THE MONETARY TRANSMISSION MECHANISM: IS IT RELEVANT FOR POLICY?*

*Bernardino Adão***
*Isabel Correia***
*Pedro Teles***

1. INTRODUCTION

Central banks implement policy changes by setting their policy instruments. Short term interest rates have recently become the most common monetary instruments, but a monetary or some credit aggregate could be and has been used.

The monetary transmission mechanisms describe the channels through which these instruments affect the final objectives of the policy maker. There is a large literature, theoretical and empirical, that attempts to describe these different channels and the most relevant variables and markets for the monetary transmission mechanism. In this note we try to analyse how important that understanding is for the conduct of monetary policy. How differently should monetary policy be conducted in economies characterized by different transmission mechanisms? The answer to this question is even more relevant when comparing countries that belong to the same monetary union. In this case the answer is a first step towards understanding the costs that a single monetary policy can impose on countries that don't share a single monetary transmission mechanism.

If the economy has no frictions, the way the monetary shock is transmitted to the economy is quite well known. An increase in the money supply will induce an increase of prices and wages. Without persistence, money would be neutral in

the economy. When the shock is persistent, the reduction in the interest rate would lead to a slight increase in output, consumption and labour. The recent literature on monetary policy has introduced mechanisms through which monetary policy can have important short-run real effects in the economy. Most deviations from frictionless economy come by moving from an environment where prices and wages are flexible, or in other words are set with the whole information including the monetary shock, to others where price and wage setting are subjects to some type of restrictions. In those environments, prices or wages respectively are set by firm or workers acting in monopolistic competitive markets from which they can extract some mark-up. Restrictions on the set of prices/wages are rationalized as a result of menu costs, information costs, decisions costs or others. Other branch of the literature assumes that markets are segmented and the heterogeneity created across agents that have access to the market and those who have not, creates a channel through which monetary policy can have real effects.

In dynamic general equilibrium macro models, these three frictions, nominal rigidities of prices or wages and limited participation, are those most frequently used to explain the transmission mechanisms of monetary policy. Although the paper in which this note is based on treats all those type of frictions, we will limit this note to an environment where prices are sticky. The argument is very similar in models with other type of frictions.

The most widespread price setting model is the Calvo model, where for every period every firm

have a positive probability of resetting prices. This probability is common across firms and therefore constant over time, that is it does not depend on the last resetting of prices by a particular firm. This probability is a measure of the degree of price stickiness. The lower the probability the stickier are prices in this economy. And the lower the probability, the higher the real effects on the economy. This probability, which can also be measured by the share of firms that have the option to change the price, measure the strength of the transmission mechanism. In this note we will show the circumstances under which that share of firms that reset prices is relevant to how monetary policy is conducted.

For the same positive monetary shock, the higher the degree of stickiness of the economy the larger would be the effect on output and later on inflation. Then if the policy maker's objective is to achieve a certain level of output (or inflation), the higher the degree of stickiness the lower should be the monetary shock to achieve that level. At first sight one could think that economies with different degrees of monetary transmission should also follow different monetary policy rules. This is the conventional wisdom and the reason for the conjecture that a common monetary policy would imposes a cost on economies characterized by different degrees of rigidity.

The use of stabilization monetary policy has been under suspicion since the works of Lucas and Barro, which show that these shocks could not be used systematically with agents that have rational expectations, but could improve the economic performance when taken as one time event. In this case the repeated use of this type of policy would simply create more volatility in the economy.

The use of short-run or cyclical monetary policy has recently been rehabilitated. This fact is clearly a corollary of the success of real business cycle models as a fundamental device to explain the high frequency characteristics of the economy. Using that paradigm in a world without frictions and without money, the cyclical characteristics are derived from exogenous real shocks to the economy, plus the transmission of these shocks through the no-friction environment. The introduction of money and the introduction of frictions lead to two different consequences: first the one usually explored, which we described above, that

an additional role is given to monetary policy since those frictions affect the transmission mechanism of a monetary policy change; and second that the way real shocks are transmitted through the economy is also affected by the existence of the same frictions that nowadays characterize most monetary dynamic general equilibrium models. It is the change in the transmission of these real shocks to the economy, due to the existence of frictions in comparison with the frictionless world, that rehabilitates the role of money as a short-run policy instrument. The argument is the following: the frictions interact with real shocks so that the equilibrium deviates from the one which results from the shock in an environment without frictions. This deviation is what is currently called a gap. That gap is usually measured through the output but we could have it measured in any other real variable. Suppose that prices are flexible and the economy suffers a negative technological shock. This shock leads, under normal circumstances to a decline of labour in the equilibrium, this reinforces the negative effects of technology, and output and consumption declines. If we analyse the same shock in an economy where prices are sticky, for example set one period in advance, and if monetary policy, either the interest rate or the quantity of money, does not react to the technological shock, transactions cannot change, either in nominal or real terms, and consumption and output cannot react to the technological shock. Equilibrium would imply that labour increases to allow the same level of output with a lower level of technology. It is easy to see that output, as well as consumption and labour, is lower in flexible prices than in sticky prices. The gap is positive in this case, since output in the environment with sticky prices is higher than output with flexible prices. Consider now that the flexible price equilibrium is desirable from the point of view of the decision maker. In that case, the objective can be expressed as to "close" the gaps that occur in the economy due to the realization of fundamental shocks. Suppose that the Central Bank uses the monetary aggregate, in the environment of sticky prices, to close the gap. As monetary policy, given the frictions, has real effects, in this case a contractionist monetary policy could replicate the flexible price allocation. That is, with sticky prices the effect of the technological shock plus the mon-

etary policy reaction to this shock determine the equilibrium. This equilibrium would be the same that results in flexible prices due to the technological shock. In this case, what is identified as a monetary policy shock it is not an exogenous shock to a rule, but is a reaction to a fundamental shock, being therefore endogenous and defining the rule. If the technology follows a stochastic process, the policy instruments will also follow a stochastic process, and even when the rule is transparent, when the realization of fundamental shocks is not part of the information set of a group of economic agents, the instruments realizations will also not belong to that set.

The results of this work are that, contrary to conventional wisdom, the monetary rule that connects policy instruments with fundamental shocks does not depend on the degree of stickiness in the economy. This results from a general principle that monetary policy is most effective when it is most necessary. When we apply this principle we have an explanation as to the conditions in which the strength of the monetary transmission mechanism is irrelevant for the conduct of the optimal monetary policy. These conditions coincide with the ones that make the optimum of flexible prices feasible and also optimum in economies with frictions. We will illustrate these conditions in a very simple model, both in relation to the way the monetary economy is built in the model and in relation to the proposed nominal rigidity. Money demand is derived from a cash-in-advance condition and frictions are due to Calvo price setting.

The note proceeds in the following way: In Section 2 the allocations in an economy where prices are perfectly flexible are identified. It is shown also that there exist policies that include prices independent from contemporaneous information, or even constant over time. In section 3 the following step is derived from that result: the condition that with Calvo pricing it is possible to decentralize flexible price allocations. It is also explained why the optimum with flexible prices coincides with the optimum with sticky prices. Section 4 concludes and discusses the robustness of the result of irrelevance of the transmission mechanism.

2. FLEXIBLE PRICES ECONOMY

Our model economy is very similar to the one in Adão, Correia and Teles (2003) with flexible prices. The economy consists of a large number of identical households, a continuum of firms, each producing a distinct good and a government. This government is understood in the broad sense because it can use monetary and fiscal policy instruments. In the simple environment described in this note, those instruments are the nominal interest rate, R_t the quantity of money, M_t, the tax rate on profits, τ_t^π and the tax rate on labour income, τ_t^{n} [1]. The demand for money by the households results from a cash-in-advance restriction on the transactions of consumption goods. The economy is subject to fundamental shocks. The shocks under consideration are technological shocks, A_t and public consumption shocks, G_t. The vector of shocks at t is $s_t = (A_t, G_t)$. The set of every shock at t is S_t, and the state at t is denominated by $s^t = (s_0, s_1, ..., s_t)$. All variables in this economy are a function of the state history, but to simplify notation instead of writing $X(s^t)$ for the generic variable X we will simply write X_t [2].

2.1. Equilibrium Characterization:

An equilibrium in this environment is a feasible allocation sequence, a price system, and a government policy such that: (i) given the price system and the government policy, the allocation solves: a) the problem of the households. Households maximize expected utility which depends on sequences of consumption and labour. Consumption of goods produced by different firms have constant marginal rates of substitution; and b) the problem of the firms. Every firm produces a different good with an identical technology, linear in labour, and operates in a monopolistic competitive market for these products; and (ii) the allocation sequence satisfies the market clearing conditions.

---

(1) The government has also debt state contingent as a policy instrument.

(2) For an example of the type of terminology used in this note see the article published in *Economic Bulletin*, June 2004, "Instruments of Monetary Policy".

We assume that the government chooses a policy that solves the standard Ramsey[3] problem. In other words the government chooses the policy associated with the equilibrium allocation that gives the highest value of households life time utility. Such a government policy implies $\tau_t^\pi = 1$, since the tax on profits is like a lump-sum tax.

The equilibrium sequence that determines the level of utility for the households is $(C_t, N_t)_{t=0}^\infty$. In equilibrium, the sequence can be summarized by two conditions for each date and state.

The first one comes from intratemporal households' decisions that equate the marginal rate of substitution between consumption and labour, $u_L(t)/u_C(t)$, to the net real wage, $(1-\tau_t^n)\frac{W_t}{P_t}$, discounted by the gross nominal interest rate, R_t since to consume it is necessary to hold money, $u_L(t)/u_C(t) = \left[(1-\tau_t^n)/R_t\right]W_t/P_t$. It is also obtained from the condition that determines the pricing of firms, which equal the price, P_t to the mark-up over the marginal cost, W_t/A_t where W_t is the gross nominal wage, $W_t/P_t = [(\theta-1)/\theta]A_t$. These two conditions together imply that,

$$\frac{u_L(t)}{u_C(t)} = \frac{\theta-1}{\theta}A_t\gamma,$$

were
$$\gamma_t = \frac{(1-\tau_t^n)}{R_t} \qquad (2.1)$$

where $(\theta-1)/\theta$ is the inverse of the constant mark-up, which depends on the elasticity of substitution across goods. The second one is the feasibility condition,

$$C_t + G_t = A_t N_t \qquad (2.2)$$

and this simply tell us that the resources produced with labour are represented by $A_t N_t$ because the technology is linear, and that those resources have to be used for private and public consumption. Given a trajectory for A_t and the policy instruments G_t, R_t and τ_t^n these two equations determine the equilibrium trajectories of C_t and N_t. Changes in the policy set that change γ_t lead to a different sequence of allocations. From those there is a

unique equilibrium real allocation $(C_t^*, N_t^*)_{t=0}^\infty$, that maximizes utility. This optimal equilibrium deviates from the first best equilibrium due to the wedge between the marginal rate of substitution and the marginal rate of transformation, that is by $[(\theta-1)/\theta]\gamma_t^*$. It is easy to check that this wedge cannot be eliminated in every state: $(\theta-1)/\theta$ is lower than one. It is possible to see that if $\left[(1-\tau_t^n)/R_t\right] > 1$ in every state, and of magnitude sufficient to offset the mark-up, the economy cannot finance a positive G_t even using the total taxation of profits. As $R_t > 1$ it would be necessary that $\tau_t^n < 0$, that is that in every state labour would get a subsidy. In this case, revenues from the inflation tax $(R_t > 1)$ added to the amount of profit taxes would satisfy government budget constraints only where $G = 0$ This means that the optimal solution is always a second best one. This optimal, or Ramsey allocation, will depend uniquely on the value of $(\gamma_t^*)_{t=0}^\infty$. That is, there is not a unique sequence of interest rates and taxes on labour income that decentralize the optimal sequence of consumption and labour. If the monetary authority chooses a certain trajectory for R_t, given γ_t^* there is a unique trajectory for the tax on labour income.

However, given R_t and γ_t^* there is nominal indeterminacy, that is the variables P_t, W_t and M_t are not uniquely determined in the optimum. The relevant equilibrium conditions to determine these variables are[4]:

$$\frac{W_t}{P_t} = \frac{\theta-1}{\theta}A_t, \, t \geq 0 \qquad (2.3)$$

and
$$\frac{u_C^*(t-1)}{P_{t-1}} = R_{t-1}E_{t-1}\left[\frac{\beta u_C^*(t)}{P_t}\right], \, t \geq 1, \qquad (2.4)$$

$$M_t = P_t C_t^*, \, t \geq 0 \qquad (2.5)$$

The first type of condition is the firms' pricing conditions, described above, the second represents the intertemporal decision between consumption

___

(3) A Ramsey problem is the problem regarding the choice made by a government that has the same preferences as the representative household and that has policy instruments to affect the market equilibrium of the economy.

(4) In addition to these conditions, the transversality condition must also be satisfied. The transversality condition is satisfied if both the government budget constraint and the intertemporal government budget constraint are satisfied. The budget constraint is satisfied each period and state because there are contingent government securities. The intertemporal budget constraint is satisfied because it can be written, using households first order conditions, as an infinite sum of terms that depend exclusively of real variables.

today and saving in non-contingent bonds with return R_{t-1}, where $u_C^*(t)$ represents the marginal utility of consumption at t, and the third one represents the aggregate cash-in-advance condition.

The real wage is uniquely determined by the first set of equations. However given the optimal trajectory of consumption and labour and the sequence of the nominal interest rate R_t the intertemporal equations just determine the expected inflation rate, or given the initial price, the expected price level for every state. Given the indeterminacy of the price level in every state, the nominal wage rate and the money are also indeterminate in every state. This result is summarized in the following proposition[5].

Proposition 1: Given a sequence $\left(\gamma_t^*, R_t\right)_{t=0}^{\infty}$ the optimal equilibrium allocation is determined but there is nominal indeterminacy. There are multiple sequences for the money supply, the price level and the nominal wage associated with that real allocation.

The similar indeterminacy result was first stressed in Sargent and Wallace (1975), where it is shown that the price level is indeterminate when the monetary authority picks only the interest rate.

Remember that to show the nominal indeterminacy we choose a path for the nominal interest rate but that the real optimal allocation of consumption and labour are compatible with a multiplicity of those trajectories that satisfy γ_t^*. Since there are many equilibrium sequences of nominal variables, $P_t, W_t, M_{t=0}^{\infty}$, compatible with the same equilibrium sequences of real variables, $\left(C_t^*, N_t^*\right)_{t=0}^{\infty}$ we investigate whether it is possible to have an equilibrium sequence for the price level that is state independent or even independent of the whole history. In the first case the price level today is independent of the state, that is of the realization of A_t and G_t, and depends just on the state of yesterday. The second case is a stronger one, where the price today not only does not depend on the realization of

A_t and G_t but also does not depend on the whole history. In this case, the price level would be constant over time.

The answer is affirmative and easy to reach. The structure of the proof is as follows. First we prove that any trajectory for the price level can be an equilibrium, and in particular trajectories with the price level independent of the state history are equilibrium trajectories. Once the sequence of the price level is fixed, the remaining nominal variables and policy instruments are uniquely determined. Propose a certain trajectory for the price level. Given $\left\{C_t^*, N_t^*\right\}_{t=0}^{\infty}$ cash-in-advance conditions determine uniquely the sequence of money supply in the economy. Pricing equations determine the nominal wages and the substitution of the price level trajectory in (2.4) determines the sequence of the nominal interest rate. Given this sequence of the nominal interest rate, the γ_t^* determines the optimal tax rate on labour income that can decentralize the optimal sequence of consumption and labour.

We have just proved the result that we restate in the following proposition:

Proposition 2: The instruments $\left\{\tau_t^n, R_t, M_t\right\}_{t=0}^{\infty}$ can be chosen in such a way that $\left(P_t^*\right)_{t=0}^{\infty}$ does not depend on the state history and implements the optimal real allocation $\left\{C_t^*, N_t^*\right\}_{t=0}^{\infty}$.

Lucas and Stokey (1983) confirmed in a dynamic general equilibrium model the result of Sargent and Wallace (1975). They have shown that there are many equilibrium price levels compatible with the same equilibrium real allocation and equilibrium interest rate. Building on this, Carlstrom and Fuerst (1998) showed that inside this set of equilibrium prices there is a subset of prices that are pre-determined in the sense that they do not depend on the contemporaneous state of the economy.

In Adão, Correia and Teles (2004), we extend this result since we show that there are government policies able to make at least one of the nominal variables, prices, wages or deposits, independent of the history.

3. TRANSMISSION MECHANISMS

The model contained in the previous section is not the model that is usually used to study monetary policy. The type of models used contain fric-

---

(5) In order to establish the result it must show that there are less equations than unknowns. Let there be one state at date 0 and $\Phi_t\left(s^{t-1}\right)$ states at date t for the history s^{t-1}, with $t \geq 1$. At $t = 0$, there is one equation of the type (2.3) and one equation of the type (2.5). At $t \geq 1$ there are $\Phi_t\left(s^{t-1}\right)$ equations of the type (2.3), $\Phi_t\left(s^{t-1}\right)$ equations of the type (2.5), but only one equation of the type (2.4). Thus, there are $2\Phi_t\left(s^{t-1}\right) + 1$ equations to determine $3\Phi_t\left(s^{t-1}\right) + 1$ variables. There are $\Phi_t\left(s^{t-1}\right) - 1$ degrees of freedom for setting these nominal variables.

tions that allow the monetary policy to have real effects in the short-run. We consider here the most popular type of friction in the literature, rigidities in setting prices.

The most popular way of formalizing a friction by setting prices is the so-called Calvo model. In this environment, just some firms can decide the price in a given time period. We use α to define the probability that a particular firm can determine the price in a given period, and also to the share of firms that are allowed to review its price. The remaining firms have to maintain the price that they decided sometime in the past. Each firm has the same probability α of being able to decide the price. As a result, in general in a given period there will be different prices for the goods produced. This difference creates a heterogeneity across firms that did not exist in the model described in the last section. In this case α is an indicator of the degree of rigidity of the economy When, for example, there is a monetary injection in the economy, because some individual prices are already set and cannot be revised, prices will not increase fully in order to compensate the additional money supply; consumption and employment will increase. The value of the α determines the strength of that monetary shock in the economy. The smaller is α less firms will increase their prices, and therefore for a shock of identical magnitude the more will consumption, employment and output increase. This monetary injection will increase the real wage. Due to this increase, marginal costs increase, and ex-post mark-up for the firms that cannot decide the price will be lower than it would be if prices were flexible. This reduction in the mark-up is in itself beneficial. However, there will also be a relative price distortion, because the flexible prices will adjust in order to partially absorb the shock. Obviously, even if the gains offset the losses, this policy cannot be used systematically. As described in the introduction, a stochastic monetary policy, independent of the state of the economy, is not useful.

In the presence of price rigidity, shocks on government expenditures, taxes or technology will also have effects on ex-post mark-ups and relative prices. As we saw, the usual way of describing these effects is to measure the gaps that will depend on the type of shock and on the degree of rigidity of the economy, that is on the transmission mechanism. The first question to be answered is if, given the policy instruments, the flexible price equilibrium, $\left(C_t^*, N_t^*\right)_{t=0}^{\infty}$, it is possible to replicate for any α. That is, whether it is feasible to "close" the gaps and to reproduce in a sticky price environment the optimal solution that was obtained when prices were flexible. The answer is the following:

Proposition 3: In an economy with sticky prices, for example with Calvo's pricing, whatever the value of α it is possible to decentralize one equilibrium identical to the optimal of flexible prices. That allocation can be decentralized with the same vector of policies whatever the value of α, that is whatever the strength of the transmission mechanism.

The proof for this proposition can be seen as a corollary to Proposition 2. As we show that there is a price vector constant over time that can decentralize the sequence $\left(C_t^*, N_t^*\right)_{t=0}^{\infty}$ this implies that, for every period, the restrictions to price changing are not bidding, and that the set of firms which can choose their prices will set exactly the same price as every other which had the option to decide on the whole past history of the economy. Then the mark-up is constant and identical across firms and there are no relative price distortions.

As a result of the last proposition, the monetary transmission mechanism which results from a particular nominal rigidity, in the case described prices, it is irrelevant when the allocation chosen by the policy maker is $\left(C_t^*, N_t^*\right)_{t=0}^{\infty}$. It is irrelevant in the sense that the magnitude of the policy instruments, including the monetary instruments, is independent of the transmission mechanism of an isolated monetary shock.

Will it be desirable in an environment with sticky prices to replicate the optimal flexible price allocation? That is, should we formalize the policy maker's objective as a minimization of gaps? If the answer is affirmative, it means that the optimal decision, when the optimal sequence of flexible prices, $\left(C_t^*, N_t^*\right)_{t=0}^{\infty}$ belong to the feasible set, it is that same allocation. The literature on this question concludes that the answer depends on the policy instruments available. Let us quote two examples that illustrate this point in the second best literature of sticky prices. In the first one prices are set one period in advance. In Adao, Correia and Teles (2003) it is shown that, even when the mone-

tary policy is decided independently of the fiscal policy, under quite strict conditions the flexible price allocation is the optimal one. This result is revisited in Correia, Nicolini and Teles (2001), the second example. There, fiscal instruments are extended and decided simultaneously with monetary instruments and the work concludes that it is always optimal to replicate the flexible price allocation. This result is summarized in the following proposition:

Proposition 4: When prices are sticky, the optimal monetary policy $\{M_t, R_t\}_{t=0}^{\infty}$ is independent of the value of α.

The following corollary highlights the main policy conclusion of this note:

Corollary: Economies characterized by different αs, that is, with different transmission mechanisms, but with the same type of friction, share the same optimal policy reaction to aggregate shocks. Empirically it would be impossible to estimate the degree of rigidity, α, with aggregate data.

The intuition behind the first part of this result is related with three facts. First, that monetary instruments should react to fundamental shocks. Second, that the effects of the fundamental shocks over the economy give rise to larger gaps (the absolute difference with respect to the flexible economy allocation) the more rigid is the economy. And third that the real effects of the monetary shocks on the economy are larger the more rigid the economy is. Thus, a fundamental shock on two economies with two different transmission mechanisms will have different effects. If we compare an economy which is more flexible, with a higher α to a more rigid economy, where α is smaller, we know that a given monetary shock has higher real effects in the more rigid economy. However, it is also in this economy that the gaps created by fundamental shocks are larger. On the contrary the same monetary shock will have a smaller real effects in the more flexible economy but it is also in this economy that the gap will be smaller. Since the monetary policy should replicate the flexible allocation, or close the gap, it would have to have a bigger impact in the more rigid economy. And that is precisely the case, since the same monetary policy has more efficacy when it is more necessary. Then, for a given fundamental shock, a monetary shock of identical magnitude is able to replicate the same equilibrium in economies with very dif-

ferent degrees of rigidity, and this equilibrium is the optimum.

Another way to look at our results is in the positive analysis or in the contribution of monetary policy to explain the cyclical behaviour of the economy. As the equilibrium does not depend on the degree of rigidity of the economy, this cannot be identified. Without the identification of the degree of rigidity it is not possible to identify the transmission mechanism of a pure monetary shock, the one that is not a reaction to a fundamental shock. One reason why the quantitative contribution of the monetary shocks for the explanation of the cycles has turned out to be relatively insignificant may be due to the fact described in the corollary. In the environment described, if the monetary policy is optimal, it is not possible to separate the fundamental shock from the monetary shock that reacts to the first one. Therefore, a full flexible economy model can replicate the main real business cycles of actual economies, but cannot be used to assess the efficacy of monetary policy.

4. CONCLUSION

In monetary economies with frictions, money shocks will have very different effects depending on the strength of the monetary transmission mechanism. A monetary policy conducted with a stochastic component that does not react to the state of the economy is not, however, the way monetary policy is, or should be, run. This does not show that when it is feasible and optimal to conduct monetary policy so that the allocation under full flexibility is replicated the transmission mechanism is irrelevant.

This result is a benchmark against which we should measure what happens in actual economies. It would be on the distance of reality from this paradigm that the monetary transmission mechanism would differ across countries with different strengths of frictions. One reason why reality could differ from the simple environment used in this note is because it may not be feasible to replicate the full flexibility allocation. In general, monetary policy cannot undo the effects of more than one source of friction. The monetary policy that makes the price non-state contingent is different from the monetary policy that makes the wage

(or deposits) non-state contingent. In this case, the monetary transmission mechanism is relevant for monetary policy. But is it really the case that there is such a vast menu of transmission mechanisms as we commonly see in the policy oriented surveys on this issue? It seems that recent work on cyclical behaviour of economies are converging toward the conclusion that there is a major distortion in the formalization: this distortion can be interpreted as a nominal wage rigidity. In favour of this point we could conjecture that the reason why the monetary policy shocks do not play a role in the early real business cycle literature may be because the monetary policy followed was the one able to replicate the flexible price allocation which would mean that there was not more than one friction in the economy. Another case in which it is not feasible to replicate the full flexibility allocation is when the technological shocks are idiosyncratic across firms. To replicate flexible prices, the relative prices would have to change according to the shocks. It is not reasonable to think that an aggregate policy could be the instrument to use in that case. Even when it is feasible to decentralize the flexible price allocation, the choice made by policy makers could be a different one: either because it is not optimal in the Ramsey sense, or because policy makers have different objectives.

The existence of different transmission mechanisms has influenced the discussion on the costs of a common monetary policy. The first step towards understanding these costs is to identify whether economies with different transmission mechanisms should follow different monetary policies. We conclude in this paper that this may not be the case.

REFERENCES

Adao, Bernardino, Isabel Correia and Pedro Teles, 2003, "Gaps and Triangles", *Review of Economic Studies*, October Vol 70 (4)nº 245, pag 699-713.

Adao, Bernardino, Isabel Correia and Pedro Teles, 2004, "The Monetary Transmission Mechanism: Is it Relevant for Policy?", *Journal of the European Economic Association*, April-May 2(2-3) p. 310-319.

Carlstrom C. T. and T. Fuerst, 1998, Price Level and Interest Rate Targeting in a model with Sticky Prices, mimeo, Federal Reserve Bank of Cleveland.

Correia, Isabel, Juan-Pablo Nicolini and Pedro Teles, 2003 "Optimal Fiscal and Monetary Policy: Equivalence Results", *Working Paper*, Banco de Portugal

Lucas, Robert E. Jr. and Nancy Stokey, 1983, Optimal Fiscal and Monetary Policy in an Economy without Capital, *Journal of Monetary Economics*, vol. 12, 55-93.

Sargent, T. J. and Neil Wallace, 1975, "Rational Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule", *Journal of Political Economy*, vol. 83, 241-254.