Resumen

Este trabajo presenta una teoría de inercia salarial y desempleo Keynesiano estable derivada de un esquema de peticiones conflictivas, una idea que remonta a Keynes. Los salarios nominales son rígidos porque, en ausencia de un mecanismo para asegurar reducciones simultáneas, cualquier grupo que tome la iniciativa de reducir su salario resultara perjudicado, porque los demás grupos, en vez de reducir su salario proporcionalmente, se aprovechan de los mejores términos de intercambio y del incremento en la demanda agregada derivada de una reducción en el nivel de precios. Políticas Keynesianas anti-cíclicas resultan entonces efectivas para estabilizar el empleo y el producto. Como en la literatura sobre contratos salariales escalonados, ineficiencias ocurren por fallas de coordinación entre grupos de trabajadores. Aquí, sin embargo, estas fallas se deben a la existencia de una situación de juego con pocos jugadores, y no de asincronias en la fijación de los contratos.

Abstract

This paper offers a theory of wage inertia and stable Keynesian unemployment based on conflicting claims, an idea which goes back to Keynes. Nominal wages are rigid because, in the absence of a mechanism for simultaneous wage reductions, any group taking the initiative of a wage cut ends up worse off, as other groups do not reciprocate but take advantage instead of the better terms of trade and higher aggregate demand derived from a fall in the price level. Keynesian countercyclical demand management is then effective to stabilize output and employment. As in the staggered wage contracts literature, inefiency arises because of a coordination failure between wage setters. But it is a result here of a game situation with few large agents, rather than built-in asynchronisms.

I. Introduction

The literature on conflicting income claims has traditionally emphasized their inflationary impact.[1/] The idea that they might also help to explain the existence of stable under-employment equilibria, through wage rigidity, has not been formalized as such,[2/] although it goes back to Keynes:

"...since there is, as a rule, no means of securing a simultaneous and equal reduction of money-wage in all industries, it is in the interest of all workers to resist a reduction in their own particular case." [3/]

This paper presents a model in which, although an economy-wide wage cut would be advantageous to everybody, rational groups or classes of workers choose not to reduce their wage in isolation, if the following five conditions are met:

1/ The link between conflicting income claims and inflation goes back to the fifties; see in particular Aujac (1950), Morton (1950) and the survey in Bronfenbrenner and Holzman (1963). It was later incorporated as one of the main building blocks of the "structuralist" literature, Scandinavian style, Latin American or otherwise.

2/ Recent papers (See in particular Gylfason and Lindbeck(1982)) have formalized interdependances in wage formation; they have not shown however the existence of stable Keynesian equilibria.

3/ The General Theory, chapter 19 p. 264. Harcourt, Brace edition.

a) income claims should be inconsistent in a Bertrand game in which each group sets it own wage while taking the other groups' wages as nominally given;

b) the economy should not be very far from full employment;

c) wage settlements are costly and, once reached, cannot be altered for some period of time;

d) there does not exist a mechanism for coordinating uniform wage reductions;

e) groups should be large enough for a change in their own wage to have a significant impact on other groups' incomes.

If these conditions hold, wage stickiness may occur with unemployment because each group knows that if it decides to reduce its nominal wage in isolation, other groups may benefit from it and be better off not reducing theirs. The group having taken the initiative may then end up worse off if the gain in employment does not compensate the fall in the real wage. An active countercyclical demand management policy is effective in this case to maintain full employment. And interestingly enough, active government interventions in response to both demand and supply shocks are linked, as systematic monetary accomodation to supply shocks tends to create the conflicting conditions under which keynesian demand management is necessary to

stabilize the economy.

The model which is presented here considers an economy with two groups of workers, possibly two trade unions, as in Oswald (1979) and Gylfason and Lindbeck (1982). However, unlike the models presented by these authors, the full macro implications of wage changes are explicitely modeled and taken into consideration by each group. The interaction between groups has thus a macro dimension, derived from changes in aggregate demand, as well as a micro dimension, linked with factor substitution. As a result, there is no need to introduce a psychological "envy" parameter into utility functions.

The result which is obtained, of inefficient Keynesian equilibria with fully rational maximizing agents, is similar to Hart's (1982). However unlike Hart's model, monetary non neutrality is not due to the existence of a wealth effect affecting utilities in nominal, rather thran real, terms. Inefficiency arises here because of a coordination failure between wage setting agents, as in the staggered wage contracts literature.[4/] Unlike that literature however, failures arise even though there is no built-in asynchronism in wage contracts. They are a consequence, instead, of a game situation with few players. As such, the model offers an alternative explanation of wage rigidity and inertia which is appropriate to economies with highly oligopolistic structures, either a few large trade unions or highly polarized social classes.

4/ As in Taylor (1979). More recent contributions along the same line can be found in Blanchard (1983) and Jackman (1984).

The paper is structured as follows. Section II presents the model and analyzes the characteristics of the equilibria obtained in a no conflict situation and a Bertrand game. Section III extends the analysis to the conflict case in a Stackelberg context, and shows how wage stickiness or wage inertia may arise. Final comments are in Section IV.

II Monetary Accomodation and voluntary unemployment: the no conflict case.

Consider an economy with two labor inputs, classified by skills, sectors, institutions or any other characteristic which holds them together as a common interest group. The aggregate production function is CES with constant returns, so that the unit cost function may be written:

$$c = (W_1^{1-\sigma} + W_2^{1-\sigma})^{\frac{1}{1-\sigma}} \qquad (1)$$

where W_1 and W_2 are the nominal wages for boths groups and σ is the elasticity of factor substitution. Firms are perfectly competitive, so that price equals unit cost. By Shephard's lemma, factor demands are:

$$L_i^D = \frac{\partial c}{\partial w_i} Y = \left(\frac{c}{W_i}\right)^{\sigma} Y \qquad i=1,2 \qquad (2)$$

where Y is output. The total labor supply in each group, L_i^S, is fixed; hence actual employment is:

$$L_i = \min (L_i^D, L_i^S) \qquad i=1,2 \qquad (3)$$

On the demand side, assume, for greater simplicity, that the velocity of circulation of money is constant, so that:

$$Mv = c\,Y$$

where M is the money supply.[5/] Monetary authorities follow, in response to supply shocks, an accomodation rule of the form:

$$M = \bar{m}^{\varepsilon}\, \bar{M}^{1-\varepsilon}\, c^{\varepsilon}, \qquad \varepsilon \in (0,1) \qquad (5)$$

where $\bar{m}$ is the full-employment level of real balances:

$$\bar{m} = \bar{Y}/v \qquad (6)$$

and $\bar{Y}$ is full-employment output. Define $\bar{c}$ as the full-employment price level associated with $\bar{M}$; then:

$$\bar{c} = \bar{M}/\bar{m} \qquad (7)$$

5/ Alternatively, one could start from the reduced form of an IS/LM construct and introduce fiscal as well as monetary variables. Depending on the interest elasticities of the IS and LM curves, fiscal or monetary accomodation would matter more.

and (4) may be rewritten, with (5), (6) and (7):

$$Y = \bar{Y}(\bar{c}/c)^{1-\varepsilon} \qquad (8)$$

Thus, when $\varepsilon=1$, full accomodation is obtained, as the nominal money stock follows all cost variations and output is maintained at full-employment; while for $\varepsilon=0$, the nominal money stock is kept constant and output varies inversely with costs.

Each group of workers sets its nominal wage so as to maximize its income 6/:

$$Y_i = W_i L_i / c \qquad (9)$$

while fully incorporating both supply (equations (1), (2) and (3)) and demand (equation (8)) restrictions and, to begin with, following a Bertrand game in which the other group's wage is taken as given.

Let us first examine the characteristics of a solution with unemployment, $L_i = L_i^D < L_i^S$. With (1), (2) and (8), (9) can be expressed as:

6/ A particularly simple objective function was chosen. One could alternatively consider more elaborate forms of trade-union behavior, as surveyed for example in Oswald (1984). But, besides the fact that there does not seem to be wide agreement on which particular form those should have, the objective functions should be compatible with the simple macroeconomic framework of the model. In particular, the Stone-Geary functional form, which can be explained at a micro level, would be harder to justify at a macro level.

$$\underset{W_i}{\text{Max}} \quad \frac{\bar{Y}\,\bar{c}^{1-\varepsilon}\,W_i^{1-\sigma}}{\left[W_i^{1-\sigma} + \hat{W}_j^{1-\sigma}\right]^{\frac{2-\varepsilon-\sigma}{1-\sigma}}} \qquad i,j = 1,2 \qquad (10)$$

where $\hat{W}_j$ is the wage expected by group i for group j. The solution to this maximization is straightforward and yields the following reaction functions:

$$W_i = \left(\frac{1-\sigma}{1-\varepsilon}\right)^{\frac{1}{1-\sigma}} \hat{W}_j \qquad i,j = 1,2 \qquad (11)$$

thus, group i sets his wage as a function of group j's; what matters is the relative wage. However, the expression above has a feasible solution if $\sigma < 1$, only. As $\sigma \to 1$, $W_i \to 0$ and $L_i^D \to +\infty$, by the factor demand equations; employment becomes supply constrained. It is obvious from (10) that, in absence of supply restrictions, $W_i = 0$ would also be the solution for the case in which $\sigma > 1$. Hence, in the unemployment region, σ should be less than one and (11) applies.

Suppose then $\sigma < 1$ and consider a map in the space (W_1, W_2), as shown in Figure 1. Below full employment, the reaction curves (11) are rays passing through the origin. Group 1's (R_1 in the figure) will lie above group 2's if $\sigma > \varepsilon$, that is if the elasticity of factor substitution is greater than the degree of monetary accomodation. In this case, given any $\hat{W}_2$, group 1 is settling for a wage $W_1 < \hat{W}_2$; viceversa for group 2. Given the symmetry of the CES cost function, it is intuitive that claims

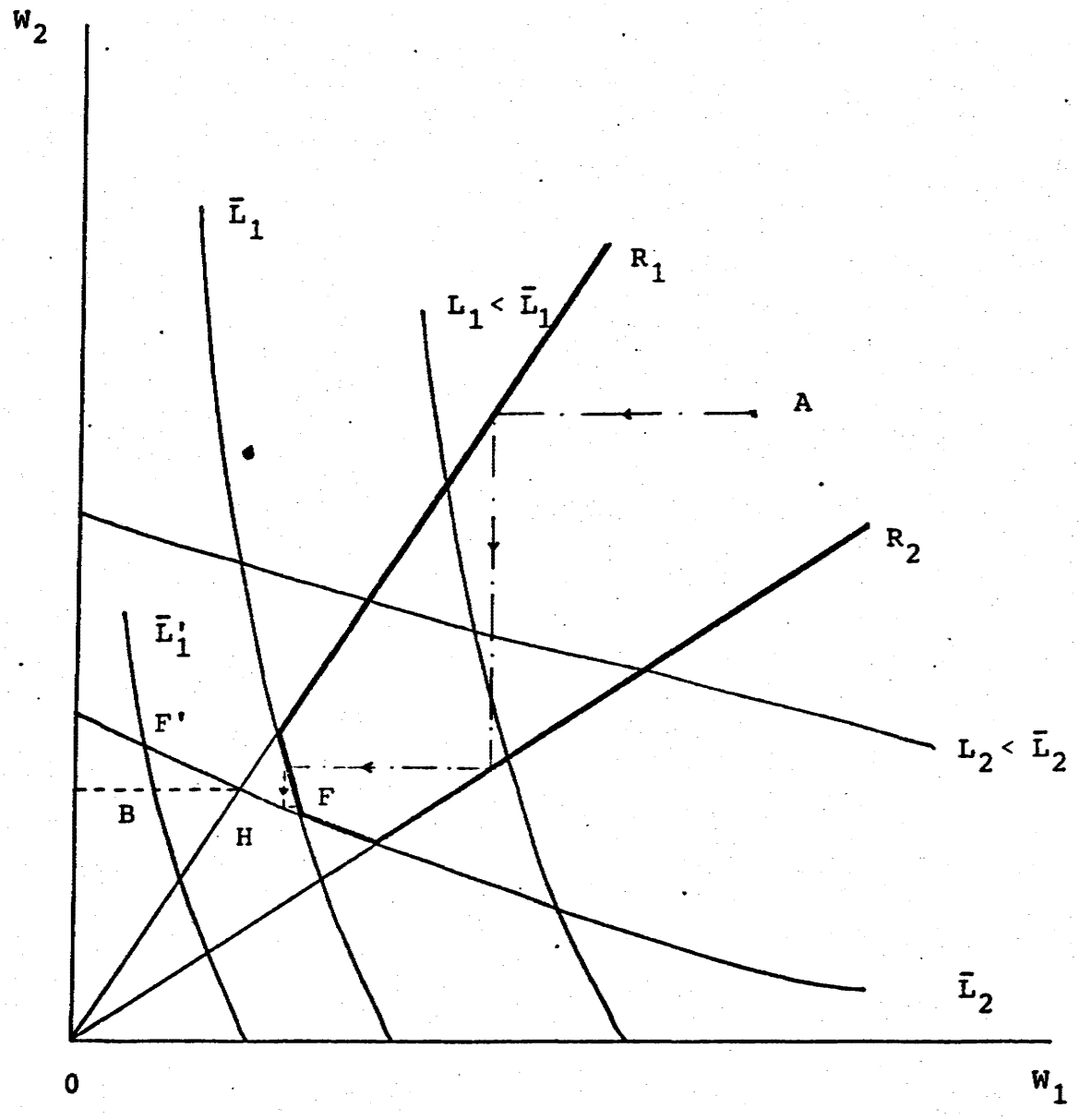

Figure 1: The no conflict case

should not exhaust output. This may be checked easily by deriving group 1's income, with (1) and (2), as:

$$Y_1 = \frac{W_1 L_1}{c} = \left(\frac{W_1}{c}\right)^{1-\sigma} Y = \frac{1}{1 + (\hat{W}_2/W_1)^{1-\sigma}} Y \qquad (12)$$

For $W_1 < \hat{W}_2$, $Y_1 < Y/2$ and $Y_1 + Y_2 < Y$. Hence, $\sigma < \varepsilon$ is a no-conflict condition; assume it holds.

In Figure 1, iso-employment loci, as obtained from equations (1), (2) and (8), can be upwards or downwards sloping. Consider group 1's; their slope is negative when the aggregate demand effect in (2) dominates the substitution effect. In that case, a higher W_1 requires a lower W_2 to prevent unit costs and the price level from rising and depressing employment through a reduction in aggregate demand. Inversely, if the substitution effect dominates, a higher W_1 requires a higher W_2 to prevent factor substitution from reducing 1's employment. Suppose we are in the former case [7/] and iso-employment loci are the sets of curves labelled L_i in Figure 1, the $\bar{L}_i$ being the ones corresponding to full-employment. Assume also, for the time being, that F, the point where both groups are fully employed and the $\bar{L}_i$ schedules intersect, lies within the cone formed by the reaction curves R_1 and R_2.

7/ Nothing of substance would be altered by considering the alternative case of positively sloped iso-employment loci.

Let the economy be initially at a point such as A, where both wages are too high to ensure full-employment. At that point, group 1, given 2's wage, lowers its W_1 to reach R_1; 2 lowers then W_2 down to R_2 and the economy proceeds iteratively down the reaction cone, towards full-employment. After any of the groups hits full-employment, it is obvious that wages should stop falling, as employment cannot be further increased. The reaction curves become the full-employment loci and it is easy to see by inspection, that the economy should then converge to F, on the $\bar{L}_i$ schedules. Stability at full-employment is thus ensured in this no-conflict case, not as a result of perfect competition Walrasian adjustment, but as a corner solution of a two player game.

Suppose now that the point where both groups are fully employed, lies at F', outside the reaction curve, perhaps because group 1's full-employment schedule shifted to the left, to $\bar{L}_1'$, as a result of an increase in that group membership. Convergence would then stop at H, the intersection of R_1 and $\bar{L}_2$, and group 1 would remain partially unemployed. That unemployment is not Keynesian however, since 1 is better off at H than at F'.[8/] It is voluntary unemployment and it is due to the monopsonic power of group 1, which is able to maximize its income through with olding employment and asking a higher real wage.

8/ To see this, consider the point on $\bar{L}_1'$ at the same W_1 as H (B in Figure 1). B is prefered to F' since it corresponds to the same employment but has a higher real wage. On the other hand, H is prefered to B since it lies on the Bertrand reaction curve; hence H is prefered to F'.

Let now σ rise. The R_1R_2 reaction cone becomes wider and convergence to the full employment region faster. For values of σ equal to one and beyond, the cone covers the whole map of positive wages and convergence proceeds on the full-employment loci right from the start. Similarly, if β falls, the R_1R_2 cone opens up, and convergence to full-employment is accelerated. In both cases, if voluntary unemployment existed, it would eventually disappear. The economic interpretation of these results is straightforward: a higher elasticity of factor substitution or a smaller degree of monetary accomodation steepens the slope of the demand curve input groups are facing, and raises the employment penalty associated with a wage increase. As a result, lower wage claims ensure faster convergence and less voluntary unemployment. In particular, it is interesting to notice that a widely accomodative policy, geared to maintain full-employment, can raise the "natural" rate of unemployment, a point which is often made in other contexts.

Inversely, as σ falls and β rises, the angle of the reaction cone, which can be seen as a no-conflict safety margin, shrinks and reaches zero when $\sigma=\beta$. In this last case, any point below full-employment on the reaction line R_1R_2 is a truly Keynesian equilibrium: without explicit agreements on simultaneous wage reductions by both groups, nobody will take the initiative of cutting its wage, even though remaining there is clearly inefficient. These equilibria are not stable however; as soon as $\sigma<\beta$, R_1 lies below R_2 and claims become conflic-

tive, as their sum exceeds output. In a Bertrand game, see Figure 2, the economy would fall into an ever worsening stagflationary spiral: given the other group's wage, each group chooses an even higher wage and employment falls forever as higher and higher prices keep reducing aggregate demand. Something has to yield if collapse is to be avoided. What should be altered is the nature of the game since both groups should sooner or later realize that each of their moves will call for a countermove from the other group. The next section does precisely that, as it explores the dynamics and equilibria obtained in a Stackelberg context.

III. Stable Keynesian equilibria and demand management: The conflict case.

Suppose that a wage which has just been altered, cannot be changed again for some period of time, either because wage settlements are costly or because of the existence of contracts. Furthermore, to make things simpler, each groups limits its time horizon to a single play. The game is of the Stackelberg variety: when contemplating wether or not altering their wage, both groups know that if they do, the other group will react by choosing the best outcome, given that the first player's wage is then fixed; they will thus choose a point on the Bertrand reaction function.

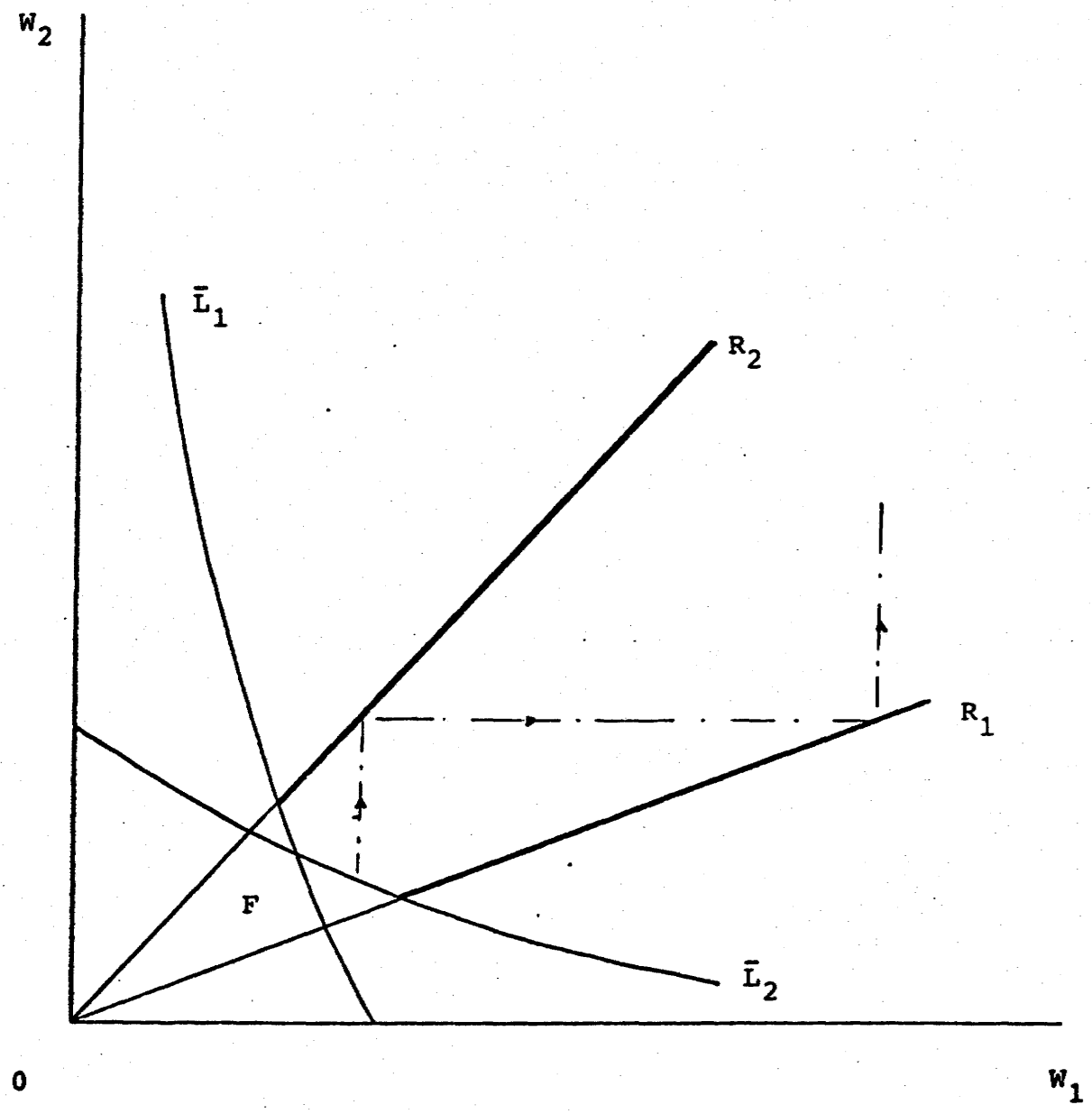

Figure 2: The conflict case with a Bertrand game

To analize the outcomes of the game, it will be useful to draw the iso-income contours for both groups. We know that real wages are constant on a ray passing through the origin, while employment is constant on the iso-employment lines. Thus, considering group 1, and going rightwards in Figure 3, its iso-income contours should intersect the constant wage rays from above, the iso-employment lines from below. Furthermore, they should, by construction, intersect horizontally the Bertrand reaction curves, and go through the origin while intersecting vertically the horizontal axis, as infinite employment would be needed to compensate a null real wage. Their shape should thus be the one shown in Figure 3, group 2's being symmetric with respect to the 45 degree line. It is obvious (for group 1) that the lower the contours, the higher the income.

Let A and B be the points where $\bar{L}_1$ intersects R_2 and $\bar{L}_2$ intersects R_1, respectively. Consider the iso-income contours Y_i and Y_i' which pass through A and B. They divide the reaction cone R_1R_2, below full-employment, into four zones labelled I to IV in Figure 3. Suppose the economy is initially in region I, say at H_1. If group 2 moves first and 1 reacts, the best possible outcome for 2 would be point B on R_1. But, by construction, 2 would be worse off at B than at H_1, and would not therefore be the first one to move. 1, on the other hand, could end up at A if it acted as a leader and lowered its wage to reach H_1', on the vertical of A, because 2 would then lower W_2 to reach R_2 at A. Hence, in region I, 1 would take the leadership and, by reducing its wage, would bring the economy back to the full-employment region. Notice that at A, 1 has a lower real wage

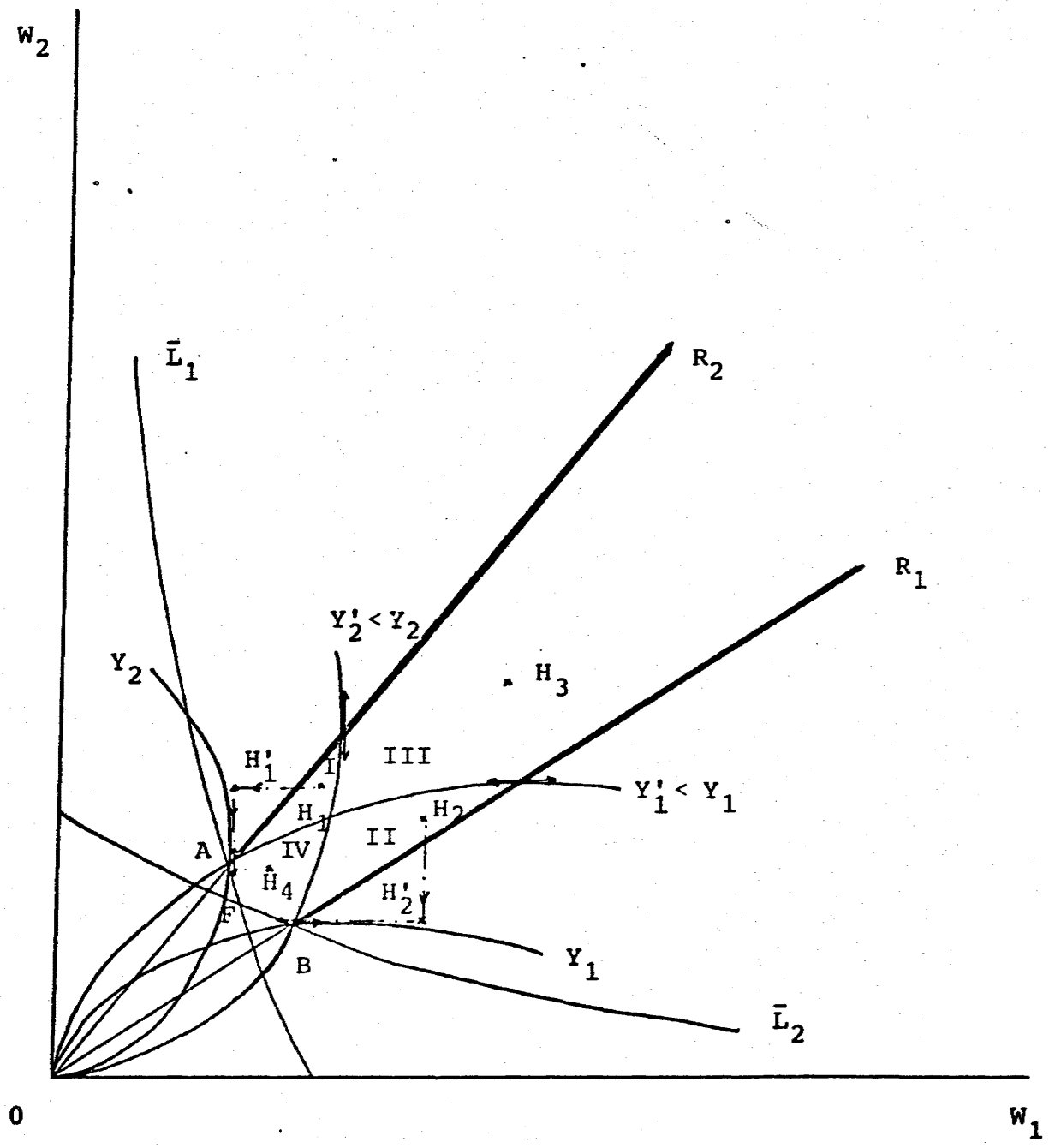

Figure 3: The conflict case with a Stockelberg game

than at H_1, but willingly sacifices some of its wage share in order to gain more employment. Similarly, if the economy is initially in region II, 2 would take the initiative of a wage cut and bring the economy back towards full-employment.

But suppose now that the economy is initially further away from full-employment, in region III. It is then easy to check that both groups, because they would benefit from a wage cut, could be potential leaders. However, by acting first, 1 would end up at A, while it could, by waiting and letting 2 take the initiative, end up at B, which is clearly preferable. And similarly for 2. There is thus an incentive, when far away from full-employment, to wait and let others adjust first. If left alone, a substantial amount of time could be required to bring the economy back to full-employment. Notice also that the more intense the conflict between groups, the wider the reaction cone and the further apart points A and B; the larger then the income gap between Y_i and Y_i', the higher the incentive to wait and the higher the downwards inertia of wages.

Consider finally the case in which the economy is relatively close to full-employment but not too close to either of the reaction curves, at some point of region IV. No group would then have any incentive to move since if they did they would end up worse off, at A if 1 moved first, B if 2 did. All points in IV are thus stable Keynesian equilibria: a uniform wage reduction would make everybody better off; in the absence however of explicit agreements between groups and of a

fall. The reason is clear: when the economy is relatively close to full-employment and income claims are conflictive, the group acting as a leader would suffer an excessive real wage loss, compared with its potential rise in employment, while the other group would take advantage of the situation and avoid reciprocating to an extent that would make it worthwhile for the first group to take the initiative. It is thus a coordination failure due to the lack of mechanisms to ensure uniformity in wage reductions.

In region IV, demand shocks give rise to changes in output and employment but no price variations. To see this, go back to the definition of the demand side of the model, equations (6) to (8). Suppose the velocity of circulation falls; then $\bar{m}$ rises, $\bar{c}$ falls and Y falls, together with employment. In Figure 3, the whole structure of iso-employment lines shifts towards the origin. If unemployment does not rise excessively, however, and the economy stays in region IV, no wage adjustment will occur and unemployment remains higher. In that case, demand management is effective to bring the economy back towards full-employment: let $\bar{M}$ rise in (7) by as much as $\bar{m}$, which, by (5), implies of course that M should rise; then $\bar{c}$ recovers its initial value and so does Y in (8). In Figure 3, iso-employment lines are pushed back to the original position.

Thus, moderate demand variations will keep altering quantities but not prices, in typical Keynesian fashion, and active Keynesian policies are effective to maintain full-employment. Curiously enough, state interventionism may have created

the right conditions for more intervention, as conflicting claims may have been caused, on the supply side, by an extremely accomodative policy which gave rise to a region in which the use of active demand policies is justified. On the other hand, the systematic use by the state of countercyclical demand policies may come to be expected by wage setting groups. In that case, no group will ever take the initiative of cutting its wage, since it would always be better to let the state intervene and bring the economy back to its starting point, instead of sacrificing some of its wage share. Keynesian activism may then cause greater rigidities in relative prices.

IV. Some concluding comments.

This paper offered a theory of wage inertia and stable Keynesian unemployment based on conflicting claims. Nominal wages are rigid because, in the absence of a mechanism for simultaneous wage reductions, any group taking the initiative of cutting its wage would end up worse off, as other group would not reciprocate. They would take advantage instead of the better terms of trade and higher aggregate demand generated by a rise in their relative wage and a fall in the price level. Keynesian countercyclical demand policies may then be effective to stabilize the economy around full-employment.

The model which was presented here used a simple game framework with few large players who interacted at the macro

level through changes in aggregate demand linked with price variations. As such, the story applies to economies with few trade unions, or higly polarized Marxian-type social classes. The model can be extended in particular to the case of a single labor and a firm owners class, by adopting the same framework but setting the elasticity of factor substitution to zero.9/

9/ In that case however, the mechanisms ensuring that firm owners act in their best interest as a group might have to be substantiated.

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