*) to do what is also good for the monetary union as a whole (*global rationality*). We explain this behaviour using analytical tools borrowed from the theory of cooperative games. We model a monetary union as an n-person cooperative game. If consider the monetary union as a closed system, then the n-person game is a *zero-sum game*. Zero-sum games have an *empty core*, which means that the unification of the conditions of individual rationality and Pareto optimality fails; therefore, the incentives for coordination of macroeconomic policies cease to exist.

The paper is organized as follows. In the next section, we specify the economic background of the currency area. In the third section, we explain why under a decentralized mode of behaviour (without a binding agreement), the equilibrium outcome is not Pareto efficient, but an outcome with *deflationary bias* that undermines the stability of the currency area. In the fourth section, we reinforce this result treating the monetary union as an n-person cooperative game. In the last section we conclude.

2. Monetary unions: the underlying economy

A monetary union is defined as a group of countries sharing a common currency but without fiscal integration. It is assumed that in the currency area full employment prevails, the quantity theory of money holds, and that relative prices are constant. The last assumption (constant relative prices) implies a one good world. In a one good world, spatial arbitrage assures that good prices will be the same in all countries (Dornbusch, 1980). Given these assumptions, a currency area (as a closed system) is in equilibrium when the following two conditions hold:

(a) The total nominal income of the currency area equals its total nominal spending.

(b) The common currency is *distributed* among the individual members of the currency area in such a way so that the nominal income in each member is equal to each nominal spending.

In a two country world, condition (a) implies:

$$p(y+y^*) = vm + v^*m^* \qquad (1)$$

where py denotes the nominal income, vm nominal spending. In this expression, p denotes the price level, y the output, v is a constant that may be interpreted as the expenditure velocity, and m is the common currency allocated to a member of the monetary union. Obviously, $m+m^* = M$, where M is the total supply of the common currency. Variables without an asterisk (*) refer to country 1, while those with an asterisk to country 2.

Condition (b) is written:

$$(yp - mv) = (m^*v^* - y^*p) = 0 \qquad (2)$$

which is a Pareto efficient in the sense that the concerned countries cannot find another outcome z (one that they can achieve by mutual consent) such that every country is better off in z than in (2), or at least, in z, no country is worse off and some other country better off.

The *equilibrium price* level of the monetary union is derived from (1) as:

$$p = (vm+v^*m^*) / (y+y^*) \qquad (3)$$

The equilibrium price level depends on the *distribution* of the common currency among the member countries and the *output level* of the monetary union as a whole.

A given real asymmetric shock redistributes the common currency among the member countries, and this redistribution affects their levels of nominal spending as well as the price level: then, the nominal spending in each country is no longer equal to its nominal income. Given condition (1), the resulting situation is expressed as:

$$(py- vm) = (v*m*- py*) \qquad (4)$$

Condition (4) says that at the price level p, the excess of nominal income over nominal spending in country 1 (its rate of *hoarding*) is equal to the excess of nominal spending over nominal income of country 2 (its rate of *dishoarding*). The rate of hoarding may be interpreted as the *trade surplus* of country 1, while the rate of dishoarding as the *trade deficit* of country 2. Thus, (4) may be taken as an expression of the *imbalances* within the currency area following an asymmetric shock.

The issue on imbalances poses the following question: Under what conditions these imbalances may be removed and the equilibrium is again established in a currency area?

This issue is studied below in the context, first that the members of a currency area exhibit a *decentralized mode* of behavior, (commitments are not binding) and secondly in the context of a currency area, the members of which are more than two and hence joint actions of country-groups cannot be avoided.

We proceed with the investigation of this issue using the analytical tools provided by the cooperative game theory.

3. Decentralized behavior in a monetary union: commitments are not binding

Consider a monetary union consisting of two countries as in section **2**. We assume that these countries operate in a *decentralized* economic framework. This means that they are interested in maximizing their *own* utility and *do not seek to agree* on some coordinated choice of policies as to achieve an optimal outcome. It is assumed, further, that the members of the currency area are *rational* in the sense that their decisions are consistent with their preferences. Classical economists (and their followers) argued that the optimal outcome is reached *automatically* through the redistribution of the common currency that acts like a transfer. In a *fixed exchange rate* regime (and a fortiori in a currency area), the redistribution of the common currency is endogenous through the balance of payments. In the *surplus* country the money supply increases and with it, the economic activity. The reverse is true for the

deficit country. The redistribution of the common currency continues until condition (2) of the model above is restored.

The defects of the classical view do not lie so much on its dependence on the validity of the quantity theory of money and on the assumption on perfect price flexibility, but on its postulate of *automaticity*, i.e., the postulate that there is an *automatic mechanism* ensuring balance of payments equilibrium. In reality, this postulate is violated because the *surplus* countries are reluctant to adjust (Keynes, 1980; Eichengreen, 2012)[2]. The reluctance of the surplus countries to adjust reveals their *preferences* over the outcomes of their actions: each country prefers to be a creditor if the other country is a debtor, and is forced to be a debtor if the other country is a creditor.

These preferences can be explained by the economics of monetary unions. In a monetary union the domestic money supply and the rate of interest are endogenous, i.e., they are determined by the balance of payments. Therefore, there are no orthodox means open to authorities for stimulating domestic economic activity and employment except by running an export surplus at the expense of the rest of the world. But this means that while condition (2) *may be optimal* from the point of view of the monetary union as a whole, it *is not so* from the point of view of a single member. Or, to put it differently, *individual rationality* does not coincide with *global rationality*. The creditor may prefer to be in a situation described by the condition (4) rather than in a situation described by the situation (2).

Thus, it is in the interest of the *creditor* to hoard its surpluses, (i.e., to violate the "rules of the game"), in order to preserve its preferred position. To this end, the creditor will keep its spending **vm** constant, by sterilizing the monetary effects of the money inflow. In doing so, the creditor *invalidates* the classical mechanism of adjustment and throws the burden of adjustment on the deficit country, the optimal response of which is to reduce its nominal spending **m*v***, reducing thus its rate of dishoarding. This *asymmetric* behaviour (a contraction in nominal spending of the deficit country which is not matched by an increase in the nominal spending of the surplus country) leads to a decline in the equilibrium price level (by condition (2)). The net result is an equilibrium characterized by *deflationary* bias for the monetary union as a whole[3]. This is shown in Figure 1.

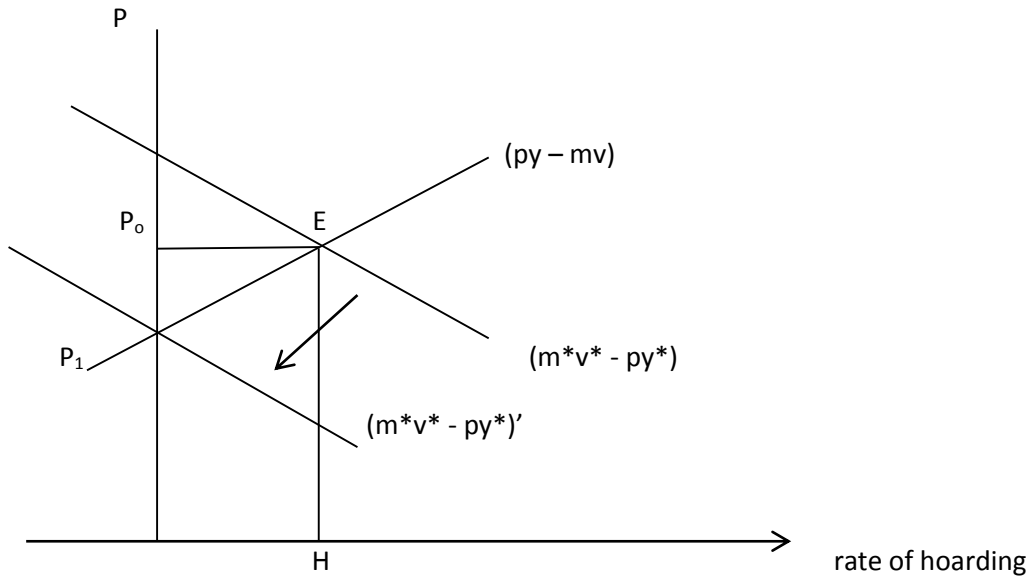

Figure 1

Deflationary bias

Figure 1 measures along the horizontal axis the rate of hoarding and along the vertical axis the price level. The schedules for hoarding and dishoarding (py-vm and v*m* - py* respectively) are drawn for a given level of output and nominal money as in Dornbusch (1980). These schedules cross at the point E. At this point the price that equates hoarding and dishoarding is p_0. Assume now that country 2 reduces its spending while country 1 is reluctant to adjust. As a result, the hoarding schedule remains constant, while the dishoarding schedule moves to the left, as shown in Figure 1. Equilibrium is restored but at a *lower* price level p_1.

These *deflationary* effects for the union as a whole, drawn on the basis of the observed imbalances, following the asymmetric behavior of the member countries, are undesirable (are not revealed by the model), and may be *destabilize* the currency area (De Grauwe, 2011; De Grauwe and Yuemei, 2013).

Deflation increases the real burden of the debt and sets in motion the debt deflation dynamics described by Fisher (1933). In order to avoid the undesirable effects of

these dynamics, governments are forced to take over private debt. The accumulation of debt by the governments may lead to self-fulfilling liquidity crises. This is so because, the members of a currency area (their governments) cannot guarantee to bond holders that cash will always be available to pay them out at maturity, because they borrow in a currency the supply of which do not control. If, in addition, the currency area lacks a lender of last resort, then it is left vulnerable to self-fulfilling liquidity crises. Investors may sell the debt of a deficit country fearing default. In so doing, they drive up that country's borrowing costs and depress its economy so much, that they provoke the very default investors fear (De Grauwe and Yuemei, 2014). But if a country faces a debt crisis, this is likely to lead to financial repercussions to other member countries, because sharing a common currency leads to intense financial integration of the currency area as a whole. This makes the currency area vulnerable to the changing sentiments of the market, and therefore unstable.

We may conclude: In a decentralized economic system, where commitments are not binding, macroeconomic policy coordination fails. The outcome resulting from the rational behaviour of the individual countries is characterized by *deflationary bias*. Deflation sets in motion the debt deflation dynamics that may destabilize the currency area.

These *inefficient* results may be avoided if the set of all countries concerned agree to coordinate their activities in order to reach a Pareto efficient outcome. The question is to specify the *necessary* and *sufficient* conditions under which this agreement is effective (i.e., it cannot be challenged by anyone). This investigation requires a different model in which the primitives are the *joint actions* of *groups of countries*, rather than the actions of individual countries as in the decentralized framework assumed so far. In a *non-decentralized* framework, macroeconomic policy coordination is possible if an agreements by the set of all countries concerned to coordinate macroeconomic policies, cannot be challenged by a smaller set of countries (a "subcoalition"). An agreement that cannot be challenged by any subcoalition is called a *core*. And since a core is a solution concept of *cooperative games*, we propose to investigate the issue of macroeconomic policy coordination, using the analytical tools provided by the theory of coalitional games.

4. Cooperative behavior in a monetary union: agreements are binding

In this section, we consider the monetary union as a cooperative game in characteristic function forum and with transferable utilities, consisting of a finite set of N countries which, the same time, agree to coordinate their macroeconomic policies[4]. The agreement is binding. The characteristic function assigns a real number v (S) to every subset S (subcoalition) of N. The value of v(S) indicates the worth of the coalition S, i.e., the worth (utility) that a coalition can achieve, when its members limit trade strictly to themselves. The worth of v(S) has to be evaluated.

To this end, we model the monetary union as an n-person (finite) game. In this game N = {1,2,..,n} is the set of counties (the members of the monetary union) and S is an arbitrary subset of N. The n members of the monetary union play a *zero-sum game* since the gains of the n- x countries (their rate of hoarding) is matched by the losses of the remaining x countries (their rate of dishoarding). Assume now that the creditors of the currency area form a coalition in the sense that they shall decide as a group upon individual courses of action which, together, cause the group to do as well as possible. The same is true for the debtors. Call the coalition of creditors S and that of the debtors N-S. Coalition S versus coalition N-S is a two-person zero-sum game, where S is the maximizing player and N-S the minimizing one. For this game, there is a unique value v(S) given by the minimax theorem. This means that the members of the coalition S (the creditors) can employ a joint mixed strategy which will guarantee an expected value of v(S), regardless of the mixed strategy employed by the coalition T. Thus, v(S) is the worth of the coalition S.

Thus, the *characteristic function* of the monetary union has the following properties:

(i) $v(\emptyset) = 0$

(ii) $v(S)+v(T) \leq v(S \cup T)$ with $S \cap T = \emptyset$

(iii) $v(S)+ v(N-S) = v(N) = 0$ for all S belonging to N.

Property (i) is trivial. The worth of the empty coalition is zero. Property (ii) says that the members of the currency area can gain more as a group than by acting alone (the game is *essential*). Thus, there is a motive for them to maximize jointly and then

decide how to divide the proceeds among themselves. Property (iii) reflects the zero sum character of the game. It says that the gains of the coalition of creditors are equal to the losses of the coalition of the debtors.

We define an *imputation* u to be the division of joint benefits among the n members of the monetary union (or their gains from coordinating their policies). More formally, an imputation is a vector $u = (u_1, u_2, \ldots u_n)$ with real elements and with the following two properties :

(1) $u_i \geq v(\{i\})$ for all i belonging to N (individual rationality)

(2) $u_1 + u_2 + \ldots + u_n = v(N)$ (feasibility and Pareto optimality)

The condition of individual rationality [condition (1)] states that it would be irrational for a member of the currency area to agree to a joint outcome under which it receives a lower benefit than it would obtain by its own efforts. Condition (2) incorporates both the requirement that the members of the grand coalition N (the currency area as a whole) can achieve the imputation u (feasibility) and cannot achieve more (Pareto optimality).

A popular solution for the cooperative games is the *core.* The concept of the core is not unknown in Economics, as it goes back to Edgeworth (1881) and Bohm-Bawerk (1891), although under a different name. The *core* of the n-person game consists of those imputations which are feasible for the entire group of countries (the currency area as a whole) and which can be blocked by no coalition. The conditions of the core are a direct generalization of the conditions of individual *rationality* and Pareto *optimality*, and therefore its *existence* is a precondition for macroeconomic policy coordination and, by implication, the stability of monetary unions.

Unfortunately n-*person zero sum games* have an empty core (Lucas, 1992). Therefore, the unification of the conditions of *individual rationality* and Pareto *optimality* fails, and the *incentives* for coordination of macroeconomic policies cease to exist. The monetary union becomes *unstable*. A subcoalition of countries (in this case the subcoalition of creditors) gains more by violating the "rules of the game". This coalition will refuse to adjust, blocking thereby the *adjustment mechanism*, and imposing *deflation* and *unemployment* on the rest of the system. It may also impose its own economic policy on the rest of the currency area, once it becomes aware of its

own power. This conclusion is not inconsistent with the recent developments in Europe where, " … creditor nations rule in the eurozone" (De Grauwe, 2013). Thus, the conclusion reached above, is reinforced by the game theoretic analysis of this section.

The *lack* of macroeconomic policy coordination, and the *deflationary* bias associated with it, seems to be the *weak points* of the fixed exchange rate regimes and *a fortiori* of the currency areas. Cassel (1932) argued that the downfall of the *gold standard* in the thirties was due to the violation of the "rules of the game". The gold receiving countries failed to increase their money supply, and therefore their domestic prices did not increase, while in the gold losing countries prices fell. The net result was a price *deflation* that destabilized the economic system. Keynes' (1980) view was similar. According to him, the gold standard played a large part in transmitting *deflation* from one part of the global economy to another. Countries running *trade surpluses* accumulated gold reserves, which imposed deflation and unemployment on the gold losing countries.

5. Concluding remarks

In this paper we investigate the possibility of macroeconomic policy coordination both in a *decentralized* and in a *cooperative* framework. We explore, first, the conventional theory of a monetary union consisting of two countries, operating in a *decentralized* framework, and find that macroeconomic policy coordination *fails* because the surplus countries are reluctant to adjust. *Reluctance to adjust* implies a revealed preference for running a balance of payments surplus. This behaviour is rational because in a monetary union the determination of money supply is endogenous (it is determined by the balance of payments). Therefore, there is no orthodox means open to authorities for stimulating domestic economic activity and employment except by running an export surplus at the expense of the rest of the world. Thus, what is in the self interest of each country taken individually to do (*individual rationality*) is not also good for the currency area as a whole (*group rationality*).

Next, we investigate the possibility of policy coordination in a *cooperative* framework. We model the monetary union as n-person cooperative game and use as a

solution the core, i.e. the set of outcomes that is feasible for the monetary union as a whole and which can be blocked by no coalition. We find that this cooperative game is a zero-sum game (because the gains (hoarding) of the coalition of creditors have to be matched by the losses (dishoarding) of the coalition of debtors) and for this reason does not possess a core. This means that the unification of the conditions of individual rationality and Pareto optimality fails, and the incentives for coordination of macroeconomic policies cease to exist.

Failure to coordinate macroeconomic policies means that the *process of adjustment* in the currency area is no longer symmetric, but asymmetric in the sense that the burden of adjustment is borne by the *debtor country*: the debtor has to reduce its nominal spending in order to restore its balance of payments equilibrium without a matching increase in nominal spending by the creditor country. But then the advantages of the common currency (for the debtor) are dominated by the asymmetric costs of adjustment that the debtor alone has to bear.

Asymmetric adjustment has been an inherent characteristic in any fixed exchange rate regime (a monetary union is an extreme case of a fixed exchange rate regime), and was recognized in the past by a number of economists, including Keynes. Keynes' (1941) plan for a *Clearing Union* was designed to retain the advantages of fixed exchange rates while avoiding the asymmetric costs of adjustment. The fact that this plan was vetoed by the United States, which was not prepared to allow its "hard-earned" surpluses to be placed at the disposal of "profligate" debtor countries (Skidelsky, 2010, p. 161) shows that the self-interest of each country taken individually strongly dominates the interests of the group a whole. But if each country seeks to protect its own national interests, the future of a monetary union is problematic.

Notes

1. The modern theory of optimal currency area is usually credited to Mundell (1961), Kennen (1969) and McKinnon (1963), although the criteria for an optimal currency area (free trade in final goods and factors of production) were emphasized by Lerner back in 1944 (Lerner, 1949, p.375).

2. “To suppose that there exists some smoothly functioning automatic mechanism of adjustment which preserves equilibrium if only we trust to the methods of *laisser faire* is a doctrinaire delusion” (Keynes (1980), vol. xxv, pp.21-22).

3. This theoretical result is consistent with the views for the euro-area, expressed in the “*Report to Congress on International and Exchange Rate Policies”* (U.S. Department of the Treasury Office of International Affairs, October 30, 2013). “Germany’s *anemic pace of domestic demand* growth”, states the report, “and dependence on exports have hampered rebalancing at the time when many other euro-area countries have been under severe pressure to curb demand and compress imports in order to promote adjustment. The net result has been *a deflationary bias for the euro area*…..” (our italics).

4. As in Demopoulos and Yannacopoulos (1998, 1999, 2001, 2012).

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