Monetary Policy and the Political Support for a Labor Market Reform

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Abstract

Lagged benefits relative to costs can politically block an efficiency-enhancing labor market reform, lending support to the "two-handed approach". An accommodating monetary policy, conducted alongside the reform, could help bringing the positive effects of the reform to the fore.

In order to identify the mechanisms through which monetary policy may affect the political sustainability of a reform, we add stylized features of the labor market to a standard New-Keynesian model for monetary policy analysis. A labor market reform is modeled as a structural change inducing a permanent shift in the flexible-price unemployment and output levels. In addition to the permanent gains, the impact of the timing and magnitude of the reform-induced adjustments on the welfare of workers - employed and unemployed - is crucial to the political feasibility of the reform. Since the adjustments depend, on one hand, on the macroeconomic structure and, on the other hand, can be influenced by monetary policy, we simulate various degrees of output persistence across different policy rules.

We find that, if inertia is present, monetary policy affects the political support for the reform. Choosing a particular policy rule, as well as the business cycle timing of the reform, are means to enhance political sustainability.

Keywords: Monetary policy rules; Labor market reforms; Unemployment benefit; Political economy; New Keynesian models.

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1 Introduction: the Issue of Political Support for Labor Market Reforms

It is usually stated that labor market reforms, as other structural reforms, bring about short-run transition costs while longer-run permanent effects are expected to be positive, namely, permanent improvements in the short-run inflation - unemployment trade-off and in potential output. Despite these expected gains, the lack of political support is often blamed for the failure to reform labor markets.

Opposition to reform is usually related either with redistribution of losses and gains across different political lobbying groups, or with the time-lag involved before lagged net benefits appear. Typically, reforms try to improve wage flexibility through increasing competitiveness of the unemployed relative to the employed; this often involves immediate losses in real wages, which are quickly perceived by the employed. Saint-Paul (1999, 2002), strongly influenced by the seminal arguments of Fernandez and Rodrick (1991), refers that a *status quo* bias, blocking reform implementation, is likely to arise and depends on (i) the effects that increased competition in the labor market has on the wage rents of the employed over the unemployed's; (ii) the political weight of the unemployed; and (iii) the intensity of job creation. Eventually, the reform ends up improving the profitability of firms, allowing for a gradual recovery with higher real wages and lower unemployment levels which, in turn, induce a lower tax burden (for unemployment benefits) on firms and workers. However these benefits often arise with a long delay relative to costs, which can indeed make a reform politically difficult to sustain (Bean, 1998 and Elmeskov, 2000).

In the beginning of the 1990s, in the sequence of steady increases in the European unemployment rates, the need for labor market reforms became an important issue in the economic policy agenda (*e.g.*, OECD, 1999 and 2000, and Poeck and Borghijs, 2001). The issue of political support for reforms has led to the development (firstly by Blanchard *et al*, 1986) of the "two-handed approach", according to which expansionary demand-side policies, conducted alongside reform, could help in bringing its positive effects to the fore. Demand-side policies can speed up the adjustment process towards the new long-run equilibrium making the benefits of the reform more visible in the short run. The more sluggishly the economy adjusts, the larger is the scope for the "helping hand" of demand-side policies (Lindbeck and Snower, 1990, Bean, 1998, and Saint-Paul, 2002). A related argument is that macroeconomic outcomes, in the sequence of shocks hitting the economy, are significantly affected by the interplay of policy responses and labor market institutions (LMI). In general, more flexible LMI imply lower employment adjustment costs (*e.g.*, Gordon, 1996, Blanchard, 2000 and Chen *et al*, 2003).

The "two-handed approach" is also endorsed at the institutional level: demand-side policies are explicitly included as policy recommendations in the OECD Jobs Strategy in 1994; and data on the evaluation of the Jobs Strategy show that countries that shifted towards stabilization-oriented macroeconomic policies exhibited the highest follow-through rates in implementing labor market reforms and scored significant improvements in labor market indicators (OECD, 1999).

In this work we intend to assess, through model simulations, the arguments in the

literature concerning the economic determinants of political support for a reform, and to inquire how demand-side policies – in particular, monetary policy – can affect it. This requires, thus, the choice of a suitable macroeconomic model as well as the definition of criteria for the measurement of political sustainability.

As for the macro model, we propose a New-Keynesian rational-expectations framework with habit formation in consumption, modified with specific institutional features characterizing the labor market. In particular, we assume that nominal gross wages are established in a "right-to-manage" process of collective bargaining, preventing labor market clearing. This inefficiency, resulting from institutional features of the labor market, adds to the ones arising in the goods markets. Once LMI are included in the model, it is possible to identify, in a stylized manner, instruments of labor market reform. In particular, we consider the reduction of the unemployment-benefit replacement ratio.

As for the political support evaluation, we turn to the changes in the welfare of the employed and the unemployed workers, during the adjustment process after reform implementation. We compute the welfare gains for the decisive voter, meaning a currently employed individual. Welfare effects of the reform respect both the (immediate) reduction of the insurance income and of real wages, and the positive (possibly lagged) effects arising from the fall in unemployment and in the related tax bill. Assuming net positive permanent effects on the welfare of the employed, the sooner net benefits show up, the higher is the political support for the reform.

After this introductory section the paper proceeds as follows. Section 2 develops the macroeconomic model, including the definition of monetary policy rules and of alternative processes to implement a stylized reform. Section 3 discusses the criteria for political support evaluation. Computed results and further analysis for different scenarios and policy rules are also provided. Section 4 presents some concluding remarks.

2 A Macroeconomic Model with Labor Market Institutions

In this section we proceed with the description of a model designed to capture the interaction between labor market reform and monetary policy. We follow the New-Keynesian type of models used by Galí (2002; 2003) and McCallum and Nelson (1999) for monetary policy analysis. However, differently from the usual models for monetary policy analysis, modified to include non labor-market clearing features. The latter affect the non-efficient flexible-price output level and generate unemployment.

2.1 Households and Firms

We start by characterizing the behavior of the decentralized agents in the economy – firms and households. Their decisions arise from the sum of strict individual decisions of the representative household and of the representative firm.

Households Consider an infinitely-lived individual (*i.e.*, household), representative of the consumers' behavior in the economy. The individual is risk-averse and has preferences over consumption and leisure according to the following instant utility function.

$$U_t = Log\left[C_t(i) - hC_{t-1}(i)\right]\exp(g_t) - \frac{N^{s(1+\varphi)}}{1+\varphi}, \qquad h \leq 1, \tag{1}$$

where C stands for *per capita* consumption of a composite final good, N^s for the hours of labor supplied by the individual, g defines a shock to preferences and β $(0 < \beta < 1)$ is a discount factor.[1]

The utility function, based on Christiano *et al*'s (2001), U_t, captures the consumers' wish to smooth both the level and the change in consumption, slowly changing habits[2]. The degree of habit persistence is indexed by h. If $h = 0$, the utility function reduces to the time-separable utility function, whereas $h = 1$ means that the consumer cares only about consumption growth. When $h > 0$, the utility function produces a gradual hump-shaped response of consumption to shocks, an appealing form in terms of fitting the data as it avoids some counter intuitive dynamics of consumption in response to changes in the expected real interest rate (Estrella and Fuhrer,2002).[3]

In the homogenous utility function, above, it is assumed that the representative individual reflects the average behavior of the labor force, being partially employed and partially unemployed. In a simple way of weightily averaging across employed and unemployed to yield a representative consumer of the economy, N^s is better described as *per capita* "homogenized" (including employed and unemployed) units of supplied working hours. This convenient technical device allows compatibility between the simplified representative agent and the need to consider that heterogeneous individual behavior influences the aggregate dynamics of the unemployment rate. If *per capita* "homogenized" units of labor supply exceed those of labor demand (N^d) then, $\frac{N^s - N^d}{N^s}$ can be used as a proxy of the unemployment rate (u) of the economy. For instance, an unemployment rate of 5% means that 95% of the labor force works N^s hours at a given nominal wage rate (W), while the remaining 5% is being paid an unemployment benefit rate, also over N^s hours. The unemployment benefit rate is defined as a fixed percentage of the current aggregate average nominal wage (bW).[4]

The representative individual faces a budget constraint that limits real consumption per period to the real income raised during current production activity plus the changes in holdings of real risk-free government bonds (GB). Production output is distributed either under the form of "labor-related" incomes or as profit earnings, Π. Henceforth,

[1] The model we explore hereafter is that of a monetary economy without explicit demand for money derived from utility maximization. This is the case because, as we shall see below, we define a monetary policy rule that, through affecting the interest rate, clears the money market.

[2] This is how habit persistence is motivated according to Fuhrer (2000). He also reviews the literature on other motivations, namely alternative consumption behavior and the equity premium puzzle.

[3] See, for instance, the impulse responses to a monetary policy shock based on VAR estimates for the U.S in Christiano *et al*, 2001 and, for the euro-area, Smets and Wouters, 2003.

[4] This is a simplification because the unemployment benefit replacement ratio is usually applied to a weighted average of the most recent wages the individual received before becoming unemployed.

"labor-related" incomes refer to all incomes raised through the employment relationship, including wages as well as other incomes substituting for wages during the out-of-work situations, namely the unemployment benefit.[5] In particular, the "homogenized" budget constraint results from a weighted average of the constraints facing the employed and the unemployed:

$$C_t = (1-u_t)\overbrace{\left[\frac{\Pi_t}{P_t}+\frac{W_t}{P_t}(1-\tau_t)N^s - GB_{t+1}(1+rr_t)^{-1}+GB_t\right]}^{employed} + \\ +u_t\overbrace{\left[\frac{\Pi_t}{P_t}+\frac{bW_t}{P_t}N^s - GB_{t+1}(1+rr_t)^{-1}+GB_t\right]}^{unemployed}, \quad (2)$$

where rr stands for the real interest rate, P for the aggregate price level, τ for the tax rate on labor income. $(1-u)$ and u are used as proxies for the probability an individual has of being employed or unemployed, respectively. Both the employed and the unemployed are assumed to get the same *per capita* profits from firms and to save the same *per capita* amount on risk-free bonds (*i.e.*, heterogeneity applies only to "labor-related" incomes). It is also assumed that unemployment benefits are fully tax-financed (a pure Bismarckian system) by the employed, as to keep the government budget permanently balanced:

$$\begin{aligned} \frac{W_t}{P_t}\tau_t N_t^d &= \frac{bW_t}{P_t}(N^s - N_t^d) \Leftrightarrow \\ \tau_t &= \frac{bu_t}{1-u_t}. \end{aligned} \quad (3)$$

Using equations (1), (2), (3) and normalizing N^s to 1, the optimizing problem of the "homogenized" individual is defined as:

$$\underset{N^s_{t+j},C_{t+j},GB_{i+j+1}}{Max} \quad E_t\sum_{j=0}^{\infty}\beta^{t+j}\left(Log\left[C_t(i)-hC_{t-1}(i)\right]\exp(g_t)-\frac{1}{1+\varphi}\right)$$
$$s.t. \qquad C_{t+j}=\frac{\Pi_{t+j}}{P_{t+j}}+\frac{W_{t+j}}{P_{t+j}}(1-u_{t+j})-GB_{t+j+1}\frac{1}{(1+rr_{t+j})}+GB_{t+j}. \quad (4)$$

In standard monetary policy analysis models, labor supply is usually identified with the "notional labor supply" (as in Ambler *et al*, 1999, and Bovenberg *et al*, 2000), reflecting the household choice between hours of leisure and consumption. By assuming, instead, a perfectly inelastic labor supply, we intend to capture, first, the empirical regularity that labor supply is relatively inelastic in the short run (see, for instance, Burda and Wyplosz, 1997);[6] second, and given the unemployment benefit rate definition, a variable N^s could

[5] In practice, out-of-work "labor-related" incomes include, more broadly, all the other social benefits, such as injury or sickness benefits and old age or disability pensions as employment-based rights (see Harvey and Maier, 2004, on this terminology).

[6] Short-run wage inelasticity can be due to, among other causes, the existence of labor market legislation

lead to the awkward result that the more the labor supplied by the unemployed the more they would collect in terms of unemployment benefit (assuming that an unemployed worker has no leisure costs in supplying additional hours of work).[7]

Solving problem (4) we get the following Euler equation for consumption, mimicking the economy's aggregate demand dynamics (*i.e.*, the IS function).

$$\begin{aligned}(1+\beta h^2)E_t\{\Delta y_{t+1}\} = \; & h\Delta y_t + \beta h E_t\{\Delta y_{t+2}\} + \\ & +(1-\beta h)(1-h)(r_t - E_t\{\pi_{t+1}\} - \rho) - \\ & -(1-h)(v_t - \beta h E_t\{v_{t+1}\}). \end{aligned} \tag{5}$$

Where Δy_t is the change in the (log) of output, defined as $(y_t - y_{t-1})$; and $v_t = -E_t\{\Delta g_{t+1}\}$ is a demand-side disturbance, with g_t defined above, in (1). The constant $\rho = -\log\beta$ is the time discount rate and corresponds to the steady-state equilibrium real interest rate in the absence of secular growth (see, below, equation 40, in subsection 3.3).

Firms In what concerns the production side, we consider monopolistic competition in the production of intermediate goods and perfect competition in the production of the composite final good.

There is a continuum of intermediate goods producers indexed by $i \in [0,1]$, each of which producing a differentiated good, Y_{it}. If a firm sets its prices optimally (in order to maximize profits) at any period, the problem faced by the i^{th} firm can be represented by:

$$\begin{aligned} & Max_{\,Y_{it}} \; \Pi_{it} = P_{it}Y_{it} - W_t N_{it}^d \\ & s.t. \\ & Y_{it} = A_t \left(N_{it}^d\right)^{\alpha}, \quad \alpha < 1 \\ & Y_{it} = \left[\frac{P_{it}}{P_t}\right]^{-\varepsilon} Y_t, \quad \varepsilon > 1. \end{aligned} \tag{6}$$

The first restriction represents the production function, where A is a technology index common to all firms and N^d refers to the hours of labor in use by the firm producing intermediate good i. The second restriction represents the relative demand for each intermediate good i, Y_{it}, conditioned by the final good producers' optimal choice of inputs.

We also consider the existence of many producers of the composite final good, Y_t, producing through a Dixit and Stiglitz (1977) CES-type aggregation of intermediate goods. The resulting general price index, P_t, arises in a perfectly competitive market and can also be defined as a CES-type aggregation of intermediate goods prices (see, for example, Ireland, 2001).

establishing a fixed number of weekly working hours.

[7] This is also a simplifying assumption because we could attach some leisure costs to the unemployed persons' supply of working hours. Usually, to be eligible to get the unemployment benefit, the unemployed worker has to actively get involved in searching for a new job or may even be asked to engage in some public services.

The solution to 6, above, yields a constant mark-up, μ, of prices over nominal marginal costs. Assuming symmetry across firms, $P_i = P$ and $Y_i = Y$, the aggregate price resulting from the flexible-price (FP) decision of firms is given by:

$$P_t = \mu \left[\frac{1}{\alpha} W_t Y_t^{\frac{1-\alpha}{\alpha}} A_t^{-\frac{1}{\alpha}} \right], \quad \mu = \frac{\varepsilon}{\varepsilon - 1}, \quad \alpha < 1, \quad \varepsilon > 1. \tag{7}$$

However, the assumption that firms can optimally reset prices at any period is not compatible with real effects of the demand-side policies, because full price adjustment crowds out, instantaneously, any demand pressure. In fact, some price rigidity in general equilibrium models is a *sine qua non* assumption for the model to produce real effects from monetary policy conducting. As Taylor (1999b) argues, what we observe is that prices (and nominal wages) are set for some periods ahead, usually not conditioned upon conjuncture actualizations and in a non-synchronized manner. The "near rationality behavior" argument *a la* Akerlof and Yellen (1985) and the existence of menu costs that make price adjustments costly (see, among others, Barro, 1972, and Blanchard and Kiyotaki, 1987) are the main arguments that have been advanced to justify such behavior of the firms.

To introduce price rigidity we follow a discrete version of Calvo's (1983) price adjustment mechanism as proposed in Galí (2003).[8] Firms, whenever possible, adjust prices to an optimal value, P^*, conditioned upon the expected average duration of price stickiness. Each firm has a given probability of adjusting prices in each period, independent of when the firm last adjusted prices. Assuming this probability constant across firms and equal to $(1-\theta)$, we can define the (log of) aggregate price level (p) as weighted average of the lagged general price index and the currently set optimal price (King, 2000):

$$p_t = \theta p_{t-1} + (1-\theta)\, p_t^*. \tag{8}$$

This establishes the sticky price dynamics. As expected, the optimal price to be set at t must drive the best profit results conditional on the possibility that the firm's price may not be changed for some periods ahead. Taking $E_t \{\Pi_{t+j,j}\}$ as the profits expected in t for j periods ahead, with prices frozen since t, P_t^* must satisfy:

$$Max_{P_t^*} E_t \sum_{j=0}^{\infty} \left\{ (\theta\beta)^j \, \Pi_{t+j,j} \right\}. \tag{9}$$

Following, among others, Goodfriend and King (1997) and Galí *et al* (2001) on the above problem, and under low inflation, the optimal price to be set at t can be expressed in the

[8] Calvo's approach seems to be more technically appealing than the seminal Fischer's (1977) and Taylor's (1979), which explains why it is so often used in recent general equilibrium models - for instance, in Christiano *et al* (2000) and in Galí (2003). Underlying price dynamics are similar to that of Rotemberg's (1982). Other related approaches are the state-dependent price staggering proposed by Caplin and Spulber (1987) and the combined state- and time-dependent staggering proposed by Conlon and Liu (1997).

approximate log form:

$$p_t^* - p_t = \log \mu + (1 - \theta\beta) \frac{\alpha}{\alpha + \varepsilon (1 - \alpha)} \sum_{j=0}^{\infty} (\theta\beta)^j E_t \{mc_{t+j}\} + \sum_{j=1}^{\infty} (\theta\beta)^j E_t \{\pi_{t+j}\}, \quad (10)$$

with $E_t \{mc_{t+j}\}$ and $E_t \{\pi_{t+j}\}$ standing, respectively, for the log of expected real marginal costs and the expected inflation rate for period $t + j$, conditional on the information available at time t.

2.2 Labor Market

Standard models for monetary policy analysis usually assume labor market clearing. In our case, the flexible-price (FP) equilibrium output is inefficient not only due to the existence of monopolistic competition among producers, but also because labor market institutional functioning leads to unemployment. Also, the model should capture the effects of labor market reform either on (i) the adjustment mechanism to shocks hitting the economy, as reform improves real wage flexibility, and on (ii) equilibrium unemployment.

Collective Bargaining Involuntary unemployment arises because there is job rationing in the economy. Firms could set lower wages and get more workers into jobs but mechanisms of wage formation may prevent this. In this context, the insider-outsider theory provides explanation on why the market wage is usually set above the market clearing level and also why the unemployed are unable to underbid the wages that are currently paid to incumbents (see, among others, Solow, 1985, Blanchard and Summers, 1986 and Lindbeck and Snower, 1988 for seminal works). Lindbeck and Snower (1988) argue that the existence of Labor Turnover Costs (LTC) associated with insider-outsider turnover might explain why firms do not substitute outsiders for insiders at lower wages.[9] According to Manzini and Snower (2002), the insiders' market power is rising with LTC – under no LTC, the insiders and outsiders are perfect substitutes and thus, insiders, alone, can not influence the wage process.[10] Thus, under LTC, wages are set through bargaining, not between firms and the whole labor force, but rather between firms and their workers (insiders).

Among the insider-outsider models, we consider one where workers of a given firm join a labor union to negotiate over wages. There is a two-way relationship between LTC and the existence of union wage bargaining. On the one hand, LTC provide a rationale for the existence of unions: firms are reluctant to replace the unionized workers with

[9] The existence of LTC underlying the insider-outsider theory provides a foundation for insiders' market power, instead of its *ad hoc* definition as imperfect competition in wage setting (as, for instance, in Galí, 2003).

[10] Driving a wedge between insider and entrant wages, the LTC might arise from several sources. They can be production-related (such as hiring costs), rent-related (firing costs), from cooperation/harassment activities engaged by the permanent workers (insiders), or can result from failures due to imperfect information (such as effort-realted or workers' mobility costs).

non-unionized ones because it is costly to do so.[11] On the other hand, unions sustain and re-enforce LTC: unions coordinate strikes and work-to-rule activities and are a common interest group influencing the political process, lobbying for job security legislation, etc (Lindbeck and Snower, 2002). Thus, workers organize themselves in a union in order to gain wage bargaining power relative to individual negotiation; unions protect their members, the employed workers (insiders to the labor market) at the expenses of the unemployed (outsiders).

Following Layard *et al* (1991), Bovenberg *et al* (2000) and Belot and van Ours (2004),we rely on the right-to-manage approach to wage formation, in which a union bargains with a firm over wages and then each firm sets employment taking wages as given.[12] Wage bargaining is assumed to take place every period, so that no nominal wage stickiness occurs, and that unions, unlike households, are risk neutral. This simplifying assumption is not particularly relevant for the results because a household's utility is also increasing with the wage. In particular, firm and union try to

$$\begin{aligned} &\underset{W_{it}}{Max} \quad \left[P_{it}Y_{it} - W_{it}N_{it}^{d}\right]^{(1-\Gamma)} \left[W_{it} - Wout_{t}\right]^{\Gamma} \left[S_{it}(W_{it})\right]^{\Gamma} \\ &s.t. \\ &Y_{it} = A(N_{it}^{d})^{\alpha}, \quad \alpha < 1 \\ &Wout_{t} = F_{it}W_{t} + (1 - F_{it})bW_{t} = (1 - u_{t} + u_{t}b)W_{t}. \end{aligned} \tag{11}$$

For a given price level, P, the optimizing condition yields a combination of the nominal (and thus, the real) wage and the hours a firm wishes to employ (*per capita* "homogenized" hours of work). The terms in brackets, with Γ reflecting the union's bargaining power, capture the instantaneous utility for the individual firm and for the union - *i.e.*, the rent of the effective incomes over the corresponding "fallbacks" (the income either part would get if agreement fails).[13]

This objective function tries to capture several features characterizing collective bargaining. First, and differently from Bovenberg *et al* (2000), we assume that unions bargain solely over contractual gross nominal wages and not over hours of work. Usually, permanent labor contracts are subject to legally pre-established amount of working hours; this makes labor supply relatively inelastic and supports the assumption that unions do not interfere, at least in the short run, with working time (or worker's effort) negotiations.

[11] Checchi and Lucifora (2002) found evidence that, in Europe, employment protection legislation, as any other institutional device aimed at reducing labor market risks (such as unemployment insurance, wage indexation and minimum wages), tend to make unions redundant. This argument is relevant if unions play a role in providing insurance against labor market risks, namely against inflation and unemployment. However, the argument fails if unions mainly care about extracting rents, and, thus, bargaining is centered on wage claims.

[12] This contrasts with the monopoly union model and the efficient bargaining model [see, for instance, Saint-Paul (2000)]. In the monopoly union model, a special case of the right-to-manage model, the union sets wages unilaterally and then firms set employment taking wages as given. In the efficient bargaining model, firms and workers jointly bargain over both employment and wages.

[13] For a detailed exposition of the derivation of the Nash bargaining, see Belot and van Ours (2004).

The bargaining is over gross wages because it is assumed that, at such a decentralized level, the employed have little perception of the negative tax externalities: higher wages mean higher overall unemployment and, thus, higher overall taxes (Calmfors and Driffill, 1988). Also, at a decentralized level, the employed workers have little perception of how their bargaining decisions will affect their income as stockholders. This perception would be relevant only if bargaining was centralized or if any given employee held a significant amount of capital of the firm where he works. Such unperceived externalities match the evidence that moderate wage claims are more common in more centralized bargaining structures; centralized and coordinated collective bargaining yields, in general, better economic performance in terms of unemployment, employment and inflation, among others (see, for instance, evidence in Carneiro *et al*, 2002, for the OECD countries).

Second, and following Layard *et al* (1991), workers do take into account that their wage claims may have adverse effects on the firm's competitiveness and, thus, on their probability of survival inside the firm (an effect perceived at the firm-level negotiation as explained in Calmfors and Driffill, 1988), $S_i(W_i)$. The lower the wage the larger will be the number of employees hired by the firm, and so the higher the probability an insider has of maintaining his current job.

$Wout_i$ represents the employed worker's outside-option *per capita* earnings (union's "fallback"). We consider the outside earnings as an average weighted by the probability of finding a job in other than the i^{th} firm (F_i), paid at the average gross wage rate, W_t, and the probability of a displaced worker not finding a job elsewhere $(1 - F_{it})$, and thus receiving the unemployment benefit rate, bW_t. In general, $(1-F_{it})$ is specified as a function of factors that affect the competitiveness that the unemployed face when in search for jobs. Layard *et al* (1991) consider that it increases with the aggregate unemployment rate (u), and decreases with other factors that reduce competitiveness among the unemployed, such as the unemployment benefit generosity and the percentage of long-term unemployed over total unemployment. We assume, as in Bovenberg *et al* (2000), that the unemployment rate is a good proxy for the probability of not finding a job in other (continuum of) firms besides the i^{th} one.[14]

Recalling now the role of the LTC, they do not play an explicit role within this framework (these costs are not even included as determinants of the "fallbacks"), we consider that Γ, capturing the union bargaining power, incorporates, implicitly, their importance, because both concepts share common determinants, such as legislation protecting the right to strike and the firm's market power. Besides this, LTC influence an individual employee's power and, thus, they also influence collective bargaining power; hence, in the end, LTC can be considered, implicitly, as part of the presented Nash-bargaining framework.

Assuming symmetry across firms, by making $P_i = P$, $N_i^d = N^d$ and $W_i = W$, we derive

[14] One way of indirectly capturing the other determinants would be to consider not only the unemployment rate but also the change in the unemployment rate. The larger the increase in unemployment, the stronger the competitiveness between unemployed - reflecting an incoming of newly unemployed with better skills and work habits, unwilling to lose current labor income.

the optimal solution to problem (11), above:

$$(1-b)(1-\Gamma)u_t\frac{W_t}{P_t}(-N_t^d)+\left[A\left(N_t^d\right)^{\alpha}-\frac{W_t}{P_t}N_t^d\right]\left[1-(1-b)u_t\varepsilon_{SN}\varepsilon_{NW}\right]\Gamma=0, \quad (12)$$

where ε_{SN} stands for the elasticity of the survival probability with respect to employment and ε_{NW} stands for the nominal wage elasticity of labor demand. Equation (12) is obtained by using the simplifying assumption of a constant absolute elasticity of the survival probability relative to wage, $\varepsilon_{SW}=\varepsilon_{SN}\varepsilon_{NW}$, at the (flexible price) steady-state level. According to Layard *et al* (1991), ε_{SN} is typically less than 0.5 while the (flexible price) steady-state level of ε_{NW} is given by:

$$\varepsilon_{NW}=\left|\frac{\frac{\partial N}{N}}{\frac{\partial W}{W}}\right|=(1-\frac{\alpha}{\mu})^{-1}>0. \quad (13)$$

Using both equations, (12) and (13), we get the following wage offer curve, relating real wage to the employment level:

$$\frac{W_t}{P_t}=\left[1+\frac{1}{\frac{\Gamma}{(1-\Gamma)}\left[\frac{1}{(1-b)u_t}-\varepsilon_{SN}(1-\frac{\alpha}{\mu})^{-1}\right]}\right]^{-1}A_t\left(N_t^d\right)^{(\alpha-1)}. \quad (14)$$

Therefore, real wages resulting from Nash bargaining increase with:

(i) the union's relative bargaining power, $\Gamma/(1-\Gamma)$;

(ii) the union's "fallback", which, in turn, increases with b and with a lower u_t;

(iii) the survival probability, which, in turn, increases with μ, and with a lower ε_{SN} and a lower α;[15]

(iv) the marginal productivity of labor, that is, with a lower N^d.

2.3 Flexible-Price Equilibrium

The flexible price (FP) equilibrium output is defined as the long-run steady-state level of output. It refers to the output level achieved under the flexible-price adjustments, given a set of institutional arrangements characterizing the labor market.

Satisfying the right-to-manage model for wage formation, we start by combining the wage offer curve and the labor demand under the flexible price hypothesis to get the FP equilibrium output level.[16] On the one hand, log-linearization of the pricing decision

[15] The effects of μ on the real wage claims seem to be in line with arguments of Saint-Paul (1996) and Blau and Kahn (1999) - the higher the elasticity of labor demand, the lower the support for bid up wages. This conclusion seems at odds with Blanchard (2004, p. 23), for he argues that a lower mark-up provides incentives for higher real wages. However, as we shall see below, our labor demand and unemployment rate are also functions of the mark-up; for instance, a lower μ leads to lower unemployment, which, in turn, has positive effects on real wages.

[16] The wage offer curve is the institutionally meaningful labor supply because bargaining is the institutional channel through which wages are set. Even under low unionization rates, it is a generalized

under FP (equation 7, above) yields the labor demand function,

$$(w_t - p_t) = -\log\mu + \log\alpha + (\alpha - 1)\overline{n}_t^d + a_t, \tag{15}$$

reacting negatively to the real wage rate.

On the other hand, log-linearizing the wage offer curve – equation (14) – around the FP equilibrium, together with the assumption of labor supply inelasticity, we get:

$$(w_t - p_t) = \bar{d}_0 + \bar{d}_1(\Delta\Gamma_t) + \left[\bar{d}_{21} + (\alpha - 1)\right](n_t^d - \bar{n}_t^d) + \bar{d}_3(\Delta b_t), \quad \bar{d}_{21} > (\alpha - 1)\,, \tag{16}$$

$$\begin{aligned} where \qquad & \bar{d}_0 \equiv -\log\left(1 + \frac{1}{\overline{q}}\right) + a_t + (\alpha - 1)\bar{n}_t^d; \quad \bar{d}_1 \equiv \left[\frac{1}{(\overline{q}+1)}\frac{1}{(1-\bar{\Gamma})\bar{\Gamma}}\right]; \\ & \bar{d}_{21} \equiv \left[\frac{1}{(\overline{q}^2+\overline{q})}\frac{\bar{\Gamma}}{(1-\bar{\Gamma})}\frac{1}{(1-\bar{b})\bar{u}^2}\right]; \quad \bar{d}_3 \equiv \left[\frac{1}{(\overline{q}^2+\overline{q})}\frac{\bar{\Gamma}}{(1-\bar{\Gamma})}\frac{1}{(1-\bar{b})^2\bar{u}}\right]; \\ & \Delta\Gamma_t = \Gamma_t - \overline{\Gamma}_t; \quad \Delta b_t = b_t - \overline{b}_t; \quad \bar{q} = q(\bar{\Gamma}, \bar{b}, \bar{u}). \end{aligned}$$

The dashed variables refer to values at the respective FP equilibrium levels. Usually, $\Delta b = \Delta\Gamma = 0$, unless an unexpected reform affecting either of the parameters occurs. Under no reform or if it is fully announced, $b = \overline{b}$ and $\Gamma = \overline{\Gamma}$. As expected, real wages are higher, the stronger the pressure on labor demand. Under flexible prices, with $n^d = \bar{n}^d$ and $\Delta b = \Delta\Gamma = 0$, putting together the labor demand function and the wage offer curve at the FP levels, we get the following results for $\bar{u}$, $\bar{n}^d$ and $\bar{y}$, respectively:

$$\bar{u}_t = \frac{(\mu - \alpha)\bar{\Gamma}}{\left[\alpha(1-\bar{\Gamma}) + \bar{\Gamma}\epsilon_{SN}\mu\right](1-\bar{b})} = \overline{u}; \tag{17}$$

$$\bar{n}_t^d = n_t^s - \bar{u} = -\bar{u} = \overline{n}^d; \tag{18}$$

$$\bar{y}_t = -\alpha\bar{u} + a_t. \tag{19}$$

The FP equilibrium is a function of the inefficiencies (both in the labor and in the goods and services markets) present in the economy.[17] The FP unemployment rate (which coincides with the steady-state unemployment rate) determines the FP output level, $\bar{y}_t$, and increases with the unemployment-benefit replacement ratio (b), the relative power of the union in wage bargaining (Γ), and the degree of monopolistic competition in the market for intermediate goods, μ. Unless a supply-side policy - namely, a labor market reform - is enforced, so as to push the FP closer to its efficient level $y_t^e = a_t$, the long-run output level will not be higher than $\bar{y}_t < y_t^e$.

The FP output dynamics just derived enables us to recover the firm's pricing behavior, equation (10) in 2.1, above, to get the economy's aggregate supply (AS) function. Using (the log-linearized) equation (7), in 2.1, together with the dynamics of the log of the real

practice that collective bargaining agreements are extended to cover most of the non-unionized workers.

[17] Hereafter, dashed variables with time subscript refer to FP equilibrium levels, while dashed variables without time subscript stand for its respective steady-state levels.

wage (equation 16, above), allow us to define the log of the real marginal costs, mc, as:

$$mc_t = -\log\mu + \frac{\overline{d}_{21}}{\alpha}y_t - \frac{\overline{d}_{21}}{\alpha}a_t + \overline{d}_{21}\overline{u} + \overline{d}_1\Delta\Gamma_t + \overline{d}_3\Delta b_t. \tag{20}$$

Putting together equation (10), the aggregate price level definition in (8) and the real marginal cost deviations from its FP level ($\widehat{mc}_t = mc_t - \overline{mc}_t$) using equation (20), the inflation dynamics (AS) equation follows:

$$\begin{aligned} &\pi_t = \beta E_t\{\pi_{t+1}\} + k\widetilde{y}_t + \lambda(\overline{d}_1\Delta\Gamma_t + \overline{d}_3\Delta b_t), \\ &with\ k = \lambda\frac{\overline{d}_{21}}{\alpha},\ \lambda = \frac{(1-\theta)(1-\beta\theta)\alpha}{\theta\left[\alpha+\varepsilon(1-\alpha)\right]}. \end{aligned} \tag{21}$$

Inflation is thus determined by future expected inflation, by the output gap and by the unexpected reform processes. The inflation rate is related to the output gap through the features characterizing both the goods and labor markets. As to the former, the higher the price elasticity of demand (ε) and the stronger the nominal inertia in prices (θ), the less strongly inflation will react to the output gap. Concerning the ways through which the institutions of the labor market determine the reaction of inflation to the output gap, in general, features that improve the outside option or the wage bargaining power of the unions, make nominal wage growth, and thus inflation, less responsive to the cycle fluctuations.

Also according to equation (21), unexpected changes in the unemployment benefit ratio or in the relative wage bargaining power of the parties affect inflation in the same way a cost-push shock does. Cost-push shocks reflect anything that affects the firms' nominal marginal costs irrespective of the cycle fluctuations. It can also reflect mark-up shocks in either prices or wages due, for instance, to input-price shocks or to shocks in wage-growth claims. In respect to the latter, and explicitly derived in our model, an unexpected reform process motivates the existence of cost-push shocks; this improves over the pure *ad hoc* specification of general cost-push shocks ($\mathtt{u}_t$ disturbance) often taken in the New Keynesian Phillips curve:[18]

$$\pi_t = \beta E_t\{\pi_{t+1}\} + k\widetilde{y}_t + \mathtt{u}_t. \tag{22}$$

The presence of habit persistence ($h > 0$) usually affects the aggregate-supply function as Amato and Laubach (2004) show. The changes in aggregate supply do not apply to our case, though, since such changes take effect only when labor supply is variable, which we have ruled out as argued above in 2.1.

We can now sum up the model in regard to the structure describing the economy. The model, thus, is defined by an aggregate demand function derived from the households' behavior (equation 5, in 2.1, above), an aggregate supply function reflecting firms' optimal

[18] Steinsson (2003) and Ireland (2004) also provide some theoretical foundations for the presence of cost-push shocks, in both cases related to shocks in firms' desired mark-up.

price-setting decisions (equation 22, above), and by the flexible-price (given a set of LMI) output dynamics (equation 19, above).

To close the model we further need the behavior of the policy authorities, namely in what respects to the definition of the monetary policy decisions and the implementation of the labor market reform. This enables the use of the model to analyze the interaction between a demand-side, pure stabilization, policy and a structural, supply-side, policy. The following subsections describe, thus, the monetary policy rules and the scenarios for a stylized labor market reform.

2.4 Monetary Policy

This subsection is devoted to the centralized behavior of the policy maker. In particular, the relevant policy maker is an independent central bank (CB) as we assume that monetary policy is the only demand-side management policy available.[19]

Theoretically, the policy maker should behave optimally in a way to maximize the utility of the representative agent. However, the literature on monetary policy conducting shows a widespread consensus that central banks follow simple rules instead (see, for instance, Taylor, 1999a). Nonetheless, optimal policy rules perform a useful role in benchmarking simple rules. For instance, and for our purposes, optimal policy rules provide results on welfare costs, that are useful for the evaluation of simple rules.

Following a standard procedure in the relevant literature, we define the optimal monetary policy (OMP) conducting as maximizing the welfare of the "homogenized" representative agent. Here, we follow a version of Woodford's (2001) methodology, as presented in Galí's (2002), to derive the objective function of the monetary authority according to the specificities of the model we have exposed throughout. Differently from standard derivations, the following takes into account $\alpha \neq 1$ (see the production function in (6), above in 2.1), the non labor-market clearing resulting from the wage bargain process and the presence of habit formation. In particular, OMP is achieved through the maximization of the following representative-agent instant utility (relative to the correspondent FP level).

$$U_t - \overline{U}_t = Log(C_t - hC_{t-1}) - \frac{N_t^{d(\varphi+1)}}{(\varphi+1)} - \overline{U}_t. \tag{23}$$

We include N^d instead of N^s because the labor market fails to clear; also, and according to the assumption of costless job search (see footnote 7 in 2.1, above), the hours of labor supplied by the unemployed are not welfare consuming. With β close to 1, and re-defining U_t as the utility derived from period t consumption (*i.e.,* including the contribution of period t consumption to the utility in the following period due to habit formation), the welfare function can be re-written irrespective of the degree of habit persistence.[20] Under

[19]The government is assumed to be neutral, with a passive role exclusively related with income distribution: it collects taxes to pay for the unemployment benefits, constrained to keeping the budget balanced.

[20]See appendix ? on this adaptation. However, this is applied only to welfare evaluation. For general equilibrium derivation, we use the IS function (5) derived from equation (4), in 2.1, above.

the Calvo's (1983) price-setting mechanism and closely following Woodford (2001), we show in Appendix A that the monetary authority's Loss function derives from a second-order approximation to the consumer's welfare loss, expressed as a fraction of steady-state consumption (income):

$$\begin{aligned} L &= \frac{1}{2}E_0\sum_{t=0}^{\infty}\beta^t\left[\pi_t^2+\omega_{\widetilde{y}}\left(\widetilde{y}_t-z\right)^2\right], \\ &\quad where \\ &\quad z=(y_t^e-\overline{y}_t)+\frac{\alpha\log\alpha}{(1+\varphi)}, \quad \lambda_L=\frac{(1-\beta\theta)(1-\theta)}{\theta}, \quad \omega_{\widetilde{y}}=\frac{(1+\varphi)\lambda_L}{\alpha\varepsilon}. \end{aligned} \tag{24}$$

Central banks minimize a weighted sum of the square deviations of inflation and output gap from the respective targets, 0 and z. A final remark to (24) is worth mentioning. It relies on Clarida *et al* (1999)'s argument that the monetary policy is unable to affect the natural level of output (here taken as the FP level of output). They prove that efforts to equalize $\widetilde{y}_t$ to z put pressure on the long-run inflation rate without affecting $\overline{y}_t$ (inflation bias problem). Taking this result into account, we assume that a rational central bank should never push output to values different from the flexible price level outcome, and so we set $z=0$. This is equivalent to assuming that the monetary authority is perfectly aware of this constraint, or that there are more appropriate policies, other than the monetary policy, to overcome structural inefficiencies in the economy.[21] The relevant decision problem of the monetary authority is, then,

$$\begin{aligned} &\underset{\pi_{t+j},\widetilde{y}_{t+j}}{Min} \qquad E_t\sum_{j=0}^{\infty}\beta^j(\pi_{t+j}^2+\omega_{\widetilde{y}}\widetilde{y}_{t+j}^2), \qquad \omega_{\widetilde{y}}=\frac{\lambda_L(1+\varphi)}{\varepsilon\alpha} \\ &s.t. \\ &\pi_t=\beta E_t\{\pi_{t+1}\}+k\widetilde{y}_t+\mathtt{u}_t, \qquad k>0. \end{aligned} \tag{25}$$

Where the constraint refers to the AS function derived in 2.3, above; it captures the inflation - output-gap stabilization trade-off faced by the central banks when responding to cost-push shocks.

Following Clarida *et al* (1999), Galí (2003) and McCallum and Nelson (2004), we can describe two sets of solutions for the optimal policy: discretion and commitment behaviors.

Optimal policy under discretionary behavior (OMP-D) Occurs whenever the optimizing monetary authority cannot commit to any future policy actions. Because the central bank can not influence current expectations on output and inflation, it takes private sector expectations as given when solving the optimization problem (25). The

[21] In this respect, Galí (2003) and Woodford (2003) assume that there is a government subsidy that pushes the flexible price level of output to the efficient level, so that the monetary authority needs not to worry about efficiency targets.

resulting optimal target rule is

$$\pi_t = -\frac{\omega_{\widetilde{y}}}{k}\widetilde{y}_t, \forall t. \tag{26}$$

Optimal policy under commitment (OMP-C) Another form of OMP may emerge when the monetary authority has enough credibility to stick to an announced plan of action defined at a certain time and to be applied from then on. The central bank recognizes that its policy choice effectively influences private sector expectations regarding inflation and output. In this case, the optimal solution is given by:

$$\pi_1 = -\frac{\omega_{\widetilde{y}}}{k}\widetilde{y}_1, \quad t = 1 \tag{27}$$

$$\pi_t = -\frac{\omega_{\widetilde{y}}}{k}\left(\widetilde{y}_t - \widetilde{y}_{t-1}\right), \quad t = 2, 3, 4, ... \tag{28}$$

Optimally, the monetary authority behaves differently in the first period and in the following periods. This solution involves, however, a "time-inconsistency", because in the first period the central bank behaves just like in the discretionary case. For instance, if a cost-push shock occurs in period 1, in period 2 both the inflation and output gap are stabilized and thus the optimal choice would be the discretionary solution once again.

A much more attractive equilibrium under commitment is, according to McCallum and Nelson (2004), the one derived from Woodford's "timeless perspective": to implement a "systematic" control regime, the central bank should behave the same way in all periods such that (28) should apply for all t.[22]

Taylor Rules It is usually argued that, in practice, central banks fail to design and implement optimal policy rules (Taylor, 1999a and Galí, 2003, among others). One of the stronger arguments is that optimal policy rule is not robust across model specifications. To overcome this, several authors have proposed a variety of simple rules as a guideline for monetary policy conducting and for assessing its performance across different models. This is the aim of the studies compiled by Taylor (1999a) where, among other main findings, it is concluded that simple rules performance is surprisingly close to that of the optimal policies, and that they are more robust than complex rules across a variety of models. This addresses the "McCallum critique," according to which a non-optimal rule, exhibiting a moderated good performance across a variety of models, is preferable to an optimal one specific to a single model (McCallum and Nelson, 1999).

Also, simple rules are, apparently, more public-friendly, in the sense that they are easier understood by the private sector; this makes the central banks more accountable and, more importantly, provides a stronger influence of monetary policy conducting on private-sector expectations. Furthermore, there is strong empirical evidence that simple rules mimic rather well the practice of monetary policy conducting. Finally, and speaking

[22]Even though, Jensen and McCallum (2002) have found that optimality condition (28) alone (and, thus, the "timeless perspective") fails to yield the smallest average Loss. We choose to maintain it, because of its standard use and, in any case, it drives better welfare results than discretion (a result confirmed by Clarida *et al*, 1999, and Galí, 2003, among others).

strictly of the European case, to most of the small countries joining the EMU, monetary policy of the ECB is far from the optimal policy that should be directed towards the specificities of these economies. For most of these countries, monetary policy works like a non-optimal rule, enforced by a supra-national institution.

Simple rules, as those widely explored in Taylor's (1999a) volume, can, in general, be represented by the following instrument rule (*e.g.*, McCallum, 2001):

$$r_t = (1-\rho_r)\left[\rho + \phi_\pi(\pi_t - \pi^*) + \phi_y(y_t - \overline{y}_t)\right] + \rho_r r_{t-1} \qquad \phi_\pi, \phi_y > 0, \quad \rho_r \in (0,1)\,. \quad (29)$$

r_t stands for the nominal interest rate, π_t and π^* for the inflation rate and its target value, ρ is the constant steady-state real interest rate, and ρ_r stands for the nominal interest rate smoothing parameter. With slight variations, a simple interest rule of this type has become quite standard in the literature as a monetary policy rule, especially for closed economies (such as the U.S. or the EMU area), as it is supported on both theoretical and empirical grounds in a sticky-prices environment. The rule combines the interest-rate feedback Taylor rule with interest rate smoothing. On the one hand, the Taylor rule is successful in mimicking central banks' behavior and it exhibits the above-mentioned properties relative to the optimal policy. On the other hand, and in spite of its weak theoretical support, interest rate smoothing has strong empirical support from the practice of central banks.[23]

2.5 A Stylized Labor Market Reform - The Case of Unemployment Benefits

Labor market reforms have two major positive macroeconomic effects: by increasing real wage flexibility, reforms improve stabilization of costs-push shocks and reduce equilibrium unemployment, thus, increasing the flexible-price output. Saint-Paul and Bentolila (2000) refer to these as the "increasing the economy's adjustment potential" and the "increasing the economy's average performance" effects, respectively.

In this subsection we first argue on how unemployment benefits reduction works as a relevant example of labor market reform and define three different implementation processes. Then, we report the calibration values for the different alternatives at hand.

The Insider Wage Bargaining Model in Layard *et al* (1991) and the Job Search Model (Mortensen and Pissarides 1999) predict that, in contrast with other LMI reforms, a reduction in the unemployment benefit unambiguously reduces equilibrium unemployment. Among others (such as the duration of entitlement, the coverage and the strictness of the benefit system), the level of the benefits is often empirically assessed as having an important impact on the equilibrium unemployment level. Nickell *et al* (2003), providing a review of empirical works, conclude that the average results collected in the literature point to a rise of 1.11 percentage points in equilibrium unemployment induced by a 10 percentage point rise in the unemployment-replacement ratio. Moreover, Nickell *et al*'s

[23] For rather exhaustive reviews on interest rate smoothing, see, among others, Lowe and Ellis (1998), Rotemberg and Woodford (1999), Sack and Wieland (1999) and Srour (2001).

(2003) own results show that, for the OECD countries, both the level and the duration of entitlement of the unemployment benefit have a positive impact on unemployment, while only the former has a positive significant direct effect on real wages. Table 1 illustrates the replacement ratio and the duration index of the unemployment benefits for the selected OECD countries.[24]

	1988-95 Unemployment Benefit	
	Replacement Ratio	Duration Index
Europe		
Austria	0.34	0.74
Belgium	0.48	0.77
Denmark	0.64	0.84
Finland	0.53	0.53
France	0.58	0.49
Germany (w)	0.37	0.61
Ireland	0.40	0.39
Italy	0.26	0.13
Netherlands	0.70	0.57
Norway	0.62	0.50
Portugal	0.65	0.35
Spain	0.68	0.27
Sweden	0.72	0.04
Switzerland	0.61	0.18
United Kingdom	0.22	0.70
Average	**0.52**	**0.47**
Other OECD countries		
Australia	0.26	1.02
Canada	0.58	0.22
Japan	0.30	0.00
New Zealand	0.29	1.04
United States	0.26	0.18
Average	**0.34**	**0.49**

Source: Nickell et al (2003)

Table 1: Unemployment Benefit Replacement Ratio and Duration Index in OECD countries

Unemployment benefits are characterized by working as a state-provided insurance device, and also by playing a role in wage formation, providing a lower bound for wage setting.

As a pure insurance device, unemployment benefits can hardly generate harmful effects on employment. In contrast to other LMI, unemployment benefits redistribute welfare from the employed to the unemployed (Saint-Paul, 2000), which provides incentives to the decisive voter (employed) to claim low levels of unemployment benefits and, thus, of wages (insurance effect). Such redistribution results from the combination of five effects: (i) insurance is far more important to the unemployed; (ii) exposure, and thus the need for insurance, decreases with the level of employment; (iii) financing of unemployment benefits is a tax burden to the employed; (iv) by reducing search efforts unemployment benefits increase unemployment duration, and thus, the associated tax burden; and (v) a higher tax burden may lead to higher gross wage claims, which, in turn, will lead to lower

[24] The measure of benefit duration is the level of benefit in the later years of the spell of unemployment normalised on the benefit in the first year of the spell (Nickell *et al*, 2003).

job creation, increasing the employed workers' exposure to unemployment.

However, through its influence in wage formation, unemployment benefits affect real wage flexibility and, thus, equilibrium unemployment. On one hand, a rise in unemployment benefits improves the outside option for the employed, thus raising the bargained wage (wage effect). But, on the other hand, firms respond to higher bargained wages with lower demand for labor, raising unemployment, which increases exposure as well as the induced tax burden (employment effect).

Summing up, the wage effect provides incentives to high benefits claims by the employed while the insurance and employment effects provide incentives to the opposite. If the former effect is strong enough, a reduction in the unemployment benefit is expected to increase real wage flexibility, reduce equilibrium unemployment and improve adjustments to shocks.

We now model the reform process consisting of a reduction in the unemployment benefit ratio (b), under three alternative implementation processes: the baseline reform process consisting of a one-shot, pre-announced reform; a reform gradually implemented; and an unexpected reform process.

Pre-announced reforms: one-shot *vs* gradual implementation Pre-announced reform processes are modelled under two assumptions. First, the reform is announced previously to implementation, so that decentralized agents can adjust their expectations accordingly. Second, rational agents perceive the permanent effects of reform on FP-output and also on the parameters of the model. In particular, we assume that b takes a new permanent lower value, by 10 percentage points (pp), inducing a permanent change in $\overline{y}$.

We start by generally define a gradual reform process since it also embeds the baseline case of a reform operating instantaneously (one-shot reform). To capture a gradual path of reform, we proceed an analogy with a permanent, but gradual, technological change. This is appropriate, since permanent technology shocks have, like reforms, long-lasting gradual effects over FP output. Following the literature on modelling permanent technological shocks (as, for instance, in Blanchard and Quah, 1989, and in Galí *et al*, 2003), the gradual reform path can be modelled as

$$\Delta\overline{y}_t = \rho_{\overline{y}}\Delta\overline{y}_{t-1} + \frac{\partial\overline{y}}{\partial b}\Delta b_t, 0 \leq \rho_{\overline{y}} < 1 \begin{cases} \Delta b_t < 0 \Leftarrow t = first \quad implementation \quad period \\ \Delta b_t = 0 \Leftarrow otherwise \end{cases} . \tag{30}$$

Where $\overline{y}$ is the FP equilibrium-output level in steady state and Δb_t stands for a shock term that differs from zero only in the period when the reform starts being implemented. Equation (30) describes a gradual path for b (the reform process) that can be translated in terms of $\overline{y}_t$ through the structural relationship between the two variables (see equations 17 and 19). This is, of course, a particular description of a gradual reform; it produces diminishing effects as time goes by; and a higher correlation parameter, $\rho_{\overline{y}}$, corresponds to a longer implementation period and to a smaller first impact of the reform. In this respect, in the first period of reform implementation, $\Delta b_t = -0.1(1 - \rho_{\overline{y}})$. This particular description of the reform process is useful in accounting for the fact that private agents are

aware of the gradual reform effects ($\rho_{\overline{y}} > 0$) in contrast with a reform that is fully implemented in a given period ($\rho_{\overline{y}} = 0$ for the one-shot reform) and where $\Delta b_t = -0.1$. Under both processes there are fully-expected permanent effects on FP output. Accordingly,

$$\overline{y}_t = \overline{y}_{t-1} + \Delta\overline{y}_t. \tag{31}$$

Also, as economic agents are aware of the full effects of the reform on the parameters of the model, we assume that the parameters depending on the reform take their final FP values from the first period of reform implementation.

Unexpected reform An unexpected reform could apply to the case where a reform is discussed (with an uncertain outcome) between the relevant parties, previously to being effectively implemented by the regulatory authority. Economic agents are not fully aware to what extent their suggestions will be taken into account by the policy authority and the reform will be, at least, partially unexpected. We simplify by considering a totally unexpected one-shot reform, thus neglecting the reform negotiation process and the ex-post possibility of non-implementation.

Without the announcement of the reform, economic agents can not perceive its impacts in period t: firms and consumers have no *a priori* incentive to adjust supply and demand to the new $\overline{y}$. A non-announced reform works as a shock to the agents in period t, the effects being then fully perceived after implementation: that is, the new $\overline{y}$ is fully perceived in $t+1$. In order to capture these effects, it is assumed a temporary shock in b, while $\overline{y}_t$ remains at its pre-reform level ($pre-reform\ FP$) with $\Delta\overline{y}_t = E_t\left\{\Delta\overline{y}_{t+1}\right\} = 0$. From $t+1$ onwards, adjustments will combine the temporary shock effects with those of a permanent change in $\overline{y}$ ($after-reform\ FP$) - just like a pre-announced one-shot reform modelled just above.

Recalling the wage offer curve (16), the unexpected reduction in b reduces real wage claims by $0.1\overline{d}_3$. In the first period, the reform implementation effects are, thus, similar to those of a positive cost-push shock. Accordingly, the aggregate supply curve is now described by

$$\begin{aligned}
&\pi_t = \beta E_t\{\pi_{t+1}\} + k\left(y_t - \overline{y}_{t(pre-reform\ FP)}\right) + \lambda\left[\overline{d}_3\Delta b_t\right] + \mathtt{u}_t \Leftarrow t = first\ implementation\ period\\
&\pi_t = \beta E_t\{\pi_{t+1}\} + k\left(y_t - \overline{y}_{t(after-reform\ FP)}\right) + \mathtt{u}_t \Leftarrow otherwise\\
&with \quad \Delta b_t = -0.1.
\end{aligned} \tag{32}$$

Also, for simplification, the parameters are set at their new FP levels when evaluating the path of the adjustments to reform. Effects of this assumption are negligible because there is only one period during which decentralized agents are not aware of the reform.

The proposed scenarios and reform processes, as well as the corresponding calibration (exhaustively motivated in Appendix B), will be in use, in subsection 3.3, below, to measure reform transition costs and long-term effects. But first, we need to identify more precisely the potential costs and benefits associated with reform, and to define the measurement methodology.

3 Evaluating Reform Effects

In this section we first propose the methodology to evaluate the effects of a labor market reform, both permanent welfare effects as well as those associated with the political sustainability of the reform. Using this methodology, we next evaluate the political support and the stabilization costs of reform implementation, accounting for both permanent and short-run effects. To better understand the latter, we also plot the impulse response functions corresponding to the adjustments to reform implementation, until the new FP equilibrium is attained.

3.1 Criteria for evaluating political support costs

Evaluating the political support of a reform requires the definition of the political interest group as well as measuring the time it takes for positive effects to emerge. In what concerns the former, Saint-Paul (1996) stresses that exposure effect, among others (such as constituency and identifiability effects), delimits the decisive groups in voting for/against reforms. As for the latter, the upfront of costs relative to benefits of reform results from the fact that the positive impact on the supply side does not automatically lead to a full response from the demand side (see, among others Gordon, 1996; Bean, 1998; and Saint-Paul, 2002). This, in turn, results mainly from the presence of either nominal (Bean, 1998) or real persistence phenomena (*e.g.*, habit formation, unemployment hysteresis effects) that delay employment and/or real wage gains (Alogoskoufis *et al*, 1995).

As an alternative to Saint-Paul's, a simpler and more feasible approach is to treat the issue of political support abstracting from the multiple political equilibria that may arise from constituency and identifiability effects, focusing on the "exposure effect" and on the time it takes for positive reform effects to emerge. To implement that, we must define the decisive voter and identify the channels through which the reform affects his welfare.

The decisive voters are usually the employed (insiders): they constitute most of the labor force at which the reform is targeted, and are endowed with bargaining power by the existence of labor turnover costs; unemployed (outsiders) are fewer, are not so well organized in unions and are likely to be much less homogeneous (Saint-Paul, 2002). According to Saint-Paul's (1996, 1999) political economy approach, current LMI arise from, and are sustained by, the political support of the decisive voter, who benefits from high rents – high labor income relative to the outside option – at the expense of employment. In this context Saint-Paul (1996) identifies the relevant channels through which LMI, and thus reform, affect the welfare of the decisive voter. These mechanisms are a simplification because welfare is determined only by labor income-related components; other income sources as well as other features that may affect worker's welfare, such as social security transfers in specie or working conditions, are absent. The welfare of the employed results from an actualized weighted average of current and future expected incomes while employed or unemployed.

The channels identified by Saint-Paul (1996) are the following:

(i) LMI affect welfare through their impact on the equilibrium real wage – this effect is stronger when the labor demand elasticity is lower. LMI affect the outside option (*e.g.*,

unemployment benefits), the workers' rents (*e.g.*, employment protection legislation improving worker's bargaining power) and the marginal productivity of labor (*e.g.*, minimum wage legislation).

(ii) Exposure welfare effects – LMI affect the probability of an employed worker becoming unemployed (exposure); the higher the exposure, the higher the support for policies that improve the welfare of the unemployed.

(iii) The probability of remaining employed – turnover effects – exhibits complementarity relative to exposure. Policies reducing exposure usually increase the probability of staying employed (*e.g.*, tight employment protection legislation).

(iv) LMI also affect the tax burden – on the one hand, because some of them are directly financed through taxes and, on the other hand, as long as they determine unemployment, putting upward pressure on unemployment compensation and social assistance expenditures.

A sustainable reform requires the decisive voter to be better off, in the long run. However, transition may bring costs and permanent benefits may take time to surface. This balance, that may jeopardize reform, can be illustrated by using the reform described in 2.5, above, where we have identified the effects of unemployment benefits on real wage flexibility. We proceed to analyze (see Table 2) the qualitative impacts (and timings) of these effects on the welfare of the employed and the unemployed.

Immediate Effects		**Employed workers' welfare**	**Unemployed workers' welfare**
Insurance Effect:	Δ^- unemployment protection	-	-
Insurance Tax Effect:	$\Delta^- \tau \Rightarrow \Delta^+$ net real wage	+	
Wage Effect:	Δ^- outside option $\Rightarrow$ $\Rightarrow \Delta^-$ bargained wage $\Rightarrow \Delta^-$ real wage	-	-
Non Immediate Effects **(Δ^+ wage flexibility $\Rightarrow \Delta^+ y \Rightarrow \Delta^+ n^d \Rightarrow \Delta^- u$)**		**Employed workers' welfare**	**Unemployed workers' welfare**
Labor Demand Wage Effect:	$\Delta^+ n^d \Rightarrow \Delta^+$ real wage	+	+
Employment Effect:	$\Delta^- u \Rightarrow \Delta^-$ exposure	+	+
Employment Tax Effect:	$\Delta^- u \Rightarrow \Delta^- \tau \Rightarrow \Delta^+$ net real wage	+	

Table 2: Effects of a Reduction in Unemployment Benefits

As the table shows, all the non-immediate effects are welfare improving while some of the immediate ones are not. Thus, it is useful to derive a welfare measure to capture

- the quantitative impacts on welfare, and
- how long it takes for the positive non-immediate effects to outweigh the negative immediate ones.

A "labor-related" welfare measure We propose now a "labor-related" welfare measure to evaluate the political support of reform. According to Saint-Paul (1996) the decisive voter is an employed, unskilled or semi-skilled, as these groups represent more than 70% of the European labor force. In our case, it is useful to "de-homogenize" the representative agent defined in 2.1, above, splitting it into the representative employed and the representative unemployed. Since no differences in skills are considered, the decisive voter is simply the representative employed. In case of external conflict resulting from different balances of the effects of the reform, while the employed can obstruct an adverse reform, the unemployed can not.[25]

The definition of the welfare of the representative employed follows. To start with, since the main source of income to the representative labor force agent comes from the labor relationship, we assume that income from other sources is negligible.[26] The "labor-related" income includes, in general, not only the direct wage, and its complements, but also the social benefits for which the labor force is eligible even in non-work situations (such as family and sick benefits, and unemployment benefits).[27] In our stylized case, the "labor-related" income comprises only the direct wage and the unemployment benefit.

Following Saint-Paul (2000) we consider, as before, that each representative labor force agent lives for several periods and that his utility (V_t), in real terms, is defined by the present discounted value of his expected "labor-related" income.

$$V_t = \sum_{s=t}^{T} U_s \frac{1}{(1+\rho)^{s-t}}, \quad U_s = U\left[p_s(W/P)_s(1-\tau_s) + (1-p_s)(bW/P)_s\right] \tag{33}$$

where ρ is the steady-state real interest rate; U_s is the expected utility at s given the information available in t, p_s is the probability of being employed in period s conditional on the information available in t; $(W/P)_s$ stands for the real wage an individual is expected to earn if employed at time s, while $(bW/P)_s$ is the real unemployment benefit an individual is expected to receive if unemployed at date s. Nominal wages and the price level are determined in the model as presented in subsections 2.1 and 2.5, above. In equation (33) employed workers' income is net after taxes, with the tax rate (τ) respecting the assumptions outlined above in subsection 2.1, equation (3). V_t stands for the present value, in t, of the welfare of each representative labor force agent between t and T.

Rewriting equation (33) recursively, we get

[25] If, in addition, skill differences among the employed were accounted for (as in Saint-Paul, 1996 and 2000), an internal source of conflict between different skills could emerge.

[26] This is a simplification relative to what has been assumed for the representative agent in 2.1, where firms' profits and interest from savings are also part of income. In the political support framework, we consider that profit-earning employed and unemployed, are neither politically relevant nor a target for the reform.

[27] For a detailed list of the benefits that may be include in labor-related income, see, for instance, the interpretative guide of the *OECD Database - 1980-1998, 20 Years of Social Expenditure*. Pensions and services for the elderly and disabled should not be included because the recipients are no longer in the labor force.

$$V_t = U_t + \beta E_t V_{t+1}, \quad \beta = \frac{1}{1+\rho}, \tag{34}$$

where E_t denotes the expectation conditional on information available at t. Using equation (34) we can distinguish between the welfare of the employed (decisive voter) and that of the unemployed. Assuming that the individual knows if he is employed or unemployed in period t, the following equations are, respectively, the employed worker's (Ve) and the unemployed worker's (Vu) welfare functions:

$$Ve_t = U_t[(W/P)_t(1-\tau_t)] + \beta E_t[(1-S_t)Ve_{t+1} + S_t Vu_{t+1}]. \tag{35}$$

$$Vu_t = U_t[(bW/P)_t] + \beta E_t[F_t Ve_{t+1} + (1-F_t)Vu_{t+1}]. \tag{36}$$

S_t denotes the probability an employed worker has of loosing his job between t and $t+1$ and F_t stands for the probability an unemployed worker has of finding a job between t and $t+1$. U is defined as the log of consumption (in this case fully financed with "labor-related" incomes), as described for the representative agent in subsection 2.1 (equation 1), above.

We allow all variables to be time dependent in order to capture changes during the transition period after the implementation of the reform. In steady-state equilibrium, before reform implementation or after full adjustment having occurred to the new potential output in response to reform, both incomes and labor-force flows (into and out of employment) are constant.

The model also verifies $(1-F) = S = \overline{u}$ in steady state, in order to make equilibrium-unemployment determination compatible with the one arising from job matching models. Consider the following flow equilibrium:

$$\begin{aligned} \mathtt{U}_t - \mathtt{U}_{t-1} &= S_t N^d_{t-1} - F_t \mathtt{U}_{t-1} \\ u_t - u_{t-1} &= S_t(1-u_{t-1}) - (1-u_t)u_{t-1} \\ S_t &= u_t, \quad N^s_t = 1, \quad \forall t, \end{aligned} \tag{37}$$

where $\mathtt{U}$ stands for the unemployment level. Because of the use of the unemployment rate as a proxy for the probability an unemployed worker has of not finding a job and given the constant labor supply, the job-separating and job-finding rates are complements, $\forall t$.[28] Note, however, that under a variable labor supply, complementarity between the two rates would occur only in the steady state.

For $T \to \infty$, Ve and Vu can be solved forward to yield the following steady-state expressions.

[28] This also conforms to the derivation in Belot and van Ours (2004). They also set $F_t = (1-S_t)$, where F_t stands for the total employment in all firms and, given a constant labor force also normalized to 1, it corresponds to a probability of being employed equal to the fraction of the employed labor force, by definition $(1-u)$.

$$Ve_{(SS)} = \frac{(1-\beta\overline{u})}{1-\beta}U[(W/P)(1-\tau)] + \frac{\beta\overline{u}}{1-\beta}U[bW/P]. \tag{38}$$

$$Vu_{(SS)} = \frac{\beta(1-\overline{u})}{1-\beta}U[(W/P)(1-\tau)] + \frac{[1-\beta(1-\overline{u})]}{1-\beta}U[bW/P]. \tag{39}$$

Inspection of (35) and (36), together with the assumption $S = (1-F)$, shows that $Ve_{(SS)}$ and $Vu_{(SS)}$ differ only in the first period incomes. This justifies why the real unemployment benefit is relatively more important to the current unemployed workers, while the net real wage affects relatively more the current employed ones (recall the effects in Table 2, above). Given the complementarity between F and S, if a reform is to be implemented after the current period, it will yield the same expected effects (gains or losses) on the welfare of either a current employed or a current unemployed worker. In this case, and in spite of different permanent (steady-state) welfare gains, transition effects are common to both labor-force groups.

Using the measure for transition-costs evaluation Analysis of steady-state welfare is useful to assess the sustainability of the reform in the long run. However, since we take this as given – otherwise reform would not make sense at all – the main issue to the political support to the reform concerns the costly adjustments to the new FP equilibrium. We analyze, below, in subsection 3.3, how these adjustments vary with the scenarios for the economy, the processes of reform implementation and the policy rules. Policy choice combined with different environments may reduce the likelihood of reform because it may conduct economic variables along a slower path towards the new steady-state equilibrium (see, among others, Blanchard *et al*, 1986, Gordon, 1996, and Bean, 1998) and so, postpone the gains from reform.

In order to analyze the short-run costs, attention is given to the time horizon that voters have when they face the decision of whether to support a reform or not. According to several empirical studies from the political business cycle literature, voters seem not to be fully rational nor purely forward-looking.[29] Moreover, infinite time horizon may not be a realistic assumption to compute welfare. According to Bean (1998), political feasibility of reforms is often jeopardized because when losses precede gains, voters do not look sufficiently ahead. Hence, we assume that the time horizon is relevant for gains to effectively affect voters' welfare. In fact, we rely on the theoretical argument of Lächler (1984) to justify political cycles under rational expectations behavior of the voters: he argues that the vote outcome reflects the welfare maximization of the median generation, characterized by a finite time horizon and imperfectly altruistic in the choices regarding future generations' welfare. Following this line of thought, it seems reasonable to assume that the longer it takes for positive effects of the reform to operate, the lower is its political support.[30]

[29] See, among others, Keil (1988) on the British voters' behavior and Smyth *et al* (1994).

[30] Assuming agents infinitely lived in the derivation of the model, above in chapter 2, had the purpose of making expenditure decisions inter-temporally dependent, with a view to mimic the dynamics of aggregate variables accordingly to both theoretical and empirical fundamentals. In any case, having infinite-lived

Considering, for simplicity, rational behavior of the voters, we evaluate the political acceptance of reform implementation as a function of the time it takes to generate benefits to the decisive voter's welfare. For different scenarios, different monetary policy conducting and different types of reform process, we compute the shortest time period horizon ($p-lim$) the representative labor force voter must have in order to ensure political support to reform implementation.

The $p-lim$ period is defined considering the following:

- the employed must decide in period t whether he is in favor or against reform implementation in $t+1$;
- using equation (35), the welfare of the decisive voter is compiled for the n-periods following t, starting with the shortest time horizon ($n=1$);
- taking expectational welfare values as the true ones, we compute:

- the welfare without reform (Ve_0), using current steady-state values of incomes and flow probabilities, and
- the welfare with reform implementation (Ve), using the values of incomes and flow probabilities recovered from the impulse responses of the endogenous variables to a permanent shock in the unemployment benefit replacement ratio.

The $p-lim$ period corresponds to the shortest time horizon that verifies

$$Ve \geq Ve_0,$$

and, thus, can be defined as the shortest time horizon that agents have to wait until they enjoy net welfare gains from the reform. Results of the political support for the reform are presented and analyzed, below, in 3.3.

3.2 Evaluation of Permanent Effects

As explained above, in 3.1, the impact of a reduction in the unemployment benefit ratio may affect differently the welfare of the representative employed and unemployed. Political support by each representative member of the labor force is also linked to the starting level of the benefit, in addition to its changes.

Notes on the optimal unemployment replacement ratio As we have already explained (subsection 2.5, above), the rationale for unemployment benefits rests, largely, on insurance motives rooted in the risk-averse behavior of workers: they prefer a certain income to a variable one that has the same average value, a feature captured in the model's utility function (equation 1, above).

Figure 1 plots the steady-state "labor-related" welfare values for the employed and the unemployed workers against the plausible range of b (unemployment-benefit replacement

agents does not mean that agents are the same all the time but, instead, should be interpreted as a continuum of finite-lived agents through time.

ratio) values. Given the model calibration, there exists optimal b levels (*i.e.*, steady-state welfare maximizing) for the employed and the unemployed. The employed workers' optimal b level is lower (0.3) than that of the unemployed (0.4), a result qualitatively in line with Holmlund's (1998), where preferred unemployment benefit rates are computed using a search-matching framework. The reason for the unemployed to require a higher b is that the unemployment-benefit insurance effects are larger while the tax effects are smaller relative to the employed workers'. If the unemployment benefit is either too generous (above 0.4) or too small (below 0.3), it harms both the employed and the unemployed. Unemployment-benefit reduction improves labor market matching (positive employment effect) and net real wages (positive wage effect), while reducing income for the unemployed (negative insurance effect); when b is high, the first two effects appear to dominate the insurance effect, while the opposite happens for low values of b. Also, when a reduction in b improves (diminishes) welfare, the employed experience higher gains (lower losses) than the unemployed resulting, in line with the conclusions of Holmlund (1998), from differentiated insurance effects: the unemployed are currently affected while the employed will only be affected in the future, if they become unemployed.

Using the simulations from Figure 1, we can also determine the unemployment benefit replacement ratio for which the unemployment benefit compensation ruins incentives to work; under our baseline calibration, if the replacement ratio is higher than 0.85, being unemployed is more appealing than being employed ($Vu > Ve$).

In the reform example we have been simulating, a reduction in the unemployment benefit replacement ratio from 0.7 to 0.6, both pre and post-reform unemployment benefit ratios are above the optimal level for the unemployed. As a consequence, positive permanent effects on welfare result higher for the employed relative to the unemployed. The reasons for the unemployment benefit ratio to be, arguably, higher than optimal in many countries (compare, for example, our optimal value between 0.3 and 0.4 with the actual values for the countries in Table 1, above) may result from historical maladjustment: the optimal level may have changed without the corresponding adaptation of labor market legislation, which may not change as frequently.[31]

Breakdown of permanent reform effects Table 3 illustrates the breakdown (as described in Saint-Paul, 2000) of steady-state effects on the "labor-related" welfare of the employed and the unemployed, of a reduction from 0.7 to 0.6 in the unemployment benefit ratio. It confirms the positive effects on the steady-state welfare of both employed (1.679) and unemployed (1.51).

Three additional conclusions can be drawn from Table 3.

First, insurance and real wage effects hit negatively both the unemployed and the employed. While real wage effects are the same whatever the worker situation, the insurance effects are stronger for the unemployed. Real wage effects reflect the specific form of the

[31] According to our model, the balance of tax, wage, employment, and insurance effects, and, thus, the optimal level of b, is mainly determined by the same variables that determine unemployment, for example, the firms' market power, labor intensity and the trade unions' bargain power (see equation 17, above).

	Employed	Unemployed
Insurance Total	**-0.274**	**-0.425**
Insurance	-1.104	-1.247
Tax	0.831	0.822
Employment	**2.148**	**2.130**
Flows	0.571	0.571
Tax	1.576	1.559
Real Wage	**-0.195**	**-0.195**
Total	**1.679**	**1.510**

Table 3: Breakdown of Permanent Effects of the Reform on the Welfare of the Labor Force

workers' utility function: if workers were risk neutral, with a linear utility function on "labor-related" incomes, this effect would be stronger for the employed. In respect to the insurance effect, the asymmetry reflects the fact that the unemployed are the ones who are currently dependent on unemployment benefit compensation, while the employed only face the risk of unemployment in the future.

Second, employment effects are stronger on the employed than on the unemployed. Given our assumption that the probability of keeping a job equals the probability of finding a job if unemployed[32], the flow effects are the same for both group of workers because their expected future employment situation is equally weighted by considering the expected unemployment rate. However, the effects of tax rate reduction, due to the positive indirect effects of the reform on the unemployment rate, are slightly higher for the employed: they currently affect the employed while actual unemployed see these effects postponed for future dates. The same reasoning applies to the insurance tax effects, capturing the direct effect of the change in b on the tax rate.

Third, the amount of the tax effects provides an illustrative example of how the model assumptions may change the steady-state effects of reform. If, instead of being determined by the need to finance the unemployment-related expenditure (recall equation 3, in subsection 2.1, above), the tax rate were constant (zero tax effects), there would be no political support for the reform because, as Table 3 shows, the positive flow effects are not large enough to compensate for the insurance and real wage negative effects. Another example would be if entry/separating rates from unemployment were not fully indexed to the level of unemployment, in which case, flow and tax effects would be smaller. Generalization of these conclusions should, thus, be taken carefully. In particular, the results are sensitive to the starting level of the unemployment-benefit replacement ratio and to the model calibration.

[32] An assumption to keep the model in line with the equilibrium search model approach (recall equation 37, in section 3.1, above)

3.3 Evaluation of Transition Costs

We proceed with exploring the adjustments to a reduction by 10 percentage points in the unemployment benefit replacement ratio, for the three reform processes as defined in subsection 2.5, above. In particular, gradual and unexpected reform processes are analyzed under the no habit formation scenario (baseline scenario). As for the one-shot, pre-announced reform, it applies for different degrees of habit persistence. The adjustments are also studied under different assumptions for monetary policy conducting: following OMP rules, either through discretionary or commitment behavior, or following the simple Taylor rule (TR). When the reform is pre-announced, optimal monetary policy delivers always $\pi_t = \widetilde{y}_t = 0$, and so the AS does not constrain the monetary authority optimization problem. The reform does not produce a trade-off between inflation and output-gap stabilization, thus making the distinction between discretionary and commitment behavior irrelevant. In OMP conducting we assume, as default, $\omega_{\widetilde{y}} = 0.01$, which corresponds to a 3.8% annualized weight attached to output-gap stabilization. When results are expected to be sensitive to the relative weight put on price stabilization, we also consider outcomes under the extreme opposite case – $\omega_{\widetilde{y}} = 1$, a 80% annualized weight put on output-gap stabilization. In regard to the TR, and in spite of considering interest rate smoothing in the evaluation of the transition costs and the permanent effects of reform, below, illustrative adjustments in this subsubsection refer only to the simple TR.

In the case of the one-shot, pre-announced process, reform implementation leads to short-run adjustments similar to those implied by a negative demand-side shock – this view of reform as a recession is also noted by Saint-Paul (2002). The announced reduction in b directs expectations to a higher FP output level, thus increasing the output gap, and leads to price reduction due to a fall in nominal bargained wages caused by the unemployment benefit reduction. Gradual and unexpected reforms, in contrast, exhibit patterns of cost-push shock adjustments.

Table 4 shows the results of our evaluation of the political support to the reform. It shows the gains (net of transition costs) accumulated in the 20 periods after reform implementation, and the breaking-time horizon for political support ($p - lim$, defined in 3.1, above), considering alternative scenarios, alternative reform processes and different monetary policy rules. The net gains represent the increase in welfare attributable to the reform, *i.e.,* $Ve - Ve_0$, as defined in 3.1, above, where it was also explained that, due to complementarity between the job-separating and job-finding rates, the net accumulated gains accruing to the employed equal the ones obtained by the unemployed.

Figure 2 illustrates, for the case of high habit persistence under the TR, the relationship between the timing of political support and the net accumulated gains along the way.

We next analyze in detail the adjustments under each case and its implications for the political support results recorded in Table 4.

Adjustments under no habit persistence (baseline scenario) – one-shot, pre-announced reform Perfectly aware of the reform design, agents immediately expect b to take the new FP value such that $\Delta b_t = 0$ (see equations 16 and 21 in subsection 2.3, above).

	Scenarios		Political Support							
			Breaking time horizon for political support p-lim				Net accumulated gains Ve-Ve$_0$ (t=20)			
			OMP		TR		OMP		TR	
			D	C	simple	smoothing	D	C	simple	smoothing
1	Baseline *(h=0)*		1		1	1	0.2842		0.2842	0.2842
2	Low habit formation *(h=0.5)*		Baseline		4	4	Baseline		0.2193	0.2334
3	High habit formation *(h=0.7)*		Baseline		9	8	Baseline		0.1461	0.1767
4	Gradual reform *($\rho_y = 0.7$)*		13		5	5	0.0945		0.1918	0.1745
5	Unexpected reform	$\omega_y = 0.01$	8	7	8	8	0.1699	0.1811	0.1580	0.1621
		$\omega_y = 1$	9	9			0.1536	0.1558		

OMP - C: Optimal Monetary Policy under Commitment

OMP - D: Optimal Monetary Policy under Discretion

TR: Taylor Rule

Table 4: Evaluation of Political Support

On the supply side, firms expect demand to rise to the new FP output equilibrium level ($\overline{y}$). Higher real wages, due to employment pressure, fully crowd out the effects of a lower unemployment benefit on firms' paid wages, and thus on marginal costs; as current and expected marginal costs are constant, there is no incentive for price changes in t nor in the subsequent periods – $\pi_t = 0$.

As for the demand-side, combining the IS function (recall equation 5, above in 2.1), under no habit persistence ($h = 0$), with the real interest rate (rr_t) definition, the FP equilibrium real interest rate ($\overline{rr}_t$) yields

$$\overline{rr}_t = \rho + E_t\{\Delta\overline{y}_{t+1}\} + v_t = \rho + E_t\{\Delta a_{t+1}\} + v_t. \tag{40}$$

After reform, current demand is immediately driven to the new FP output equilibrium level as current and expected inflation remains at zero because monetary policy ensures both price and output-gap stabilization; while the expectations of future output gap and inflation are zero, the long-run real interest rate ($\overline{rr}_t$) remains constant at ρ because the reform is one-shot, leaving no expectations of future changes in the FP equilibrium-unemployment rate – see equation (40), above.

Even under the Taylor rule, which does not allow the nominal interest rate to optimally fluctuate with the FP real interest rate, there is full adjustment to the new FP equilibrium. The reason, again, as noted above, is that the real interest rate does not change, as reform is fully implemented in period t.

Figure 3 shows output, nominal interest and inflation rates and output-gap responses to a permanent change in the FP output level induced by a decrease in b. The responses are common to optimal and non-optimal monetary policy conducting. Because of the immediate adjustment to the new FP equilibrium, under this scenario there are no political costs and permanent positive effects of the reform show up immediately.

Adjustments under habit formation – one-shot, pre-announced reform In this scenario we allow for consumption smoothing, as described, above, in subsection 2.1. Figure 4 shows adjustment responses to the reform under the optimal and the simple Taylor rule with h set at 0.5 (recall, again, equation 5 in 2.1).

The main implication of this scenario is that the private demand impulse is not sufficient to immediately attain the new $\overline{y}$. As the FP unemployment rate falls, the long-run real interest rate now decreases in the period of reform implementation, as can be checked in the expression below, that results from adapting the equilibrium real interest-rate equation (40), above, to the case of habit persistence.

$$\begin{aligned} \overline{rr}_t &= \rho + h_1 E_t\{\Delta\overline{y}_{t+1}\} + h_2 E_t\{\Delta\overline{y}_{t+2}\} + \\ &\quad + h_3\{\Delta\overline{y}_t\} + \frac{1}{(1-\beta h)}[v_t - \beta h E_t\{v_{t+1}\}], \qquad (41) \\ with \quad h_1 &\equiv \frac{(1+\beta h^2)}{(1-\beta h)(1-h)}; h_2 \equiv -\frac{\beta h}{(1-\beta h)(1-h)}; h_3 \equiv -\frac{h}{(1-\beta h)(1-h)} \\ and \quad & h_1 + h_2 + h_3 = 1. \end{aligned}$$

In the reform implementation period, $\Delta\overline{y}_t > 0$, while in the subsequent periods, $E_t\{\Delta\overline{y}_{t+1}\} = E_t\{\Delta\overline{y}_{t+2}\} = 0$. The change in $\overline{rr}_t$ keeps the current real interest rate above the FP equilibrium level, refraining consumption and causing a negative output gap. When compared to the baseline scenario, the conduct of optimal policy (OMP) works exactly in the same way to influence demand and supply behavior, but now private demand inertia requires active expansionary monetary policy alongside with the reform. The only way to promote a zero output gap consistent with price stabilization is to lower the nominal interest rate. The conduct of the OMP, pushing the desired demand to the new $\overline{y}$, keeps, as in the baseline scenario, firms from changing prices and ensures equilibrium since t with $\pi_t = \widetilde{y}_t = 0$. OMP eliminates the effects of inertia in private demand and so nominal interest rate recovers, in $t+1$, to the pre-reform level (Figure 4-C, solid line). Although through a different mechanism relative to the baseline case, OMP ensures no political support costs, because the policy faces no constraint regarding output-gap - inflation stabilization: under habit persistence and OMP, the real interest rate diminishes to fully incentive demand towards the new equilibrium output level, thereby eliminating deflation pressures; therefore, OMP is expansionary.[33]

Under the TR, adjustment to the new FP output level is slower, thereby originating stabilization costs. Immediate adjustment under the TR would only occur if the FP real interest rate did not change, which is not the case. As we have seen above, immediate adjustment requires an active monetary policy. But TR nominal interest-rate adjustment can only be triggered by inflation or output pressures, which contradicts full adjustment. Since this is understood by the agents, firms do not expect policy to fully push demand

[33]Recall that active monetary policy is not necessary in the baseline case because, with exclusively forward-looking rational expectations, the existence of a perfectly known rule ensures that private agents' actions are sufficient to the adjustment.

to the new $\overline{y}$, thereby laying the ground for inertia effects to operate. Real wages remain lower than the new FP level because employment pressure is only gradual whereas unemployment benefits reduction is immediate. Therefore, current and expected marginal costs are lower and prices follow. Summing up, the effects of reform, shown in Figure 4 (dashed line), are: gradual adjustment to the new FP output level, deflation, and expansionary monetary policy (recall Figure 3). The higher the demand-side inertia, the slower is the adjustment to the new FP equilibrium and, thus, the later will the positive output effects of the reform outweigh its negative impacts on real wages. With moderate habit persistence ($h = 0.5$), it takes four periods for workers to start enjoying the positive effects of the reform; while with higher persistence ($h = 0.7$), it is necessary to wait five additional periods. We have also concluded (results not reported in Table 4) that the larger the feedback parameters in the TR, the higher the political support for the reform; this is not surprising, as larger feedback parameters drive the TR closer to the OMP, although at the expense of higher interest-rate variability. Table 4 also shows that with interest rate smoothing reform becomes politically more appealing (higher $Ve - Ve_0$) and may even reduce the $p - lim$.

We can interpret the political-support results under demand-side inertia as supporting the "two-handed approach": to achieve the new FP equilibrium, an expansionary monetary policy is required alongside the reform; the more expansionary the policy is, the lower are political costs.[34]

Adjustments under the baseline scenario – gradual, pre-announced reform Figure 5 depicts the adjustment paths to the gradual reform defined in equation (30), with $\rho_{\overline{y}} = 0.7$, above in 2.5. Optimal monetary policy ensures, as in the previous cases, the adjustment to the new $\overline{y}$ but, because reform is gradual, output takes longer to stabilize. With pre-announcement, each step-change in b during reform implementation is concomitant with the economy's adjustment to the entire process. The economy fully adjusts to the successive changes in $\overline{y}$, but, in contrast with previous cases, nominal and real interest rates rise together. This restrictive monetary policy is required because expectations of future increases in FP output drive FP real interest rate up (equation 40, above) which incentives current consumption, putting upward pressure on prices.[35]

The TR response to the rise in the FP real interest rate is not as restrictive, therefore accommodating some inflation, with output temporarily above the FP equilibrium level.

The political support for a gradual reform is lower than for a one-shot type of reform, under either OMP or TR policy conducting. Lower political support certainly reflects the longer time it takes for reform to be implemented. As it was shown in the breakdown

[34] These results are robust if we add inflation inertia (considering an hybrid AS specification as in Galí and Gertler, 1999, Galí *et al*, 2001, and Amato and Laubach, 2003) to habit formation in the model. Moreover, results not reported show that the TR has more expansionary effects (relative to the scenario with habit-formation alone) and that, temporarily, the real interest rate is lower than its equilibrium level, driving output to rise above the new FP equilibrium. By generating larger short-run employment gains, this overshooting of y, increases political support.

[35] This effect is consistent with the permanent income hypothesis, which states that consumption rises with current as well as with expected future incomes.

of permanent reform effects, in Table 3 (subsection 3.2, above), above, most of the reform gains are derived from employment flows and tax effects. Under a gradual reform, the benefit of having, for a while, a higher insurance level, carries the cost of delayed employment-related gains relatively to the one-shot reform. In the case considered in Table 4, OMP demands a longer time horizon (thirteen periods) for reform support than the TR (five periods). Throughout the implementation process, a gradual reform rises the equilibrium real interest rate relatively to the current interest rate; this puts stronger pressure on current demand for goods and services and, consequently, on prices. OMP prevents this danger through an adequate restrictive policy as to keep inflation and the output gap at the zero target values, an adjustment against the "two-handed approach". Differences between discretion and commitment or in the relative weight put in inflation - output-gap stabilization are irrelevant since the OMP fully offsets the expansionary demand-side effects of the reform. Under the TR, the interest rate rises, but below the required level to avoid the expansionary period. A less restrictive policy occurs, thus, yielding, higher political support. In Table 5, gradual reforms, contrary to the previous one-shot reform cases in Table 4, are easier to implement the smaller the feedback parameters, *i.e.*, the farther the TR is from the costlier (in terms of political support) OMP (see McCallum and Nelson, 2004). Table 5 also shows that, in spite of smaller accumulated gains, the interest rate smoothing may improve the timing of political support if reform does not take too long to be fully implemented (lower $\rho_{\overline{y}}$).

TR feedback parameters			ρ_y=0.6		ρ_y=0.7		ρ_y=0.8	
output gap	inflation		TR		TR		TR	
			simple	smoothing	simple	smoothing	simple	smoothing
1	1.5	*p-lim*	3	2	7	7	15	15
		Ve-Ve$_0$ (t=20)	0.224	0.211	0.175	0.160	0.064	0.052
0.5	1.5	*p-lim*	2	1	5	5	13	14
		Ve-Ve$_0$ (t=20)	0.236	0.222	0.192	0.175	0.087	0.071
0.5	1.01	*p-lim*	1	1	4	3	9	12
		Ve-Ve$_0$ (t=20)	0.245	0.225	0.211	0.182	0.130	0.088

Table 5: Political Support for a Gradual Reform, under the Taylor Rule

Adjustments under the baseline scenario – unexpected reform In this case, differences in adjustment are to be expected not only between optimal and non-optimal monetary policy, but also between optimal discretionary and optimal with commitment.

The reform works as a cost-push shock that reduces marginal costs in the implementation period: real wages fall with the reduction of the outside option, while labor demand pressure rises, but not as much as the new FP level. This combination leads a fraction of the firms to lower prices in period t. The more the average price falls, the closer is output to the new FP level.

Firms that can only adjust prices in the following periods have no incentives to do so, because the effects of the reform are, by then, completely perceived. If it were not

for the impact of the first period surprise, adjustment would be the same as with the pre-announced reform. Under discretionary optimal policy, the impact of the surprise vanishes after the first period, since agents are aware that the monetary authority will respond fully to the shock in the current period.

Under commitment, the impact of the first period surprise extends to the following periods. As occurs with any other positive cost-push shock, in order to change private expectations and get an improved inflation - output-gap trade off in the first period, the monetary authority generates a transitory expansion in the following periods. Expected positive output gaps lead to weaker downward pressure in prices, and, thus, to a smaller increase in output in period t. Figures 6 to 8 represent adjustments under OMP, under commitment and discretion, compared with the TR.

In this context, and as long as OMP reflects strong preferences over inflation stabilization ($\omega_{\tilde{y}} = 0.01$, in Table 4), OMP yields higher political support than the TR. The reason stems from its relatively more inflation-averse behavior: in reaction to a cost-push shock, the TR leads to higher inflation variability and lower output variability when compared to the OMP, thereby delaying the effects on employment, which, in turn, induce gains in flows, taxes and wages. If, however, preferences are stronger in favor of output-gap control ($\omega_{\tilde{y}} = 1$, in Table 4), TR-type rules yield higher political support: $p - lim$ rises to 9 for both optimal policies, while it remains at eight periods under the TR. This is because the more reactive policy is to output-gap stabilization, the costlier is the adjustment in the first period, since policy strongly pushes output to its before-reform FP level. Gains of commitment over discretion are related with the overshooting effects on output from period 2 onwards and, as such, are reduced with the weight attached by the CB to output-gap control (recall the adjustments in the case of a one-shot reform, above, and Figures 6 and 7).

The analysis of the adjustments to either gradual or unexpected reforms show that OMP is no longer sufficient for immediate reform gains to occur. Higher political support may even be achieved under the non-optimal policy, TR. However, results can still be read in the light of the "two-handed approach": in fact, the more expansionary (or the less contractionary) the policy is, the faster is the recovery to the new FP equilibrium.

Differentiated job-finding probabilities – a note Results in Table 4 exhibit equality in the welfare gains to both the employed and the unemployed ($Ve - Ve_0$ and $Vu - Vu_0$, respectively). This results from: (i) political-support evaluation not taking into account the current, pre-reform, period; and (ii), given the assumptions for S and F (respectively the job-separating and the job-finding probabilities defined in subsection 3.1, above), implying complementarity, *i.e.* $S = (1 - F) = u$, the present discounted value of the welfare of the unemployed and the employed is the same, after the first period (recall equations 35 and 36 in subsection 3.1, above).

For the sake of exemplification, we will allow, although in an *ad hoc* way, a more realistic assumption considering that an unemployed worker has a lower probability of finding a new job than an employed worker, that is, $F < (1 - S)$. Let us re-define, maintaining the indexation to the unemployment rate,

$$1 - F_t = Ou_t, \qquad O > 1, \tag{42}$$

and use the flow approach to changes in unemployment, as in (37), above in 3.1, to re-define

$$S_t = \frac{u_t(1 - Ou_{t-1})}{(1 - u_{t-1})}, \quad N_t^s = 1, \quad \forall t. \tag{43}$$

$F < (1 - S) \Leftrightarrow S < (1 - F)$, in steady-state, requires $O > 1$. Accordingly, real wage and the FP unemployment rate are now re-defined, respectively, as

$$\frac{W_t}{P_t} = \left[1 + \frac{1}{\frac{\Gamma}{(1-\Gamma)}\left[\frac{1}{(1-b)Ou_t} - \varepsilon_{SN}(1 - \frac{\alpha}{\mu})^{-1}\right]}\right]^{-1} A_t \left(N_t^d\right)^{(\alpha-1)}, \tag{44}$$

and

$$\bar{u}_t = \frac{(\mu - \alpha)\bar{\Gamma}}{\left[\alpha(1 - \bar{\Gamma}) + \bar{\Gamma}\epsilon_{SN}\mu\right](1 - \bar{b})O} = \overline{u}. \tag{45}$$

Interpretation of (44) and (45) reveals that: (i) the FP unemployment rate moves inversely with O while the responses of real wages to the cycle (recall the now re-defined $\overline{d}_{21}$, in equation 16, above in 2.3) move directly with O – in steady state, as the outside option yields now lower income, the employed workers move towards more moderate wage claims within the firm, and, hence, the FP unemployment rate is now smaller than before; and, (ii) either in steady state or during transition, reform gains are expected to be higher for the employed workers than for the unemployed, since the former have higher probability of finding a new job if fired. To illustrate the effects on the welfare transition gains, Table 6 shows, for the demand-side inertia case, the $p - lim$ periods and the $Ve - Ve_0$ and $Vu - Vu_0$ values for a 20 periods horizon after the announcement of reform.

	Scenarios	Political Support							
		Breaking time horizon for political support (by the employed) p-lim				Net accumulated gains Ve-Ve$_0$ and Vu-Vu$_0$ (t=20)			
		OMP		TR		OMP		TR	
		D	C	simple	smoothing	D	C	simple	smoothing
1	**Baseline** ***(h=0)***	1		1	1	0.1375 and 0.1359		0.1375 and 0.1359	0.1375 and 0.1359
2	**Low habit formation** ***(h=0.5)***	Baseline		7	6	Baseline		0.085 and 0.0813	0.0967 and 0.0929
3	**High habit formation** ***(h=0.7)***	Baseline		15	12	Baseline		0.0273 and 0.0227	0.0531 and 0.0485

OMP - C: Optimal Monetary Policy under Commitment

OMP - D: Optimal Monetary Policy under Discretion

TR: Taylor Rule

Table 6: Evaluation of Political Support with Differentiated Job-Finding Probabilities

Besides the fact that higher gains occur for the currently (before reform implementation) employed, the results exhibit the same patterns as before (Table 4): OMP yields

the best results and smoothing ensures better performance relative to the simple TR; under the non-optimal rules, political support takes longer to emerge, as a result of (i) the real wage falling strongly during the recovery to the new steady state, and (ii) the unemployment gains from reform being smaller (around 1 percentage point instead of the previous 2 percentage points, calculated using 45).

4 Final Remarks

Having included political support determinants in the macroeconomic analysis, we were able to assess to which extent monetary policy can help to ensure the political sustainability of a labor market reform, a view in line with the "two-handed approach".

The need for labor market reforms in Europe is largely motivated by the damaging unemployment performance in recent decades, which is, to a great extent, explained by the presence of rigid labor market institutions interacting with shocks that have hit the European economies and with the construction of the EMU. Because reforms often involve redistributive effects and benefits take time to emerge, they often face political resistance that may block implementation. Furthermore, EMU entails an additional constraint – the common monetary policy limits the application of the "two-handed approach" to overcome political resistance to reform implementation. Motivated by this environment, our model – New-Keynesian style – is, on the one hand, based on well-established literature about monetary policy analysis and, on the other hand, includes labor market institutional features based on the macro-labor literature.

Simulating a reduction in the unemployment benefit replacement ratio as a stylized labor market reform, we find that, in spite of its positive permanent effects on the equilibrium unemployment rate and on the real wage flexibility, reform implementation may lack political sustainability.

Optimal monetary policy ensures political sustainability for an announced one-shot reform. As for the gradual and the unexpected reform processes, the optimal policy can not avoid political support resistance to reform implementation and the Taylor rule may even provide higher political support. Also, with the exception of the gradual reform, interest-rate smoothing favors the political support to the reform relative to the simple Taylor rule.

Results are in agreement with the "two-handed approach" according to which policy-driven cycles can decisively improve political support to the reform: the more expansionary (or the less contractionary) the policy is, the faster is the recovery to the new FP equilibrium. Political support decreases with (i) the time it takes for reform implementation, (ii) the degree of uncertainty about reform enforcement, and (iii) the importance of habit persistence in consumption.

We have also simulated situations in which political support by the employed may differ from the unemployed workers'; the harder it is for an unemployed worker to find a new job relative to a current employed worker, the lower are the reform gains in terms of the equilibrium unemployment rate, the lower is the overall political support and the larger are the relative gains for the employed.

A Optimal Monetary Policy

Consider the following first order Taylor approximation, around the steady state:

$$\begin{aligned} Log(C_t - hC_{t-1}) &= Log(1-h) + LogC + \frac{1}{(1-h)}\left(LogC_t - LogC\right) - \\ &\quad - \frac{h}{(1-h)}\left(LogC_{t-1} - LogC\right) + o(||a||^2), \end{aligned} \tag{46}$$

where C stands for the steady-state level of consumption. The intertemporal utility (adding the leisure argument and neglecting shocks) is approximated by

$$E_0 \sum_0^\infty \beta^t \left\{ \left[Log(1-h) + \frac{1}{1-h}(c_{t+j} - hc_{t+j-1}) \right] - \frac{N^{d(\varphi+1)}}{\varphi+1}, \right\}. \tag{47}$$

With β close to 1, we re-define U_t as the utility derived from period t consumption (*i.e.,* including the contribution of period t consumption to the utility in the following period due to habit formation) simplifies as follows:

$$U_t = Log(1-h) + \frac{1-\beta h}{1-h}(c_t) - \frac{N^{d(\varphi+1)}}{\varphi+1} \simeq Log(1-h) + c_t - \frac{N^{d(\varphi+1)}}{\varphi+1}. \tag{48}$$

Re-writing (23) as

$$U_t - \overline{U}_t = \left[Log(1-h) + c_t - \frac{N_t^{d(\varphi+1)}}{(\varphi+1)} \right] - \overline{U}_t, \tag{49}$$

and using a second order Taylor approximation to the utility function around the FP level, we get:

$$U_t - \overline{U}_t = \overline{U}_{c,t}\overline{C}_t\left(\widetilde{c}_t\right) + \overline{U}_{n,t}\overline{N}_t^d\left(\widetilde{n}_t^d + \frac{1+\varphi}{2}\left(\widetilde{n}_t^d\right)^2\right) + o(||a||^3). \tag{50}$$

Where a second order approximation of relative deviations in terms of log deviations was also used.[36] Lower case variables represent variables in the log form, with $\widetilde{x}_t = \log\left(\frac{X_t}{\overline{X}_t}\right)$; $\widetilde{x}_t$ is assumed to be of order $o(||a||)$. Using the definition

$$\widetilde{n}_t^d = \frac{1}{\alpha}\left(\widetilde{y}_t + s_t\right), \quad s_t = \log\int_0^1 \left(\frac{P_{it}}{P_t}\right)^{-\varepsilon} di \tag{51}$$

and the goods market clearing condition $Y_t = C_t$, we have

$$U_t - \overline{U}_t = \overline{U}_{c,t}\overline{Y}_t\left(\widetilde{y}_t\right) + \overline{U}_{n,t}\overline{N}_t^d\left[\frac{1}{\alpha}\left(\widetilde{y}_t + s_t\right) + \frac{1+\varphi}{2\alpha^2}\widetilde{y}_t^2\right] + o(||a||^3), \tag{52}$$

[36] *I.e.,* $\left(\frac{C_t - \overline{C}_t}{\overline{C}_t}\right) = \widetilde{c}_t + \widetilde{c}_t^2 + o(||a||^3)$.

where $\overline{U}_{n,t}\overline{N}_t^d = \left[-\overline{U}_{c,t}\overline{Y}_t \left(\overline{N}_t^d\right)^{(\varphi+1)} \alpha\right]/\alpha$.

Disregarding, for now, the s_t term, define:

$$[1-\Phi] = \frac{\left(\overline{N}_t^d\right)^{(\varphi+1)}}{\alpha} = \frac{(1-\overline{u})^{(\varphi+1)}}{\alpha}, \tag{53}$$

where Φ can be seen as a measure of the economy's inefficiency, that is, a measure of how far the FP equilibrium is from the efficient level, y_t^e (the FP output level observed under full resource utilization). A first order approximation to Φ yields:

$$\begin{aligned} \Phi &= (\varphi+1)\overline{u} + \log\alpha + o(||a||^2) \Leftrightarrow \\ \Phi &\simeq (\varphi+1)\frac{(y_t^e - \overline{y}_t)}{\alpha} + \log\alpha, \quad y_t^e - \overline{y}_t = \alpha\overline{u}. \end{aligned} \tag{54}$$

If the labor market clears in steady state ($\overline{u}=0$) then, for α close to one, Φ is close to zero.

Using (54) we can write the monetary authority's optimization problem as:

$$\begin{aligned} &\overline{U}_t - U_t = \frac{1}{2}\overline{U}_{c,t}\overline{Y}_t \left[2s_t + \frac{1+\varphi}{\alpha}\left(\widetilde{y}_t - z\right)^2\right] + t.i.p. + o(||a||^3), \\ &z = (y_t^e - \overline{y}_t) + \frac{\alpha\log\alpha}{(1+\varphi)}. \end{aligned} \tag{55}$$

Since z depends only on structural variables characterizing the economy – such as those characterizing labor market functioning, the degree of competition between firms and the features of the production function technology – it is quite straightforward to assume that it is not affected by monetary policy. In this context, z can be classified as terms independent of policy ($t.i.p$); in particular, the term $t.i.p$ in equation (55) is equal to $-z^2$.

Deriving a first order approximation to $\overline{U}_{c,t}\overline{Y}_t$ around the steady state (U_cY) and using

$$s_t = \frac{\varepsilon}{2} var_i\left\{p_{it}\right\} + o(||a||^3) \tag{56}$$

together with the following Lemma, as shown in Woodford (2001)[37],

$$\sum_{t=0}^{\infty}\beta^t\left(var_i\left\{p_{it}\right\}\right) = \frac{1}{\lambda_L}\sum_{0}^{\infty}\beta^t\pi_t^2 + t.i.p. + o(||a||^3),\ \lambda_L = \frac{(1-\beta\theta)(1-\theta)}{\theta}, \tag{57}$$

we can write a second order approximation to the consumer's welfare loss, expressed as a fraction of steady-state consumption (income):

[37] This identity is particular to the Calvo's (1983) price setting mechanism. If price setting differs from such specification, the definition of price variability will also change.

$$L = \frac{1}{2} E_0 \sum_{t=0}^{\infty} \beta^t \left[\pi_t^2 + \omega_{\tilde{y}} \left(\widetilde{y}_t - z \right)^2 \right], \quad \omega_{\tilde{y}} = \frac{(1+\varphi)\lambda_L}{\alpha \varepsilon}. \tag{58}$$

B Model Calibration

The values for the set of parameters are chosen with a view to match the Euro area macroeconomic environment. We start by combining the calibration proposed in Moyen and Sahuc (2004) with Galí (2003), and then use other additional sources. Table 7 presents the values.

Description	Parameter	Value
Price elasticity of demand	ε	11
Quarterly discount factor	β	0.99
Probability of firms not changing prices in a given period	θ	0.83
Unemployment benefit replacement ratio	b	0.6
Elasticity of the survival probability with respect to employment	ε_{SN}	0.4
Labor intensity	α	0.9
Technology index	A	1
Union's bargaining power	Γ	0.1
Gradual reform correlation parameter	ρ_y	0.7
Low/High habit formation	h	0.5 / 0.7
Low/High inflation inertia	γ^b	0.27 / 0.5
Low/High loss relative weight on output stabilization	ω_y	0.01 / 1
Inflation feedback parameter	ϕ_π	0.5
Output-gap feedback parameter	ϕ_y	0.125
Interest rate smoothing parameter	ρ_r	0.8

Table 7: Parameter Calibration

For the labor market specific parameters, we set an indicative European after-reform replacement ratio of 60% and also a value of 0.4 for the elasticity of survival with respect to the expected number of insiders (based on Layard *et al*, 1991, pages 514 and 105, respectively). Labor intensity and the relative power of firms in the bargaining process are chosen in order to get a reasonable equilibrium unemployment rate ($\overline{u}$ in equation 17, subsection 2.3, above), around 6% - an equilibrium unemployment rate near that recently observed in the EMU area. The low value for Γ is supported by the low and decreasing degree of unionism in European countries (see, for instance, Blanchard, 2004, p. 26).[38] As

[38] Cahuc *et al.* (2002) estimate a bargaining power of about 0.2 in France, a result consistent with

for α, we set it slightly below 1, since a decreasing marginal productivity of labor ensures the trade-off between real wage and employment levels.

For the gradual reform process, we consider a long implementation period with $\rho_{\overline{y}} = 0.7$ to compare with the one-shot pre-announced reform ($\rho_{\overline{y}} = 0$). As for the habit formation, the evidence in Christiano *et al* (2001) and in Fuhrer (2000) clearly points to a high degree of persistence. Our values have been chosen closer to Christiano *et al*'s (2001), given that we adopt their theoretical formulation. We also take the case under no habit formation ($h = 0$) for illustrative purposes.

In respect to monetary policy, we consider two types of central banks: an inflation-averse CB, that attaches a high value to price stabilization; and an inflation-prone CB, that mostly cares about output stabilization. These values are taken from McCallum and Nelson (2004). For the non-optimal interest rate rule we chose the original Taylor's feedback parameters, while taking the interest rate smoothing parameter also from McCallum and Nelson (1999; 2004).

References

Alogoskoufis, C. Bean, G. Bertola, D. Cohen, J. Dolado and G. Saint-Paul (1995), *Unemployment: Choices for Europe – Monitoring European Integration 5*, Chs. 6 and 7, CEPR

Akerlof, G. A. and J. L. Yellen (1985), "A Near-Rational Model of the Business Cycle, with Wage and Price Inertia", *The Quarterly Journal of Economics*, Vol. 100, Supplement, pp. 823-838

Amato, J. D. and T. Laubach (2003), "Rule of Thumb Behaviour and Monetary Policy", *European Economic Review*, Vol. 47, N^o 5, October, pp. 791-831

Amato, J. D. and T. Laubach (2004), "Implications of Habit Formation for Optimal Monetary Policy", *Journal of Monetary Economics*, Vol. 51, N^o 2, March, pp.305-325

Ambler S., A. Guay and L. Phaneuf (1999), "Wage Contracts and Labour Adjustment Costs as Endogenous Propagation Mechanisms", CREFE Working Paper, N^o 69, CREFE

Barro, R. J. (1972), "A Theory of Monopolistic Price Adjustment", *Review of Economic Studies*, XXXIX, January, pp. 17-26

Bean, C. (1998), "The Interaction of Aggregate Demand Policies and Labor Market Reform", *Swedish Review of Economic Policy*, X, pp. 1-36

Belot, M. and J. C. van Ours (2004), "Does the Recent Success of Some OECD Countries in Lowering Their Unemployment Rates Lie in the Clever Design of Their Labor Market Reforms?", *Oxford Economic Papers*, Vol. 56, N^o 4, October, pp. 621-642

Blanchard, O. (2000), "EuropeanUnemployment: the Role of Shocks and Institutions", homepage

Blanchard, O. J. (2004), "The Economic Future of Europe", *Journal of Economic Perspectives*, Vol. 18, N^o 4, Fall, pp. 3-26

others using Canadian and British data sets. Note, however, that the average unemployment rate was, during the estimation period, around 10% in France (see, for instance, Nickell and Layard, 1999), higher than our 6% fitted equilibrium unemployment rate.

Blanchard, O. J. and D. Quah (1989), "The Dynamic Effects of Aggregate Demand and Supply Disturbances", *The American Economic Review*, Vol. 79, N^o 4, September, pp. 655-673

Blanchard, O. and L. Summers (1986), "Hysteresis and the European Problem", *NBER Macroeconomics Annual*, Cambridge, MIT Press

Blanchard, O. J. and N. Kiyotaki (1987), "Monopolistic Competition and the Effects of Aggregate Demand", *American Economic Review*, Vol. 77, N^o 4, September, pp. 647-666

Blanchard, O.J., R. Dornbush, J. Drèze, H. Giersch, R. Layard and M. Monti (1986), "Employment and Growth in Europe: A Two-handed Approach", in *Restoring Europe's Prosperity: macroeconomic papers*, O. J. Blanchard *et al* (eds.), pp. 95-124, Centre for European Policy Studies, MIT Press, Cambridge, MA

Blau, F. and L. Kahn (1999), "Institutions and Laws in the Labor Market" in *Handbook of Labor Economics*, O. Ashenfelter and D. Card (eds.), pp. 1399-1461, Elsevier Science B.V.

Bovenberg, A., Johan J. Graafland and Ruud A. Moij (2000), "Tax reform and the Dutch Labor Market: an Applied General Equilibrium Approach", *Journal of Public Economics*, Vol. 78, N^o 1-2, October, pp. 193-214

Burda M. and C. Wyplosz (1997), *Macroeconomics – A European Text*, 2nd edition, 613 p, Oxford University Press

Cahuc, P., C. Gianella, D. Goux and A. Zylberberg (2002), "Equalizing Wage Differences and Bargaining Power: Evidence From a Panel of French Firms", CEPR Discussion Papers, N^o 3510, CEPR

Calmfors L. and J. Driffil (1988), "Bargaining Structure, Corporatism and Macroeconomic Performance", *Economic Policy*, N^o 6, pp. 13-62

Calvo, G.A. (1983), "Staggered Prices in an Utility-Maximizing Framework", *Journal of Monetary Economics*, Vol. 12, N^o 3, pp. 383-398

Caplin A.S. and D. Spulber (1987), "Menu Costs and the Neutrality of Money", *The Quarterly Journal of Economics*, Vol.102, N^o 4, pp. 703-725

Carneiro, Francisco, Amit Dar and Indermit Dar (2002), "A Survey on Labour Market Institutions, collective Bargaining and Macroeconomic Performance", Social Science Research Network Electronic Paper Collection, Jan 9, http://papers.ssrn.com/abstract=289664

Checchi, Daniele and Claudio Lucifora (2002), "Unions and Labour Market Institutions in Europe", *Economic Policy*, Vol. 17, N^o 35, October, pp. 362-408

Chen, Yu-Fu, Dennis Snower and Gylfi Zoega (2003), "Labour-Market Institutions and Macroeconomic Shocks", *Labour*, Vol. 17, N^o 2, June, pp. 247-270

Christiano, L., M. Eichenbaum and C. Evans (2000), "Monetary Shocks: Facts and Frictions", manuscript, Northwertern University

Christiano, L., M. Eichenbaum and C. Evans (2001), "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy", NBER Working Paper Series, N^o 8403, NBER

Clarida, R., J. Galí and M. Gertler (1999), "The Science of Monetary Policy: A New Keynesian Perspective", *Journal of Economic Literature*, Vol. XXXVII, December, pp. 1661-1707

Conlon J. R. and C. Y. Liu (1997), "Can More Frequent Price Changes Lead to Price Inertia? Non-Neutralities in a State-dependent Pricing Context", *International Economic Review*, Vol. 38, N^o 4, November, pp. 893-914

Dixit A. K. and J. Stiglitz (1977), "Monopolistic Competition and Optimum Product Diversity", *American Economic Review*, N^o 67, pp. 297-308

Elmeskov, Jorgen (2000), "Implementing the OECD Jobs Strategy – Assessing Performance and Policy", Remarks at The Conference on Jobs, Helsinki 27 and 28 January

Estrella, A. and J. C. Fuhrer (2002), "Dynamic Inconsistencies: Counterfactual Implications of a Class of Rational-Expectations Models", *American Economic Review*, Vol. 92, N^o 4, pp. 1013-1028

Fernandez, Raquel and Dani Rodrick (1991), "Resistance to Reform: Status Quo bias in the Presence of Individual-Specific Uncertainty", *The American Economic Review*, Vol. 81, N^o 5, pp. 1146-1155

Fischer, S. (1977), "Long-term Contracts, Rational Expectations, and the Optimal Money Supply Rule", *Journal of Political Economy*, Vol. 85, N^o 1, pp. 191-205

Fuhrer, J. (2000), "Habit Formation in Consumption and its Implications for Monetary-Policy Models", *The American Economic Review*, Vol. 90, N^o 3, pp. 367-390

Galí, J. (2002), Notes on Monetary Policy – Lectures, Barcelona Summer School, UAB

Galí, J. (2003), "New Perspectives on Monetary Policy, Inflation, and the Business Cycle", in *Advances in Economic Theory*, L. Hansen and S. Turnovsky (eds.), Vol. III, pp. 151-197, Cambridge Uiversity Press

Galí, J., J. D. López-Salido and J. Vallés (2003), "Technology Shocks and Monetary Policy: Assessing the FED's Performance", *Journal of Monetary Economics*, Vol. 50, N^o 4, May, pp. 723-743

Galí, J. and M. Gertler (1999), "Inflation Dynamics: A Structural Econometric Analysis", *Journal of Monetary Economics*, Vol. 44, N^o 2, pp. 195-222

Galí, J., M. Gertler and J. D. López-Salido (2001), "European Inflation Dynamics", *European Economic Review*, Vol. 45, N^o 7, pp. 1237-1270

Goodfriend, M. and R. G. King (1997), "The New Neoclassical Synthesis and the Role of Monetary Policy" in *Macroeconomics Annual 1997*, Rotemberg and Woodford (eds.), pp. 231-295, NBER

Gordon, Robert J. (1996), "Macroeconomic Policy in the Presence of Structural Maladjustment", NBER Working Paper Series, N^o 5739, September, NBER

Harvey, M. and R. Maier (2004), "Rights over Resources" in *Wage and Welfare-New Perspectives on Employment and Social Rights in Europe*, B. Clasquin, N. Moncel, M. Harvey and B. Friot (eds), PIE – Peter Lang, Brussels

Holmlund, Bertil (1998), "Unemployment Insurance in Theory and Practice", *Scandinavian Journal of Economics*, Vol. 100, N^o 1, March, pp. 113-141

Ireland, P. N. (2001), "Sticky-price Models of the Business Cycle: Specification and Stability", *Journal of Monetary Economics*, Vol. 47, N^o 1, February, pp. 3-18

Ireland, P. N. (2004), "Technology Shocks in the New Keynesian Model", *The Review of Economics and Statistics*, Vol. 86, N^o 4, November, pp. 923-936

Jensen, C. and B. McCallum (2002), "The non-Optimality of Proposed Monetary Policy Rules under Timeless-Perspective Commitment", *Economic Letters*, Vol. 77, N^o 2,

October, pp. 163-168

Keil, M. W. (1988), "Is Political Business Cycle Really Dead?", *Southern Economic Journal*, Vol. 55, N^o 1, July, pp. 86-99

King, R. G. (2000), "The New IS-LM Model: Language, Logic and Limits", Federal Reserve Bank of Richmond Economic Quarterly, Vol. 86/3, Summer 2000, pp. 45-103

Lächler, U. (1984), "The Political Business Cycle under Rational Voter Behaviour", *Public Choice*, Vol. 44, N^o 3, pp. 411-430

Layard, R., S. Nickell and R. Jackman (1991), *Unemployment*, Oxford University Press, Oxford

Lindbeck and Snower (1988), "Cooperation, Harassment, and Involuntary Unemployment: an Insider-Outsider Approach", *American Economic Review*, Vol. 78, pp. 167-188

Lindbeck and Snower (1990), "Demand and Supply-side Policies and Unemployment: Policy implications of the Insider-Outsider Approach", *Scandinavian Journal of Economics*, Vol. 92, N^o 2, pp. 279-305

Lindbeck, A. and D. Snower (2002), "The Insider-Outsider Theory: a Survey", IZA Discussion Paper, N^o 534, IZA

Lowe, P. and L. Ellis (1998), "The Smoothing of Official Interest Rates", in *Proceedings of Reserve Bank of Australia 1997 Conference: Monetary Policy and Inflation Targeting*, P. Lowe (ed.), pp. 286-312

Manzini, Paola and Dennis Snower (2002), "Wage Determination and the Sources of Bargaining Power", IZA Discusssion Paper, N^o 535, July, IZA

McCallum, B. (2001), "Should Monetary Policy Respond Strongly to Output Gaps?", *American Economic Review*, Vol. 91, N^o 2, May, pp. 258-262

McCallum, B. and E. Nelson (1999), "Performance of Operational Policy Rules in an Estimated Semiclassical Structural Model", in *Monetary Policy Rules*, J. B. Taylor (ed.), pp. 15-45, NBER

McCallum, B. and E. Nelson (2004), "Timeless Perspective vs. Discretionary Monetary Policy in Forward-Looking Models", *Review of the Federal Reserve Bank of San Francisco*, March, pp. 43-56

Mortensen, D. and C. Pissarides (1999), "Job reallocation, employment fluctuations and unemployment" in *Handbook of Macroeconomics*, J. Taylor and M. Woodford (eds.), Ch. 18, Vol. 1B, Handbooks in Economics, Vol. 15, pp. 1171-1228, Amsterdam; New York and Oxford: Elsevier Science, North-Holland

Moyen, Stéphane and Jean-Guillaume Sahuc (2004), "Incorporating Labour Market Frictions into an Optimizing-Based Monetary Policy Model", Banque of France Working Paper, N^o 105, January, Banque of France

Nickell, S. and R. Layard (1999), "Labor Market Institutions and Economic Performance", in *Handbook of Labor Economics*, O. Ashenfelter and D. Card, Vol. 3C, pp. 3029-3084, Elsevier Science B.V.

Nickell, S., L. Nunziata, W. Ochel and G. Quintini (2003), "The Beveridge Curve, Unemployment and Wages in the OECD from the 1960s to the 1990s", in *Knowledge, information, and expectations in modern macroeconomics: in honor of Edmund S. Phelps*, Aghion *et al* (eds), pp. 394-440, Princeton University Press

OECD, *1980-1998, 20 Years of Social Expenditure – The OECD Database* (database interpretative guide)

OECD (1999), "Labour Market Performance and the OECD Jobs Strategy", Ch. IV, *OECD Economic Outlook* 66

OECD (2000), "Recent Labour-Market Performance and Structural Reforms", Ch. VII, *OECD Economic Outlook* 67

Poeck, André Van and Alain Borghijs (2001), "EMU and Labour Market Reform: Needs, Incentives and Realisations", *World Economy*, Vol.4, N^o 10, November, pp.1327-1352

Rotemberg, J. (1982), "Monopolistic Price Adjustment and Aggregate Output", *Review of Economic Studies*, XLIX, pp. 517-531

Rotemberg, J. J. and M. Woodford (1999), "Interest Rate Rules in an Estimated Sticky Price Model", in *Monetary Policy Rules*, J. B. Taylor (ed.), pp. 57-126, NBER

Sack, B. and V. Wieland (2000), "Interest Rate Smoothing and Optimal Monetary Policy: a Review of Recent Empirical Evidence", *Journal of Economics and Business*, Vol. 52, N^o 1-2, January-April, pp. 205-228

Saint-Paul, G. (1996), "Exploring the Political Economy of Labour Market Institutions", *Economic Policy: A European Forum*, N^o 23, October, pp. 265-315

Saint-Paul, G. (1999), "Toward a Theory of Labor Market Institutions", Economics and Business Working Papers, N^o 433, December, Universitat Pompeu Fabra

Saint-Paul, G. (2000), *The Political Economy of Labor Market Institutions*, Oxford and New York, Oxford University Press, 280 p

Saint-Paul, G. (2002), "Macroeconomic Fluctuations and the Timing of Labor Market Reforms", CEPR Discussion Papers, N^o 3646, CEPR

Saint-Paul, G. and S. Bentolila (2000), "Will EMU increase Eurosclerosis?", CEPR Discussion Papers, N^o 2423, CEPR

Smets, F. and R. Wouters (2003), "An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area", *Journal of the European Economic Association*, Vol. 1, N^o 5, September, pp. 1123-1175

Smyth, D. J., P. Dua and S. W. Taylor (1994), "Voters and Macroeconomics: Are they Forward or Backward Looking?", *Public Choice*, Vol. 78, N^o 3-4, March, pp. 283-293

Solow, R. (1985), "Insiders and Outsiders in Wage Determination", *Scandinavian Journal of Economics*, Vol. 87, pp. 411-428

Srour, G. (2001), "Why do Central Banks Smooth Interest Rates?", Bank of Canada Working Paper, N^o 2001-17, October, Bank of Canada

Steinsson, Jón (2003), "Optimal Monetary Policy in an Economy with Inflation Persistence", *Journal of Monetary Economics*, Vol. 50, N^o 7, Special Issue October, pp. 1425-1456

Taylor (1979), "Staggered Wage Setting in a Macro Model", *Journal of Political Economy*, Vol. 69, N^o 2, pp. 108-227

Taylor, J.B (1999a) (ed.), *Monetary Policy Rules*, University of Chicago Press and NBER, 442 p.

Taylor, J.B (1999b), "Staggered Price and Wage Setting in Macroeconomics", in *Handbook of Macroeconomics*, J.B. Taylor and M. Woodford (eds.), Vol. 1, Elsevier Science

B.V.

Woodford, M. (2001), "Inflation Stabilization and Welfare", NBER Working Paper, N^o 8071, January, NBER

Woodford, M. (2003), *Interest and Prices-Foundations of a Theory of Monetary Policy* (Chs. 3 and 6), Princeton University Press, 800 p

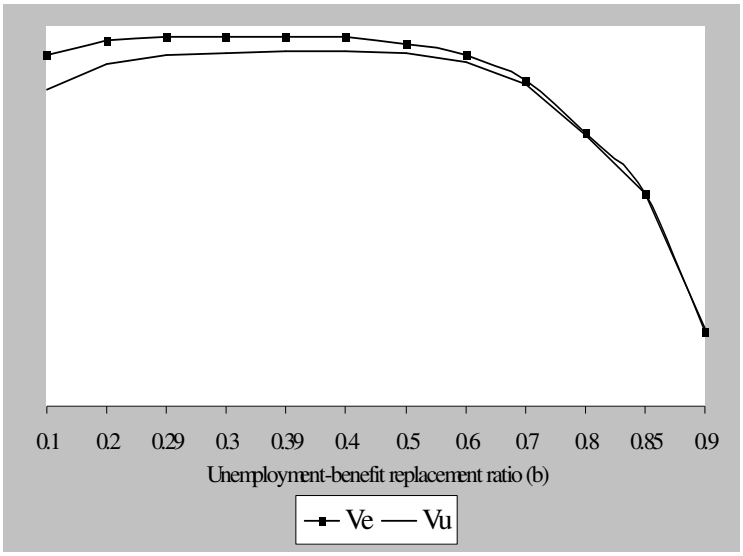

Figure 1: Steady-state welfare of employed (Ve) and unemployed (Vu) for different unemployment-benefit replacement ratios (b)

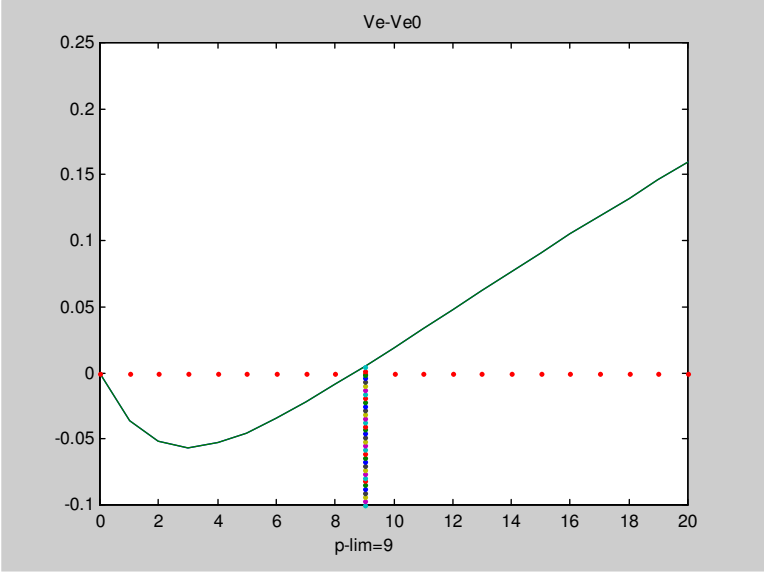

Figure 2: $p - lim$ period and net accumulated reform-gains under TR, habit formation ($h = 0.7$)

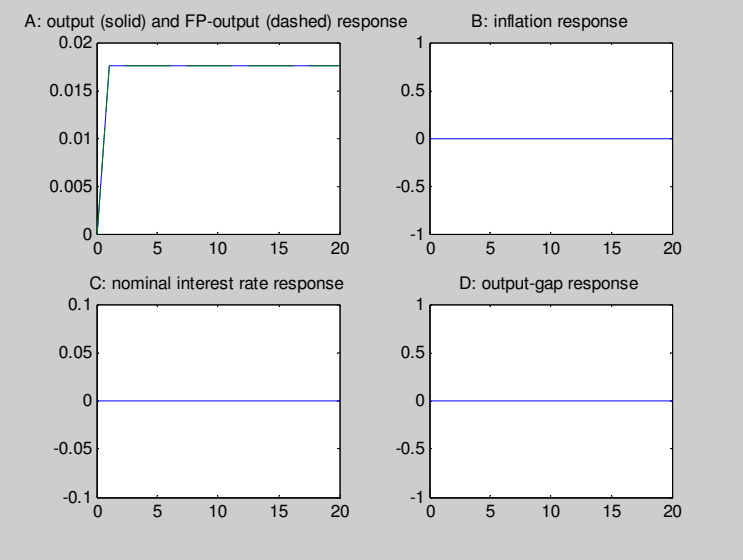

Figure 3: Adjustments to a one-shot pre-announced reform, baseline scenario

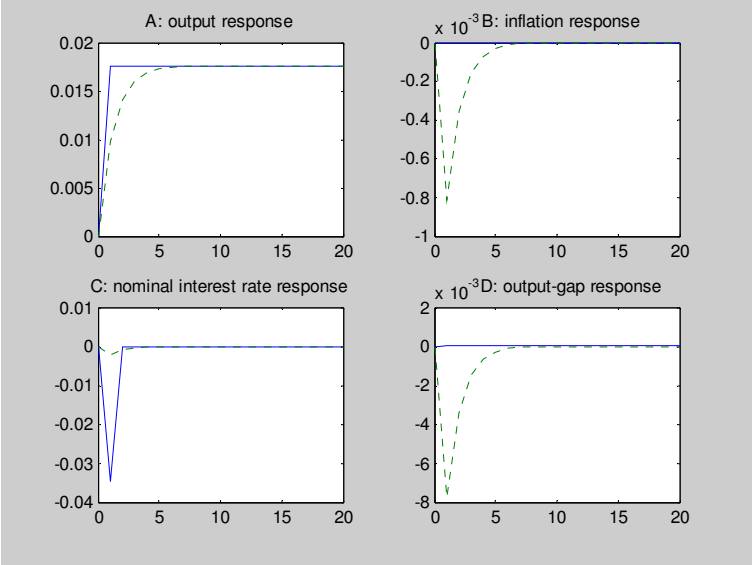

Figure 4: Adjustments to a one-shot pre-announced reform, habit formation ($h = 0.5$) - OMP (solid) *vs* TR (dashed)

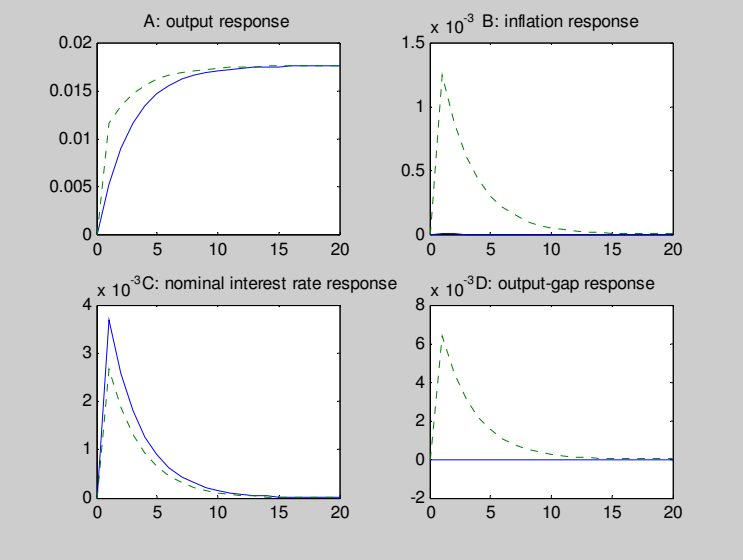

Figure 5: Adjustments to a gradual pre-announced reform ($\rho_{\overline{y}} = 0.7$), baseline scenario - OMP (solid) *vs* TR (dashed)

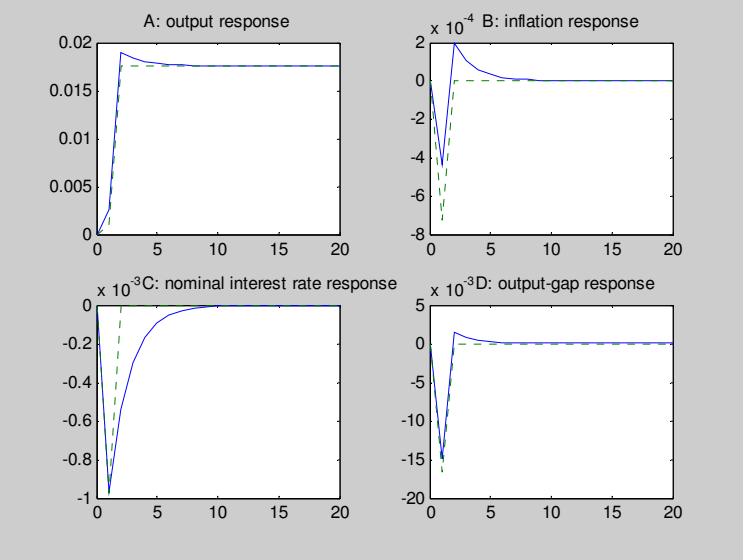

Figure 6: Adjustments to an unexpected reform, baseline scenario - OMP-C, $w_{\widetilde{y}} = 0.01$, (solid) *vs* TR (dashed)

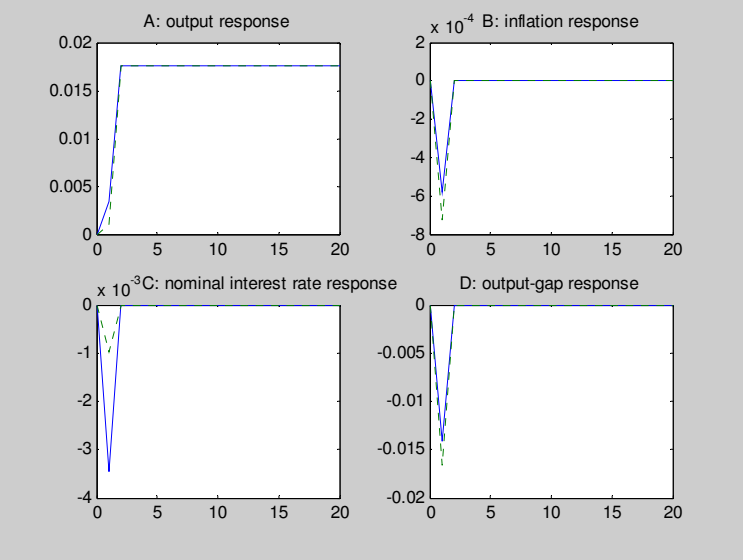

Figure 7: Adjustments to an unexpected reform, baseline scenario - OMP-D, $w_{\tilde{y}} = 0.01$, (solid) *vs* TR (dashed)

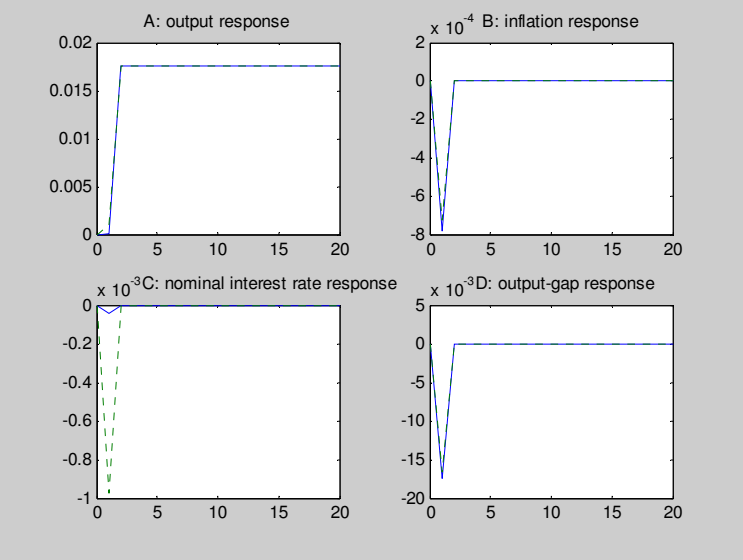

Figure 8: Adjustments to an unexpected reform, baseline scenario - OMP-D, $w_{\tilde{y}} = 1$, (solid) *vs* TR (dashed)