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STRATEGIC GAMES AND CURRENCY AREAS

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Abstract

The requirement that a country with a current account surplus should have an expanding money supply, while a country with a current account deficit a contracting money supply (the "rules of the game") is an important element for the stability of a currency area. We argue in this paper, that decentralized behaviour of member countries does not guarantee that the "rule of the game" are respected, and this leads the currency area to equilibria, however, with systemic distortions[1].

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

JEL Classification: C 62, E 32, F 15

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1.Introduction

A currency area is defined as a group of countries sharing a common currency. The cost of moving to a currency area is generally identified with the sacrifice of the exchange rate as a tool of economic policy. The role of the exchange is to act as an absorber of asymmetric shocks. A currency area is characterized as optimal if the cost from this sacrifice is minimal. The founders of the theory of optimal currency areas Mundell (1961), McKinnon (1963), and Kennen (1969)[2] identified three criteria to define an optimum currency area (OCA): the openness of the economies involved to trade among themselves, the susceptibility of the member countries to asymmetric shocks, and the flexibility of adjustment to such shocks. What the OCA theory states, is that when a currency area is subjected to an asymmetric shock, equilibrium is restored either through factor mobility or via nominal price flexibility or (perhaps) a combination of the two (De Grauwe and Vanhaverbeke, 1993). And if factor mobility fails to restore equilibrium after an asymmetric shock, nominal prices have to change. Prices have to increase in the country experiencing a trade surplus and decline in the country exhibiting a trade deficit.

However, in a currency area the price level and the balance of payments are determined by the distribution of the common currency. This means that equilibrium will be restored, after an asymmetric shock, if the common currency is allowed to flow from the country exhibiting a trade balance deficit to the country with a trade balance surplus. But this presupposes that the "rules of the game" (requiring that a country with a trade surplus has an expanding money supply and a country with a trade deficit a contracting one) are respected by all members of the currency area. If they are not, disequilibria (in the form of current account imbalances) will remain. Thus, the criteria proposed by the received OCA theory, cannot define an optimum currency area, unless the member countries agree to respect the "rules of the game".

The aim of this paper is to show that if a currency area works as a *decentralized* economic system, the "rules of the game" are not necessarily respected and this may lead to disequilibria that may undermine the stability of the currency area.

The paper is organized as follows: In the next section, we specify the economic background of a currency area, and argue that there is no automatic mechanism able to preserve equilibrium in it, because the process of adjustment is compulsory only for

the debtor and optional for the creditor. In the third section, we model the currency area as a strategic game, the outcomes of which (Nash equilibria) resulting from the strategic interactions of the two countries, are not economically efficient. In the final section, we conclude.

2. Decentralized economic systems and the "rules of the game"

We consider the case of a group of countries sharing a common currency but without fiscal integration. It is assumed that the member countries adopt a *decentralized* mode of behaviour (Demopoulos and Yannacopoulos, 2012). This means that each country chooses its policy actions autonomously (given the restrictions imposed by the definition of the currency area) without considering the effects of these actions on the other member countries. It is assumed, as in Dornbusch (1980), that the quantity theory of money holds, the economy is fully employed and that relative prices are constant.

Given these assumptions the currency area (as a closed system) is in equilibrium when the following two conditions are satisfied: (i) The nominal income of the currency area as a whole is equal to its nominal spending. And (ii) the rate of hoarding in each member country i (i= 1,2,…,n) is zero. Hoarding is defined as the difference between nominal income py_i and the nominal spending $m_i v_i$, where p is the price level of the currency area, y_i ,is the full employment output, v_i is a constant (expenditure velocity) and m_i is the common currency. Obviously $m_1+m_2 +\ldots+ m_n =M$, where M is the amount of the common currency. The index denotes the member country. Thus, the currency area is in equilibrium when, given (i), $(py_i - m_i v_i)=0$.

An *asymmetric* real shock (due, for example, to a change in tastes from the goods of country 1 to those of the country 2) reallocates the common currency between the members of the currency area. In the two country case, the resulting situation can be written as:

$$py_1-v_1m_1=v_2 m_2 - py_2 \qquad (1)$$

which says that the rate of hoarding in country 1 ($py_1-v_1 m_1$) must equal the rate of dishoarding ($v_2 m_2 - py_2$) in country 2 or, equivalently, the positive trade balance in country 1 has to be matched by the negative trade balance in country 2.

According to the conventional theory, equilibrium is restored *automatically* via monetary flows. Money flows from the country with an excess of spending over nominal income (with a trade deficit) to the country with an excess of nominal income over nominal spending (with a trade surplus). The outflow of money from the deficit country reduces its rate of dishoarding (via a reduction in its nominal spending) while the inflow of money in the surplus country reduces its rate of hoarding (via an increase in its nominal spending). Eventually, equilibrium is restored, in the sense that the rate of hoarding (dishoarding) in every country is reduced to zero, which implies that the balance of payments in every member country is in equilibrium.

However, as Keynes (1980, pp. 21-22) has remarked, "to suppose that there exists some smoothly functioning automatic mechanism, which preserves equilibrium if only we trust the methods of *laisser-faire*, is a doctrinaire delusion". In reality, the process of adjustment is *compulsory* for the debtor and *optional* for the creditor. The debtor has no other option but to reduce its nominal spending, while the creditor has the option of increasing its nominal spending or hoarding its surpluses. Therefore, the preferences of the creditor cannot be ignored. The facts of experience show that the creditors prefer to hoard (sterilize) their surpluses than to adjust. This is explained:

In a currency area (as in all cases in which the supply of money is endogenous), the only policy open to authorities for stimulating domestic economic activity and employment is to run an export surplus. And since, in a closed system, all countries cannot run, simultaneously, a balance of payments surplus, employment policies in a currency area are *beggar thy neighbour policies.* Thus, the welfare of a country depends not only on its own actions but also on the actions of the other members of the currency area. This is a situation of *strategic interdependence,* and the appropriate tools for its analysis are provided by the *non-cooperative game theory* (Yannacopoulos, 2014)[3].

3. A game theoretic approach

In a *non-cooperative* game the primitives are the sets of actions of individual countries; commitments *are not binding*. The key equilibrium concept of the non-

cooperative game is the Nash equilibrium: a profile of actions is Nash equilibrium if a unilateral deviation from it is not profitable.

The model we are considering consists of a set N of countries, a set of actions (the set of policy tools) A_i available to each county $i \in$ N, and a *preference relation* on the set of action profiles (outcomes). The preference relation of the player i can be represented by a *payoff function* $u_i \rightarrow$ R, in the sense that $u_i(a) \geq u_i$ (b), whenever player i prefers a to b. The values of this function are known as utilities or payoffs. In the two country currency area, which we are considering, *reluctance to adjust* means that each country prefers to retain its position as a creditor if the other country is a debtor, and is forced to be a debtor if the other is a creditor. A strategic game that captures this situation (known as *Hawk-Dove* game) is shown in Figure 1.

	s	s*
σ	(1/2,1/2)	(0, 1)
σ*	(1, 0)	(-1/2,-1/2)

Figure 1

The set of actions of the country 1 is {σ,σ*} and that of the country 2 is {s,s*}. The first element in every strategy set means "adjust" and the second element "not adjust". "Adjust" means that the countries select policies that remove imbalances: the surplus country increases its spending while the deficit country restricts it. "Not adjust" means that the surplus country retains its surplus in its balance of payments by restricting its domestic spending:

If both countries choose (σ, s), then the two countries *coordinate* their policies (the reduction of spending in the deficit country is matched by an increase in spending in the surplus one), and the equilibrium is restored as the classical economic theory

suggests. The resulting situation is a *"cooperative"* outcome, i.e., an outcome that could be achieved by mutual consent. In this example, the Neumann-Morgenstern utilities accruing to the countries are (1/2, 1/2), the first number being the utility accruing to the first country and the second the utility accruing to the second (the two countries derive the *same benefits* from the common currency).

If the countries choose the actions (σ, s*), then the second country retains its preferred position (that of the creditor of the rest of the world) at the expense of the first country (the debtor). The Neumann-Morgenstern utilities corresponding to this case are (0, 1). The opposite is true if the countries choose the actions (σ*, s).

The *worst outcome* is that in which both countries *do not adjust*. In a closed economy, both countries cannot run (simultaneously) a balance of payments surplus, and for this reason we assign to the actions (σ*, s*) (-1/2,-1/2) utilities. The game has two Nash equilibria, (σ, s*) with value (0, 1) and (σ*,s) with value (1,0), depending on whether the first or the second player is the debtor. If the second player is the debtor, then the equilibrium is (σ*, s) and its value is (1, 0). Thus, the *symmetric* solution implied by the automatic adjustment mechanism (the outcome (σ,s)) cannot be reached and the *imbalances* in the currency area remain.

This Nash equilibrium (σ*, s) may be a *rational* outcome, but it is not *Pareto efficient*. And because it reflects a *symbiosis* of a surplus economy with a deficit one, it is not (economically) sustainable. This is because the deficit country has to finance its deficits by borrowing in a currency, the supply of which does 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 they fear (De Grauwe and Yuemei, 2013).

4. Concluding remarks

Using a simple game theoretic model we have shown that if the members of a currency area play a *non-cooperative* game, the "rules of the game" are not necessarily respected and this may lead to inefficient outcomes (Nash equilibria), that may destabilize the currency area. This theoretical conclusion is supported by historical experience: That the "rules of the game" in fixed exchange rate regimes and in monetary unions *were rarely respected*, was emphasized by Keynes when he remarked that the "process of adjustment is compulsory for the debtor and voluntary for the creditor" (Keynes, 1980,p. 28). It was observed that during the 1928-32 crisis, the then surplus countries (USA and France) refused to abide by the rules of the gold standard, and adopted a restrictive monetary policy despite the inflow of gold, that eventually destroyed the system.

Today, the surplus countries of the Eurozone are reluctant to adjust, and throw the burden of adjustment to the deficit countries of the system; the deficit countries have no other choice but to deflate and allow unemployment to rise. These inefficient outcomes can be removed if the members of the currency area (both debtors and creditors) agree to coordinate their policies, i.e., agree to "clear" their accounts (Demopoulos and Yannacopoulos, 2012). However, given the present structure of the workings of the Eurozone, the chances of reaching a stable agreement on this issue among its members are almost non-existent.

Notes

1. The paper draws on Demopoulos and Yannacopoulos (2012).

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

3. Currency areas as cooperative games are discussed in Demopoulos and Yannacopoulos (1998, 1999, 2001)

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