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"Solvency Rule" and Capital Centralization in a Monetary Union

by

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Abstract

Brancaccio and Fontana (2013) have suggested that the central bank influences the solvency conditions of firms and households in the economic system. This "solvency rule" is examined here within a stylised model of a monetary union characterised by different rates of accumulation and inflation across its two member countries. The rule highlights the existence of a relationship between the interest rate set by the central monetary authority, and the allocation of ownership of physical capital among the member countries of the monetary union, i.e. the "rates of capital centralization". The paper also shows the conditions under which the existence and stability of policy mechanisms, including deflationary, currency devaluation and government intervention policies, are able to guarantee the achievement and maintenance of the solvency condition in a stylised monetary union.

Keywords: Taylor rule, Solvency rule, monetary union, capital centralization, deflation, currency devaluation.

JEL classifications: E5, F34, F36, G33, G34

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VECCHIO

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The paper also shows the nexus between solvency and government debt sustainability and examines the implications of deflationary or currency devaluation policies for the solvency condition and the speed of capital centralization.

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1. Introduction

According to the conventional interpretations of monetary policy inspired by the original works of John B. Taylor on the Federal Reserve System, the central bank determines the interest rate as a positive function of the deviation of GDP from its "natural" level and the deviation of the inflation rate from a given inflation target. By following this "rule" the central monetary authority aims to stabilize the economy around its natural equilibrium (Taylor, 1993, 1999, 2000). The Taylor rule, or sophisticated versions of it, plays a crucial role in the so-called New Consensus Macroeconomics (NCM) and its Dynamic Stochastic General Equilibrium (DSGE) representations (e.g. Clarida *et al.*, 1999; Woodford, 2003; see also, for a critical analysis, Arestis, 2009; Dullien, 2011; Fontana, 2009B). Various studies have explored the implications of the Taylor rule within the sphere of a stylized monetary union characterized by "central" countries, with low inflation and a tendency towards current account surplus, and "peripheral" countries, with higher inflation and current account deficit. In presence of asymmetric shocks affecting the aggregate demand for goods and services, the monetary policy rule adopted by the central bank could be in line with the economic trends of the central countries, and hence to be suboptimal for the peripheral countries of the union (Artis, 2003; Moons and Van Poeck, 2008; Chortareas, 2008). The divergence between central and peripheral countries could then be amplified, with the latter countries likely to experience marked fluctuations in output and unemployment. In the absence of a federal budget and a transfer mechanism from the central countries, the exit of peripheral countries from the monetary union could prove an inevitable conclusion. These views are nothing new in themselves. Since the seminal contribution of Mundell (1961), the literature on optimal currency areas has highlighted

that the conditions for the survival of a monetary union could prove somewhat restrictive (e.g. De Grauwe, 2000). The present crisis of the European Monetary Union (EMU) provides some support to this view. However, this conventional line of research does present some limitations.

First, it rests on the idea that monetary policy can affect the market interest rates such that to bring output and the unemployment rate toward their "natural" equilibrium levels, and hence the inflation rate toward its target level (see, for a critical assessment of this causal link, Kriesler and Lavoie, 2007). Second, it assumes that the natural equilibrium levels of unemployment, output and interest rate are determined ultimately by the so-called neoclassical "fundamentals" of endowments, preferences and technology, which are considered in turn to be independent from monetary policy, and more generally from changes in the aggregate demand (see, for a critique of this concept of equilibrium, Kurz and Salvadori, 1995; Pasinetti, 2000; see also Fontana, 2010). The policy implication of this view is that the Taylor rule, together with the NCM and standard DSGE models that embed it, acknowledge the short-run real effects of monetary policy, while accepting the neutrality of monetary policy in the long run, when expectations are fully realized.

Furthermore, there is an interesting though often neglected corollary of this dualistic role of monetary policy in the NCM. Monetary authorities should intervene in favour of illiquid institutions, yet abstain from any action in the case of insolvent institutions. The difference between illiquid and insolvent institutions in effect mimics the distinction between the short-run and long-run effects of monetary policy. The notion of illiquidity describes a temporary situation dictated by changes in the state of expectations, with consequent fluctuations of economic variables around their natural

equilibrium. By contrast, the concept of insolvency refers to financial positions that are unsustainable in an inter-temporal equilibrium framework when expectations are fully realised. On the basis of this distinction, the conventional analysis implicitly provides support to the position of those who, in the course of the EMU crisis, have opposed the use of monetary policy in order to safeguard the solvency of the member countries of the monetary union (Deutsche Bundesbank, 2012, p. 6).[1]

Brancaccio and Fontana (2013) have discussed at great length criticisms against monetary policy rules à la Taylor, and the NCM and standard DSGE models that embed those rules. They argue that if the mechanical (inverse) relation between the interest rate and aggregate demand is questioned, and/or the existence of the natural equilibrium is denied, then the logical foundations and practical usefulness of monetary policy rules à la Taylor are called into questions. Drawing upon the broadly defined Post Keynesian literature on the monetary circuit / endogenous money theory, Brancaccio and Fontana (2013) have then proposed the "solvency rule" as an alternative interpretation of the actual behaviour of monetary authorities. According to it, by setting the interest rate - *ceteris paribus* - monetary authorities influence the interest rate payments to be made by borrowers. Therefore, monetary authorities affect the solvency conditions of all borrowers operating in the economic system. In this sense, monetary authorities perform the role of 'regulators' of a social conflict between firms capable of accumulating profits higher than interest rate payments due on their debts, and hence solvent, and firms that tend to make losses, hence become insolvent.

Building on Brancaccio and Fontana (2013), this paper examines the working of the solvency rule for the firms of a stylised monetary union characterised by structural divergences due to the different rates of accumulation and inflation among its two

member countries. In other words, the solvency condition used in this paper refers to the financial position of the national firms (taken as all) of each country, and the consequent allocation of ownership of existing physical capital among countries.

The paper has two main objectives. First, it explores the link, if any, between the nominal interest rate set by the central monetary authority and the net purchases or sales of existing physical capital between domestic and foreign firms (e.g. the cross-border mergers and acquisitions of capital). These net purchases or sales are defined as "rates of centralization".[2] Secondly, it investigates the existence and stability of policy mechanisms, including deflationary, currency devaluation and government intervention policies, which are able to guarantee the achievement and maintenance of the solvency condition in a stylised monetary union.

The paper is organised as follows. Section 2 presents the model of a stylised monetary union. Section 3 shows the working of the solvency rule proposed by Brancaccio and Fontana (2013) in the stylised monetary union. Section 4 provides a diagrammatic representation of the solvency conditions for the firms of the member countries of the union. It illustrates how the interest rate policy decisions of the monetary authority affect the allocation of ownerships of physical capital among the countries of the union. Section 5 analyses some potential dynamics of the monetary union under two assumptions exploring the link between the rates of capital accumulation, the rates of capital centralization, and the mark-ups set by banks over the nominal interest rate of the monetary authority. Section 6 discusses the effects of deflationary and currency devaluation policies. Section 7 analyses the link between the solvency of firms and the sustainability of the government debt. Finally, Section 8 concludes.

2. A simple model of a monetary union

This Section presents the model of a stylised monetary union. The model has some crucial Post Keynesian and Classical features. First, the level of income and employment are determined by the level of effective demand for goods and services, with an exogenous rate of accumulation and different propensities to consume out of wages and profits (Dutt, 1990). Second, the real wage is determined by a Classical equation with an exogenous normal rate of profit (Kurz and Salvadori, 1995) and a given monetary wage (Brancaccio, 2008). Changes in the degree of utilisation of productive capacity from its normal level make the hypothesis of an exogenous rate of accumulation consistent with the hypothesis of an exogenous normal rate of profit (Garegnani, 1992; Kurz, 1994). Finally, a simplified version of the monetary circuit of bank loans and repayment is made explicit (Graziani, 2003). Commercial banks creates loans, that is banks set the interest rate on loans as a mark-up on the interest rate set by the central monetary authority, and then accommodate the demand for loans by creditworthy firms (Lavoie, 2003; Fontana, 2009A, Ch. 8).[3] The only limit to the supply of loans is thus given by the willingness of firms to borrow, and by the willingness of banks to grant creditworthy status to firms.[4]

The stylised monetary union consists of country I and country II, and a central monetary authority issuing a common currency. Each country has its own workers, firms and their owners considered as a whole a consolidated sector (see, for a similar approach, Kaldor, 1966; Gupta & Lensik 1996), and commercial banks. The existence of a national (or supranational) government is in the first instance ignored. This simplifying hypothesis which allows the analysis to focus on the relationship between monetary policy and the solvency condition of the monetary union is removed in

Section 7. Commercial banks only make loans to national firms in order to finance the acquisition of national capital goods, and to re-finance previous loans. Firms of each country can accumulate or de-cumulate financial assets, namely bonds, against the firms of the other country. Wages are paid *ex post*, hence firms do not require loans for this purpose. This means that the relevant interest rate payment for the analysis in this paper is the interest rate payment for the loans made by commercial banks to firms. Interest rate payments to workers for their deposits, to the central monetary authority for the supply of monetary reserves, and to capitalists for their bank equity assets do not alter the main features of the loan supply process, and are ignored here for the sake of the simplicity of the analysis. Similarly, bank loans to households and financial intermediaries and related interest rate payments are ignored for the simplicity of the analysis.

Each country produces one good which acts as both a consumer good and an investment good. The investment good is produced in one period, and then fully used in the next period. For the sake of simplicity, it is also assumed that Tobin's-q is equal to unity (Tobin 1969), namely that the going market price for exchanging existing capital assets (the market price of old capital) is equal to the replacement or reproduction cost of capital (the market price for the newly produced capital). As a result, the absence of fixed capital (of infinite duration) does not alter the analysis of the stylised monetary union with circulating capital only. Furthermore, under the same assumption that Tobin's-q is equal to unity, the existence of the equity market where capital is bought and sold can be ignored.

Each country has also an abundant supply of labour services and of productive capacity, i.e. the level of effective demand determines the degree of utilization of labour

and capital. For the sake of simplicity of the analysis, it is also assumed that workers spend all their wages on national goods, whereas firms use their profits either to buy foreign goods, conceived as consumption goods for their owners, or to repay bank loans. If firms cannot meet their debts requirements towards banks, they have either to renegotiate new bank loans or sell part or all of their capital.

The key macroeconomic variables for country I are the following. Y is the level of production corresponding to the normal utilisation of the productive capacity, L is the number of workers employed in the production process, K is the physical quantity of the capital used, W is the nominal wage, r is the normal rate of profit, and P the nominal price correspondent to the normal rate of profit and the current nominal wage. The productive technology used is $y = Y/L$, $k = K/L$, and hence $K/Y = k/y$. It is then assumed that the income produced is distributed entirely between firms and workers: $PY = WL + (1 + r)PK$. Therefore, it follows:

$$(1) \quad P = \left(\frac{1}{1 - (1 + r)(k/y)}\right)\frac{W}{y}$$

A similar equation can be derived for country II. Using the prime symbol to indicate its key macroeconomic variables, namely Y', L', K', W', r', P', y', and k', it follows:

$$(1') \quad P' = \left(\frac{1}{1 - (1 + r')(k'/y')}\right)\frac{W'}{y'}$$

Equations (1) and (1′) describe the price of the consumption and investment good for country I and country II, when the degree of utilisation of productive capacity is at its normal level Y and Y', respectively. However, for a given productive technique and a normal rate of profit, changes in aggregate demand trigger a deviation in the degree of utilisation of productive capacity away from its normal level.

In order to highlight the effects of a change in the aggregate demand for country I, the following variables are introduced: Y^* is the current level of production, $u = Y^*/Y$ is the actual degree of utilisation of productive capacity, and (γr) is the actual rate of profit, which deviates from the normal rate r as a result of changes in either the price level P or in the degree of utilisation of the productive capacity u. Assuming for the sake of simplicity that there are not changes in the degree of utilisation of labour, it follows that $PuY = WuL + (1 + \gamma r)P_{t-1}K$. Then, with $\pi = ((P_t/P_{t-1}) - 1)$ indicating the rate of inflation, it follows that the actual degree of utilisation of productive capacity for country I is:

$$(2) \quad u = \frac{(1 + \gamma r)k}{(1 + \pi)(y - W/P)}$$

Similarly, the actual degree of utilisation of productive capacity for country II is:

$$(2') \quad u' = \frac{(1 + \gamma' r')k'}{(1 + \pi')(y' - W'/P')}$$

The final equation of the stylised monetary union model presented in this paper describes the macroeconomic equilibrium between production and aggregate demand. Therefore, an equation for investment, imports and exports needs to be added to the model. The investment expenditure of the firms of country I and country II are defined as $I = (1+g)PK$ and $I' = (1+g')P'K'$, respectively, where g and g' are the rate of capital accumulation for the two countries. The expenditure for imports of countries I and II is given respectively by:

$$M = m_0(1 + \gamma r)P_{t-1}K + m_1(P - P')K$$

and

$$M' = m'_0(1 + \gamma' r')P'_{t-1}K' + m'_1(P - P')K'$$

where m_0 and m'_0 represent the share of profits used by firms to buy foreign goods, and m_1 and m'_1 measure the imports elasticity to price differentials of the countries, with $m_1>0$ and $m'_1<0$. Since there are only two countries in the model, the expenditure for exports of country I is equal to the expenditure for imports of country II, and *vice versa*. In other words, it is: $X=M'$ and $X'=M$. It follows then that the macroeconomic equilibrium of countries I and II is respectively:

$$WuL + (1+\gamma r)P_{t-1}K = WuL + (1+g)PK + M' - M$$

$$W'u'L' + (1+\gamma' r')P'_{t-1}K' = W'u'L' + (1+g')P'K' + M - M'$$

The combination of the conditions of macroeconomic equilibrium for countries I and II gives rise to a system of two equations with two unknowns γ and γ', which contribute to the determination of the actual rates of profit γr and $\gamma' r'$. If for simplicity $m_0=m'_0$, the macroeconomic equilibrium for countries I and II is respectively:

$$(3) \quad 1+\gamma r = \frac{(1+m_0)(1+\pi)(1+g)+(m_0)\left(1+\pi'\right)\left(1+g'\right)+\left(m'_1-m_1\right)(\pi-\pi')}{1+2m_0}$$

$$(3') \quad 1+\gamma' r' = \frac{(1+m_0)\left(1+\pi'\right)\left(1+g'\right)+(m_0)(1+\pi)(1+g)+\left(m_1-m'_1\right)(\pi-\pi')}{1+2m_0}$$

Assuming that the conditions of existence and uniqueness of an economically significant equilibrium are satisfied, the systems of equations (1) - (2) - (3) and (1′) - (2′) - (3′) can be solved in the following way. Given the price levels in the previous period P_{t-1} and P'_{t-1}, the technique k, the output-labour ratio y, the monetary wage W, the normal rate of profit r, the rate of accumulation g and the parameters m_0 and m_1, and with P' and π' known from equation (1′), then equation (1) determines P (and then π), equation (3) determines γ, and equation (2) determines u. In a similar way, it is possible to determine P' (and π'), γ', and u' for country II in the system of equations (1′) - (2′) - (3′).[5] Finally, the trade balance between the two countries is determined as follows:

$t = M'/P'_{t-1}K' - M/P_{t-1}K$, which it corresponds to:

$$t = \frac{m_0}{1+2m_0}\left[(1+\pi')(1+g') - (1+\pi)(1+g)\right] + \frac{1}{1+2m_0}\left[(m_1' - m_1)(\pi - \pi')\right]$$

3. Solvency rule and rates of capital centralization

Brancaccio and Fontana (2013) have suggested a "solvency rule" as an alternative to the Taylor rule in order to explain how through changes in the nominal interest rate the central bank influences the solvency conditions of firms and workers in a closed economy.[6] According to the solvency rule, on average firms are solvent if their income is equal or greater than their expenditure in correspondence with the macroeconomic equilibrium. In the case of a stylized monetary union this condition can be expressed in the following terms: in correspondence with the macroeconomic equilibrium, the firms of country I are solvent if the sum of their profits and new bank loans is equal to, or greater than, the total expenditure on foreign goods, bank debt repayments and net acquisition of capital from the firms of country II. A similar proposition applies for the solvency of the firms of country II.

In order to derive a solvency rule equation for the firms of countries I and II, the following variables are introduced: i is the nominal interest rate set by the central monetary authority, s the mark-up on i set by the banks of country I in order to determine the interest rate on bank loans in the same country, s' the mark-up on i set by the banks of country II in order to determine the interest rate on bank loans in country II, cFL the new set of bank loans to the firms of country I, $c'FL'$ the new set of bank loans to the firms of country II, and ΔK^A the net acquisition by the firms of country I of existing capital from the firms of country II. Please note that FL (and FL') denotes the planned or desired debt-financed spending of firms, and c (and c') is the proportion of

bank loans to firms that are deemed creditworthy by banks. Therefore, the supply of bank loans *cFL* (and *c′FL′*) is therefore the effective supply of loans, which may differ from the desired amount of bank loans *FL* (and *FL′*) demanded by firms. The mark-ups *s* and *s′* measure the liquidity preference of the commercial banks of countries I and II (Fontana, 2009A, Ch. 7), respectively, and are determined by several factors, including the market powers of banks and the country-risks faced by their borrowers. Lastly, the net national amount of financial assets issued by the firms of country I is represented by the term NFA_t, which can be positive, negative or zero depending on whether the firms are net creditor, net debtor or in balance with the firms of country II. Similarly, the term NFA'_t indicates the net national amount of financial assets issued by the firms of country II vis-à-vis the firms of country I. For the sake of simplicity, it is assumed that for the firms of each country the interest rate on financial assets is equal to the interest rate on bank loans, i.e. the cost of borrowing from banks or foreign firms is equal. It follows then that the solvency rule equation for the firms of countries I is:

$$WuL + (1+\gamma r)P_{t-1}K + cFL + (1+si)NFA_{t-1} \geq WuL + (1+g)PK + m_0(1+\gamma r)P_{t-1}K + m_1(P-P')K + (1+si)cFL_{t-1} + NFA_t + P^*\Delta K^A$$

where:

$$cFL = (1+g)PK + \lambda(1+si)cFL_{t-1}$$

$$cFL_{t-1} = (1+g)P_{t-1}K_{t-1} + \lambda_{t-1}(1+si)cFL_{t-2}$$

Also, it is:

$$P^* = P \quad if \quad \Delta K < 0$$

$$P^* = P' \quad if \quad \Delta K > 0$$

If ΔK^A is positive (negative), it means that the firms of country I are buying (selling)

existing capital at price P' (P) from (to) the firms of country II. Therefore, if ΔK^A is positive the current price P^* of the existing capital traded among the two countries is P', while if ΔK^A is negative it is P.

The term λ (and λ') is a measure of the degree of "financial instability" in the economic system (Minsky, 1977). It represents an indicator of the degree to which firms refinance their debts with banks. An increase in λ (and/or λ') means that firms do not repay in full their debts, but instead apply to banks for fresh loans in order to cover their debts obligations towards the banks. In this case, the distinction first made famous by Minsky (*op. cit.*) among hedge, speculative and Ponzi financial profiles applies. The prospective income flows of firms with a hedge profile cover interest rate payments and the principle. The near-term income flows of firms with a speculative profile only cover interest rate payments. Finally, the near-term receipts of firms with a Ponzi profile are even insufficient to cover interest rate payments. As Minsky warned, during a business cycle expansion, firms may increasingly move from a hedge position to a speculative or even a Ponzi position. This will then have serious implications for the financial health of both firms and banks. For instance, the banks most exposed towards firms with speculative and Ponzi profiles may then be forced to make up for the missing reimbursements by contracting debts with the banks of the other country, or with the central monetary authority.[7]

At this stage it is also worth highlighting that bank only accommodate the demand for loans of firms deemed to be creditworthy, and at a price, the interest on loans, as well as other lending conditions, of their own choice. The latter, as well as the definition of creditworthiness, change over time for various reasons, including the liquidity preference of banks (Dow, 1997; Rotheim, 2006). For instance, if λ (or λ')

increases, and banks become aware of increasing lending and borrowing risks, that is if the preference of banks for liquid assets increases, banks may raise the mark-up *s* (or *s'*) and/or refuse credit altogether by reducing *c* (and/or *c'*), that is some firms may lose their creditworthiness status. In other words, the desires of firms to raise leverage and to move to more speculative or Ponzi positions could be frustrated by the lending criteria set by banks.

By substituting *cFL* and cFL_{t-1} in the solvency condition, defining the rate of change of net financial assets with the term $\delta = (NFA_{t+1}/NFA_{t-1})$, rearranging and dividing the whole by $P_{t-1}K$, it follows:

$$1 + \gamma r \geq \frac{1}{1 - m_0}\left[(1-\lambda)(1+si) + m_1(\pi - \pi') + (1+\pi^*)\frac{\Delta K^A}{K} + (\delta - si)\frac{NFA_t}{P_{t-1}K}\right]$$

where π^* refers to the domestic or foreign inflation rates depending on whether ΔK^A is positive (i.e. net foreign purchases) or negative (i.e. net foreign sales). By substituting equation (3) in the condition of solvency, assuming $g_c = \Delta K^A/K$, and $nfa = NFA_t/P_{t-1}K$, it then follows:

$$(4)\quad g_c \leq \frac{(1-m_0)^2(1+\pi)(1+g) + (m_0 - m_0^2)(1+\pi')(1+g')}{(1+\pi^*)(1+2m_0)} + \left[\frac{(1-m_0)(m_1' - m_1)}{(1+2m_0)} - m_1\right]\frac{(\pi - \pi')}{(1+\pi^*)} - \frac{(1-\lambda) + \delta nfa}{(1+\pi^*)} - \frac{(1-\lambda) - nfa}{(1+\pi^*)}si$$

Condition (4) describes the solvency condition for the firms of country I. In a similar way, it is possible to derive a condition (4′) for the solvency of firms of country II, with λ' measuring the degree of financial instability of the firms of country II and $\delta' = (NFA'_{t+1}/NFA'_{t-1})$. Since for accounting reasons $\delta nfa = -(\delta' nfa')$, it follows that:

$$(4') \quad g'_c \leq \frac{(1-m_0)^2(1+\pi')(1+g') + (m_0 - m_0^2)(1+\pi)(1+g)}{(1+\pi^*)(1+2m_0)}$$

$$+ \left[\frac{(1-m_0)(m'_1 - m_1)}{(1+2m_0)} - m_1\right]\frac{(\pi - \pi')}{(1+\pi^*)} - \frac{(1-\lambda') - \delta nfa}{(1+\pi^*)}$$

$$- \frac{(1-\lambda') + nfa}{(1+\pi^*)} s'i$$

The terms g_c and g'_c can be defined as the "rates of centralization" of physical capital. They refer to net purchases of foreign capital, i.e. the buying and selling and consequent ownership transfers from one country to the other of already existing capital, divided by the total amount of existing capital in the country examined. These rates correspond to net sales or acquisitions of existing capital that are necessary to guarantee the respect of the solvency conditions for the firms of country I and II, respectively. For example, a positive rate of centralization g_c indicates that in aggregate terms the firms of country I acquire existing physical capital from the firms of country II. By contrast, a negative rate of centralization g_c indicates that in aggregate terms the firms of country I need to sell physical capital to the firms of country II in order to be solvent. A similar argument applies to country II for a positive or negative rate of centralization g'_c, respectively. There is therefore a difference between the terms g_c and g'_c, and g and g', which represent the actual rates of accumulation of newly formed capital.

Conditions (4) and (4′) can be interpreted as an application of the solvency rule proposed by Brancaccio and Fontana (2013) to the case of a stylised monetary union. Once the solutions of the systems (1) - (2) - (3) and (1′) - (2′) - (3′) have been determined, and on the preliminary assumption that the spreads s and s' and the degrees of financial instability λ and λ' are given, solvency conditions (4) and (4') describe the

relationship between the nominal interest rate i set by the monetary authority and the rates of centralization g_c and g'_c. Compared to its original version, the solvency rule examined here presents a novelty. In fact, it connects not only the interest rate to the inflation rate and the rate of accumulation, but also to net sales of capital from one country to the other. As it is argued in the next Sections, by influencing the solvency conditions of the firms of countries I and II, the interest rate decisions of the central monetary authority may become crucial for the allocation of ownerships of physical capital between the two countries.

4. Monetary policy, solvency and capital centralization

The solvency rule represented by conditions (4) and (4′) highlights the existence of a relationship between the interest rate i set by the central monetary authority and the rates of capital centralization g_c and g'_c. This relationship is examined below in greater depth with the aid of a diagram (Figure 1). The X-axis displays the rate of interest i set by the central bank, while the Y-axis presents the rates of centralization g_c and g'_c. The lines (4) and (4′) represent the respective solvency conditions under the constraint of strict equality. They show that as the interest rate increases, the related rates of centralization consistent with solvency tend to decrease. When the lines cross the X-axis, the rates of centralization become negative. From that point onwards the firms of countries I and II are obliged to sell capital in order to remain solvent, hence they move from the position of net buyer of physical capital assets to the position of net seller of physical capital. In turn, this will affect the inflation rate used to measure the capital assets. For instance, in the case of country I, if $g_c > 0$, then country I is a net buyer, hence the inflation rate refers to foreign capital: $\pi^* = \pi'$. Alternatively, if $g_c < 0$, then country I is a net seller, hence $\pi^* = \pi$. A similar argument applies to country II. For

each country, the solvency of firms is guaranteed only by the area situated beneath its own line.

In order to simplify the graphical representation, it is initially assumed that *nfa = 0*. For a non-negative rate of interest, an intersection of the lines representing the equations (4) and (4´) exists for economically significant values, if the following condition is observed: $s(1-\lambda)(1+\pi^*) \neq s'(1-\lambda')(1+\pi^*)$. If this condition is not met, the two lines are parallel. If the condition is satisfied, equations (4) and (4′) will be represented by two broken lines that change in inclination at the point of intersection with the X-axis. The lines will have one or two intersections economically significant. In every case, the broken lines will form a quadrilateral. In the particular case in which $\pi > \pi'$, $s = s'$, and $\lambda = \lambda'$ the quadrilateral takes the form of a parallelogram. This case is represented in Figure 1 below.

PLEASE INSERT FIGURE 1

The decision of the monetary authority on the interest rate will place the monetary union in one of the five areas indicated by the numbers (I), (II), (III), (IV), and (V). For example, if the central monetary authority sets the interest rate along the segment $\overline{OA}$ of the X-axis, the financial position of the member of the union will be represented by area (I). In this area the conditions of solvency (4) and (4′) can be satisfied with non-negative rates of centralization: $g_c \geq 0$ and $g_c' \geq 0$. This means that the firms of both countries are capable of meeting their respective conditions of solvency without having to sell capital to the firms of the other country. Of course, this does not imply that cross-border takeovers and sales of capital would not occur. It just means that these takeovers and sales would not be necessary for solvency purposes.

In area (II) the rate of centralization of country II is positive, while the rate of centralization of country I is negative, i.e. $g_c \leq 0$ and $g'_c \geq 0$. The firms of country I need to transfer ownership of physical capital to the firms of country II in order to be solvent. Furthermore, the firms of country II are capable of purchasing all of the physical capital assets offered by the firms of country I. This capital haemorrhage from country I to country II continues in area (III). The rate of centralization of country I is more and more negative. The firms of country I need to make large transfer of physical capital in order to be solvent. However, in this case the firms of country II are not able to buy all the physical capital offered by the other country. Thus, if the central monetary authority sets the interest rate along the segment $\overline{BC}$ of the X-axis, a third party buyer is necessary to avoid the risk of insolvency for some firms of country I. Area (IV) and area (V) represent the situation of a general solvency crisis. The firms of country I and II need to make large sales of physical capital in order to be solvent.

So far it has been assumed that $nfa = 0$. This simplifying assumption is now relaxed, such that the firms of country I can accumulate or de-cumulate financial assets, against the firms of country II, and vice versa. This has important consequences. In the case of country I, the sign of the relationship between the rate of centralization g_c and the interest rate i now depends on the sign of the following expression: $-[(1-\lambda)-nfa]$ (an analogous relationship also holds for the firms of country II). It then follows that an increase in the interest rate does not necessarily lead like before to a decrease in the rate of centralization. For instance, if the firms of country I have accumulated financial assets against the firms of country II, and they are able to obtain new bank loans, the expression above maybe greater than zero. Therefore, the rate of centralization g_c is now correlated positively with the interest rate i. In terms of Figure 1, this means that above

the X-axis the slope of the solvency line (4) becomes positive. The firms of the country I now gain from an increase in the interest rate, while this is not the case for the firms of country II. This is of course only one of many potential outcomes when the firms of country I accumulate financial assets against the firms of country II. But this outcome provides further evidence of the significance of the relationship between the interest rate set by the central monetary authority and the allocation of ownership of physical capital among the member countries of a monetary union. In the circumstances described above, other things being equal, the central monetary authority may exacerbate the transfer of ownership of physical capital from country I to country II.

Finally, Figure 1 is constructed under simplifying assumptions and for given values of the variables and parameters contained in the equations (4) and (4′). Therefore, the nominal interest rate set by the central monetary authority is only one of the variables determining the area where the monetary union will fall. Yet, the diagram shows that the role of the central monetary authority is far more crucial than it is generally thought to be in the conventional NCM literature. The allocation of existing capital among member countries of the union depends significantly on the policy decisions of the central monetary authority. Far from being neutral, these policy decisions have therefore important long-run effects on the economic structure of the member states of the monetary union.[8]

5. Capital accumulation, interest rate mark-ups and solvency

Conditions (4) and (4′) show that in the absence of deliberate actions of the central monetary authority, the solvency of the stylised monetary union is only maintained through a continuous transfer of capital ownership from the debtor country toward the creditor country or an external creditor.[9] These conclusions rest on a model which has

been so far based mainly on accounting relationships (see, for some motivations of this methodological "objectivism", Kurz and Salvadori, 2005). These relationships are in this Section supplemented with two behavioural hypotheses in order to make some conjectures about the potential dynamics of the monetary union.

Starting with the first behavioural hypothesis, it is now assumed that the rates of accumulation of capital depend on the rates of centralization of the previous period. In particular, it is assumed that the rate of accumulation is lowered when the rate of centralization of the previous period has been positive, since in this case firms prefer to purchase already existing capital rather than risking to produce new capital. Furthermore, it is assumed that the rate of accumulation falls when the rate of centralization of the previous period has been negative, since firms will be reluctant to make investment in new capital, when they are forced to sell existing capital in order to be solvent (empirical support for these propositions is offered among others by Wang 2010). It then follows that for country I the relationship between capital accumulation and capital centralization can be described in the following terms:

$$(5) \quad g = g_0 - v(g_{c(t-1)})^2$$

where g_0 and v are exogenous parameters. A similar relationship can be derived for country II in terms of g' and $g'_{c(t-1)}$.

The second behavioural hypothesis is that the mark-ups set by banks over the nominal interest rate i fixed by the monetary authority depend on the rates of centralization of the previous period. This is due to the fact that the component of the mark-up which makes s and s' different represents the spread which measures the risk of lending to the firms of a specific country. More precisely, it is assumed that the greater is the amount of capital that the firms of a country have to sell in order to be solvent,

ceteris paribus the higher is the country-risk faced by these firms, then the riskier these firms will be considered, and hence the higher is the mark-up required by banks (a similar case could also be made when firms borrow directly from the market). In general, the riskier firms are perceived, the higher will be the mark-up s or s' that they will have to face when borrowing from banks or the market.[10] It then follows that for country I the relationship between capital centralization and the mark-up can be expressed by the following equation:

$$(6) \quad s = s_0 - q(g_{c(t-1)})$$

where s_0 and q are exogenous parameters. A similar relationship can be derived for country II in terms of g' and $g'_{c(t-1)}$.

By substituting equations (5) and (6) in (4), imposing the constraint of strict equality and rearranging the whole, it follows:

$$(7) \quad g_{c(t)} = a\left(g_{c(t-1)}\right)^2 + b(g_{c(t-1)}) + c$$

where:

$$a = \frac{-v(1-m_0^2)(1+\pi)}{(1+\pi^*)(1+2m_0)}$$

$$b = \frac{q[(1-\lambda)-nfa]i}{(1+\pi^*)}$$

$$c = \frac{(1-m_0^2)(1+\pi)(1+g_0)+(m_0-m_0^2)(1+\pi')(1+g')}{(1+\pi^*)(1+2m_0)} + \left[\frac{(1-m_0)(m_1'-m_1)}{1+2m_0} - m_1\right]\frac{(\pi-\pi')}{(1+\pi^*)} - \frac{[(1-\lambda)-nfa]s_0 i}{(1+\pi^*)} - \frac{(1-\lambda)+\delta nfa}{(1+\pi^*)}$$

Again, like for equations (5) and (6), there will be a corresponding equation (7') for country II.

Compared to the conditions (4) and (4'), equations (7) and (7') describe a solvency rule that assigns an even more crucial and problematic role to the central bank. For instance, if a steady state condition $g_{c(t)} = g_{c(t-1)}$ is imposed, the relationship between the interest rate and the rate of centralization necessary for the solvency of the firms of country I is not straightforward. Condition (4) described in Figure 1 is always characterized by a negative derivative dg_c/di, with the exception of the case of $nfa > 0$ and a high λ, that is when the firms of country I have accumulated financial assets against the firms of country II, and they are able to obtain new bank loans. By contrast, the condition (7) has several points in which $dg_c/di > 0$. The case of $nfa > 0$ and a high λ makes the possibility of a positive derivative dg_c/di even more frequent and binding. This positive correlation between the rate of centralization and the interest rate can also happen below the X-axis, where negative rates of centralization can result in a reduction of the rates of accumulation and an increase in spreads so pronounced such as to require a further reduction of the interest rate *i* in order to ensure that the firms of country I are solvent. A similar argument of course applies to the firms of country II with condition (7').

In such a case, the net sales of capital cannot contribute to improving the financial position of the firms of a country and may even damage it. As a result, the room for manoeuvre of the monetary authority is more limited: in order to guarantee the achievement and maintenance of the solvency condition, the central monetary authority can only set a very narrow range of positive interest rates *i* that are compatible with non-negative rates of centralizations for countries I and II. Furthermore, any relationship based on conditions (7) and (7′) is likely to be unstable (see, for an analysis of these types of dynamic equations, Sydsæter *et al.* 2008). In this context, both the

circumstances for the achievement of the solvency conditions and those for their maintenance become more restrictive. As a consequence, the role of monetary policy becomes necessary not only to determine the solvency of the member countries of the monetary union but also to preserve it.

6. Deflation, currency devaluation and solvency

The (1) – (6) and (1′) – (6′) models described so far in this paper are an useful starting point for wide-ranging analyses of the link between monetary policy and capital centralization in a monetary union. They are also helpful to reinterpret the notion of "Mezzogiornification of Europe", which was originally put forward by Krugman (1991).[11] However, the (1) – (6) and (1′) – (6′) models do not consider the implications of price flexibility on the solvency conditions of the firms of countries I and II. Yet the changes in the inflation rate and their effects on relative competitiveness and net exports have often been considered suitable to deal with solvency issues among member countries of a monetary union. For instance, Blanchard (2007, 2012) has suggested that deflationary policies in peripheral countries of the EMU (e.g. Greece) will help these countries to prosper again, since firms in these countries are less competitive and operate with higher costs. The European Central Bank (ECB) itself has given its support to the peripheral countries of the EMU provided that they adopt deflation policies (Draghi, 2012). Others suggest that the rebalancing of the EMU cannot be achieved only through the efforts of the less competitive countries, and therefore have suggested inflationary policy like an increase in nominal wages in the central countries of the EMU (e.g. Germany) (see, for example, Brancaccio 2012).[12] Although these studies suggest opposite solutions, they have in common the fact that the flexibility of prices is

considered effective for the purpose of rebalancing competitiveness and achieving solvency among member countries of a monetary union.

In the models described in this paper, changes in the inflation rates produce three main effects in countries I and II. First, they affect the rate of profit consistent with the macroeconomic equilibrium of each country. Second, they alter the relative competitiveness, and hence the trade balance of the two countries: since by definition $m'_1 < 0$, the overall value of $dt/d\pi = -m_0(1+g')/(1+2m_0) + (m_1^{'} - m_1)/(1+2m_0)$ is always negative. Finally, changes in the inflation rates affect the value of the existing capital assets. In particular, deflation reduces the value of capital, and thus can force firms to sell a greater amount of physical capital in order to remain solvent. It follows that the overall outcome of changes in the inflation rates depends on the relative strength of these three effects, which cannot be determined *a priori*. Conditions (4) and (4′) confirm that $dg_c/d\pi$ and $dg'_c/d\pi'$ are of uncertain signs. More specifically, these derivatives become negative only for high absolute values of the parameters m_1 and m'_1, which indicates the sensitivity of the trade balances to changes in the price levels. For example, assuming that country I is a net buyer and that $\pi^*=\pi'$, it then follows:

$dg_c/d\pi < 0$ for $m_1^{'} < [(1+2m_0)/(1-m_0)+1]m_1 - (1-m_0)(1+g)$.

In this case, changes in the inflation rate determine effects of the same sign in the solvency condition and in the trade balance of the country under consideration. In summary, the solvency condition and the trade balance impose different constraints to the firms of each country of the monetary union. For a low sensitivity of net exports to price changes, deflation policies could worsen rather than improve the solvency condition of a country. Furthermore, it is easy to see that also the signs of $(\delta g_c/\delta\pi)d\pi + (\delta g_c/\delta i)di$ and $(\delta g'_c/\delta\pi)d\pi + (\delta g'_c/\delta i)di$ are uncertain. Such result

raises doubts about the widespread idea that the central bank of a monetary union can help a country to achieve solvency by demanding deflation policies in exchange for lower interest rates. Finally, the effects of price changes are even more controversial in the model represented by the conditions (7) and (7'): a deflationary process, in particular, could increase the instability of the solvency rule.

Some economists and policy-makers also held the view that the abandonment of the monetary union and consequent currency devaluation could be a more effective way to obtain solvency. In order to analyses the effects of currency devaluation policies, the (1) – (2) – (3) and (1′) – (2′) – (3′) models need to be slightly amended by multiplying the term $(1 + \varepsilon^*)$ for $(1 + \pi^*)$ in the solvency conditions (4) and (4′), respectively, where E is the exchange rate and ε its rate variation over time, i.e. $1 + \varepsilon = E_t/E_{t-1}$. For all values of $g_c < 0$, then $\varepsilon^* = 0$ and $\pi^* = \pi$; and for values of $g_c > 0$, then $\varepsilon^* = \varepsilon$ and $\pi^* = \pi$. In all these cases, the sign of $\delta g_c/\delta\varepsilon$ is uncertain. In other words, the overall effects of currency devaluation policies on the solvency conditions of the firms of country I are indeterminate. In the specific case in which $g_c < 0$, a devaluation policy not only increases competitiveness, but also reduces the value of existing capital, which means that even larger quantities of capital may have to be sold in order to guarantee the solvency condition. A similar argument can also be made by examining the (1) – (6) model and the solvency condition (7). For example, there is no guarantee that a devaluation policy would contribute to make stable a hypothetical solution for $g_c \geq 0$. These policies could actually hinder any possible attempt by the central monetary authority to make the solvency conditions independent from sales of capital abroad in order to avoid situations in which $dg_c/di > 0$. The same results, again, apply for country II.

It may be interesting to note that the models described above suggest a further interpretation of the so-called fire sales of capital that typically occur when a country abandons a monetary union and devalues its own currency. According to Froot and Stein (1989) and Krugman (1998), the depreciation of the domestic currency lowers the relative wealth of domestic firms, which in turn lead to foreign acquisitions of certain domestic capital assets. The models described above suggest an additional explanation for the fire sales of capital. A currency devaluation policy may lead to a depreciation of domestic capital assets so pronounced that firms need to sell more capital assets than initially planned in order to be solvent. Furthermore, under certain conditions, a currency devaluation policy can push the economic system in an area where $dg_c/di>0$, which means that the sales of capital abroad trigger a downward spiral that threatens the solvency condition.[13]

7. Solvency of firms and the sustainability of government debt

The stylised monetary union presented in the previous sections ignored the existence of a national (or supranational) government. This simplifying hypothesis allowed the analysis to focus on the relationship between monetary policy and the solvency condition of firms. The hypothesis is removed in this section in order to analyse the link between the solvency of firms and the sustainability of the government debt. The additional macroeconomic variables for country I to be considered are the following. Z is the nominal government expenditure and $z = Z/P_{t-1}K$ is the government expenditure in relation to the capital. If for the sake of simplicity it is assumed that only profits are taxed at a rate ψ, then the nominal tax revenues correspond to $X = \psi(1 + \gamma r)P_{t-1}K$, while $x = \psi(1 + \gamma r)$ is the tax revenues in relation to the capital, and $m_0 = m\ (1 - \psi)$ is the propensity to import net of taxation. For simplicity, it is again assumed that $nfa = 0$. It

then follows that the national income and the macroeconomic equilibrium between the production and demand of country I are $PuY = WuL + (1+\psi)(1+\gamma r) P_{t-1}K$ and $PuY = C + I + Z + X - M$, respectively. A similar set of variables and equations can be derived from country II by using the prime symbol.

The solvency condition for the firms of country I is then:

$$g_c \leq \frac{[1-m^2(1-\psi)^2][(1+\pi)(1+g)+z]+[m(1-\psi)-m^2(1-\psi)^2[(1+\pi')(1+g')+z']}{(1+\pi^*)(1+\psi)(1+2m_0)}$$

$$+\left[\frac{[1-m(1-\psi)](m_1'-m_1)}{(1+\psi)(1+2m_0)}-m_1\right]\frac{(\pi-\pi')}{(1+\pi^*)}-\frac{(1-\lambda)}{(1+\pi^*)}(1+si)$$

The condition of sustainability of the government debt for country I can now be derived. The nominal stock of government debt of the country I is represented by the following accounting identity, namely $D_t = D_{t-1} + siD_{t-1} + Z_t - X_t$, while the stock of government debt in relation to the capital is $d_t = D_t / P_{t-1}K$. Following Pasinetti (1998), it is assumed that the government debt is sustainable if $d_t \leq d_{t-1}$. It then follows that the government spending that stabilizes the public debt is $z_s \leq [(g + \pi) - si]\, d + x$. But, since $x = \psi(1+\gamma r)$, then

$$z_s \leq \frac{(1+\psi)[(1+2m(1-\psi)]}{(1+\psi)-m(1-\psi)+2m(1-\psi)^2-1}\left\{[(g+\pi)-si]d\right.$$

$$\left.+\frac{[1+m(1-\psi)](1+\pi)(1+g)+m(1-\psi)[(1+\pi')(1+g')+z']+(m_1'-m_1)(\pi-\pi')}{(1-\psi)^2(1+2m)}\right\}$$

Again, two similar equations can be derived for country II.

There are two main implications that can be derived for country I from the new solvency condition of firms and the condition of sustainability of government debt. First, the inclusion of the national government in the model increases the importance of the decisions of the monetary authority for the overall dynamics of the system. In fact, if the central monetary authority sets a relatively high interest rate, then the solvency of firms deteriorates both directly, because of the increase (other things being equal) in cost of their debt, and indirectly, by tying the possibilities for expansion of government expenditure for a given steady state debt. Second, since $dg_c / dz > 0$, it is clear that if the scope is to ensure the solvency of firms without selling capital abroad, then it may be necessary to increase public spending and thus increase the steady state government debt.

8. Conclusions

Brancaccio and Fontana (2013) have proposed a solvency rule as an alternative to the Taylor rule for explaining the nature and role of monetary authorities in modern economies. According to the solvency rule, monetary authorities set the nominal interest rate as a function (among other things) of the inflation rate and the rate of capital accumulation. This paper has analysed the working of the solvency rule in a stylised monetary union characterised by structural divergences due to the different rates of accumulation and inflation among its member countries. Building on the Post Keynesian literature on the monetary circuit and endogenous money, it has derived major effects of these structural divergences on the solvency of firms, and the consequent allocation of ownership of existing physical capital among the member countries of the stylised monetary union. The analysis, which helps to reinterpret the

concept of "Mezzogiornification of Europe" originally suggested by Krugman (1991), leads to the following main conclusions.

First, the solvency rule examined here associates the interest rate set by the central monetary authority to the rates of capital centralization, i.e. the net sales of existing capital from one member country to the other. This means that the decisions of the central monetary authority may become crucial for the allocation of ownerships of physical capital within the monetary union. Second, while a deflation policy enhances the competitiveness of a country, it also reduces the value of the existing capital assets: if the latter effect prevails on the former, this policy undermines the solvency condition. Thus, if the central monetary authority requires deflation measures in exchange for lower interest rates, the solvency of a country may not be maintained even through increasing sales of capital abroad. Similarly, a currency devaluation policy can provoke conflicting effects on the financial position of a country. Therefore, even the mere abandonment of a monetary union may be inadequate to solve the problems of solvency and competitiveness of a country.[14] Third, a national government is able to affect positively the solvency condition of national firms, but at the expense of a rising steady state of government debt. Therefore, a fiscal policy rule that imposes a government debt reduction could worsen the solvency condition of national firms, and hence amplify the transfer of ownership of physical capital from one country to another.

Finally, it is worthy highlighting that this paper is not about imperfections, design or market failures that cause a crisis in an otherwise efficient monetary union among a confederation of states. The conclusions of this paper apply to any monetary union, with or without the imperfections or design failures, including the lack of stabilising features like the existence of a central bank acting as lender of last resort, that

for instance De Grauwe (2013) and other authors have associated with the Eurozone. Once this is appreciated, then many features of the paper should become clear, including the limitations of the distinction between a "liquidity crisis" and a "solvency crisis" in a monetary union; the issue of the solvency of commercial banks, which is closely intertwined with the solvency of firms; the crucial links between trade deficits and the solvency condition of firms and between the solvency of firms and the sustainability of government debt.

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[1] This conventional view has not been exempted from objections. For instance, Goodhart (1987) and Freixas, Parigi, Rochet (2004) have questioned this distinction between insolvent and illiquid institutions in the presence of asymmetric information or imperfect markets. Wray (2013) highlights the interdependence of the two concepts.

[2] The original concept of "centralization" was suggested by Marx (1976) to indicate the acquisitions of already formed capital, while he used the term "concentration" for the accumulation of newly formed capital. The concept of centralization was later taken up and developed by Hilferding (1910). It should be noted that Hilferding, and the broadly defined non-mainstream literature, sometimes use the term concentration as a synonym of centralization in Marx's sense (e.g. Wray 2009). Within the mainstream literature the term concentration completely replaces that of centralization, which is hardly ever used. From an exegetical point of view, however, the two concepts should be kept separate.

[3] Please note that, given the focus of the paper, borrowing by creditworthy workers or households is not considered for the sake of simplicity of the analysis.

[4] The model also builds on some aspects of Post Keynesian studies in the field of open economies, including Metcalfe and Steedman (1979), Fitzgerald (2005), Godley and Lavoie (2007), and Parrinello (2009).

[5] This solution should not be confused with the conventional, non-steady growth equilibrium. It is rather a deviation from the so-called long-period classical position. This means that within each country the effective rate of profit can differ from the normal rate, which corresponds to the long-period

position (Garegnani, 1992; Kurz, 1994). Furthermore, the uniformity of the normal rates of profit between countries is hindered by frictions in the free movements of capital and labour.

[6] The analysis of the solvency condition of workers in a monetary union is not pursued here and left for future research.

[7] In order to examine the effects of a change in the degree of financial instability, this paper assumes that in the previous period $\lambda_{t-1} = 0$ for both countries. Given this hypothesis, then the relationship (4) between g_c and λ is always positive. Alternatively, when $\lambda_{t-1} \neq 0$, the relationship between g_c and λ is positive if λ is growing (that is $\lambda > \lambda_{t-1}$), and it is negative if λ is decreasing over time (that is $\lambda < \lambda_{t-1}$). This means that if a country is a net buyer of capital, this could be due to a growing speculative trend. This result could be interpreted as an open economy version of the concept of Minsky's financial instability hypothesis.

[8] The macroeconomic equilibriums (3) and (3′) and the solvency conditions (4) and (4′) have been built under the hypothesis that cross-border dividends are negligible. However, it is possible to make explicit them by assuming that profits of firms are distributed on the basis of two parameters, namely α and β, that represent the share of national capital owned by the firms of country I and II, respectively. It then follows that in equations (3) and (4) profits in country I are represented in the following way:

$\alpha(1+\gamma r)\, P_{t-1}K+\beta(1+\gamma' r')P'_{t-1}K'$

If the firms of country I have been net owners of capital in the previous period (that is $g_{c(t-1)} > 0$), then $\alpha=1$ and $1 \geq \beta > 0$. An analogous expression with $(1-\alpha)$ and $(1-\beta)$ applies to country II. In this case, it is possible to show that the higher is β, the higher is the risk of insolvency for the firms of country II. In other words, positive cross-border dividends aggravate the position of the firms which are net sellers of capital abroad.

[9] Another possibility will be deliberate actions of a supranational fiscal authority. Given the goal of the paper, this possibility is left for future research

[10] Since the rate of centralization is strictly related to the net external position compatible with the solvency conditions of firms, it is no surprise that the relationship between the current mark-ups

and the previous rate of centralizations find strong supports in the empirical literature (see, among others for the EMU, Barrios *et al.*, 2009; Gros, 2011).

[11] Drawing on the economic divide between the North and the South or "Mezzogiorno" of Italy, Krugman used the notion of Mezzogiornification in order to describe the possibility of a growing concentration of industries in the central regions of the EMU at the expenses of the peripheral regions. Although in many ways prescient, the analysis of Krugman has serious limitations. First, it is derived from a model characterised by increasing returns of scale, and is implicitly linked either to full employment or a natural equilibrium level of employment. Second, the potential concentration of industries is examined restrictively in physical terms, i.e. in terms of the geographical location of productive activities, and hence also of the workers employed in these activities. The (1) – (6) and (1′) – (6′) models offer a different interpretation of the notion of "Mezzogiornification of Europe". First, they do not require increasing returns of scale, and above all do not entail references to full employment or a natural rate of unemployment. Second, the fulfilment of the solvency conditions takes place without reference to the migrations of physical capital and labour. In other words, the fulfilment of the solvency conditions could lead to the centralization of the ownership and control of capital assets, but the question of the geographical location of the firms is secondary.

[12] See also, on the more general relationship between wage and effective demand, Hein and Schulten (2004), Stockhammer (2011), and Stockhammer and Onaran (2012).

[13] This result supports the numerous studies devoted to the counterintuitive effects of currency devaluation (e.g. Blecker and Razmi, 2008). It also helps to highlight the limits of those attempts to solve complex problems of open macroeconomic policy simply through extreme solutions on exchange rates (Palley, 2003).

[14] See, for a balanced assessment of the implications of the full opening of the capital and goods markets to foreign transactions, Chang (2004), Grabel (2011) and Rodrik (2011).

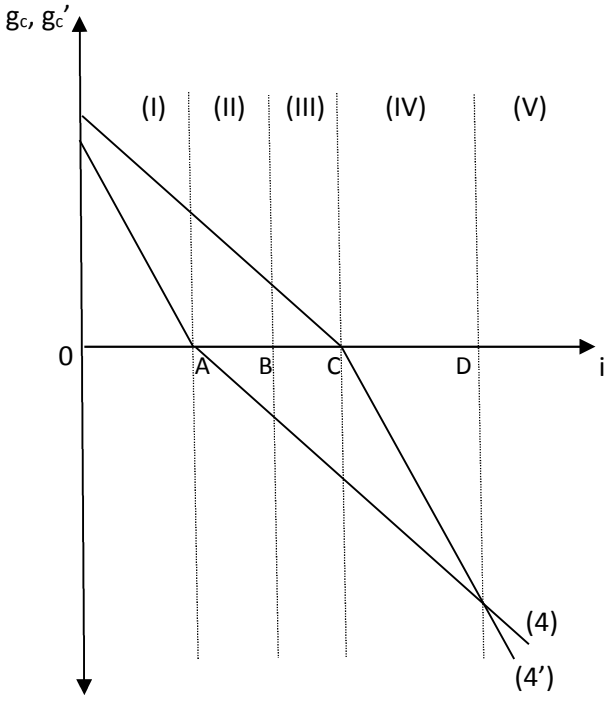

Fig. 1 – The "Solvency Rule" in a Two-Country Monetary Union