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Pricing Behaviour and the Cost-Push Channel of Monetary Policy

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Abstract

This paper examines the empirical and theoretical status of the cost-push channel of monetary policy, according to which interest rates affect the costs of production and hence pricing behaviour. Particular attention is paid to modelling the cost-push channel in a manner consistent with cost-plus pricing theory, which is identified as the canonical model of pricing behaviour in heterodox economics. It is shown that different variants of cost-plus pricing behaviour give rise to qualitatively different specifications of the cost-push channel, with important consequences for macrodynamics and the conduct of monetary policy.

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Notes

[1]The cost-push channel is also referred to as Gibson's paradox (following Keynes, 1930), the Cavallo-Patman effect (following Taylor, 1991) and the 'price puzzle' (following Eichenbaum, 1992).

[2]It is beyond the scope of this paper to explore these implications. See Lima & Setterfield (2008) for a preliminary investigation.

[3]As they explain: 'The presence of a price puzzle is important because it casts serious doubts on the possibility of correctly identifying a monetary policy shock. If the central bank monitors and responds to a larger information set than that of the econometrician, what may be referred to as a policy shock by the latter is actually a combination of a genuine policy shock and some endogenous policy reactions. The result of this omission is that a policy tightening in anticipation of future inflation could be wrongly interpreted by the econometrician as a policy shock, delivering spurious correlation between a tightening of policy and a rise in inflation: the price puzzle' (Castelnuovo & Surico, 2006, p. 4). In fact, this is essentially Sims' (1992) argument. Sims was the first to draw attention to the anomaly labelled 'the price puzzle'. He also claimed that the inclusion of a commodity price index in a VAR seems to capture enough additional information about future inflation as to possibly solve this puzzle.

[4]The cost-push channel of monetary policy also serves as the main building block in limited-participation models of money (e.g., Christiano et al., 1997), which are the most prominent mainstream alternatives to sticky price, rational expectations versions of the IS-LM model, and in the literature on agency cost effects in monetary transmission (e.g., Cooley & Nam, 1998). In the canonical limited-participation model, the friction that generates monetary non-neutrality is not stickiness in price setting, but a credit market friction implying that firms need to borrow cash in advance from financial intermediaries to finance the wage bill.

[5]Linnemann (2005) offers a different explanation for the supply-side effect of monetary policy. Under a balanced government budget, a higher nominal interest rate leading to

a higher real interest rate commands a higher tax rate since it implies higher interest payments on the existing stock of debt and because reduced demand diminishes the tax base. Thus, by discouraging current labour supply for intertemporal substitution reasons, there is an upward pressure on wages and hence prices. Note that a heterodox variant of this mechanism could be derived by combining Linnemann's (2005) balanced budget assumptions with Mott & Slattery's (1994) discussion of tax shifting. In this case, monetary-policy-induced tax increases would directly impact prices via firms' price setting behaviour.

[6]It should be noted that the presence of the cost-push channel of monetary transmission in New Keynesian models of optimal monetary policy has serious implications for equilibrium determinacy, uniqueness and stability. For instance, Brückner & Schabert (2003) introduce working capital into an otherwise conventional New Keynesian model and show that active interest rate policy remains necessary but should be moderate to ensure real determinacy. The nominal interest rate enters the aggregate supply curve as it raises the marginal costs of firms, implying that the reactiveness of the interest rate rule now has both a lower bound (the Taylor principle, which requires that the nominal interest rate is raised by more than one for one in response to changes in the inflation rate, so as to avoid self-fulfilling inflation expectations) and an upper bound (which varies negatively with the elasticity of labour supply) to ensure equilibrium uniqueness.

[7]As summarised by Smith (2001, p. 47): 'In conjunction, Tooke's Banking School theory proposed that in the long run causality ran from the rate of interest to the price level, and then to the quantity of money in circulation, given the technique of production, level of aggregate output and institutional setting of the financial system (i.e., normal income-velocity). In the short run, Tooke proposed that causality ran from fluctuations in nominal income—according to changes in market prices and economic activity—to the quantity of money in circulation associated with variations in the velocity of circulation of banknotes and coin'.

[8]Kitchin (1923) and Peake (1928) also report evidence of a positive correlation between short-term interest rates and prices, although only the latter is mentioned by Keynes.

[9]'That is to say, when the natural rate of interest is falling (or rising), the banking world does not quickly detect this or respond to it, so that there is a tendency for the market rate to lag behind and to fall (or rise) less than it should if it is to maintain contact with

the natural rate. In other words, when savings are abundant or deficient in relation to the demand for them for investment at the pre-existing level of interest, the rate does not adjust itself to the new situation quick enough to maintain equilibrium between savings and investment' (Keynes, 1930, p. 182). As it goes well beyond the scope of this paper to discuss either Keynes's or Fisher's explanations of the Gibson paradox, we would redirect the reader to Shiller & Siegel (1977), where the whole controversy surrounding Gibson's work (including Wicksell's and other later contributions to the debate) is empirically evaluated.

[10]Pivetti's notion of normal distribution does not refer to actual or effective profits, but to normal profits: 'The latter, reckoned gross of interest, correspond to the rate of return on capital which would be obtained by firms using dominant or generally accessible techniques, and producing output at levels regarded as normal at the time the capacity was installed' (Pivetti, 1991, p. 20). As for the money rate of interest, Pivetti means the 'rate on long-term government bonds, or an arithmetical average of this rate and the ordinary interest rate on reasonably secured long-term private loans' (Pivetti, 1991, p. 21).

[11]Another implication of this view is that changes in interest rates will tend to be related to changes in aggregate demand, but through a very different route from that traditionally emphasised. For instance, demand for capital goods will not be directly affected by changes in the interest rate. Since normal returns are not independent of the interest rate, but rather tend to move parallel with it, a lasting reduction (increase) in the long-term rate will not raise (lower) the demand price of a capital good relative to its supply price. Hence, no increase in investment can be expected as a result of a lasting reduction in interest rates (Pivetti, 1991, pp. 44–45). The propensities to consume and to invest are important determinants of output, but their influence on the latter in response to changes in the interest rate operates through changes in the normal distribution of income between profits and wages (Pivetti, 1991, p. 45).

[12]There is an obvious parallel between this discussion of the impact of interest rates on firms' pricing procedures and Mott & Slattery's (1994) Kaleckian analysis of 'tax shifting' (the process by which firms pass on taxes to consumers in the form of higher prices). Indeed, while the main motivation for this paper is the recent increase in interest in the cost-push channel of monetary policy, it can also be thought of as a counterpart to Mott & Slattery's work, in which the impact of monetary (rather than fiscal) policy on pricing procedures (and ultimately macroeconomic outcomes) is the

focus of attention. There is also a parallel between the analysis of the cost-push channel of monetary policy pursued in this paper and Arestis & Milberg's (1994) analysis of exchange rate pass-through in a Kaleckian framework, where changes in the nominal exchange rate lead to changes in either unit prime costs or mark ups. In an open economy with capital mobility and flexible exchange rates, therefore, a rise in the domestic interest rate, by causing an appreciation in the nominal exchange rate, would have an indirect cost-reducing effect on domestic inflation, alongside the cost-push effect examined in this paper. The reason is that such an exchange rate appreciation would reduce unit prime costs associated with imported inputs (including any external borrowing) and/or mark ups.

[13]See also Kreisler & Lavoie (2007, p. 391) on these and other references to the cost-push channel in Post Keynesian macroeconomics, including several of those discussed below.

[14]Note that the rate of interest could affect the pricing decision through its effects on labour productivity (1/a), if technological innovation depends on external financing. Moreover, high debt-servicing costs are likely to impact negatively on firms' ability to finance technological innovation from retained net profits. We abstract from these possibilities in this paper.

[15]Note that equation (2) focuses on the effects of the interest rate on firms' given financial liabilities and hence the pricing decision. If firms retain profits, however, then they will accumulate financial assets which will also be affected by changes in the interest rate. Moreover, variations in the interest rate may affect the propensity of firms to accumulate debt. We abstract from these observations here. See, however, the discussion of changes in the leverage ratio in Section 3.3 below, which is informed by the notion that firms that accumulate retained earnings may be induced to substitute internal for external financing in the event of an increase in the interest rate.

[16]Equation (2) can also capture Minsky's (1975) theory of counter-cyclical mark ups, in which a fall in sales during a downturn forces firms to raise mark ups to meet outstanding financial obligations. This would be captured by an increase in the parameter δ in equation (2). See also Chevalier & Scharfstein (1996) for a mainstream counterpart to Minsky's theory, in which the counter-cyclical behaviour of mark ups is justified by the claim that, since capital-market imperfections constrain the ability of

firms to raise external financing, liquidity-constrained firms will increase (lower) mark ups during recessions (booms).

[17]There are, of course, many ways of describing the determinants of wage inflation, and we make no claim that equation (4) is definitive. It is employed here (and in what follows) as a simple first approximation that, in each case, allows us to write an equation for the rate of inflation in which inflation is sensitive to (inter alia) the level of real activity—i.e., an equation that takes the recognisable form of a SRPC. The precise functional form of equation (4) has no bearing on the relationship between price inflation and the interest rate in which we are interested, except in so far as it assumes that interest rates have no direct effect on wage formation (only an indirect effect operating through actual and hence expected price inflation). This is tantamount to assuming that only firms carry debt. In a world in which households also carry debt, the interest rate may influence workers' target real wage in which case it may have a secondary effect on price inflation via the rate of wage inflation. Even if workers do not carry debt, the possibility remains (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. The models of the Phillips Curve set out in this paper can be thought of as abstracting from these possibilities. We would therefore 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 of the cost-push channel of monetary policy.

[18]Rowthorn (1977) develops an early model of conflict inflation, while Lavoie (1992, ch. 7) and Burdekin & Burkett (1996) provide surveys of the conflicting claims approach to inflation. See Lee (1998) and Lavoie (1992, pp. 129–133) 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 & Kenyon (1976) and Eichner (1987) that emphasise the influence of investment and growth on the size of the mark up (see Lavoie, 1992, p. 133).

[19]The parameter β will also likely vary with y, but this is overlooked for the sake of simplicity.

[20]Note that enterprise profit as defined here is based on firms' cash flow, so that the rate of enterprise profits derived above is, in fact, the real cash flow rate (see Setterfield, 2009 for further discussion). It is appropriate for firms to target the cash flow rate if cash flows constrain investment spending (as suggested by Fazzari & Mott, 1986–87; Fazzari et al., 1988; and Ndikumana, 1999) and the purpose of the mark up is to raise funds to finance investment.

[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. 360–361; 1995) on the pricing theory of Eichner (1987).

[22]This recalls the emphasis on permanent or lasting changes in the interest rate in the work of Panico (1988) and Pivetti (1991) discussed earlier. Hence consistent with equation (12a), short-run variations in the interest rate that leave the normal rate of interest, ι_n, unchanged will leave the equilibrium mark up and hence prices unchanged, ceteris paribus.

[23]A nonlinearity would emerge in the event that the SRPC given by equation (14a) were not linearised in the normal rate of interest, as in equation (15b). Suppose that the leverage ratio is given by , so that the term in equation (14a) becomes an inverted-U function of the normal rate of interest, with roots given by and . As a result, an increase in the normal rate of interest would lead to a rise (fall) in the level of inflation if the normal rate of interest were lower (higher) than . Meanwhile, the change in inflation would vary positively (negatively) with the actual rate of interest if the normal rate of interest were lower (higher) than . Indeed, the level of inflation would be nonlinear in the actual interest rate in the approach taken in Section 3.2 if the actual leverage ratio is given by . In this case, both the level and the rate of change of inflation will vary positively (negatively) with the nominal rate of interest if the latter is lower (higher) than . Given the sometimes ambiguous—or even contradictory—results found in the burgeoning empirical literature on the cost-push channel of monetary policy reviewed in the previous section, we would suggest that these nonlinear specifications are worthy of further (particularly empirical) investigation.

[24]In other words, having determined the size of , firms immediately set prices consistent with this value of k, rather than undertaking the process of gradual adjustment described in equation (6). Note that the model of pricing and price dynamics developed by Hannsgen (2006) to accommodate the cost-push channel of

monetary policy considers only a gradual adjustment process akin to equation (6). Another problematic feature of Hannsgen's model is the assumption that firms start with no money, having to borrow the full amount of the wage bill. Nonetheless, firms are assumed to pay back their loans and retain profit at the end of each period. It is therefore unclear why firms must borrow the full amount of the wage bill at the start of the period if there may exist retained profits from preceding periods. Fortunately, the interesting macroeconomic results of the Hannsgen model are not compromised by the fact that not all of its microeconomic assumptions are spelled out.

[25]In the model developed by Godley (1999), the mark up also depends on the real interest rate because of debt-financed inventory accumulation. But the ratio of inventories to total output, ξ, is made to vary negatively with the nominal interest rate. Under these assumptions, we would again arrive at an expression identical to equation (1), with the mark up now given by , where . A rise in the nominal interest rate would now exert both an upward pressure (due to the rise in the cost of servicing debt-financed inventory accumulation) and a downward pressure (due to the fall in the ratio of inventories to total output, ξ) on the mark up. A rise in the nominal interest rate could lower the rate of inflation if it induces a sufficiently large fall in the ratio of inventories to output. See Godley & Lavoie (2007, ch. 8) for further exploration of this approach.

Alternatively, suppose that ξ varies negatively with the normal rate of interest, and that ι_n again varies in response to firms' experience of prevailing actual rates of interest, as represented by equation (16). In this case, the rate of change of the inventories to output ratio would depend on the level of the nominal interest rate, and not on its rate of change, although a rise in the nominal interest rate could still end up lowering the rate of inflation. Therefore, a ratio of inventories to total output that varies negatively with the nominal rate of interest is another mechanism through which the cost-push channel of monetary policy may operate in a nonlinear manner, as described in footnote 21.

[26]Moreover, as also mentioned earlier, interest rates may affect pricing: (a) if fiscal-monetary interaction causes interest rates to affect tax rates, and if firms practice what Mott & Slattery (1994) describe as 'tax shifting' in their pricing behaviour; (b) via the exchange rate (and hence the cost of imported inputs into the production process); and (c) if technological change—and hence labour productivity—is sensitive to the costs of external financing.

[27]See Hannsgen (2006) for a recent attempt to consider the implications for macroeconomic stability of one particular variant of the cost-push channel; see Lima & Setterfield (2008) for preliminary investigation of the implications of multiple variants.

Of course, addressing the question identified above might be made easier by prior empirical analysis to determine which of the theoretically plausible SRPCs identified in this paper are most likely to be important in practice. While such empirical analysis is beyond the scope of this paper, it, too, can be identified as a key component of future research into the cost-push channel of monetary policy.

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