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The Cost Channel of Monetary Policy in a Post Keynesian

Macrodynamic Model of Inflation and Output Targeting

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Abstract

This paper contributes to the debate about whether or not inflation targeting is compatible with Post Keynesian economics. It does so by developing a model that takes into account the potentially inflationary consequences of interest rate manipulations. Evaluations of the macroeconomic implications of this so-called cost channel of monetary policy are common in the mainstream literature. But this literature uses supply-determined macro models and provides standard optimizing microfoundations for the various ways in which the interest rate can affect mark-ups, prices and ultimately the form of the Phillips curve. Our purpose is to study the implications of different Phillips curves, each embodying the cost channel and derived from Post Keynesian, cost-based-pricing microfoundations, in a monetary-production economy. We focus on the impact of these Phillips curves on macroeconomic stability and the consequent efficacy of inflation and output targeting. Ultimately, our results suggest that the presence of the cost channel is of less significance than the general orientation of the policy regime, and corroborate earlier finding that, in a monetary-production economy, more orthodox policy regimes are inimical to macro stabilization.

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1. Introduction

There has been some intense debate about whether or not inflation targeting is compatible with Post Keynesian economics. As might be expected, several contributors have expressed concerns with the potential real costs (in terms of foregone output and employment) of a singular focus on low inflation as the goal of macroeconomic policy (see, for example, Atesoglu and Smithin, 2006; Rochon and Rossi, 2006). These concerns become acute when inflation targeting is taken to involve not just the pursuit of low inflation enshrined in a target that public policy authorities credibly and accountably commit to achieve, but also – and more specifically – the dedicated use of monetary policy to achieve this goal.[1]

According to Setterfield (2006), however, Post Keynesian concerns with inflation targeting can be set aside once it is recognized that, by using more and different policy instruments to reconcile the pursuit of low inflation with real macroeconomic policy goals, inflation targeting can be accommodated in a monetary-production economy.[2] Lima & Setterfield (2008) consider further the relationship between inflation targeting and Post Keynesian economics by explicitly taking into account the role of expectations in the inflation process, and by evaluating the impact of different policy reaction functions on the effects of inflation targeting and the stability of macroeconomic equilibrium. Two important results emerge from this analysis. First, the potential compatibility of inflation targeting with a Post Keynesian economy extends to a broader range of policy interventions than was originally envisaged by Setterfield (2006). And second, the more orthodox the policy blend becomes in a Post Keynesian

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[1] See, for example, Mishkin (2002). Svensson (2010) also identifies inflation targeting with the conduct of monetary policy, but notes that low and/or stable inflation may not be the singular pursuit of the monetary authorities in an inflation targeting regime.
[2] See also Davidson (2006), Palley (2006), and Sawyer (2006) on the compatibility of inflation targeting and Post Keynesian economics.

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economy, the more adverse are the consequences for macroeconomic stability and the viability of inflation targeting.[3]

But an important omission from Lima and Setterfield (2008) is the cost channel of monetary policy, according to which interest rates affect costs of production and hence (potentially) price dynamics. A second drawback is that Lima and Setterfield's analysis is based on a simple aggregate structural model, the Post Keynesian pedigree of which is justified largely by appeal to heuristics. One of the purposes of this paper is to provide proper Post Keynesian foundations for the simplified policy model utilized by Lima and Setterfield (2008). These foundations take into account the potentially inflationary consequences of interest rate manipulations, arising from the fact that interest rates affect firms' debt servicing and hence their costs of production and (potentially) their pricing decisions.[4] Hence a second purpose of the paper is to study macroeconomic stability and the efficacy of inflation targeting in a monetary-production economy characterized by the cost channel of monetary policy. Evaluations of the macroeconomic implications of the cost channel are common in the mainstream literature. But this literature uses supply-determined macro models and provides standard optimizing microfoundations for the various ways in which the interest rate can affect mark-ups, prices and

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[3] This second result bears a striking resemblance to that of Isaac (1991). The relationship between the analysis conducted in this paper and that found in Isaac (1991) is discussed in detail in sub-section 2(iv) below.

[4] A recent survey jointly conducted by nine major Eurosystem national central banks covering more than 11,000 firms showed that prices are mostly set following some markup rule (Fabiani et al., 2006). Firms were also asked to assign scores between 4 (greater importance) and 1 (minor importance) to three main cost factors according to their importance for price increases. Suggestively, financial costs received an average score of 2.2, while with 3.0 and 3.1 the average scores of labor costs and raw material costs, respectively, were not that much higher.

ultimately the form of the Phillips curve.[5] Our purpose is to study the implications of different specifications of a Phillips curve, embodying the cost channel of monetary policy, derived from Post Keynesian, cost-based-pricing microfoundations in Lima and Setterfield (2010). While the inflationary (and therefore potentially self-defeating) consequences of raising interest rates in an effort to fight inflation have been emphasized by several Post Keynesian authors,[6] scant (if any) attention has been paid to them in the literature debating whether or not inflation targeting is compatible with Post Keynesian economics. Ultimately, then, we seek to analyze the stability of macroeconomic equilibrium and the consequent possibilities for successful inflation and output targeting in a demand-determined economy characterized by the cost channel of monetary policy.

The remainder of the paper is organized as follows. In section 2, we outline the structural model on which our analysis is based. Section 3 then examines the consequences of the cost channel of monetary policy for macroeconomic stability and the efficacy of inflation and output targeting in a monetary-production economy. Finally, section 4 concludes.

2. The Model and its Foundations

i) Some preliminary profit accounting

We begin by defining enterprise profits as:

$$\Pi_E = \Pi - \iota D \qquad\qquad [1]$$

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[5] Interestingly, this literature yields a single specification of the Phillips curve embodying the cost channel – a further point of contrast with our own analysis (see also Lima and Setterfield, 2010).
[6] See, for example, Wray (2007).

where Π_E denotes enterprise profits and Π denotes gross profits (both in nominal terms), and ιD denotes payments to rentiers (ι is the nominal rate of interest and D is the nominal stock of debt). Deflating by the price level, P, we get:

$$\Pi_{ER} = \Pi_R - \iota D_R \qquad [2]$$

where an R-subscript denotes the real value of a variable. The expression in equation [2] can be thought of as the "real cash flow" of firms.

Since the model we are constructing is of an environment characterized by inflation, we will observe the steady depreciation of D_R over time, *ceteris paribus*. We assume that firms will take this into account when they calculate enterprise profits. Note that since:

$$D_R = D / P$$

it follows that:

$$\dot{D}_R = (\hat{D} - p)D_R$$

where p is the rate of inflation, so that the depreciation of real debt over time due to inflation can be written as:

$$d = pD_R \qquad [3]$$

Adding the expression for d in [3] to the cash flow concept of (real) enterprise profits in [2], we get:

$$\Pi'_{ER} = \Pi_R - (\iota - p)D_R \qquad [2a]$$

The concept of enterprise profits in [2a] can now be thought of as the "real net profits" of firms. Finally, deflating [2a] by the capital stock, K, we get:

$$r_E = r - (\iota - p)\zeta \qquad [4]$$

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where $\zeta = D_R/K$ is the debt to capital stock ratio, which we take as given in the short run. Equation [4] gives us the real rate of enterprise profits which, as will become clear in what follows, enters into the investment and pricing decisions of firms.

ii) Expectations

Our theory of expectations is based on the work of Gerrard (1994, 1995) and Dequech (1999). For any variable *x* that decision makers are attempting to forecast, we write:

$$x^e = E(x|\Omega) \qquad [5]$$

where:

$$\Omega^T = [\Psi \ \Theta \ \Phi]$$

with Ψ denoting decision makers' information set, Θ denoting their animal spirits and Φ denoting their creativity. The idea here is that in an environment of uncertainty, in which there is no time-invariant "true model" on which to base forecasts, expectations are a product of what decision makers *do* know (or think they know) about the structure of the data-generating process (the incomplete information set, Ψ), the capacity of decision makers to anticipate innovations that produce novel change in the structure of the data-generating process (captured by their creativity, Φ) and decision makers' animal spirits (Θ), which influence expectations via their effects on "spontaneous optimism" (see Dequech, 1999, p.419). Hence, as in equation [5], x^e is conditional on a vector Ω that reflects each of these influences – information, creativity and animal spirits – on expectations.

Note that, in addition to their impact on expectations, animal spirits exert a second and separate influence on decision making, as in equation [5]. This is because in an environment of uncertainty, behaviour depends not only on expectations themselves, but also on the *confidence*

with which these expectations are held. A change in animal spirits, by altering decision makers'

aversion to and/or perception of uncertainty, can alter the confidence that decision makers have

in any given set of expectations, and hence their behaviour (Dequech, 1999, p.419). This

exemplifies what Gerrard (1994, 1995) describes as the "two-step" nature of decision making

under uncertainty: decision makers first formulate a "most probable forecast" (captured by x^e in

equation [5]), and then assess the "credence" of this forecast before deciding how to act. In this

way, anything that affects the "credence" of a forecast can alter behaviour quite independently of

changes in the forecast itself.[7] In this paper, we abstract from these dynamics for the sake of

simplicity, taking animal spirits as given.[8]

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[7] The obvious contrast here is with the canonical version of rational expectations, where $x^e = E(x|\Psi')$ and Ψ' constitutes a complete information set (including the time-invariant "true model" of the process generating x), and factors such as animal spirits exert no influence on behaviour either indirectly (via x^e) or directly. The key characteristic of rational expectations is that they cannot be systematically wrong. In contrast, expectations formed under uncertainty on the basis of the incomplete information set ψ *can* be systematically wrong, and decision makers are aware of this – hence the role and importance of the second step in the decision making process described above.

[8] In this way, we are "locking up without ignoring" (Kregel, 1976) some of the dynamics of a Post Keynesian economy in an effort to focus attention on other dynamics in a "conditionally" or "provisionally" closed system (see Setterfield, 1997, 2003 and Chick and Caserta, 1997 respectively). Closure is conditional or provisional in the precise sense that it depends on our ability to treat as unchanging certain features of the economy that are, in principle, subject to change over time. Note that the need to introduce such conditional closure cannot be avoided by simply adding more equations until our model is expressed in terms of Lucasian "deep parameters" and absolute closure is achieved. These "deep parameters" are assumed not to exist and the economy is, instead, treated as an open system (see Lawson, 1995). Indeed, this is understood to be the source of the fundamental uncertainty that decision makers face in a Post Keynesian economy.

Alternatively, the assumption that $\Theta = \bar{\Theta}$ can be interpreted as an "equilibrium of action" (Chick, 2002), in which even in the absence of evidence confirming the realization of expectations, decision makers find no basis in current economic events to change the credence they attach to these expectations.

In order to render equation [5] explicit, we appeal to the claims originally made by Keynes (1936, 1937) that, in an environment of uncertainty, expectations will be heavily influenced by recent events and social conventions. In light of this insight, we write:

$$E(x|\Omega) = k\sum_{i=1}^{n} \Gamma(1-\Gamma)^{i-1} x_{-i} + (1-k)x_c$$

where $\Gamma \leq 1$ and x_c denotes a salient conventional value of the variable of interest. In other words, the expected value of x is modelled as a weighted average of the convention, x_c, and a distributed lag of past values of x. The parameter k can be thought of as decreasing in the salience and credibility of the conventional value x_c.[9] In what follows, we assume for simplicity that $\Gamma = 1$ so that the expected value of any variable x can be written as:

$$E(x|\Omega) = kx_{-1} + (1-k)x_c \qquad\qquad [6]$$

A simple – but for our purposes, instructive – example of how expectations are formed in conjunction with equation [6] arises in the case where $x = p$. Following Lima and Setterfield (2008), we assume that transparent policy rules are good examples of salient social conventions, so that if policy authorities engage in inflation targeting – by which we mean the pursuit of a clearly announced target rate of inflation, p^T, that policy makers credibly and accountably commit to achieve – then $x_c = p^T$. In this case, we can write:

$$E(p|\Omega_p) = p^e = kp_{-1} + (1-k)p^T \qquad\qquad [6a]$$

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[9] We treat k as a constant in this analysis, but it is easy to imagine that it need not be. For example, given what has been said above, the value of k may change over time in response to discrepancies between x_c and the actual value of x, to the extent that such discrepancies are understood to reduce the credibility of x_c. The value of k may also vary with the extent and effectiveness of *communication* between policy makers and the private sector (on which see, for example, Blinder et al, 2008) in cases where x_c is a policy convention (on which, see below). In such cases, communication may affect either the salience or the credibility of x_c (or both).

Note that in this particular case, *k* will be decreasing in the transparency of policy makers' target rate of inflation, and the credibility of their commitment to achieve this inflation target.

iii) The AD curve

We begin by specifying a Kaleckian model of the form:

$$g = \gamma + g_u u^e + g_r r_E^e \qquad [7]$$

$$g^s = s_\pi r \qquad [8]$$

$$r = \frac{(1-\omega)u}{v} \qquad [9]$$

Equation [7] is a standard neo-Kaleckian investment function in which the rate of accumulation depends on the expected rates of utilization and (enterprise) profits. Equation [8] is the Cambridge equation, and equation [9] is true by definition.[10]

Drawing on the accounting relationship in equation [4], we write:

$$r_E{}^e = r^e - (\iota^e - p^e)\zeta$$

In other words, the expected rate of enterprise profits earned on whatever volume of capital goods are acquired in the present period will depend on the expected future gross profits earned by this capital (r^e), less interest payments on the debt undertaken to acquire this capital ($[\iota^e - p^e]\zeta$). This latter term reflects the value of the debt to capital stock ratio, ζ (which is assumed

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[10] Note that, for the sake of simplicity, we assume that investment is the only interest-sensitive component of aggregate spending. By abstracting from interest-sensitive components of consumption expenditure, we are also able to abstract, in our description of wage-setting behaviour in sub-section 2(iv) below, from any direct impact of interest rates on the wage bargain that might follow from households bearing a debt-service burden.

Note also that, since $r = r_E + (\iota - p)\zeta$ from [4], we are implicitly assuming in [8] that capitalists and rentier households (the only classes contributing to aggregate saving) have the same propensity to save.

fixed in the short run), and the expected rates of inflation (p^e) and nominal interest (ι^e).

Substituting the expression for r_E^e stated above into equation [7], we arrive at:

$$g = \gamma + g_u u^e + g_r (r^e - [\iota^e - p^e]\zeta)$$ [10]

Now let:

$$r^e = \frac{(1-\omega)u^e}{v}$$

i.e., we assume that firms' profit and utilization expectations are consistent (with the identity in [9] that relates r and u).[11] Substituting into [10] yields:

$$g = \gamma + g_u u^e + g_r \left[\frac{(1-\omega)}{v} u^e - [\iota^e - p^e]\zeta \right]$$ [11]

Finally, drawing on the theory of expectations outlined in the previous sub-section (and again assuming $\Gamma = 1$), we write:

$$u^e = k_u u_{-1} + (1 - k_u)u^T$$

where:

$$u^T = \frac{y^T v}{K}$$

is the salient, conventional value of u that (given v and K) is derived from the target level of output y^T that informs policy making.[12] We also write:

$$\iota^e = k_\iota \iota_{-1} + (1 - k_\iota)\iota^T$$

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[11] Note that the above expression for the expected rate of profit features the actual (rather than expected) wage share, ω. In sub-section 2(iv) below, our approach to modelling wage and price dynamics will imply that the equilibrium wage share – and hence, by definition, the equilibrium size of the markup – is consistent with firms' target wage share, and hence can be treated as a constant.

[12] In this model, the parameter y^T is understood to be a policy choice. Policy makers, however, may interpret y^T as a "natural" level of output. The consequences of this possibility are investigated in sub-section 2(vi) below.

which, setting $k_\iota = 1$ on the basis that there is no salient conventional value of ι that can be derived from policy makers' behaviour,[13] reduces to:

$$\iota^e = \iota_{-1}$$

Substituting into [11] (and re-arranging) yields:

$$g = \gamma + (1 - k_u)u^T\left[g_u + \frac{g_r(1-\omega)}{v}\right] + g_u k_u u_{-1} + g_r\left[\frac{(1-\omega)k_u}{v}u_{-1} - [\iota_{-1} - p^e]\zeta\right]$$

If we now solve this last expression in conjunction with equations [7] and [8] under the equilibrium conditions $g = g^s$, $u = u_{-1}$, and $\iota = \iota_{-1}$, we arrive at:[14]

$$u = \frac{\left(\gamma + [1 - k_u]u^T\left[g_u + \frac{g_r(1-\omega)}{v}\right] - g_r[\iota - p^e]\zeta\right)v}{(s_\pi - g_r k_u)(1-\omega) - g_u k_u v} \qquad [12]$$

Finally, since:

$$y = \frac{uK}{v}$$

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[13] As will become clear, this is consistent with the policy rules introduced in sub-section 2(vi) below, in which the value of the nominal interest rate is indeterminate. If firms' decision making involves a normal rate of interest, ι_n – on which, see sub-section 2(iv) below – then it is plausible to conjecture that $\iota^e = k_\iota \iota_{-1} + (1 - k_\iota)\iota_n$. This reformulation of ι^e would affect the evaluation of δ in equation [14] as discussed in sub-section 2(v) below, by implying that $dy/d\iota \neq dy/dp^e$ by virtue of the introduction of k_ι into the first of these derivatives. But since k_ι is assumed constant, this would have no material effect on the dynamical analysis in section 3.

[14] Note that if $k_u = 1$ (so that $u^e = u_{-1}$ as in the standard Kaleckian model), then the expression in [12] reduces to:

$$u = \frac{(\gamma - g_r[\iota - p^e]\zeta)v}{(s_\pi - g_r)(1-\omega) - g_u v}$$

It is conventional to assume that $\gamma > g_r[\iota - p^e]\zeta$ and that $s_\pi > \frac{g_u v}{(1-\omega)} + g_r$, so that the outcome in the expression above is both positive and stable. Note that if the first of these conditions holds, the numerator in [12] will necessarily be positive and it must be true that $s_\pi > \left(\frac{g_u v}{(1-\omega)} + g_r\right)k_u$, since k_u

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it follows on the basis of [12] that:

$$y = \frac{\left(\gamma + [1 - k_u]u^T\left[g_u + \frac{g_r(1-\omega)}{v}\right] - g_r[\iota - p^e]\zeta\right)K}{(s_\pi - g_r k_u)(1-\omega) - g_u k_u v}$$ [13]

This aggregate demand curve can be written in simplified form as:

$$y = y_0 - \delta(\iota - p^e)$$ [14]

The precise relationship between the parameters of [14] and those of equation [13] will be made clear following the discussion of pricing behaviour below, since (as will become clear) the latter impinges upon this relationship.

iv) Wage and price dynamics

Our approach to modelling wage and price dynamics is informed by the theory of target return pricing, in conjunction with insights from the conflicting claims theory of inflation.[15] Throughout our analysis, we assume that firms set prices in conjunction with the equation:

$$P = \kappa W a$$ [15]

where P is the price level, κ is the gross mark up (one plus the percentage margin for gross profits), W is the nominal wage and a is the labour to output ratio (which is assumed fixed). In

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< 1 by assumption. In other words, the standard Kaleckian existence and stability conditions suffice to ensure the existence and stability of the equilibrium rate of capacity utilization in [12].
[15] The analysis in this sub-section is based on Lima and Setterfield (2010). Rowthorn (1977) develops an early model of conflict inflation, while Lavoie (1992, chpt. 7) and Burdekin and Burkett (1996) provide surveys of the conflicting claims approach. See Lee (1998) and Lavoie (1992, pp.129—33) for discussion of target return pricing procedures, and Lee (1998, p.206) for evidence of the use of target return pricing by firms. Note that target return pricing can be related to the cost plus pricing models of Wood (1975), Harcourt and Kenyon (1976) and Eichner (1987) that emphasize the influence of investment and growth on the size of the mark up. See, for example, Lavoie (1992, p.133).

what follows, we explore several possible specifications of [15], each of which is consistent with the notion that firms' pricing decisions are sensitive to (*inter alia*) the interest rate.[16]

We begin by hypothesizing that:

$$\hat{\kappa} = \psi(\omega - \omega_F) \qquad [16]$$

where ω and ω_F are the actual wage share and firms' target wage share, respectively.[17] According to [16], the mark-up grows in response to any disparity between the actual wage share and firms' target wage share, an idea that is well established in the conflicting-claims literature. Since it follows from [15] that:

$$p = \hat{\kappa} + w \qquad [17]$$

(recalling that a is a constant), substituting [16] into [17] we get:

$$p = \psi(\omega - \omega_F) + w \qquad [18]$$

as our initial description of the rate of inflation.

Appealing once again to conflicting-claims theory, we now write:

$$w = \tau(\omega_W - \omega) + \sigma p^e$$

and:

$$\tau = \eta y + \chi Z$$

where ω_W is the target wage share of workers, Z reflects institutional determinants of the ability and willingness of workers to raise nominal wages, and p^e is determined as in equation [6a]. Together, these expressions imply that:

$$w = (\eta y + \chi Z)(\omega_W - \omega) + \sigma p^e \qquad [19]$$

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[16] See Lima and Setterfield (2010) for fuller investigation of these and other examples of this cost channel of monetary policy.

[17] Since a is exogenously given, the actual (target) wage share is equivalent to the actual (target) real wage, both here and throughout our analysis.

According to equation [19], the growth of nominal wages depends on inflation expectations, the gap between workers' target wage share and the actual wage share, and both the state of the real economy and the institutional structure of the labour market (which influence the willingness and/or ability of workers to bargain for a higher real wage, and hence the size of τ).[18]

An important feature of conflicting claims models of inflation is that their equilibrium solutions describe *both* the rate of inflation *and* the value of the wage share. In order to derive an expression for the short-run Phillips curve (SRPC) that is consistent with the equilibrium conditions of the conflicting claims process, we therefore need to consider the situation where the wage share is constant (at its equilibrium value) in order to further our analysis. From the definition of the wage share, a constant wage share implies that $p = w$ (recalling once again that a is constant). Substituting this condition into [18], we get:

$$\omega = \omega_F \qquad [20]$$

In other words, the equilibrium wage share – and hence, by definition, the equilibrium size of $\kappa = P/Wa = 1/\omega$ – is consistent with firms' target wage share. If we now substitute [20] into [19] and again use the condition $p = w$, we arrive at a SRPC of the form:[19]

$$p = (\eta y + \chi Z)(\omega_W - \omega_F) + \sigma p^e \qquad [21]$$

So far, however, our model appears to make no connection between interest rates, prices and inflation. But suppose – consistent with the theory of target return pricing – that what is

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[18] The parameter σ will also likely vary with y and Z, but this is overlooked for the sake of simplicity.

[19] It may be more accurate to refer to equation [21] (and the Phillips curves that follow) as quasi-SRPCs, since some of the disequilibrium adjustment mechanisms that can be properly associated with the short period, such as the adjustment of ω towards ω_F described in [16] and (in subsequent expressions) the adjustment of ι^e towards ι, are absent, assumed (for the sake of simplicity) to have been previously resolved. It should be noted that this has no effect on the results reported in the next section. We are grateful to Søren Harck of the University of Aarhus for drawing this matter to our attention.

driving the equilibrium value of κ established by firms is a target rate of return on their capital, r^T. Drawing on equation [9], we can write:

$$r^T = \frac{(1 - \omega_F)u_n}{v}$$

or:

$$\omega_F = 1 - \frac{r^T v}{u_n} \qquad\qquad [22]$$

where u_n denotes the normal rate of capacity utilization at which the target rate of return, r^T, is calculated. In other words, firms' target wage share (the inverse of the equilibrium mark up) is ultimately explained by a target rate of return (given the values of v and u_n).[20] Furthermore, referring back once again to the accounting relationship in equation [4], we can write:

$$r^T = r_E^T + (\iota^e - p^e)\zeta \qquad\qquad [23]$$

In other words, the target rate of return which determines firms' target wage share depends on firms' target rate of enterprise profits, together with their expectations of inflation and the nominal interest rate. Given that $k_t = 1$ so that $\iota^e = \iota_{-1}$, and assuming that $\iota_{-1} = \iota$, substituting [23] into [22] yields:[21]

$$\omega_F = 1 - \frac{(r_E^T + [\iota - p^e]\zeta)v}{u_n} \qquad\qquad [24]$$

Finally, substituting [24] into [21] yields:

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[20] If $u_n \neq u^T$ – as is plausible in the short run – the it might be argued that *both* u_n and u^T should feature in the calculation of firms' utilization expectations, a possibility that has not been taken into account heretofore. However, since both u_n and u^T are constants in our analysis and will therefore have no effect on the macrodynamics in section 3, we abstract from this possibility for the sake of simplicity.

[21] Note that not all variants of target return pricing admit a role for the interest rate in the determination of the mark up in this fashion. See, for example, Lavoie (1992, pp.360—1; 1995) on the pricing theory of Eichner (1987).

$$p = (\eta y + \chi Z)\left[\omega_W - \left(1 - \frac{[r_E^T + (\iota - p^e)\zeta]v}{u_n}\right)\right] + \sigma p^e \qquad [25]$$

This is essentially a conventional SRPC, in which p is increasing in p^e, y (given the conventional assumption that $\omega_W > \omega_F$) *and* the nominal interest rate, ι. Linearizing [25] for the sake of simplicity, we can now write (as an approximation of the inflation process):

$$p = \beta + \varphi p^e + \alpha y + \theta Z + \varepsilon(\iota - p^e) \qquad [26]$$

Note, however, that according to [23], the target rate of return and hence the equilibrium mark up will vary every time the expected nominal interest rate changes. But mark ups are conventionally regarded as fixed for discrete intervals of time. In light of this observation, it might be more accurate to describe the target rate of return as:

$$r^T = r_E^T + (\iota_n - p^e)\zeta \qquad [23a]$$

where ι_n is what firms regard as the normal rate of interest. The normal rate of interest is taken as given in what follows,[22] and is understood (over the time horizon of this model) to be conceptually different from the expected rate of interest that featured in the derivation of equation [25]. Substituting [23a] into [22] and the result into [21], we now get an SRPC of the form:

$$p = (\eta y + \chi Z)\left[\omega_W - \left(1 - \frac{[r_E^T + (\iota_n - p^e)\zeta]v}{u_n}\right)\right] + \sigma p^e \qquad [25a]$$

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[22] The "normal" rate of interest may change over time in response to firms' experience of prevailing actual rates of interest (see Lima and Setterfield, 2010, pp.32). But any impact that this might have on the macrodynamics of the system under construction can be thought of as being approximated by the previous case where ι rather than ι_n enters the SRPC, since $i_n = i$ is the most extreme form of adjustment of the normal rate of interest in reponse to changes in the actual rate. Indeed, in light of this last observation, unless there is a qualitative difference between the macrodynamics of systems in which the target rate of return is formulated as in [23a] rather than [23], there would seem to be no point in exploring the impact of other, more gradual adjustments of ι_n in response to changes in ι on the properties of the system.

and linearizing this result yields:

$$p = \beta + \varphi p^e + \alpha y + \theta Z + \varepsilon(\iota_n - p^e) \qquad \text{[26a]}$$

The analysis above provides us with two different but plausible specifications of the SRPC (in equations [26] and [26a]), each of which is consistent with the basic principles of target-return pricing and conflicting claims inflation theory, and each of which incorporates some variant of the cost channel of monetary policy, according to which interest rates enter into firms' cost accounting, and hence their pricing decisions, and hence inflation.

v) On the foundations of the AD curve once more

We are now in a position to make a more definite statement about the relationship between the parameters of equation [14] – and in particular, δ – and the parameters of equation [13]. First, it is evident from [13] that the partial derivative of y with respect to $\iota_R = \iota - p^e$ is:[23]

$$\frac{\partial y}{\partial \iota_R} = \frac{-g_r \zeta K}{(s_\pi - g_r k_u)(1-\omega) - g_u k_u v} < 0$$

But we now also know (from the discussion in sub-section 2(iv) above) that:

$$\omega = \omega_F$$

and that either:

$$\omega_F = 1 - \frac{(r_E^T + [\iota - p^e]\zeta)v}{u_n}$$

or:

$$\omega_F = 1 - \frac{(r_E^T + [\iota_n - p^e]\zeta)v}{u_n}$$

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[23] Recall that $s_\pi > \left(\dfrac{g_u v}{(1-\omega)} + g_r \right) k_u$.

In other words, any increase (decrease) in the nominal interest rate that causes an increase (decrease) in the actual real interest rate will either reduce (increase) or leave unchanged the value of the wage share, ω, and hence either increase (reduce) or leave unchanged the value of the gross profit share, $1 - \omega$.[24] In short:

$$\frac{\partial(1-\omega)}{\partial \iota_R} \geq 0$$

And since it follows from [13] that:[25]

$$\frac{\partial y}{\partial(1-\omega)} = \frac{-\left([1-k_u]u^T g_r g_u k_u + [s_\pi - g_r k_u][\gamma + (1-k_u)u^T g_u - g_r(\iota - p^e)\zeta]K\right)}{[(s_\pi - g_r k_u)(1-\omega) - g_u k_u v]^2} < 0$$

it therefore follows that the *total* derivative of y with respect to ι_R – and hence the value of δ in equation [14] – is given by:

$$\delta = -\frac{dy}{d\iota_R} = -\left[\frac{\partial y}{\partial \iota_R} + \frac{\partial y}{\partial(1-\omega)} \cdot \frac{\partial(1-\omega)}{\partial \iota_R}\right] > 0$$

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[24] In other words, if firms pass on interest costs in the form of higher prices, an increase in the interest rate effectively redistributes income from wages to rents. This calls attention to the fact that even though we have assumed that households do not carry debt, it is possible for the wage bargain to be affected by monetary policy. For instance, in this case the possibility arises (following Pivetti 1991) that since the normal profit of the enterprise does not depend on the behaviour of any component of total unit cost other than interest expenses, wage bargaining – in order to have any permanent effect on income distribution – will seek to influence the interest rate. Though we abstract from this possibility in what follows, we would nevertheless identify the relationship between the interest rate, wage formation and hence prices and price inflation as an important topic for further research into the precise workings – and implications for macroeconomic stability – of the cost channel of monetary policy.

[25] Recall that $\gamma > g_r[\iota - p^e]\zeta$.

vi) Policy reaction functions

Our model features two policy reaction functions – one describing the pursuit of monetary policy, the second describing adjustments to labour market institutions – which we use to characterize two different macroeconomic policy regimes.[26] Initially, we write:

$$i = \dot{p}^e + \lambda(y - y^T) \qquad\qquad [27]$$

$$\dot{Z} = -\mu(p - p^T) \qquad\qquad [28]$$

This (with $\dot{p}^e = \dot{p}$) corresponds to Lima and Setterfield's (2008) basic Post-Keynesian policy regime, in which monetary policy is used to target output, and labour market institutions are adjusted in an effort to control inflation – in other words, the policy authorities pursue some form of incomes policy.[27] We also consider the "inverted" policy reaction functions:

$$i = \dot{p}^e + \lambda(p - p^T) \qquad\qquad [27a]$$

$$\dot{Z} = -\mu(y - y^T) \qquad\qquad [28a]$$

This (again with $\dot{p}^e = \dot{p}$) corresponds to Lima and Setterfield's (2008) simplified orthodox policy regime, in which monetary policy is used to target inflation, and elected policy authorities claim to be increasing labour market "flexibility' – interpreted in [28a] as increasing worker insecurity and hence reducing the ability of workers to bargain for nominal wage increases – in an effort to reduce a perceived "natural" rate of unemployment associated with the real policy target y^T.[28]

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[26] For more extensive discussion of these policy reaction functions and other policy regimes associated with them, see Lima and Setterfield (2008).

[27] The idea of adjusting an *incomes policy* in the pursuit of short-run stabilization may seem strange. But note that in tax-based incomes policies (see, for example, Wallich and Weintraub, 1971), the policy instrument is a tax rate which could, in principle, be varied in the short run.

[28] According to [28a], such policy initiatives will be easiest to pursue during booms ($y > y^T$), but may be resisted during downturns ($y < y^T$). See Lima and Setterfield (2008, pp.454-5) for further discussion.

By considering the two pairs of policy reaction functions [27]-[28] and [27a]-[28a], our modelling exercise can essentially be seen as updating and extending the earlier work of Isaac (1991). Like Isaac, we consider a monetary-production economy characterized by conflicting claims inflation, in which a crucial distinction exists between monetary policy that is sensitive to the real economy (as in [27]) and monetary policy that is insensitive to the real economy (as in [27a]). But whereas Isaac's monetary policy regimes describe monetarist and non-monetarist money supply growth rules, we update the description of monetary policy so that it is couched in terms of interest rate operating procedures. In our model, the interest rate is the instrument of monetary policy, and the quantity of money in circulation is rendered endogenous (to the credit demands of the non-bank private sector) *regardless* of the precise monetary policy regime. At the same time, we extend Isaac's analysis by introducing a second policy instrument (Z), allowing us to distinguish between more and less orthodox macroeconomic policy regimes in additional detail (as in equations [28] and [28a]), in a model with two policy objectives (y and p) and two policy instruments (ι and Z).

vii) The complete model

Our complete structural model can now be stated as follows:

Aggregate demand: $\qquad\qquad\qquad y = y_0 - \delta(\iota - p^e)$ $\qquad\qquad$ [14]

Phillips curve: $\qquad\qquad\qquad p = \beta + \varphi p^e + \alpha y + \theta Z + \varepsilon(\iota - p^e)$ $\qquad$ [26]

$\qquad\qquad$ or: $\qquad\qquad p = \beta + \varphi p^e + \alpha y + \theta Z + \varepsilon(\iota_n - p^e)$ $\qquad$ [26a]

Again, it may appear odd to think of adjusting labour market institutions in the short run, But note that the sort of "institutions" that policy makers would seek to vary in accordance with [28a] include unemployment benefit generosity and the value of the minimum wage – which are, once again, potentially amenable to change in the short run.

Inflation expectations: $\quad\quad\quad\quad\quad p^e = kp_{-1} + (1-k)p^T$ [6a]

$\quad\quad\quad\quad$ where: $\quad\quad\quad \dot{k} = 0$

Economic policy: $\quad\quad\quad\quad\quad i = \dot{p}^e + \lambda(y - y^T)$ [27]

$\quad\quad\quad\quad\quad\quad\quad\quad\quad \dot{Z} = -\mu(p - p^T)$ [28]

$\quad\quad\quad\quad$ or:

$\quad\quad\quad\quad\quad\quad\quad\quad\quad i = \dot{p}^e + \lambda(p - p^T)$ [27a]

$\quad\quad\quad\quad\quad\quad\quad\quad\quad \dot{Z} = -\mu(y - y^T)$ [28a]

3. Implications of the cost-push channel of monetary transmission

Before we turn to assess the impact of the policy regimes described by [27]-[28] and [27a]-[28a] on the possibilities for successful inflation and output targeting and the stability of macroeconomic equilibrium, we should first recall the corresponding results derived by Lima and Setterfield (2008) using a simpler model (with no cost channel). In an economy described by equation [14] (with $p^e = p$), equation [26] (with $\varepsilon = 0$), equation [6a] (with $k = 0$ and $\dot{p}^e = \dot{p}^T = 0$), and equations [27] (with $p^e = p$) and [28], the policy authorities set and pursue output and inflation targets that are, in turn, revealed to comprise the stable equilibrium configuration of the economy. This establishes what Setterfield (2006) defines as the *full* compatibility of inflation targeting with the underlying structure of the economy: not only are the policy authorities able to both set and achieve an inflation target (establishing the *partial* compatibility of inflation targeting with the economy), they are able to do so without real costs and hence without thwarting the achievement of any output target set independently of p^T (establishing *full* compatibility). Indeed, the policy authorities can change their inflation target

and still meet this target without affecting the real economy (and hence their ability to achieve any freely chosen, as far as inflation is concerned, output target). By the same token, policy makers can also set and pursue an output target without any fear of it having inflationary consequences.

Meanwhile, in an economy described by the same simplified versions of equations [14], [26] and [6a] described above, but with the policy mix given by [27a]-[28a], full compatibility obtains only in exceptional circumstances. In general, the policy authorities set and pursue output and inflation targets that are revealed as the *unstable* equilibrium configuration of the economy. Hence even the *partial* compatibility of inflation targeting with the underlying structure of the economy is lost: the policy authorities are unable to both set and (in general) achieve an inflation target. Only if, by chance, the economy happens to be on the stable arm of its saddle-point will an equilibrium consistent with $p = p^T$ and $y = y^T$ be reached. In this quite exceptional circumstance, *full* compatibility of inflation targeting with the economy is observed.

We now turn to assess the impact of the pairs of policy reaction functions given by [27]-[28] and [27a]-[28a] on both the feasibility of inflation targeting and the stability of macroeconomic equilibrium in the economy described by [14], [26] and [6a], starting with the policy mix given by [27] and [28]. First, note that from [14] we obtain:

$$\dot{y} = -\delta(i - \dot{p}^e) \qquad [29]$$

Meanwhile, it follows from [6a] that:

$$\dot{p}^e = \dot{k}p_{-1} + k\dot{p}_{-1} + \dot{p}^T - \dot{k}p^T - k\dot{p}^T$$

from which, given $\dot{k} = 0$ and assuming $\dot{p}^T = 0$, it follows that:

$$\dot{p}^e = k\dot{p}_{-1} \qquad [30]$$

Now note that, by definition, we have:

$$p_{-1} = p - \dot{p}\Delta t$$

from which it follows that:

$$\dot{p}_{-1} = \dot{p} - \ddot{p}\Delta t$$

and finally, assuming $\ddot{p} = 0$ and substituting the resulting expression into [30] above, we obtain:

$$\dot{p}^e = k\dot{p} \qquad [31]$$

Substitution of this expression and [27] into [29] then yields:

$$\dot{y} = -\delta\lambda(y - y^T) \qquad [32]$$

Finally, it follows from [26] that:

$$\dot{p} = \varphi\dot{p}^e + \alpha\dot{y} + \theta\dot{Z} + \varepsilon(i - \dot{p}^e)$$

from which, by utilizing [27], [28] [31] and [32], we obtain:

$$\dot{p} = \frac{1}{(1 - \varphi k)}[\lambda(\varepsilon - \alpha\delta)(y - y^T) - \theta\mu(p - p^T)] \qquad [33]$$

Equations [32] and [33] constitute a planar autonomous two-dimensional system of linear differential equations in which the rates of change of y and p depend on the levels of y and p, and on various parameters. Solving for the equilibrium configuration by imposing $\dot{y} = \dot{p} = 0$ on equations [32] and [33], we obtain the following isoclines:

$$y = y^T \qquad [34]$$

and:

$$y = y^T - \frac{\theta\mu}{\lambda(\varepsilon - \alpha\delta)}p^T + \frac{\theta\mu}{\lambda(\varepsilon - \alpha\delta)}p \qquad [35]$$

It follows from these isoclines that $y^* = y^T$ and $p^* = p^T$, which means that the equilibrium configuration of the economy is characterized by the achievement of both policy

targets. Meanwhile, the matrix J of partial derivatives for this dynamic system, from which the stability properties of the corresponding equilibrium configuration can be computed, is given by:

$$J_{11} = \partial\dot{y}/\partial y = -\delta\lambda$$

$$J_{12} = \partial\dot{y}/\partial p = 0$$

$$J_{21} = \partial\dot{p}/\partial y = \lambda(\varepsilon - \alpha\delta)/(1-\varphi k)$$

$$J_{22} = \partial\dot{p}/\partial p = -\theta\mu/(1-\varphi k)$$

A necessary condition for stability of the equilibrium configuration represented by $y^* = y^T$ and $p^* = p^T$ is $\mathrm{Det}(J) = \delta\lambda\theta\mu/(1-\varphi k) > 0$, which is automatically satisfied given our assumptions that $0 < \varphi < 1$ and $0 \le k \le 1$. Another necessary condition for stability of the equilibrium solution is $\mathrm{Tr}(J) = J_{11} + J_{22} < 0$, which is therefore likewise automatically satisfied. [29] Hence the equilibrium configuration given by $y^* = y^T$ and $p^* = p^T$ is stable when macroeconomic policy is conducted according to the reaction functions given by [27] and [28]. Moreover, this is so no matter how strong the cost channel of monetary policy happens to be – i.e., regardless of the size of ε.

In the economy described by equations [14], [26], [6a], [27], and [28], then, the policy authorities are able to set and pursue output and inflation targets that are revealed to comprise the stable equilibrium configuration of the economy. As in the basic model elaborated in Lima and Setterfield (2008) – a special case of the model analyzed above which assumes that aggregate demand depends on the actual real interest rate, monetary policy is conducted by manipulating the actual real interest rate and $\varepsilon = k = 0$ – we observe the *full* compatibility of inflation targeting with the underlying structure of the economy. It follows that the cost channel is not

disruptive to the functioning of a Post Keynesian economy in which policy is pursued in accordance with [27] and [28].[30] All of the original results found in Lima and Setterfield (2008) regarding macro stability and the full compatibility of inflation targeting with the structure of the economy still go through. Graphically, the $\dot{y} = 0$ isocline (given by [34]) is parallel to the p axis, while the $\dot{p} = 0$ isocline (given by [35]) is positively (negatively) sloped if $\varepsilon > \alpha\delta$ ($\varepsilon < \alpha\delta$), that is, if the cost-push channel in the Phillips curve (measured by ε) is stronger (weaker) than the standard demand-pull channel of monetary transmission (measured by $\alpha\delta$). In either case, since $\partial\dot{y}/\partial y$ is negative, $\dot{y}$ undergoes a steady decrease as y increases, so that the sign of $\dot{y}$ is positive (negative) below (above) the $\dot{y} = 0$ locus. Meanwhile, given that $\partial\dot{p}/\partial p$ is negative, $\dot{p}$ undergoes a steady fall as p rises, with the sign of $\dot{p}$ then being positive (negative) to the left (right) of the $\dot{p} = 0$ isoclines. Therefore, the equilibrium configuration given by $(y^*, p^*) = (y^T, p^T)$ is a stable node, which implies that both output and inflation converge monotonically (and hence with no over- or undershooting) to their corresponding equilibrium values.

Let us now turn to assess the impact of the pair of policy reaction functions given by [27a]-[28a] on the feasibility of inflation targeting and the stability of macroeconomic equilibrium in the economy described by [14], [26] and [6a]. First, recall that it follows from [14] that:

$$\dot{y} = -\delta(i - \dot{p}^e) \qquad [29]$$

Substitution of [27a] into the above expression then yields:

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[29] Note that $0 < \varphi < 1$ is not a necessary condition for stability, as the necessary and sufficient condition for stability given by $\varphi k < 1$ can be satisfied even when $\varphi > 1$.
[30] Nor are heterogeneous expectations – i.e., $k \neq 0$.

$$\dot{y} = -\delta\lambda(p - p^T) \tag{36}$$

Now recall that it follows from [26] that:

$$\dot{p} = \varphi\dot{p}^e + \alpha\dot{y} + \theta\dot{Z} + \varepsilon(i - \dot{p}^e)$$

from which, by utilizing [27a], [28a], [31] and [36], we obtain:

$$\dot{p} = \frac{1}{(1-\varphi k)}[\lambda(\varepsilon - \alpha\delta)(p - p^T) - \theta\mu(y - y^T)] \tag{37}$$

Equations [36] and [37] constitute another planar autonomous two-dimensional system of linear differential equations in which the rates of change of y and p depend on the levels of y and p, and on parameters. Solving for the equilibrium configuration by imposing $\dot{y} = \dot{p} = 0$, we arrive at the following isoclines:

$$p = p^T \tag{38}$$

and:

$$p = p^T - \frac{\theta\mu}{\lambda(\varepsilon - \alpha\delta)}y^T + \frac{\theta\mu}{\lambda(\varepsilon - \alpha\delta)}y \tag{39}$$

It follows from these isoclines that $y^* = y^T$ and $p^* = p^T$, so that the equilibrium configuration is again characterized by the achievement of both policy targets. Note, however, that this equilibrium configuration is saddle-point unstable. This can be verified by reference to the matrix J of partial derivatives for this dynamic system, which is given by:

$$J_{11} = \partial\dot{y}/\partial y = 0$$

$$J_{12} = \partial\dot{y}/\partial p = -\delta\lambda$$

$$J_{21} = \partial\dot{p}/\partial y = -\theta\mu/(1-\varphi k)$$

$$J_{22} = \partial\dot{p}/\partial p = \lambda(\varepsilon - \alpha\delta)/(1-\varphi k)$$

The elements of the Jacobian described above imply that $Det(J) = -\delta\lambda\theta\mu/(1-\varphi k) < 0$, which is a necessary and sufficient condition for saddle-point instability of the equilibrium solution represented by $y^* = y^T$ and $p^* = p^T$. Stability would only ever be observed if $\varphi k > 1$ (which requires $\varphi > 1$, since $0 \le k \le 1$), as this would make for $Det(J) > 0$. With $\varphi k > 1$, stability is then ensured by $\varepsilon > \alpha\delta$ – i.e., a sufficiently strong cost channel – which makes $Tr(J) < 0$. But in terms of the standard treatment of inflation expectations in the wage equation – which suggests either that there is full indexation of expected inflation in nominal wage growth ($\varphi = 1$, the neoclassical case) or else there is incomplete indexation ($\varphi < 1$, the heterodox case) – $\varphi > 1$ cannot be considered economically meaningful. We are therefore left with the conclusion that pursuing a simplified policy orthodoxy in a Post Keynesian economy where the cost channel operates through the effect of the actual nominal interest rate on pricing behaviour is de-stabilizing. Once again, this is identical to the result in Lima and Setterfield (2008). This, in turn, suggests that it is the choice of policy regime, rather than the existence and strength of a cost channel, that most seriously affect the functioning of a monetary production economy in which inflation targeting is attempted.

This claim is only reinforced if we reconsider the micro-foundations of the pricing decision and, in so doing, replace the SRPC in [26] with that in [26a]. Hence consider first the impact of the policy reaction functions given by [27]-[28] on both the feasibility of inflation targeting and the stability of macroeconomic equilibrium in an economy whose Phillips curve is given by [26a], in which the rate of inflation varies positively with the real *normal* interest rate. First, recall that from [14] we obtain:

$$\dot{y} = -\delta(i - \dot{p}^e) \qquad [29]$$

Meanwhile, substitution of [27] into the above expression yields:

$$\dot{y} = -\delta\lambda(y - y^T) \qquad [32]$$

Now note that it follows from [26a] (assuming $i_n = 0$) that:

$$\dot{p} = \varphi\dot{p}^e + \alpha\dot{y} + \theta\dot{Z} - \varepsilon\dot{p}^e$$

from which, by utilizing [27], [28] and [31], we obtain:

$$\dot{p} = -A[\alpha\delta\lambda(y - y^T) + \theta\mu(p - p^T)] \qquad [40]$$

where:

$$A \equiv \frac{1}{1 + (\varepsilon - \varphi)k}$$

Equations [32] and [40] constitute a third planar autonomous two-dimensional system of linear differential equations in which the rates of change of y and p depend on the levels of y and p, and on various parameters. Solving for the equilibrium configuration by imposing $\dot{y} = \dot{p} = 0$ on equations [32] and [40], we obtain the following isoclines:

$$y = y^T \qquad [41]$$

and:

$$y = y^T + \frac{\theta\mu}{\alpha\delta\lambda}p^T - \frac{\theta\mu}{\alpha\delta\lambda}p \qquad [42]$$

It follows from these isoclines that $y^* = y^T$ and $p^* = p^T$, which means that, once again, the equilibrium configuration is characterized by the achievement of both policy targets. Meanwhile, the matrix J of partial derivatives for this dynamic system, from which the stability properties of the corresponding equilibrium configuration can be computed, is given by:

$$J_{11} = \partial\dot{y}/\partial y = -\delta\lambda$$

$$J_{12} = \partial\dot{y}/\partial p = 0$$

$$J_{21} = \partial\dot{p}/\partial y = -\alpha\delta\lambda A$$

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$$J_{22} = \partial \dot{p}/\partial p = -\theta \mu A$$

A necessary condition for stability of the equilibrium configuration represented by $y^* = y^T$ and $p^* = p^T$ is $\text{Det}(J) = \delta \lambda \theta \mu A > 0$, which is automatically satisfied given our assumptions that $0 < \varphi < 1$ and $0 \le k \le 1$ (which together imply that $A > 0$). Another necessary condition for stability of the equilibrium solution is $\text{Tr}(J) = J_{11} + J_{22} < 0$, which is likewise automatically satisfied. Hence the equilibrium configuration given by $y^* = y^T$ and $p^* = p^T$ is stable when macroeconomic policy is conducted according to the reaction functions given by [27] and [28]. Moreover, this is so regardless of the strength of the cost channel of monetary policy (i.e., no matter what the size of ε). In the economy described by equations [14], [26a], [6a], [27], and [28], then, we observe *full* compatibility of inflation targeting with the underlying structure of the economy: not only are the policy authorities able to both set and achieve an inflation target (establishing the *partial* compatibility of inflation targeting with the structure of economy), they are able to do so without real costs and therefore without thwarting the achievement of any output target set independently of p^T. Another point that this analysis makes clear is that the question as to whether it is the actual or the normal rate of interest that affects firms' pricing decisions makes no difference to the efficacy of inflation targeting in a Post Keynesian economy.[31]

Let us now turn to assess the impact of the pair of policy reaction functions given by [27a]-[28a] on the desirability of inflation targeting and the stability of macroeconomic equilibrium in the economy described by [14], [26a] and [6a]. First, recall that it follows from [14] that:

$$\dot{y} = -\delta(i - \dot{p}^e) \tag{29}$$

Substitution of [27a] into the above expression then yields:

$$\dot{y} = -\delta\lambda(p - p^T) \tag{36}$$

Now recall that it follows from [26a] that:

$$\dot{p} = \varphi\dot{p}^e + \alpha\dot{y} + \theta\dot{Z} - \varepsilon\dot{p}^e$$

from which, by utilizing [27a], [28a] and [31], we obtain:

$$\dot{p} = -A[\alpha\delta\lambda(p - p^T) + \theta\mu(y - y^T)] \tag{43}$$

where, as before:

$$A \equiv \frac{1}{1 + (\varepsilon - \varphi)k}$$

Equations [36] and [43] constitute another planar autonomous two-dimensional system of linear differential equations in which the rates of change of y and p depend on the levels of y and p, and on parameters. Solving for the equilibrium configuration by imposing $\dot{y} = \dot{p} = 0$, we arrive at the following isoclines:

$$p = p^T \tag{44}$$

and:

$$p = p^T + \frac{\theta\mu}{\alpha\delta\lambda} y^T - \frac{\theta\mu}{\alpha\delta\lambda} y \tag{45}$$

It follows from these isoclines that $y^* = y^T$ and $p^* = p^T$ – the now familiar result that the equilibrium configuration of the economy is characterized by the achievement of both policy targets. Note, however, that this equilibrium configuration is saddle-point unstable. This can be

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[31] This observation, together with the results reported below, bears out the notion alluded to earlier, that we can safely abstract from variations in ι_n in response to changes in ι without affecting the generality of our results.

verified by noting that the matrix J of partial derivatives for this dynamic system, which is given by:

$$J_{11} = \partial\dot{y}/\partial y = 0$$

$$J_{12} = \partial\dot{y}/\partial p = -\delta\lambda$$

$$J_{21} = \partial\dot{p}/\partial y = -\theta\mu A$$

$$J_{22} = \partial\dot{p}/\partial p = -\alpha\delta\lambda A$$

implies that $\text{Det}(J) = -\delta\lambda\theta\mu A < 0$ (recall that $0 < \varphi < 1$ and $0 \le k \le 1$, so that $A > 0$), which is a necessary and sufficient condition for saddle-point instability of the equilibrium solution represented by $y^* = y^T$ and $p^* = p^T$. A necessary condition for stability in this case is $A < 0$, which would make $\text{Det}(J) > 0$. But this is economically meaningless, because it would require $\varphi > 1$.[32] Moreover, $A < 0$ would mean that $Tr(J) > 0$, thwarting stability. In short, the more orthodox policy regime inevitably renders the equilibrium configuration of the economy unstable. In contrast to the case where the same economy is subject to the policy interventions described in equations [27] and [28], the pursuit of a simplified policy orthodoxy (as in equations [27a] and [28a]) diminishes the prospects for stability to the special case where the economy begins somewhere on the stable arm of the saddle point represented by the equilibrium solution $y^* = y^T$ and $p^* = p^T$. These conclusions hold whatever the strength of the cost channel of monetary policy – i.e., regardless of the size of ε.[33]

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[32] Again, the standard assumptions are that either $\varphi = 1$ (full indexation) or else $\varphi < 1$ (incomplete indexation).

[33] As a final experiment, we analyzed the implications of Lima and Setterfield's (2008, p.460) "full policy orthodoxy" regime for macroeconomic stability and the pursuit of inflation targeting in the presence of the cost channel. This policy regime was found to make the economy unambiguously unstable, regardless of the strength of the cost channel (i.e., the size of ε).

4. Conclusions

Post Keynesian macroeconomists are inclined to be skeptical of inflation targeting, because of the frequent neglect of the real costs that such policies can entail. According to Lima and Setterfield (2008), however, it is possible to pursue inflation targeting in a Post Keynesian economy *without* detrimental real effects, as long as an appropriate policy regime is adopted. But one important shortcoming of these results is Lima and Setterfield's complete neglect of the cost channel of monetary policy, according to which changes in interest rates affect the costs of production and hence (potentially) price dynamics.

The purpose of this paper has been to: a) provide a proper foundation in Post Keynesian macro- and micro-principles for the simplified policy model utilized by Lima and Setterfield; b) incorporate the cost channel of monetary policy into the price dynamics of this model; and c) study the stability of, and efficacy of inflation targeting in, the resulting monetary-production economy, under different (more and less orthodox) policy regimes. The key result that our analysis produces is that Lima and Setterfield's (2008) conclusions survive the introduction of the cost channel. Specifically:

- the appropriate (Post Keynesian) policy mix can successfully stabilize the economy and deliver full compatibility of inflation targeting with the underlying structure of the economy

- the more orthodox the policy mix becomes, the graver the consequences for stability and the potential success of inflation targeting

- it follows that the problem with inflation targeting is not so much *whether* it is pursued as *how*. In other words, it is the precise policy regime that is potentially harmful to economic performance in a monetary production economy, rather than the policy objective (of low inflation) *per se*.

These conclusions (and the results on which they are based) are robust to switching between the normal and the actual rate of interest in the pricing decision from which the aggregate Phillips curve relationship is derived.

At first sight, the conclusions reached above may seem to be nothing more than common sense, because unlike the orthodox policy regime, the Post Keynesian policy regime does not devote monetary policy to fighting inflation (with the attendant risk of antagonizing inflation through the cost channel, and thus establishing a de-stabilizing dynamic). But as our results demonstrate, the *target* of monetary policy is not, in fact, the key driver of macroeconomic stability and the associated efficacy of inflation targeting. On the contrary, it has been shown that *none of our results – including the instability introduced by more orthodox policy measures – is in any way affected by the magnitude of the cost channel*. Put differently, neither the efficacy of a Post Keynesian policy regime, nor the superiority of this regime relative to a more orthodox policy mix, is influenced by the existence of a cost channel of monetary policy.

This last point leads to a final and important conclusion when it is put into the context of Isaac's (1991, p.93) earlier findings, that while "monetary policy rules are a crucial determinant of macroeconomic performance" and "stable macrodynamic behavior requires the implementation of activist policy," only "accommodative [Post Keynesian] policies are stabilizing [whereas] ... monetarist policies are destabilizing." Taken together with our own results, this suggests that:

- regardless of whether monetary policy is considered in isolation (as in Isaac, 1991) or as part of a broader policy regime (as in our own analysis);

- regardless of whether the instrument of monetary policy is the quantity of money in circulation (as in Isaac, 1991) or the interest rate (as in our own analysis); and

- regardless of whether or not a monetary policy conducted through the manipulation of interest rates is sensitive to the existence of the cost channel

a robust finding of Post Keynesian macrodynamics is that in monetary production economies with conflicting claims inflation mechanisms, *more orthodox policy regimes have unambiguously negative consequences for macro stabilization*. What is required for successful stabilization is activist macroeconomic policy that is properly attuned to the intrinsic structures and properties of the economy.

It is obviously beyond the scope of this paper to reflect at length on the implications of this last conclusion for recent macroeconomic events. However, it is tempting to conjecture that:

i) the Great Moderation was achieved neither through luck nor successful (orthodox) monetary policy so much as through changes to labour market institutions that resulted in the (unintentional?) creation of an "incomes policy based on fear," that held quiescent conflicting claims inflation mechanisms even as economies such as the US neared capacity (Setterfield, 2007)

ii) the Great Recession represents, in some measure, the culmination of the inherent macroeconomic instability engendered by the pursuit of orthodox macroeconomic policies in a monetary production economy.

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