Non-neutrality of monetary policy in policy games

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Abstract

This paper investigates the sources of non-neutrality in policy games involving one or more trade unions. We use a simple open economy model to demonstrate basic mechanisms that also arise in other frameworks. There are common roots in the non-neutrality results obtained in such apparently different contexts as, for example, an inflation-averse union playing against the government; a union sharing some other common objective with a policymaker; and when more than one union interacts with monopolistic competitors in the goods market and a policymaker.

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1. Introduction

The interaction between monetary policy and wage setting was analysed in the 1970s and 1980s in terms of policy games with a particular focus on questions of time consistency, central bank independence and the like. A related aspect of such interaction, that of the non-neutrality of money (i.e., the possibility for the monetary authorities to control the rate of output growth), was first investigated by Gylfason and Lindbeck (1994). They make use of a rather simple game between government and organised labour and show that ‘monetary expansion stimulates output and employment despite the optimal
reaction of the unions as long as they care about inflation’ (Gylfason and Lindbeck, 1994, p. 43).

The property noted by Gylfason and Lindbeck has been widely used in the literature to derive a number of unconventional results. For instance, Jensen (1997) shows how the Rogoff’s result of counter-productiveness of international co-ordination is not robust when trade unions are introduced as players. However, Jensen’s result no longer holds if the assumption of an inflation-averse union is removed. Cukierman and Lippi (1999) derive a Calmfors and Driffill hump-shaped relationship between the degree of centralisation and employment. Their result also collapses into a monotonic relationship if the assumption of an inflation-averse union is removed. Moreover, their result is not robust if an information setting where players simultaneously interact (Nash equilibrium) is considered rather than a game where the unions are able to pre-commit to their wage policies (Stackelberg equilibrium). The reason the inflation-aversion assumption does not provide the same results in the Nash case is not completely understood (see Ciccarone and Marchetti, 2001).1

The fruitfulness of the results obtained in policy games between the central bank and one or several unions, together with the criticism of the assumption of an inflation-averse union,2 has motivated several studies where non-neutrality comes out not from the union inflation-aversion but from the interaction between goods and labour markets (Soskice and Iversen, 1998, 2000; Coricelli et al., 2000, 2001; Lippi, 2001). However, even in these cases, the non-neutrality result is not robust with respect to the elimination of the assumption of either a multiplicity of unions acting in the labour markets or monopolistic competitors in the goods markets.

While the literature on policy games and unionised economies has moved several steps beyond the pioneering models of the 1970s, as we have indicated, not all the results are completely understood. In particular, although many studies have based their results on some sort of non-neutrality proposition, only a few have risen to the challenge of investigating its roots.3

We shall investigate the sources of non-neutrality in policy games involving trade unions in a simple model in order to clearly expose the basic mechanisms, which also apply to more complex frameworks. We then show that there are common roots in the non-neutrality results obtained in apparently different contexts. Finally, we show that there are other cases where these results can arise.

Section 2 clarifies the definition of neutrality and the propositions that have been advanced to state the conditions for non-neutrality. Section 3 presents a simple general model that is used in Section 4 to discuss the mechanisms that drive non-neutrality.

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1 Inflation-aversion of unions plays a crucial role in many other studies, e.g., Grüner and Hefeker (1999), Guzzo and Velasco (1999), Lawler (2000a,b, 2001) and Jerger (2002). See Ciccarone and Marchetti (2001) for a critical survey.


3 Apart from Gylfason and Lindbeck (1994), Acocella and Ciccarone (1997) and Cubitt (1997) are two exceptions (see Section 2).
Section 5 states necessary and sufficient conditions for non-neutrality to arise. Section 6 summarises our findings and draws general conclusions.

2. The non-neutrality proposition

The classical definition of money neutrality implies that autonomous changes in money supply have no influence on the level of output. In the realm of policy games, such a definition cannot be maintained, as money supply is an endogenous variable. Instead, the following definition of neutrality can be accepted: When the optimal equilibrium output does not depend on the preferences of the policymaker, monetary policy is neutral.

Gylfason and Lindbeck (1994) analyse the robustness of the property of monetary policy neutrality in a simple game between a policymaker and a union. By assuming that the policymaker reasonably cares at least about inflation and output and unions about the real wage and output (as a proxy for employment), they derive a condition that allows monetary policy to be non-neutral. We can summarise their proposition (henceforth, the Non-Neutrality Proposition, NNP) as follows: When the union’s preferences take prices into account (GL’s assumption), monetary policy is non-neutral.

In particular, Gylfason and Lindbeck show that non-cooperative maximisation of a union’s preference function quadratic in real wages and income and a government’s utility function quadratic in both income and prices implies a lower stagflation bias when a quadratic cost for price stability is introduced in the union’s preference function. The effects of an inflation-averse union are extensively discussed in Cubitt (1995, 1997).

The justifications for union inflation-aversion advanced in the literature\(^4\) appear rather weak and one could generally agree with Soskice and Iversen (2000) that introducing an inflation term directly into the union’s preference function is an ad hoc means of obtaining non-neutrality. However, the union may also be induced to care about inflation indirectly, in a number of ways. One such way is to consider a co-operative game between a union and a policymaker who cares about inflation. Another way might be when there is a wage-\textit{wedge}, i.e., when a wedge arises between the relevant wage for the union and the relevant wage for firms’ labour demand. In this case, even if the union cares only about real wages and output, there is no one-to-one correspondence between the real wage relevant for the union and that directly relevant for output. The union’s preference function can be shown to depend on output and the price level. If this is the case, non-neutrality may arise.

\(^4\) There may be reasons why unions care about inflation. The large number of retired workers who are union members in certain countries with un-indexed pensions may be one such reason. The unions may also be opposed to inflation because this not only reduces the real wage of a representative member, but also has a negative impact on the member’s savings and other nominal assets (see Gylfason and Lindbeck, 1994; al-Nowaihi and Levine, 1994). Another possible reason is of a socio-political nature: the union may be involved in a policy of reducing a high level inflation that could break up the socio-political system (see Detken and Gärtner, 1994; Di Bartolomeo, 2001).
There are several ways to introduce a real wage-wedge and, therefore, inflation into the union’s preferences. The real wage relevant for workers differs from that relevant for firms because of taxation. However, to represent a situation of this kind would require a much more complicated model. In a context where several unions interact in monopolistic goods markets, the real wage relevant for a union does not correspond to that relevant for the firm that negotiates the nominal wage with the union, since the former will be calculated by considering the average price index whereas the latter is computed by taking account of the producer price only. Similarly, in an open economy, the relevant wage for the union is the wage calculated on the basis of the consumer price index (which also includes the price of foreign goods). Conversely, the firm faces a real wage that is equal to the nominal wage deflated by the domestic producer price index. In Section 3, we show how consideration of the wage-wedge has a crucial impact by considering the latter example. However, our results can be generalised to different mechanisms by introducing a real wage-wedge.

Finally, note that, in a critical extension of Gylfason and Lindbeck (1994), Acocella and Ciccarone (1997) generalise the union inflation aversion result to any objective different from the real wage or employment shared by the union and the monetary authorities, e.g., the budget deficit. In this paper, we only consider the case where the union cares about inflation. However, all results can be generalised in the manner noted by Acocella and Ciccarone (1997) by introducing a shared objective other than inflation.

3. A simple policy game

In this section, we present a simple policy game between a monopoly union and the monetary authorities in a small open economy with fixed exchange rates. The model is based on Gylfason and Lindbeck (1990). We choose this specification because it encompasses several different cases relevant to our analysis, such as the standard closed economy model and the wage-wedge case, which we describe in detail later. In order to highlight the roots of non-neutrality, we solve the model with respect to different information settings and consider alternative common specifications for the union’s preferences.

The economy is represented by the following simple logarithmic AD/AS model.

\[ y = m - p - \mu(p - e - p^*) \]  \hspace{1cm} (1)  

\[ y = -\eta(w - p) \]  \hspace{1cm} (2)  

where \( y \) is income (a proxy for employment), \( m \) is the nominal supply of money, \( p \) the price level, \( e \) and \( p^* \) are the exogenously given nominal exchange rate and the foreign price level, respectively, \( \mu \) is the real exchange rate elasticity of output, \( w \) the nominal

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5 We also assume sterilisation of the monetary consequences of current account imbalances and, more generally, a short-run setting. Since our aim is to study the basic roots of non-neutrality simple assumptions are proposed to model our open economy. The reader interested in this subject can see Lawler (2000b).
wage, and \( \eta \) the real wage elasticity of income. By making aggregate demand for output dependent on real money balances, Eq. (1) shows the traditional inverse relationship, for a given money supply, between demand for output and price level. The terms of trade are also introduced in Eq. (1) in order to consider international competitiveness. Eq. (2) describes the aggregate supply of output by competitive profit-maximising firms as negatively related to the real wage.

In this economy, the policymaker sets the nominal money supply and the union sets the nominal wage. Both seek to maximise objective functions expressing their preferences:

\[
U_P = -\frac{\beta}{2} (\pi - \pi_P)^2 - \frac{1}{2} (y - y_P)^2
\]

\[
U_U = \alpha_1 \omega U - \alpha_2 (\omega U - \omega)^2 - \frac{1}{2} (y - y_U)^2 - \frac{\vartheta}{2} (\pi - \pi_U)^2
\]

where \( \pi = p - p_{-1} \) is the inflation rate; the two pairs \( \{\pi_P = p_P - p_{-1}, \pi_U = p_U - p_{-1}\} \) and \( \{y_P, y_U\} \) give the players’ target values for inflation and income, respectively; and \( \omega \) is the exogenous union’s real wage target. Notice that, in an open economy, the relevant real wage for firms could differ from that relevant for the union. In fact, the relevant real wage for firms, \( \omega^F = \frac{w}{p} \), is expressed in terms of producer prices while the one relevant for the union, \( \omega^U = \frac{w}{p} - [hp + (1 - h)p^*] \), regards the consumer price index, where \( h \) is the weight of domestic goods in the consumption basket of wage-earners. A wage-wedge, therefore, exists (for \( 0 < h < 1 \)).

By assuming some ‘prior’ level of prices, we may talk of inflation and current prices interchangeably (Cubitt, 1995, p. 247). We will assume \( \pi_{-1} = 0 \) for expositional convenience and without loss of generality. All marginal rates of substitution are assumed to be finite and positive, unless stated otherwise.

The policymaker has a usual preference function quadratic in inflation and output. The union’s preference is a function of the real wage, employment, and, if \( \vartheta \neq 0 \), inflation. Eq. (4) is a rather general union utility function that can be reduced to the two common specifications used in the literature: the linear quadratic case (for \( \alpha_2 = 0 \)) and the quadratic case (for \( \alpha_1 = 0 \)). Henceforth, we refer to the former as the GL-(union) preferences and to the latter as the AC-(union) preferences.6

The game is solved in accordance with the assumed information setting. Two cases are considered: the Nash equilibrium and the Stackelberg equilibrium with the union’s leadership.7 For the sake of exposition, we assume the exogenous parameters \( p^*, e, p_P \) and \( p_U \) equal to zero, without loss of generality.

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6 The former was first used in this literature by Gylfason and Lindbeck (1994). The latter was introduced by Acocella and Ciccarone (1997). These specifications are common in the literature: see, for example, Grüner and Hefeker (1999), Cukierman and Lippi (1999) or Holden (2001).

7 The policymaker’s leadership is not considered here since this gives results similar to the Nash case. A proof is available upon request.
The non-cooperative Nash solution is obtained by maximising the functions of the players with respect to their respective controls and solving. The Nash equilibrium level of output and the Nash equilibrium price level then turn out to be:

\[
y^N = \frac{\beta \eta^2 (1 + \mu) y_U - \beta \eta [1 + \mu + \eta (1 - h)] (\alpha_2 \omega + \alpha_1)}{[\beta + \eta^2 (1 - h)] [1 + \mu + \eta (1 - h)] \alpha_2 + \eta^2 [\beta (1 + \mu) + \eta \partial]} + \frac{\eta^2 \{(1 - h) [1 + \mu + \eta (1 - h)] \alpha_2 + \eta \partial\} y_P}{[\beta + \eta^2 (1 - h)] [1 + \mu + \eta (1 - h)] \alpha_2 + \eta^2 [\beta (1 + \mu) + \eta \partial]}
\]

\[
\pi^N = \frac{\eta^2 [1 + \mu + \eta (1 - h)] (\alpha_1 + \alpha_2 \omega) - \eta^3 (1 + \mu) y_U}{[\beta + \eta^2 (1 - h)] [1 + \mu + \eta (1 - h)] \alpha_2 + \eta^2 [\beta (1 + \mu) + \eta \partial]} + \frac{\eta \{(1 + \mu + \eta (1 - h)] \alpha_2 + \eta^2 (1 + \mu)\} y_P}{[\beta + \eta^2 (1 - h)] [1 + \mu + \eta (1 - h)] \alpha_2 + \eta^2 [\beta (1 + \mu) + \eta \partial]}
\]

By assuming that the union is the game leader, the game is solved by backward induction and its sub-game perfect equilibrium outcomes are:

\[
y^S = \frac{\beta^2 \eta^2 y_U - \beta \eta [\beta + \eta^2 (1 - h)] (\alpha_2 \omega + \alpha_1)}{[\beta + \eta^2 (1 - h)]^2 \alpha_2 + \eta^2 (\beta^2 + \eta^2 \partial)} + \frac{\{(1 - h) [\beta + \eta^2 (1 - h)] \alpha_2 + \eta \partial\} \eta^2 y_P}{[\beta + \eta^2 (1 - h)]^2 \alpha_2 + \eta^2 (\beta^2 + \eta^2 \partial)}
\]

\[
\pi^S = \frac{\eta^2 [\beta + \eta^2 (1 - h)] (\alpha_1 + \alpha_2 \omega_U) - \beta \eta^3 y_U}{[\beta + \eta^2 (1 - h)]^2 \alpha_2 + \eta^2 (\beta^2 + \eta^2 \partial)} + \frac{\{(\beta + \eta^2 (1 - h)] \alpha_2 + \beta \eta^2\} \eta y_P}{[\beta + \eta^2 (1 - h)]^2 \alpha_2 + \eta^2 (\beta^2 + \eta^2 \partial)}.
\]

In both information settings, the NNP holds, i.e., monetary policy is non-neutral when the union cares about inflation. This result is not surprising, but it must be carefully examined in the case in which the union’s inflation-aversion is removed. We do this in the next section. In order to study alternative sources of non-neutrality, henceforth, we consider \( \partial = 0 \).

4. Preferences, information settings and non-neutrality

By assuming \( h = 1 \) and \( \mu = 0 \), we have the traditional closed economy setup. In the closed economy, there is no wage-wedge of the kind we are dealing with and standard Barro-Gordon results hold if unions are not inflation averse.
An intuitive explanation for this result is the following. When output and the real wage are the only arguments of the union’s preference function, it is always possible to rewrite the union’s preference function in terms of the real wage or output only. In fact, given the aggregate supply function of our model, there is a one-to-one correspondence between the two arguments. Therefore, the union has to set one instrument, i.e., the nominal wage rate, against one target, which can be expressed either in terms of the real wage or employment. By contrast, given our setting, when $h < 1$, the policymaker’s preference function cannot be reduced to one objective. Thus, the policymaker has to set one instrument to maximise a preference function with two targets. Then, it faces a real trade-off.

In an open economy, in fact, the one-to-one correspondence between the real wage relevant for the union and employment does not hold because of the wage-wedge. Therefore, non-neutrality could arise even if the union is not inflation averse.

First, we consider the outcomes associated with the different information settings in the case of a union’s linear quadratic function, i.e., when $\gamma_2 = 0$. Eqs. (5) and (7) become:

$$\tilde{y}_N^* = y_U - \frac{1 + \mu + \eta(1 - h)}{1 + \mu} \frac{x_1}{\eta} \quad (9)$$

$$\tilde{y}_N^* = y_U - \frac{\beta + (1 - h)\eta^2}{\beta} \frac{x_1}{\eta}. \quad (10)$$

In the Nash regime neutrality again holds. Moreover, when $h = 1$, equilibrium values do not depend on the assumption of an open economy and are the same as those for the closed economy model (when $\tilde{\vartheta} = 0$). This occurs for the same reason as in a closed economy (i.e., the existence of a one-to-one relationship between output and the real wage).

Conversely, when $h$ is less than one, the equilibrium values of output, real wage rates and inflation are different from the corresponding values in a closed economy. This is partly attributable to the existence in an open economy of parameters such as $h$ and $\mu$, which in any case influence these variables and are partly attributable to the different way the economy functions. The output level is lower in our open economy essentially owing to the existence of a free rider problem in wage setting, since $h < 1$. Moreover, there is a negative influence on the terms of trade induced by the wage rise.

In the open economy case with $h < 1$, two wage rates exist. Since one (the real wage in terms of consumer prices) is relevant for the union, whereas the other (i.e., the real wage in terms of producer prices) is related one-to-one to output, it is impossible to express the union’s preference function in terms of only one of its arguments. However, in this case (with $\gamma_2 = 0$ and Nash equilibrium), the union faces a marginal rate of substitution between the arguments of its preference function that depends only on the deviation of output from the bliss point (and not on prices). It has then an incentive to pursue the output target only. In other words, the cost of its policy in terms of wages (or output) does not vary in relation to the level of prices. The union therefore tends to pursue the maximisation of its preference function irrespective of the price level associated with its strategy. This leaves no room for the policymaker to trade off the output target against the inflation target.
Now consider the equilibrium value of income in the case of union leadership given by Eq. (10). Monetary policy is not neutral (unless \( h = 1 \)), even if GL’s assumption does not hold (and the results are always independent of the international competitiveness parameter). This occurs because when the union acts as a leader it maximises its preference function subject to the policymaker’s reaction function, thus implicitly taking prices into account.\(^8\)

More specifically, the reason for the different outcomes of Nash and Stackelberg equilibria resides in a particular property of the marginal rate of substitution between the arguments of the union’s preference function implied by the AC-specification: the rate is independent of the real wage. The effects of this property can easily be understood by rewriting the AC-preferences in terms of real output and the price for a generic level of union satisfaction \((\bar{U})\):\(^9\)

\[
-\frac{1}{2} y^2 + \left( y_U - \frac{\xi}{\eta} \right) y + (1 - h) x p - (1 - h) x p^* - \frac{1}{2} y_U^2 = \bar{U}. \tag{11}
\]

Eq. (11) is the analytical representation of the union’s indifference curves drawn in Fig. 1. The reaction function of the union is built in panel (a), whereas panel (b) describes the games between the union and the central bank.

In Fig. 1 (panel a), the union’s indifference curves are no longer straight lines—as they would be in the case when \( h = 1 \)—but parabolas. However, they still imply a vertical union reaction function \((\bar{U})\).\(^10\) Neutrality is, therefore, the straightforward result of both Nash

\(^8\) This does not happen in the closed economy case, where the union’s indifference curves on the \((m, w)\) plane are linear, since there is no wage-wedge, and therefore the Stackelberg solution is a ‘limit’ solution coinciding with the Nash equilibrium (see Hersoug, 1985).

\(^9\) Eq. (11) is obtained by adding and subtracting \( p \) to the AC-preference function and by considering the demand for labour, which always holds in equilibrium.

\(^10\) Following Cubitt (1997), the quasi-reaction function of the union is drawn by considering the highest indifference curve for each given aggregate demand (e.g., \( AD_1, AD_2 \), and \( AD_3 \)). The policymaker’s reaction function \((PP)\) is drawn in a similar manner considering the given aggregate supplies (not drawn in the figure).
equilibrium and the Stackelberg equilibrium where the policymaker acts as the leader in the game (panel b, point \( N \) and \( L \)). By contrast, when union leadership is introduced, monetary policy is non-neutral and, under realistic assumptions about the relative value of some parameters, real output (inflation) will be higher (lower) than the value associated with the Nash equilibrium. In this case, the union uses its first-mover advantage to pre-commit itself to a (credible) wage moderation strategy in order to reduce the price conflict with the policymaker and, therefore, to internalise the negative externality associated with price increase effects on competitiveness.\(^{11}\)

The equilibrium associated with the policymaker’s leadership is represented by point \( L \). The policymaker’s leadership corresponds to a game played in accordance with a credible fixed monetary policy rule. Not surprisingly, the policymaker is therefore able to eliminate the inflation bias, while leaving the real output level unchanged, which it cannot affect (neutrality again arises).

The game-leader is always better off. However, when the union is the leader both players are able to reach a higher indifference curve than that associated with the Nash equilibrium. The union’s gain is clear from the figure, while the policymaker also achieves higher utility than that under the Nash equilibrium since both output and inflation are closer to its target. Conversely, when the central bank is the leader, the union obtains the lowest utility.

Considering the GL-preferences instead of the AC-preferences, Eq. (5) becomes:

\[
\tilde{y}_N^* = \frac{\beta(1 + \mu)\Omega_1}{\eta^2} - \frac{\alpha\beta\Omega_1\omega}{\Omega_2/\eta^2} + \frac{\alpha(1 - h)\Omega_1\eta^2}{\Omega_2/\eta^2} - \frac{\alpha\beta(1 - h)\Omega_1\eta^2}{\Omega_2/\eta}
\]

where \( \Omega_1 = [1 + \mu + \eta(1 - h)] \) and \( \Omega_2 = \alpha\Omega_1[\beta + \eta^2(1 - h)] + \beta\eta^2(1 + \mu) \).

Eq. (12) confirms the result of Eq. (9). In the Nash regime, when there is no wage-wedge (\( h = 1 \)), neutrality holds and competitiveness has no effect on output. Conversely, Eq. (12) shows, in contrast to Eq. (9), that non-neutrality holds for \( h < 1 \) even if \( \nu = 0 \).\(^{12}\)

In other words, when we consider GL-preferences instead of AC-preferences, we always obtain non-neutrality in the Nash regime as well. This occurs simply because the marginal rate of substitution between the real wage and output is not independent of the actual level of the real wage (and, thus, of prices). Therefore, the union is ‘forced to share’ the payoff in terms of output with the policymaker. This result also holds true for a preference function linear in output and quadratic in the real wage. In fact, this preference function is also characterised by a marginal rate of substitution between the union’s objectives that is independent of the actual level of output, but not of the actual level of the real wage.

\(^{11}\) Notice that both the wage-wedge and the competitiveness effects are needed to assure non-neutrality of monetary policy.

\(^{12}\) Note that, in this open economy, we do not obtain the results expected by Gylfason and Lindbeck (1994), i.e., wage moderation and money non-neutrality. In fact, only if \( h < 1 \) does non-neutrality hold. However, assuming an inflation-averse union cannot be the shortcut suggested by Gylfason and Lindbeck (1994). When an open economy is modelled, quite the opposite effect is observed as a consequence of union’s free riding: the higher nominal wage (because of the wage-wedge) implies a lower output level, all the more so the higher the degree of international competition (i.e., the higher \( \mu \)).
The GL-preferences can be shown to imply non-neutrality when the union is the Stakelberg leader. More generally we have verified that in our setup, if a wage-wedge exists, the union’s leadership always leads to non-neutrality, whereas a Nash solution is associated with non-neutrality when the union’s marginal rate of substitution depends on prices.\(^{13}\)

5. Non-neutrality and the costs and benefits of the union’s wage policies

The previous section gave an intuitive explanation of non-neutrality based on the impossibility of reducing the union’s preference function to one objective (real wages or output) after substituting the demand for labour into the union’s preferences. The presence of a union that is inflation-averse (GL’s assumption) may imply non-neutrality since it adds a second objective to the real wage or output. Direct inclusion of inflation in the union’s preference function is not, however, a necessary condition for non-neutrality to hold, as the union’s interest in inflation can enter indirectly via the introduction of a wage-wedge (or cooperative playing). In addition, in the cases of either a direct or an indirect union interest in inflation, the information setting and the form (not only the arguments) of the union’s preference function are relevant for non-neutrality to hold. Let us state the necessary and sufficient conditions more precisely.

In our simple setup, a necessary condition for non-neutrality is that the union ultimately includes the effects of prices in its preference function. This means that the union’s preference function depends not only on output, but also on prices after taking account of the demand for labour. Let us call this condition the ‘inflation-augmented preference function.’

This necessary condition needs one of the two following qualifications to become a sufficient condition for non-neutrality to hold: (1) the marginal rate of substitution between output and prices in the ‘inflation-augmented preference function’ should depend on prices,\(^{14}\) or (2) the union should be able to pre-commit to its wage policy.

The necessity of an inflation-augmented preference function for non-neutrality is simply a generalisation of GL’s assumption deriving from the consideration that not only the direct inclusion of inflation in the union’s preference function, but also the specification of the structural model or the kind of game played can indirectly make the union care about inflation. In our model, the relevant economic outcomes are inflation and real output and there is no a priori trade-off—i.e., no trade-off built into the model-between these variables: all possible pairs of inflation and output can in principle be achieved. A trade-off would only arise if the players wanted to pursue different targets at the same time. If the union is-directly or indirectly-inflation-neutral, it can raise nominal wages to pursue its sole objective considering that money expansion and price rises can take place only up to the point where further monetary expansion will no longer be profitable for the

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\(^{13}\) A similar result is found for the models in which the wage-wedge derives from a multi-union context (see Acocella et al., 2003).

\(^{14}\) This would not be the case if inflation entered (directly or indirectly) as a linear term in the union’s preferences.
policymaker. In other words, the process will continue until the marginal cost for the policymaker of increasing the money supply (in terms of higher prices) is equal to its marginal benefit (in terms of higher output). Neutrality is the clear result of the game: the policymaker cannot influence the real wage and output, only inflation.

By contrast, if the union takes inflation into account (in addition to caring about the real wage), both players face a real trade-off. For example, in the case of an inflation-averse union, in setting the nominal wage the union, too, will equalise the marginal cost of, for example, increasing the wage (in terms of higher prices) with its marginal benefit (in terms of decreasing output, which implies higher real wages). Non-neutrality may therefore emerge. However, as has been argued, an additional qualification is needed to ensure non-neutrality. Either the union’s marginal rate of substitution between output and prices should depend on the latter or the union must be able to pre-commit its wage policy.

If the union’s marginal rate of substitution depends on prices, both players’ trade-offs—between inflation and output—depend on the price level. Let us consider the case in which higher prices with a given output level reduce the union’s utility. If the union’s marginal rate of substitution between output and prices depends on prices, any attempt by the union to achieve a lower real output (a higher real wage) by raising nominal wages will to some extent be restrained by its negative impact on prices, all the more so the higher the initial price level. This leaves room for the government to set money in such a way as to have an effect on output, since the government’s choice can influence the price level and, thus, the inclination of the union to increase nominal wages further. Conversely, if the marginal rate does not depend on prices, the costs of the wage policy do not depend on the level of prices and, therefore, the policymaker is unable to affect the union’s strategy (which consists in setting the marginal benefit of increasing the wage equal to its marginal cost).

In the case of a union that, directly or indirectly, does not take prices into account, the marginal rate of substitution for the union does not depend on prices simply because no such marginal rate can be defined. In other cases it can be defined, since the union’s preferences depend directly or indirectly on prices, but do not vary in accordance with prices. In such cases, neutrality follows. If, however, the marginal rate of substitution depends on prices, non-neutrality holds.

If the union is able to pre-commit to its wage policy, the dependence of the union’s marginal rate of substitution on prices is not required to obtain non-neutrality. When the union has the information advantage of the first mover, it will consider this additional information in equalising the marginal cost of its wage policy with its marginal benefit. Since the reaction of the policymaker depends on the level of prices, the union will take account of it in trading off its utility in terms of prices with that in terms of output.

Summarising, given the direct or indirect influence of prices on the union’s preferences, both qualifications needed to assure non-neutrality can be explained in a similar manner. What is important in both cases is the possibility for monetary policy to affect the union’s choice by influencing the marginal cost or benefit of its wage policy. In setting its optimal policy, the union will always compare its marginal cost with its marginal benefit.

In the end, what is relevant for non-neutrality is the dependence on the money supply of the marginal costs and benefits that the union faces when it sets its optimal wage policy. Such dependence can be derived directly from the price effects (and,
therefore, money supply) on the marginal rate of substitution or indirectly from the information advantage associated with a game in which the union is able to pre-commit to its policy.

6. Concluding remarks

By using a rather general but simple model, we have investigated the sources of non-neutrality in policy games involving one or more trade unions. We have highlighted the basic mechanisms at work and found necessary and sufficient conditions for non-neutrality to hold in the particular class of models analysed.

In the manner of Tinbergen, neutrality is finally determined by a particular specification of the policy game in terms of relations between instruments and targets. In our closed-economy specification, if the union does not care about inflation, both the union and the policymaker have two apparently independent arguments in their preference functions and one instrument. However, the union’s arguments are not truly independent and, therefore, neutrality necessarily arises since the union’s two objectives can be reduced to one. By contrast, when the objectives of each player are truly independent, which happens when the union—in addition to caring about the real wage and output—also dislikes inflation, the players are forced to share their payoffs. Neutrality can then arise only as a special case. Moreover, the possible existence of a real wage-wedge plays an important role, since it is a way to introduce inflation indirectly into the union’s preferences and so to break down the one-to-one correspondence between the real wage relevant for the union and output.

Specifically, we have shown that a necessary, albeit not sufficient, condition for non-neutrality to arise is that the union take account of prices in its preference function, either directly or indirectly. Two further qualifications are required in order to have sufficient conditions: either the marginal rate of substitution between output and prices in the union’s ‘inflation-augmented preference function’ depends on prices or the union should be able to pre-commit to its wage policy.

This perspective allows us to understand the common roots in the non-neutrality results obtained in such apparently different contexts as: an inflation-averse union playing against the government, a union sharing a common objective with a policymaker, and several unions interacting with a policymaker and with monopolistic competitors in the goods market.

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References