The Case For Temporary Inflation in the Eurozone*

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Abstract

Since the onset of the great recession in peripheral Europe, nominal hourly wages have not fallen from the high levels they had reached during the boom years in spite of widespread increases in unemployment. This observation evokes a well-known narrative in which nominal downward wage rigidity is at the center of the current unemployment problem. We embed downward nominal wage rigidity into a small open economy with tradable and nontradable goods and a fixed exchange-rate regime. In this model, negative external shocks cause involuntary unemployment. We analyze a number of national and supranational policy options for alleviating the unemployment problem caused by the combination of downward nominal wage rigidity and a fixed exchange-rate regime. We argue that, in spite of the existence of a battery of domestic policies that could be effective in solving the unemployment problem, it is unlikely that a solution will come from within national borders. This leaves supranational monetary stimulus as the most compelling avenue out of the crisis. Our model predicts that full employment in peripheral Europe could be restored by raising the Euro-area annual rate of inflation to about 4 percent for the next five years.

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1 Introduction

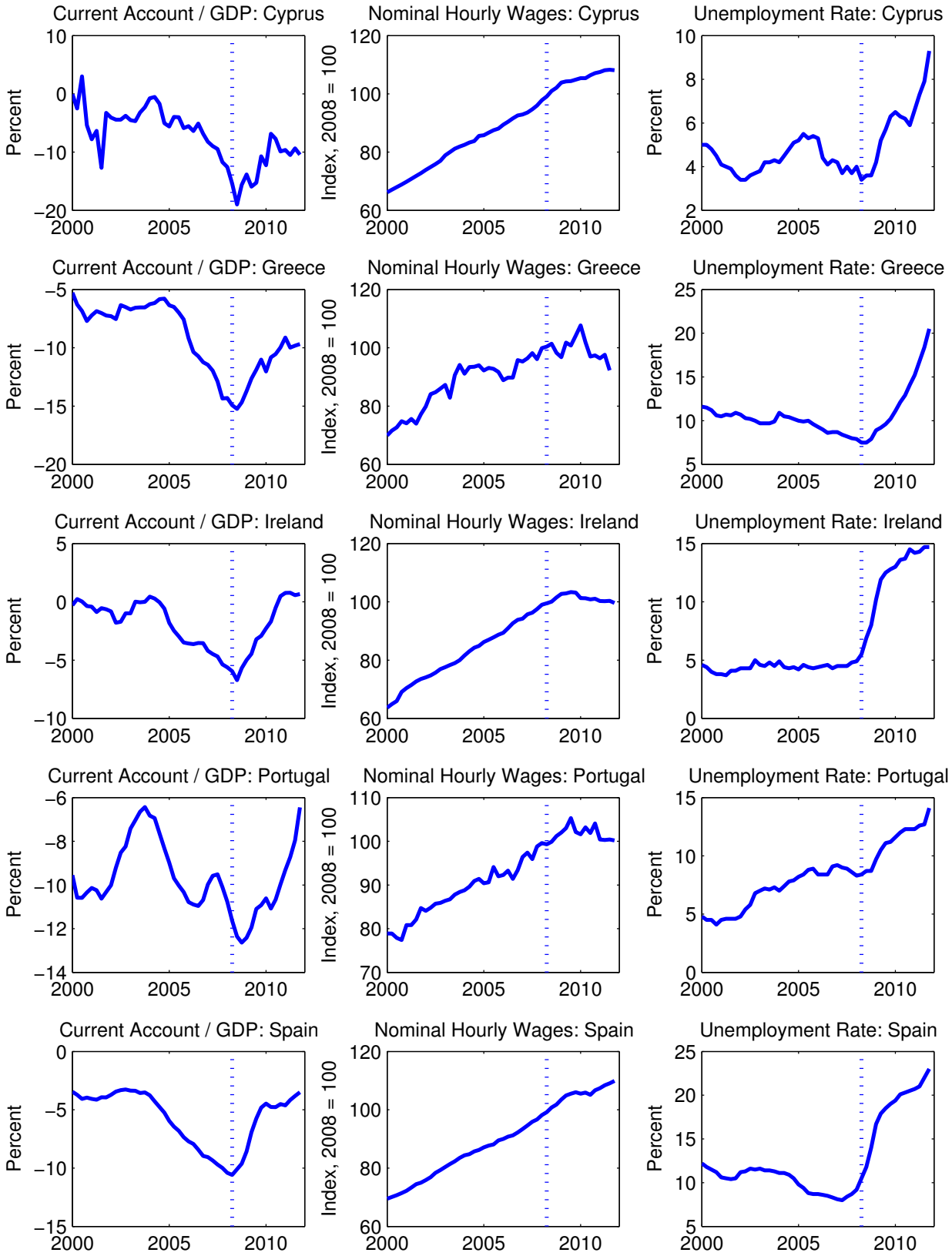
Since 2008 the periphery of Europe has been suffering an economic contraction of a magnitude, which, in several countries, is comparable to the U.S. Great Depression. During the early 2000s, the periphery of Europe enjoyed rapid growth in domestic absorption, wages, and employment. Much of this bonanza was fueled by large international capital inflows. Figure 1 displays the current account, nominal hourly wages, and the rate of unemployment in five peripheral eurozone countries between 2000 and 2011. In all five countries, current accounts sharply deteriorated between 2000 and 2008. During this period, some countries increased their external debt position by more than 50 percent of GDP. This large amount of external borrowing financed a boom in domestic absorption and was accompanied by increases in nominal wages of about 50 percent.

With the arrival of the international financial crisis of 2008, external credit to peripheral Europe suddenly dried up, causing a sharp contraction in aggregate absorption. Notably, nominal hourly wages, shown in the second column of figure 1, far from falling, remained largely unchanged from the high levels they had reached during the boom years. The combination of a weak aggregate demand and high labor costs was associated with widespread unemployment (shown in the third column of figure 1).

The observed failure of nominal wages to adjust downward after 2008 despite sizable increases in unemployment motivates a model in which the combination of downward nominal wage rigidity and a fixed exchange rate lie at the heart of the current unemployment crisis in the Euro area. The narrative underlying the model we adopt is well known and goes back at least to Keynes (1925) and Friedman (1953). Our specification is one of a small open economy with tradable and and nontradable goods, downward nominal wage rigidity, and a fixed nominal exchange rate.

Our model predicts that the current crisis is likely to be a protracted one unless sizable policy intervention is to occur. In reality, however, the affected countries find themselves with limited room for national monetary and fiscal policy action. For instance, according to

Figure 1: Boom-Bust Cycle, Downward Wage Rigidity and Unemployment in the Eurozone



Source: Eurostat.

our model, devaluations of domestic currencies would foster employment by reducing firms' real labor costs. However, for reasons that go beyond economic considerations, breaking away from the monetary union is, thus far, off the table. Similarly, our model predicts that expansionary fiscal policies, such as labor or sales subsidies, could be effective in remedying the distortions in the labor market. However, expansionary fiscal policy is discouraged by international institutions, which make fiscal austerity a precondition for financial assistance.

It follows that putting the periphery of Europe back on the path to recovery might be at least in part in the hands of supranational European institutions. The fact that the eurozone is a monetary but not a fiscal union rules out Europe-wide fiscal policy interventions. In this article, we provide theoretical arguments suggesting that a natural and practical remedy to the current situation is monetary in nature. Specifically, our model suggests that raising the Euro area overall price level would go a long way toward restoring full employment in the periphery of Europe.

Quantitatively, our theoretical framework predicts that the required monetary stimulus entails a sizable departure from the inflation policy that the ECB has been conducting since the outbreak of the crisis. The model predicts that the desired monetary policy intervention should deflate the real value of wages back to their pre-boom levels. Our model predicts that this policy could be implemented by raising the Euro-area annual rate of inflation to about 4 percent for the next five years.

The model does not predict, however, that inflation should be higher in the long run. In fact, the model prescribes that loose monetary policy should cease as soon as employment returns to normal levels. As such, the model is not inconsistent with the long-run inflation target of the European Central Bank of slightly below two percent per annum. This prediction of our model differs from related work suggesting that current inflation targets in developed countries are too low and should be raised to better deal with crises (Summers, 1991; Blanchard et al., 2010).

2 The Model

We consider a small open economy with a tradable and a nontradable sector, downward nominal wage rigidity, and a fixed exchange rate. The presentation of the model is mostly graphical. For a more formal derivation see Schmitt-Grohé and Uribe (2012).

The central friction in the present model is downward rigidity in nominal wages. Specifically, we impose that $W_t \geq \gamma W_{t-1}$, where W_t denotes the nominal wage rate and γ is a positive parameter governing the degree of downward nominal wage rigidity. The higher is γ, the more stringent is wage rigidity. Schmitt-Grohé and Uribe (2012) provide empirical evidence suggesting that for a number of emerging countries, including those in the periphery of Europe, γ is close to unity. Figure 1 also suggests that γ is close to unity. Specifically, it shows that since the onset of the great recession in 2008:Q2, even though unemployment rose sharply in the periphery of Europe, nominal wages in Cyprus, Ireland, Portugal, and Spain actually rose, implying a value of γ greater than one. In Greece, nominal wages fell by 3 percent between 2008:Q2 and 2011:Q3, suggesting a quarterly value of γ of 0.998. For this reason, for the remainder of this article we will assume that γ equals one and that the lower bound on nominal wages takes the form

$$W_t \geq W_{t-1}. \tag{1}$$

2.1 The Supply of Nontradables

Nontraded goods are produced with labor, denoted h_t, by means of an increasing and concave production technology $F(h_t)$. Let P_t^N denote the nominal price of nontraded goods. Firms are assumed to be price takers in product and factor markets, i.e., they take P_t^N and W_t as given. Profits are given by $P_t^N F(h_t) - W_t h_t$. Profit maximization requires equating the value of the marginal product of labor to marginal cost, or $P_t^N F'(h_t) = W_t$. Let P_t^M denote the nominal price of imported consumption goods. We assume that the law of one price holds

for traded goods. This means that the domestic price of imported consumption goods must satisfy $P_t^M = P_t^{*M} E_t$, where P_t^{*M} denotes the foreign-currency price of imported consumption goods and E_t denotes the nominal exchange rate defined as the domestic-currency price of one unit of foreign currency. Throughout our analysis, we will assume that the exchange rate is credibly and permanently fixed at $\bar{E}$, that is,

$$E_t = \bar{E},$$

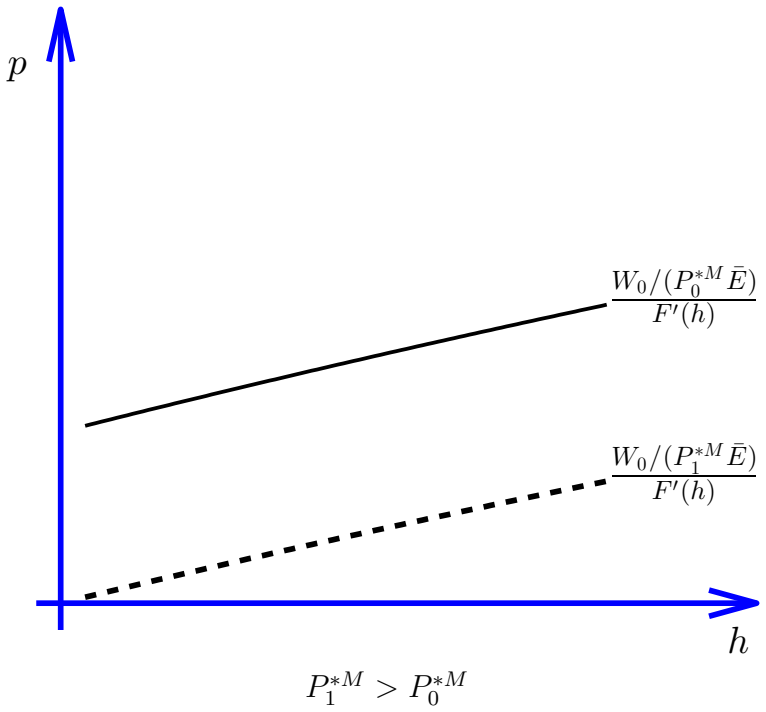
for all periods $t \geq 0$. This assumption captures the situation of a country in the periphery of the eurozone for whom breaking away from the Euro is not an option. Let $p_t \equiv P_t^N / P_t^M$ denote the relative price of nontradables in terms of traded consumption goods. Then, the profit maximizing condition of the firm in the nontraded sector can be written as

$$p_t = \frac{W_t / (P_t^{*M} \bar{E})}{F'(h_t)}. \tag{2}$$

This expression can be interpreted as a supply schedule of nontraded goods and is shown graphically with a solid upward-sloping line in figure 2. An increase in the relative price of nontradables, p_t, induces firms to supply more nontraded goods, all other things equal.

Holding constant the nominal wage, W_t, and the nominal exchange rate, $\bar{E}$, an increase in the international price of tradable consumption goods, P_t^{*M}, shifts the supply schedule down and to the right. This shift is shown with a broken line in figure 2. The reason is that an increase in the foreign price level lowers the labor cost faced by firms, which incentivates production. This is the key mechanism through which foreign inflation can have an expansionary effect in economies with downwardly rigid nominal wages and a fixed exchange rate.

Figure 2: The Supply Schedule

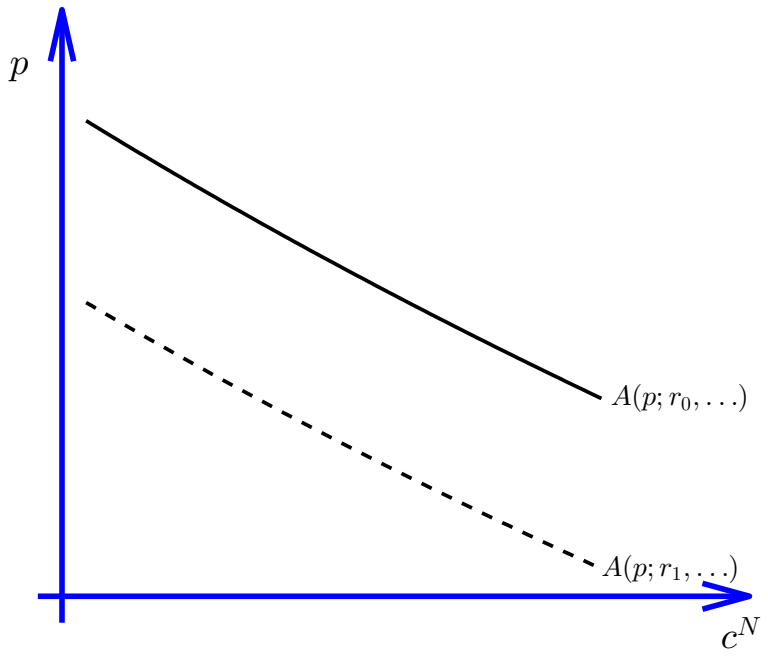


2.2 The Demand for Nontradables

We denote the aggregate demand function for nontradables by $c_t^N = A(p_t; r_t, tot_t, \dots)$, where c_t^N denotes consumption of nontradables. The demand function is decreasing in the relative price of nontradables, p_t, because, all other things equal, as nontradables become relatively more expensive, households substitute tradables for nontradables in their consumption basket. Figure 3 displays the demand function with a solid line.

The shifters of the demand schedule are variables that affect either the intertemporal price of consumption, or households' wealth, or both. Among the variables that affect both the intertemporal price of consumption and wealth is the country real interest rate, denoted r_t. This is the real interest rate that the rest of the world charges the country for borrowing in international bond markets. Country interest-rate shocks have been shown to be an important driver of business cycles in emerging economies (see Neumeyer and Perri, 2005; and Uribe and Yue, 2006). Assuming that the country is a net debtor to the rest of the

Figure 3: The Demand Schedule



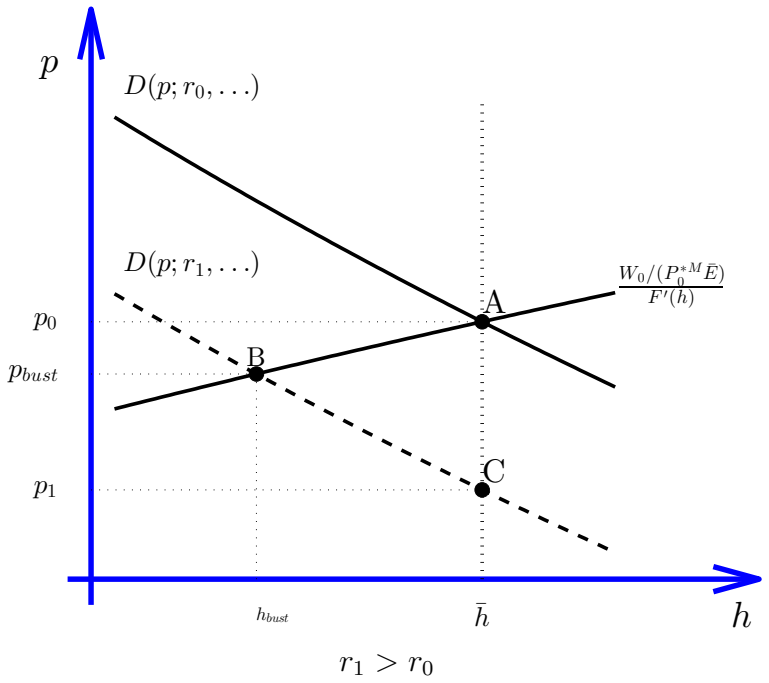
$r_1 > r_0$

world, which is the case of greatest empirical interest in the application considered here, an increase in r_t causes a negative wealth effect and a negative intertemporal substitution effect. Both of these effects tend to depress the demand for nontraded goods. Figure 3 shows with a broken line the shift in the demand schedule when the country interest rate increases from r_0 to r_1.

Another shifter of the demand schedule is the terms of trade, denoted tot_t, and defined as the relative price of exportable goods, P_t^{*X}, in terms of importable goods, $tot_t \equiv P_t^{*X}/P_t^{*M}$. An improvement in the terms of trade (i.e., an increase in tot_t) has a positive wealth effect that pushes the demand schedule up and to the right (not shown in figure 3).

In equilibrium, the market for nontraded goods clears. This means that production and consumption of nontradables must be equal to each other, or, formally, $F(h_t) = A(p_t; r_t, tot_t, \dots)$. Solving this expression for h_t, we can write $h_t = D(p_t; r_t, tot_t, \dots)$. Because F is a strictly increasing function, we have that, like A, the function D is decreasing in p_t and r_t and increasing in tot_t. We will refer to the function D, somewhat improperly, as the demand

Figure 4: External Crisis And Unemployment



schedule.

Finally, we close the model by assuming that workers supply inelastically $\bar{h}$ hours of work to the market each period. However, in some periods, workers are unable to sell all $\bar{h}$ hours at the going wage rate. In such periods, actual employment is $h_t < \bar{h}$ and the economy suffers from involuntary unemployment. Next, we analyze how involuntary unemployment can arise in equilibrium.

3 External Crisis

Having introduced the key elements of our theoretical framework, we can now interpret through the lens of our model the crisis that has been afflicting the periphery of Europe since 2008. Figure 4 provides a graphical representation. The economy starts at point A, where the labor market is operating at full employment, $h_0 = \bar{h}$. Suddenly, the country experiences a deterioration of external borrowing conditions which manifests itself in an

increase in the country interest rate from r_0 to $r_1 > r_0$. As a consequence, the demand schedule shifts down and to the left. In the absence of any policy intervention, the supply schedule remains unchanged. To see this, note that if the country chooses to keep the exchange rate pegged and if the central bank of the monetary union chooses not to change the rate of inflation in response to the country's crisis, then both E_t and P_t^{*M} are unchanged at $\bar{E}$ and P_0^{*M}, respectively. Also, because nominal wages are downwardly rigid (equation (1)), the contraction in aggregate demand does not lead to a decline in W_t, which remains at its original level W_0. Therefore, the economy is stuck at point B. At that point, the labor market displays involuntary unemployment in the magnitude $\bar{h} - h_{bust}$.

If nominal wages were downwardly flexible, full employment would be restored by a decline in wages that shifts the supply schedule down and to the left. The resulting equilibrium would be at point C, where $h_t = \bar{h}$. This outcome, however, is unrealistic in light of the evidence presented in figure 1, which shows that in peripheral countries of the eurozone nominal wages did not fall significantly since the onset of the great recession in spite of widespread unemployment.

4 Domestic Policy Options

The adjustment friction created by downward nominal wage rigidity can be overcome by a number of domestic policy interventions. One such domestic policy is to devalue the currency, i.e., to increase E_t. By deflating the real labor cost faced by firms, a devaluation causes a shift in the supply schedule down and to the right. A sufficiently large devaluation would result in an equilibrium with full employment, indicated by point C in figure 4. At the time of the writing of this article, no country in the periphery of the eurozone has chosen to abandon the Euro.

There exist, however, domestic fiscal policies that can mimic the effect of a devaluation. These policies can, for instance, take the form of a wage subsidy or a sales subsidies in the

nontraded sector. The key characteristic of such policies is that they lower the effective cost of production of firms operating in the nontraded sector. Like in the case of devaluations, countries in the periphery of the eurozone have not adopted such expansionary fiscal policies. On the contrary, the observed changes in the fiscal policy stance over the past four years have been toward fiscal austerity.

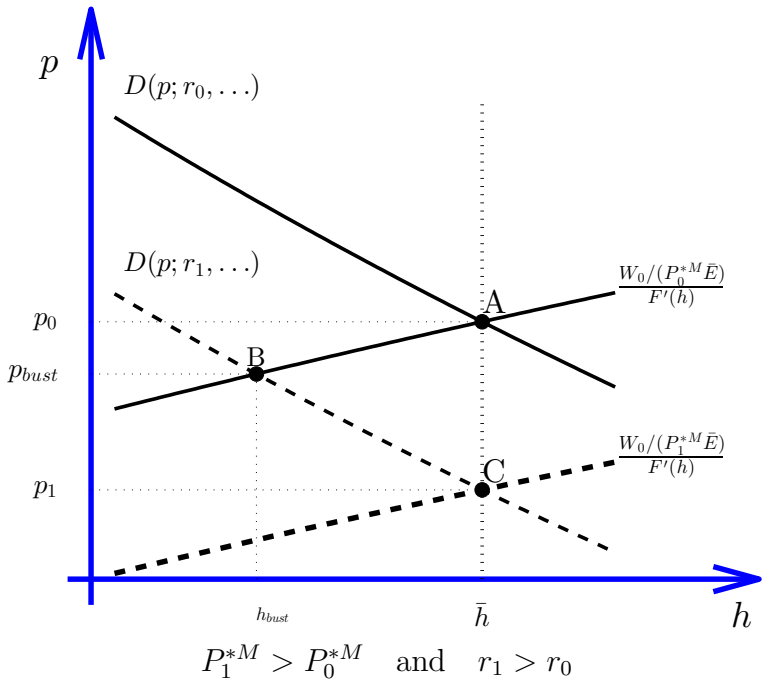
In the absence of domestic policy intervention of the type described here, our model predicts that the current situation in the euroarea is described by point B, where unemployment is high and persistent.

5 Eurozone-Wide Policy Options

In light of the difficulties that policymakers in the periphery of the eurozone face in adopting policies that stimulate employment, a natural question is whether the required stimulus could originate from supranational European policy institutions. On the fiscal side, the fact that the eurozone is not a fiscal union (i.e., there is no supranational tax or transfer system), all but eliminates eurozone-wide fiscal policy alternatives. At the same time there exists a well defined institutional framework, embodied in the European Central Bank, to implement eurozone-wide monetary policy.

The present model suggests that the central bank of the monetary union could ameliorate the unemployment problem created by the combination of downward nominal wage rigidity and a fixed exchange rate. The required policy takes the form of a temporarily higher rate of union-wide inflation. In terms of the notation used here, the central bank of the monetary union should induce a temporary increase in the general price level, P_t^{*M} and P_t^{*X}. Figure 5 shows how this policy would affect employment in the peripheral countries. The economy starts at point B in which the labor market suffers involuntary unemployment. The increase in the nominal price of imported consumption goods from P_0^{*M} to P_1^{*M} lowers the real cost of labor in terms of importables and stimulates production of nontradables. Graphically, the

Figure 5: Optimal Union-Wide Monetary Policy During Crises



increase in P_t^{*M} shifts the supply schedule down and to the right as shown with an upward sloping broken line in figure 5.[1] If the increase in P_t^{*M} is sufficiently large, the equilibrium will be at point C, where the economy displays full employment.

The present analysis suggests that emerging countries of the eurozone could benefit significantly from a temporary increase in union-wide inflation. But what about countries in which the lower bound on nominal wages was not binding during the crisis (arguably Germany and the Benelux countries)? The model predicts that in these countries the increase in P_t^{*M} would result in an increase in nominal wages without affecting employment or production. Graphically, starting from point A in figure 5 and assuming that for these countries $r_t = r_0$ for all t, the increase in P_t^{*M} shifts the supply schedule down and to the right and the increase in W_t shifts it back to its original position, so the economy never leaves point A. The increase in wages occurs automatically because at the original wage level, W_0, the increase in P^{*M} causes an excess demand for labor. Because wages are assumed to be fully

[1]The demand schedule is unaffected by the increase in foreign prices. In particular, because both P_t^{*M} and P_t^{*X} are assumed to increase in the same proportion, the terms of trade, tot_t, are unchanged.

flexible upwardly, the excess demand in the labor market is eliminated spontaneously by an increase in nominal wages.

An implication of the model is that the required level of price increases in the monetary union as a whole is larger than the one that will take place in the peripheral countries in which the lower bound on wages is binding. The reason is that adjustment in the latter countries requires a real depreciation, that is, a fall in the relative price of nontradables, p_t. To see this, refer to figure 5. In the crisis equilibrium, point B, p_t equals p_{bust}, which is higher than the full-employment equilibrium relative price p_1 associated with point C. Since $p_t = P_t^N/(P_t^{*M}\bar{E})$, in order for p_t to fall, the nominal price of nontradables, P_t^N must increase proportionally less than P_t^{*M}. The situation is different for the members of the monetary union in which the lower bound on wages is not binding. There, the real exchange rate is at its full-employment level and therefore does not need to change. Consequently, the increase in P_t^{*M} should be met with an increase in the nominal price of nontradables of the same proportion. It follows that the increases in the overall price level is proportionally larger in countries in which the nominal wage rigidity is not binding.

6 How Much Union-Wide Inflation Is Needed?

The present model can be used to gauge the price increase in the eurozone necessary to eliminate the unemployment problem in its periphery. We present two alternative ways of calculating the size of the required inflationary stimulus. One uses wage data and the other employment data.

6.1 A Wage-Based Calculation

We will assume that the real wages observed in the periphery of Europe in 2000:Q1 were at trend values. The average cumulative increase in nominal hourly wages observed in the five peripheral countries listed in figure 1 over the period 2000:Q1 to 2011:Q2 was 48.7 per-

cent. We proxy foreign inflation by the CPI inflation rate in Germany. Over the period 2000:Q1-2011:Q2 the German CPI index rouse by 20.6 percent. We will assume that total factor productivity remained constant between 2000:Q1 and 2011:Q2. It then follows that in 2011:Q2 real wages in the five peripheral European countries were on average 23.3 percent above their full-employment levels. This figure results from dividing 1.486 by 1.206. Therefore, the implied increase in the eurozone price level necessary to restore full employment is 23.3 percent.[2]

If the required price increase were to be implemented in a period of five years, the annual rate of inflation in the eurozone would have to be raised to 4.3 percent. This figure is more than twice as large as the current area-wide inflation target of 2 percent.

6.2 An Employment-Based Calculation

An alternative way to determine how much Euro-area-wide inflation is needed to restore full employment in the periphery of the eurozone is to use data on employment. This methodology does not make use of data on wages or foreign inflation.

Suppose that current employment in the nontraded sector is 10 percent below full employment. This figure is in line with the unemployment increases observed in Greece, Ireland, and Spain since 2008, but higher than those seen in Portugal and Cyprus. Assume also that the production technology in the nontraded sector is of the form $F(h) = h^{\alpha}$. Assume further that the technology for aggregating tradable and nontradable consumption goods (denoted c^T and c^N, respectively) into a composite consumption good (denoted c) is of the CES form $c = [a(c^T)^{1-1/\xi} + (1-a)(c^N)^{1-1/\xi}]^{1/(1-1/\xi)}$. Then, the model implies that $p = \frac{1-a}{a}\left(\frac{c^T}{c^N}\right)^{1/\xi}$. The right-hand-side of this expression is the marginal rate of substitution between traded and nontraded goods. The model further implies that the real wage in terms of tradable consumption goods, denoted $w \equiv W/(P^{*M}\bar{E})$, equals the value of the marginal product of

[2] A further assumption implicit in this calculation is that the full-employment real exchange rate (i.e., the full employment value of p_t), is the same in 2011:Q2 as it was in 2000:Q1. This assumption is conservative. For it is reasonable to assume that in order to service the increases in external debt observed between 2000 and 2011, the full-employment real exchange rate would have to depreciate relative to its 2000 level.

labor in the nontraded sector, that is, $w = pF'(h)$, or $w = \frac{1-a}{a}\left(\frac{c^T}{h^\alpha}\right)^{1/\xi}\alpha h^{\alpha-1}$, where we are using the market clearing condition $c^N = F(h)$. Following Schmitt-Grohé and Uribe (2012), set $\alpha = 0.75$ and $\xi = 0.44$. Finally, assume that c^T is unaffected by monetary policy.[3] Then, according to the formula just derived, eliminating 10 percentage points of unemployment necessitates a decrease in the real wage (w) of 22.9 percent. Because the lower bound on nominal wages is binding and the exchange rate is fixed, all of the decrease in the real wage must come from an increase in P_t^{*M}. That is, the monetary authority of the Euro area must engineer an increase in the overall price level of 22.9 percent, or 4.2 percent per annum for five years. This level of inflation is essentially the same as the one obtained in the previous subsection using a methodology that relies on observations of wages and foreign inflation.

[3]One can show that this is the case when the intertemporal elasticity of substitution in consumption equals the intratemporal elasticity of substitution between tradables and nontradables in consumption. See Schmitt-Grohé and Uribe (2012), proposition 2.

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