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Zentrum für Europäische Integrationsforschung
Center for European Integration Studies
Rheinische Friedrich-Wilhelms-Universität Bonn



Lilia Cavallari

**Inflationary Performance in
a Monetary Union With
Large Wage Setters**

Working Paper

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Inflationary performance in a monetary union with large wage setters^a

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Abstract

Building on a micro-founded model of a two region-world economy in the tradition of the new open economy literature, this paper analyses the strategic interaction of large wage-setters and the central bank when switching from a regime of uncoordinated national monetary policies to a monetary union. The establishment of a monetary union is shown to favour wage restraint, provided the unified central bank is not too conservative. Wage discipline may reduce equilibrium inflation in a monetary union relative to the one under uncoordinated national monetary policies when wage setting is centralised across member countries.

JEL codes: E5, F4

Keywords: monetary union, wage bargaining, inflationary bias

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1 Introduction

This paper models a two-region world economy in the tradition of the new open economy macroeconomics, with the aim of investigating the macroeconomic consequences of the establishment of a monetary union when labour markets are unionised.

In the literature on international monetary policy games, the switch from uncoordinated national monetary policies to a monetary union is generally argued to lead to higher inflation. One reason why the formation of a monetary union is likely to raise inflation for a given level of employment is that the unified central bank's incentive to boost employment is no longer restrained by the cost of the exchange rate depreciation that follows unilateral monetary expansions (Rogoff [1985a]). Higher inflation may then result as a consequence of rational agents anticipating the central bank's attempt to create surprise inflation.

A further channel leading to higher inflation has been recently stressed in the literature on strategic wage setting. Basically, it is argued that wage setters may be induced to behave more aggressively in a monetary union as they perceive an increase in their wages to have a smaller impact on the union-wide inflation rate relative to the one on their country-specific inflation rate.¹

As the move to a monetary union alters the strategic environment faced by the central bank and the labour unions, the incentives of both actors should be explicitly accounted for when analysing the macroeconomic impact of such a monetary policy regime shift. In this paper, we accomplish this task in the simplest general-equilibrium setup, where regions have asymmetric technological as well as institutional labour market features, namely different degrees of monopoly power in the factor market and various levels of wage centralisation.

While moving to a monetary union unambiguously accrues the central bank's temptation to inflate, this paper shows that such a monetary policy regime shift may either favour or inhibit wage discipline. Wage setters are found to behave less aggressively in the monetary union relative to a regime of uncoordinated monetary policies, provided the central bank is not too conservative.

¹This point has been stressed by Zervoyanni [1997], Grüner and Hefeker [1999], Cukierman and Lippi [2000] and Soskice and Iversen [1998], among others.

For an intuitive account of this result, consider the unions' perception of the inflationary consequences of their wage claims in the two monetary policy regimes. Under non-cooperative national monetary policies, each union understands that the increase in its own wage raises domestic inflation to an extent that is larger the bigger the union and the lower the central bank's inflation aversion. When switching to a monetary union, the weight of domestic wages in the union-wide inflation rate reduces. Labour unions, however, may nonetheless perceive higher inflationary repercussions of their wage hikes as they correctly anticipate the response of the unified central bank to wage pressure to be stronger than the one of national central banks for the same degree of conservativeness. This latter effect is higher the less conservative the central bank. As higher inflation awareness on the part of unions favours wage restraint, not too conservative a central bank may then turn out to induce a less aggressive wage behaviour in a monetary union relative to a regime of uncoordinated national monetary policies.

In contrast to Rogoß [1985a]; this paper further shows that international monetary policy cooperation may be effective in reducing wage inflation. In our setup, the union-wide inflation rate falls short of the one under uncoordinated national monetary policies when wage setting is internationally centralised and the unified central bank is not too conservative, namely when wage restraint is strong enough so as to compensate for the inflationary consequences of central bank's behaviour.

Since the contributions by Velasco and Guzzo [1999] and Lippi [2000], it is well-known that monetary institutions, such as central bank's conservativeness, may permanently affect the trade-off between inflation and unemployment through their effects on strategic wage setting. The results in this paper may be read as extending this insight to a particular monetary policy regime shift, by showing that the macroeconomic consequences of establishing a monetary union may depend in a non-linear way on central banking institutions.²

Strategic interactions between the unified central bank and wage setters as those analysed in this paper may be relevant in determining the inflationary performance in the EMU, as several European countries are characterised by intermediate to high centralisation in wage bargaining.³ The results in

²The significance of unionised wage setting for the optimal design of central banking institutions in a closed economy is analysed, among others, by Lawler [2000].

³Calmfors [2000] provides a comprehensive survey of nominal wage bargaining within EMU, which focuses on the impact of given bargaining institutions on real wages and

the paper stress the harmful consequences of establishing the anti-inflation credentials of the European Central Bank (ECB) through the standard Barro-Gordon way of reputation building. Our analysis suggests that appointing an ultra-conservative central banker at the ECB and imparting a "deflationary bias" in the conduct of the European monetary policy, besides the usual costs in terms of employment, may turn out to threaten the ECB's anti-inflationary credibility.⁴

This paper is closely related to a contribution by Cukierman and Lippi [2000]; which analyses the implications of the establishment of a monetary union for strategic wage behaviour. Three main distinguishing features characterise the approach proposed in this paper. Firstly, we explicitly derive demands for both labour and goods from profit and utility maximization, while Cukierman and Lippi adopt a partial equilibrium approach. Secondly, our framework encompasses trade across the countries in the monetary union. Finally, we make a first step towards a welfare-based analysis of the strategic interactions between central banks and wage setters by specifying preferences for unions and the central bank that are consistent with the behavioral analysis. Building on our micro-founded framework, we are able to show that the establishment of a monetary union may induce a more or less aggressive wage behaviour, thus increasing or decreasing area-wide inflation for a given level of employment, while only the former effect may appear in their model.

The paper is structured as follows. Section 2 provides a reduced-form representation of the two-country world economy. Section 3 describes the one-shot game between the central bank and the unions in the two monetary policy regimes. In section 4, the equilibrium outcomes under uncoordinated national monetary policies and a monetary union are compared in the case of uncoordinated national wage setting as well as under international wage centralisation. Section 5 concludes. In the Appendix, the model of a two-country world economy is laid out.

unemployment as well as on the likely effects of EMU on those institutions.

⁴This accords with the views expressed in Allsopp and Vines [1998] favouring the development of an appropriate reaction function rather than the establishment of a tough anti-inflationary reputation as the main task of the ECB. A similar conclusion is drawn by Bean [1998]:

2 The world economy

The world economy consists of two equally-sized regions, Home and Foreign. Home is inhabited by a continuum of agents $j \in [0; 1/2]$: Agents living in Foreign are indexed by $j \in [1/2; 1]$: As in Corsetti and Pesenti [2000], each country produces a single traded good out of differentiated labour units, ℓ_i , indexed in the interval $(0; 1)$. Home workers are organized in $n \in [0; 1]$ unions, Foreign workers in $n^* \in [0; 1]$ unions of size n^{i-1} and n^{*i-1} ; respectively: Each union sets nominal wages on behalf of its members.

2.1 The reduced-form representation

In each country, two reduced-form equations are needed for studying the monetary policy game (a detailed description of the economy is provided in the Appendix). The first one is obtained by substituting aggregate demand for the domestic good (A8) and optimal price-setting (A10) into the demand for labour of type i (A3) and taking logarithms

$$\ln \ell_i = \mu_i (w_i - w) - \frac{1}{\eta} \quad (1)$$

where w_i is the growth of the nominal wage of labour of type i , w is the aggregate nominal wage growth, and $\frac{1}{\eta}$ is the inflation rate.⁵

The second reduced-form equation is derived by substituting labour demand (A3) and nominal aggregate profits into the individual budget constraint (A6). Since unions are assumed to take aggregate profits as given, this gives

$$c_i = (1 - \mu_i) (w_i - w) \quad (2)$$

where c_i is (the log of) real consumption. The central bank does not take aggregate profits as given when choosing monetary policy and faces the following reduced-form budget constraint

$$c_i = (1 - \mu_i) (w_i - w) - \frac{1}{\eta} \quad (3)$$

⁵By normalising the previous period nominal wage to unity, the current nominal wage can be expressed as

$$W_i = 1 + w_i$$

where w_i is the percent increase in the nominal wage of worker i . In the text, the following approximations are used: $\log(\frac{W_i}{W}) = w_i - w$ and $\log(\frac{P}{W}) = \frac{1}{\eta} - w$

Three equations parallel to (1)-(3) hold for the foreign country.

2.2 Central bank's preferences

In the regime of uncoordinated national monetary policies, the objective function of both the domestic and foreign central bank is designed so as to trade off the average utility of their respective population with the dislike of country-specific inflation

$$\begin{aligned} - &= \frac{1}{2} \int_0^1 U_j dj + \frac{\gamma}{2} \pi^2 \\ -^* &= \frac{1}{2} \int_0^1 U_j^* dj^* + \frac{\gamma}{2} \pi^{*2} \end{aligned} \quad (4)$$

where U is the utility function (A4). The parameter γ captures the weight of inflation relative to other policy targets and represents the central bank's degree of "conservativeness" (Rogoff [1985b]).

The common central bank also cares about the average utility of the agents in the monetary union while she dislikes average inflation

$$-^U = \frac{1}{2} \int_0^1 U_j dj + \frac{1}{2} \int_0^1 U_j^* dj^* + \frac{\gamma}{2} \pi^2 \quad (5)$$

where $\pi = (\pi + \pi^*)/2$. In specifying the central bank's preferences (4) and (5), we have assumed that monetary conservativeness does not vary, so as to focus on inflation targeting as the only difference across monetary policy regimes. While domestic and foreign central banks aim at controlling country-specific inflation, the unified central bank has an average inflation target.⁶ As will become apparent soon, this alters the central bank's incentive to inflate as well as nominal wage setting.

2.3 Unions' preferences

Each domestic and foreign union is interested in the average utility of its members

⁶ The central bank in a monetary union could also target union-wide inflation. However, this would not be consistent with the way inflation targeting is actually practiced. The ECB's inflation target, for example, is specified in terms of a harmonised consumption price index.

$$\begin{aligned} a_i &= n_i^{\frac{1}{1-\alpha}} \int_0^1 U_j dj \\ a_i^\alpha &= n_i^{\frac{\alpha}{1-\alpha}} \int_0^1 U_j^\alpha dj^\alpha \end{aligned} \quad (6)$$

It is worth stressing that we abstract from unions' inflation aversion, so as to focus on the monetary policy regime shift as the only incentive for wage restraint.⁷

3 Strategic monetary policy

This section describes the one-shot, two-stage game between national central banks and labour unions in a monetary union, U, and in a regime of uncoordinated monetary policies, N.

In the first stage, each national union sets the rate of growth of the nominal wage of its members in an uncoordinated way relative to both foreign and other national unions. After wages are set, the unified central bank picks the average inflation rate in the monetary union, while each national central bank chooses the country-specific inflation rate in the uncoordinated monetary policy regime. Finally, given real wages firms choose employment and produce the traded goods. The game is solved by backward induction.

3.1 The central bank's problem

In the regime of uncoordinated national monetary policies, the domestic central bank chooses the national inflation rate so as to maximize (4) subject to (1) and (3), which yields the reaction function

$$1 - \frac{1}{2} \cdot \frac{Z}{n_i} \ln \int_0^1 U_j dj - \frac{1}{4} = 0 \quad (7)$$

An equation similar to (7) describes the behaviour of the foreign central bank. The reaction functions of the domestic and foreign central banks are common

⁷The macroeconomic impact of a monetary union when labour unions are inflation averse is analysed, among others, by Cukierman and Lippi [2000], Grüner and Hefeker [1999] and Soskice and Iversen [1998].

knowledge for wage-setters, who can easily calculate the inflationary impact of an increase in their nominal wage growth

$$\begin{aligned}\frac{\partial \pi_j}{\partial w_j} &= \frac{1}{n[\cdot + \cdot]} \cdot s^{N-2} (0; 1) \\ \frac{\partial \pi_j^*}{\partial w_j^*} &= \frac{1}{n^*[\cdot + \cdot]} \cdot s^{*N-2} (0; 1)\end{aligned}\quad (8)$$

In the monetary union, the unified central bank chooses the average inflation rate so as to maximize the utility of all agents in the union (5) subject to (1) and (3) and their foreign analogues. The central bank's optimal strategy is

$$\sum_{i=1}^N \lambda_i \cdot \sum_{j=1}^N \ln \pi_j \cdot \lambda_j + \sum_{i=1}^N \lambda_i^* \cdot \sum_{j=1}^N \ln \pi_j^* \cdot \lambda_j^* = 0 \quad (9)$$

Building on (9), domestic and foreign unions calculate the union-wide inflationary impact of their wage claims

$$\begin{aligned}\frac{\partial \pi}{\partial w_j} &= \frac{1}{n[2\cdot + \cdot = 2]} \cdot s^U \\ \frac{\partial \pi}{\partial w_j^*} &= \frac{1}{n^*[2\cdot + \cdot = 2]} \cdot s^{*U}\end{aligned}\quad (10)$$

Comparing (8) and (10), it appears that the monetary policy regime shift has two opposing effects on the way domestic and foreign unions perceive the inflationary consequences of their wage claims.

On one hand, the establishment of a monetary union decreases the perceived inflationary impact of national wage hikes, as unions are smaller relative to the whole population in the monetary union (this is captured by the first addend in brackets). A one percent increase in domestic wages, in fact, has an impact on the domestic aggregate price level and hence on domestic inflation equal to 1/2 percent, while this halves to 1/4 percent when the average inflation rate in the monetary union is considered.

On the other hand, switching from uncoordinated monetary policies to a monetary union accrues the central bank's temptation to inflate (as captured by the second addend in brackets). Under uncoordinated monetary policies, in fact, national central banks are refrained from generating surprise inflation

due to the exchange rate costs that follow unilateral monetary expansions, while these costs obviously disappear in the monetary union. This in turn may increase the unions' inflation awareness, as unions perceive the response of the common central bank to an increase in nominal wages to be stronger than the one of national central banks.

As will become apparent later, a high inflation awareness on the part of unions favours wage moderation as it leads each union to internalise the reduction in the real wage of other unions that follows the increase in its own wage.⁸ Whether the switch to a monetary union may discipline wage setters then crucially depends on which one of the two opposing effects discussed above prevails. It can be easily shown that the perceived inflationary consequences of an increase in domestic wages are higher in a monetary union relative to a regime of uncoordinated national monetary policies provided the unified central bank is not too conservative. Using (8) and (10) it is immediate to obtain

$$s^U_i - s^N_i > 0 \quad \forall i = 1, 2. \quad (11)$$

3.2 The unions' problem

Under simultaneous bargaining, each national union sets the rate of growth of the nominal wage of its members so as to maximize (6) subject to (1), (2), the central bank's reaction function in the appropriate monetary policy regime, i.e. (7) or (9), and taking as given the nominal wages set by other unions at home and abroad. The optimal non-cooperative strategy of the domestic union i is

$$(1 - s^r_i - \eta^r) + \eta^r \ln \dot{w}_i = 0 \quad (12)$$

where η^r is the elasticity of labour demand to the nominal wage of union i in the monetary policy regime $r = U, N$

$$\begin{aligned} \eta^r_i &= \frac{d \ln \dot{w}_i}{d \ln w_i} = \mu \frac{d \ln \frac{w_i}{W}}{d \ln w_i} + \frac{d \ln \frac{W}{P}}{d \ln w_i} = \\ &= \mu \left(1 - \frac{1}{n} \right) + \frac{1}{n} s^r \end{aligned} \quad (13)$$

⁸ This is analogous to the "adverse competition" effect in Cukierman and Lippi [2000].

An analogous equation describes the behaviour of the foreign union i^* : A unitary increase in the nominal wage of union i has two contrasting effects on its members' utility. On one side, utility decreases since consumption reduces (this is captured by the term in brackets in (12)), while on the other side the increase in leisure raises utility.⁹ Each union's optimal nominal wage is then set so as to balance these costs and benefits.

It is apparent in (12) that a high inflation awareness on the part of unions, a high s , reduces the marginal utility of consumption while raising the marginal disutility of labour effort. As output is sub-optimally low due to monopolistic distortions, this will reduce unions' welfare and will thus discipline wage behaviour.

Drawing on the constant relation between increases in nominal and real relative wages, $dw_i = d \ln(W_i/P) = 1/(1 - s^r)$, we can cast the first order condition (12) in terms of the real effects of the union's nominal wage, obtaining

$$\ln \hat{w}_i = \frac{1}{\sigma} \left(\frac{\bar{A}}{1 - s^r} \right) \quad (14)$$

where $\sigma^r = 1/(1 - s^r)$ is the elasticity of the demand for labour of type i to the real relative wage in regime r .

Using (13) and (8) or (10) when appropriate, the elasticity of labour demand to the real wage in the two monetary regimes can be easily expressed in terms of the model's parameters

$$\begin{aligned} \sigma^N &= \frac{(\sigma + \sigma^*)}{(n_i - 1)\sigma + n^*} (\mu_i - 1)(n_i - 1) + 1 \\ \sigma^U &= \frac{(4\sigma + \sigma^*)}{(n_i - 1)2\sigma + n^*} (\mu_i - 1)(n_i - 1) + 1 \end{aligned} \quad (15)$$

4 Inflation under alternative monetary regimes

Under uncoordinated national monetary policies, the Home and Foreign inflation rates can be obtained by combining the respective unions' equilibrium strategies (12) in a symmetric equilibrium, ($\hat{w}_i = \hat{w}$), with the central bank's reaction function (7), which yields the area-wide average inflation rate

⁹The overall effect of the increase in the nominal wage of union i on consumption is negative, since the effect of the increase in the real wage ($1/(1 - s)$) is smaller than the reduction in labor demand (σ).

$$\pi^N = \frac{1}{2} \frac{\tilde{A}}{\gamma^N} + \frac{1}{\gamma^{BN}} \quad (16)$$

For the well-known reason discussed in Kydland and Prescott [1977] and Barro and Gordon [1983], equilibrium inflation is sub-optimally positive. Other than on central bank's inflation aversion, \tilde{A} , the economy's inflationary bias depends on labour market features as synthesised in the elasticities γ^N and γ^{BN} . Using (15) it is easy to verify that equilibrium inflation is higher the less substitutable the different types of labour and the more decentralised the wage bargaining structure.¹⁰

A similar procedure that combines (12) and (9) yields the equilibrium inflation rate in the monetary union

$$\pi^U = \frac{2}{3} \frac{\tilde{A}}{\gamma^U} + \frac{1}{\gamma^{BU}} \quad (17)$$

Comparing the area-wide inflation rates in the two monetary regimes, (16) and (17), it appears that in the absence of strategic effects - i.e., when $\gamma^U = \gamma^N$ and $\gamma^{BU} = \gamma^{BN}$ - inflation under uncoordinated national monetary policies is unambiguously lower than the one in a monetary union. The reason is the stronger incentive for the common central bank to resort to surprise inflation relative to national central banks (Rogoff [1985]).¹¹ This matches with the empirical regularity documented by Romer [1993] showing that more open economies have a better inflationary performance in a broad cross-section of countries.¹²

When wage setters are large, however, the move to a monetary union also affects wage behaviour and hence inflation in a direction that is not clear a priori. As already discussed, the establishment of a monetary union may

¹⁰This accords with the analysis in Cubitt [1992] and Calmfors and Dri¢l [1988]:

¹¹In our setup, the common central bank has an incentive to inflate four time higher than the one of national central banks. This depends on two factors that are at work also in a more general framework, namely the economy's degree of openness and the type of inflation targeting. In our specification, trade openness is 1/2 under uncoordinated national monetary policies, while the monetary union is a closed economy. This accounts for the common central bank having twice an incentive to inflate relative to national central banks. By the same token, average versus country-specific inflation targeting amounts to a double temptation to inflate in our setting.

¹²See also Lane [1997] and Campillo and Miron [1997], among others. Cavallari [2001] investigates the link between inflation and openness when wage setters are large.

favour wage restraint, provided the unified central bank is not too conservative. This in turn will reduce the economy's inflationary bias for a given level of employment, by increasing the elasticities of labour demand in (17) relative to the ones in (16).

4.1 International wage coordination

In our setup, wage discipline under a monetary union, when it occurs, is not able to compensate for the increase in the union-wide inflationary bias due to central bank's behaviour. This leads one to question under what circumstances would such a wage restraint effect be strong enough to reduce inflation. An obvious candidate is the case of international wage coordination, where wage discipline is at its best. As recently stressed in the literature on nominal wage bargaining, the switch to a monetary union is likely to alter the structure of wage setting across the member countries, although opinions diverge as to the directions of this change.¹³

As an example of international wage coordination, consider a supra-national union that sets domestic and foreign nominal wages so as to maximise the average utility of the population in the monetary union, which for simplicity is assumed to consist of two perfectly symmetric regions

$$a = \int_0^1 U_j dj \quad (18)$$

under (1), (2) and the unified central bank's reaction function (9). This yields the optimal strategy

$$\ln \hat{w}_i = \frac{1}{\beta} \left(\tilde{A} - \frac{1}{\beta} \right) \quad (19)$$

where

$$\beta^W = 1 + \frac{(\mu_i - 1)}{s^W} \quad (20)$$

and the superscript W stands for wage centralisation. The supra-national union uses (9) so as to compute the perceived inflationary impact of an

¹³Calmfors [2000] argues in favour of less centralisation in wage setting as a result of monetary unification, while Holden [1999] stresses the higher gains to wage centralisation in a monetary union.

increase in domestic and foreign wages,¹⁴

$$s^W = \frac{2}{[2 + \sqrt{2}]} \quad (21)$$

Following the same steps as before, we can easily derive equilibrium inflation under international wage coordination

$$\pi^W = \frac{4}{\sqrt{2} + 2} \quad (22)$$

Comparing (16) and (22), it is easy to verify that, differently from national wage bargaining, inflation in the monetary union may fall short of the one under uncoordinated national monetary policies when wage setting is internationally centralised. We can further show that this holds true provided the central bank is not too conservative. Using (8) and (15) as well as (21) and (20) in, respectively, (16) and (22), we obtain

$$\pi^N - \pi^W = \frac{1}{\sqrt{2} + 2} [a + b\sqrt{2} + c] \geq 0 \quad (23)$$

where $a = (\mu + 1) = 2$, $b = \frac{1}{\sqrt{2} + 2} [6 + (\mu + 1)(8n + 10)]$, $c = 8 \cdot 2 (\mu + 1)(n + 1)$ and $\sqrt{2}$ is the positive root of the equation in (23).

For an intuitive account of this result, consider that under wage centralisation the switch to a monetary union always disciplines wage behaviour, as the supra-national union internalises the higher incentive to accommodate wage inflation of the common central bank relative to national central banks. The overall effect of the monetary policy regime shift on inflation then depends on whether wage restraint is strong enough so as to compensate for the higher central bank's temptation to inflate. A less inflation averse central bank, by increasing the inflation awareness of the supra-national union while not affecting the central bank's incentive to inflate across monetary regimes, may induce a less aggressive wage behaviour and hence lower inflation in the monetary union.

¹⁴ As countries are symmetric, foreign and domestic wages are equal.

5 Conclusions

Building on a micro-founded model of a two-region world economy, this paper has analysed the behaviour of large wage-setters when switching from a regime of uncoordinated national monetary policies to a monetary union.

Provided the unified central bank is not too conservative, we have shown that the switch from uncoordinated monetary policies to a monetary union may favour wage restraint. We have also shown that wage discipline may reduce equilibrium inflation in a monetary union relative to the one under uncoordinated national monetary policies if wage setting is centralised across the members of the monetary union.

6 Appendix

Home production function is

$$Y = \int_0^1 \left(\frac{w_i}{W} \right)^{\frac{\mu-1}{\mu}} di^{\frac{\mu}{\mu-1}} \quad (A1)$$

where Y represents output of the domestic good and $\mu > 1$ captures the degree of substitutability among different labour types.

Let W_i represent the Home nominal wage of worker i . Then, W , the price index for labour inputs, is defined as the minimal nominal cost of producing a unit of output

$$W = \int_0^1 W_i^{1-\mu} di^{\frac{1}{1-\mu}} \quad (A2)$$

Cost minimization implies firms' demand for labour of type i is

$$n_i = \frac{\mu W_i}{W} \left(\frac{Y}{W} \right)^{\frac{1}{\mu}} \quad (A3)$$

Agents' utility is given by

$$U_j = \ln C_j - \frac{1}{2} (\ln \hat{c}_j)^2 \quad (A4)$$

where the real consumption index C aggregates consumption of the domestic good C_H and consumption of the foreign good C_F

$$C = C_H^{\frac{1}{2}} C_F^{\frac{1}{2}} \quad (A5)$$

In this setup, economic size, as measured by the weight of Home goods in world consumption, coincides with population size.

While markets are complete domestically (everyone owns an equal share of all domestic firms), there is no international equity trade. As will become apparent later, this assumption is benign. Given the Cobb-Douglas preferences over domestic and foreign goods (A5) and the separability of individuals' utility functions, in fact, international equity trade would not affect equilibrium outcomes.

The budget constraint of the representative agent is

$$P C_j = W_j + D_j \quad (A6)$$

where D_j are nominal aggregate profits.

Home's and Foreign's current account, which are obtained by aggregating (A6) in the interval $(0; \frac{1}{2}]$ and $[\frac{1}{2}; 1)$ respectively, are balanced when consumption is equalized across countries

$$C = C^* = \bar{C} \quad (A7)$$

Then, aggregate demand for both the Home and the Foreign good is a linear function of world consumption, \bar{C}

$$\begin{aligned} C_H &= \frac{\mu_P}{P_H} \bar{C} \\ C_F &= \frac{\mu_P}{P_F} \bar{C} \end{aligned} \quad (A8)$$

where P_H is the nominal price of the domestic good, P_F is the domestic-currency price of the foreign good after normalising the nominal exchange rate to one and P is the nominal price index defined as

$$P = P_H^{\frac{1}{2}} P_F^{\frac{1}{2}} \quad (A9)$$

It is easy to verify that profit-maximizing firms will set the nominal price for the good they produce equal to the aggregate nominal wage

$$\begin{aligned} P_H &= W \\ P_F &= W^* \end{aligned} \quad (A10)$$

A parallel representation exists for the Foreign economy.

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