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ON THE BEHAVIOR OF FISCAL POLICY WITH COSTLY EXPECTATIONS

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RESUMEN

Este trabajo extiende el modelo presentado en Talvi y Végh (2005) para la determinación de la política fiscal óptima, introduciendo características del tipo *agent-based*. Al igual que en Talvi y Végh (2005), el marco teórico es *a la Barro (1979)*, pero en el modelo aquí presentado la formación de expectativas racionales está asociada a costos que dependen de la complejidad del sistema. Los agentes pueden elegir dos tipos de estrategias para la formación de expectativas: "comprar" la observación en cada período correspondiente al proceso de expectativas racionales, o seguir la tendencia sin pagar ningún costo. A diferencia de Talvi y Végh (2005), se muestra que la prociclicidad de la política fiscal no es necesariamente la conducta óptima del gobierno.

Clasificación JEL: E32, E62, H30

Palabras Clave: Política fiscal optima, ciclos, economía basada en agentes.

ABSTRACT

This paper extends the Talvi and Végh (2005) model on the behavior of fiscal policy, introducing agent-based issues. Like in Talvi and Végh (2005), the theoretical framework is *à la Barro* (1979), but rational expectations are costly. The agents can choose between two strategies in forming expectations: buying costly rational expectations or freely following the trend. Unlike Talvi and Végh (2005), I show that procyclicality of fiscal policy is not necessarily the government's optimal behavior.

JEL Classification: E32, E62, H30

Keywords: Optimal fiscal policy, cycles, agent-based economics.

ON THE BEHAVIOR OF FISCAL POLICY WITH COSTLY EXPECTATIONS [1]

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I. Introduction

There is a historical debate and a vast literature about how the behavior of fiscal policy should be determined. Basically, the focus is on how fiscal policy should be set over the business cycle.

There have been different answers to this question. Standard Keynesian models imply that fiscal policy should be countercyclical: governments should increase public spending and lower taxes in bad times, and they should do the opposite during good times. In turn, tax smoothing models inspired in Barro (1979) imply that fiscal policy should remain essentially neutral over the business cycle. Hence, if policymakers followed Keynesian or Barro's prescriptions, procyclical fiscal policy would never be observed. If a government followed Keynesian prescriptions, a positive correlation between tax rates and output growth (relative to the trend) and a negative correlation between public spending and output growth (relative to the trend) should be observed over the business cycle. Following tax smoothing prescriptions these correlations should be close to zero.

A relevant question that arises is: What do data convey about these testable implications? In OECD countries, fiscal policy is generally countercyclical or acyclical. For G-7 countries, the correlation between government consumption and output indeed appears to show no pattern and to be clustered around zero (see Fiorito and Kollintzas (1994) and Fiorito (1997)). For the United States, Barro (1990), Huang and Lin (1993), and Strazicich (1997) conclude that

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federal tax rates are set in order to smooth out "predictable" changes in government spending.

However, in many developing countries fiscal policies are procyclical. Gavin et al (1996) and Gavin and Perotti (1997a) point out that in Latin America, fiscal policy is procyclical. Talvi and Végh (2005) find that this is not only a Latin American phenomenon: procyclical fiscal policy is a common pattern in many -although not all- developing countries.

Different explanations have been suggested for this behavior. A first answer holds that procyclical fiscal policy is mainly explained by the credit supply (cf. Aizenman, Gavin and Hausmann (1996), Gavin and Perotti (1997a, 1997b), Catao and Sutton (2001) and Kaminsky, Reinhart and Végh (2004)). In bad times many developing countries cannot borrow, or they can only do so at very high interest rates; therefore, they cannot run deficits and have to cut spending. In booms, they can borrow more easily and they choose to do so, increasing public spending. However, as noted in Talvi and Végh (2005) and in Alesina and Tabellini (2005) this explanation has some problems. If the government knows that it will lose access to international credit markets during bad times, it is not clear why it will let the borrowing constraint to be binding. In fact, it could insure itself by accumulating reserves in good times, being less likely to face binding credit constraints in recessions.

Alesina and Tabellini (2005) provide an alternative explanation, in which procyclical fiscal policy is suboptimal based upon political distortions and less than benevolent governments whose objective is to appropriate rents. In such a context, voters demand more public goods or lower taxes to prevent governments from appropriating rents during good times.

Finally, Talvi and Végh (2005) give a different explanation, in which procyclical fiscal policy is optimal. They develop a model based on Barro's assumptions, but in which running budget surpluses is costly because in such a situation the private sector puts pressure on the government to increase public spending. Considering that tax base fluctuations are much larger in developing countries than in the G-7 countries, full tax smoothing would imply developing countries running larger budget surpluses in good times and larger budget deficits in bad times compared to G-7 countries. However, given the political distortion mentioned before, a government that faces large (and perfectly anticipated) fluctuations in the tax base would find it optimal to run a procyclical fiscal policy (the optimal response of the government is to reduce the tax rate in order to avoid the spending pressures). Therefore, they argue that the differences in fiscal policy between the G-7 countries and developing countries can be traced out to the fact that the tax base is much more volatile in developing countries than in the G-7 countries.

This paper extends the Talvi and Végh (2005) model, introducing agent-based issues. Like in Talvi and Végh (2005), the theoretical framework is *à la Barro* (1979), but rational expectations are costly. The agents can choose between two strategies in forming expectations: buying costly rational expectations or freely following the trend (as in Brock and Hommes (1997)). The cost of "buying" rational expectations depends on how "complex" the economy is, a concept that is defined as the sum of squares of the deviation between the short-run trend of GDP and the long-run trend on GDP. A countercyclical fiscal policy can reduce the complexity of the economy, also lowering the cost of buying rational expectations and lowering the probability of making mistakes when agents are trend followers. Therefore, a countercyclical fiscal policy has welfare-improving effects than can outweigh the political-economy costs associated to fiscal policy. Unlike Talvi and Végh (2005), I show that procyclicality of fiscal policy is not necessarily the government's optimal behavior.

II. The model

The model is built in two steps. First, Brock and Hommes (1997)'s rationalization for heterogeneous agent models is presented. A behavioral argument to assume costly rational expectations is provided. Then, the Ramsey problem of the government is analyzed in a framework of heterogeneous expectations. Barro (1979)'s and Talvi and Vegh (2005)'s (henceforth TaV2005) results are presented, and then I show that the introduction of agent-based issues may change the results previously obtained in the literature.

A. Choice of expectations with costly information

Brock and Hommes (1997) build a model of heterogeneous expectations, where the selection of strategies is endogenous and evolutionary: Those strategies that have been most successful in the recent past tend to be chosen with higher probability than less successful strategies.

Let H be the cardinality of the set of strategies. The fitness of strategy h is given by a random utility model,

$$\tilde{U}_{ht} = U_{ht} + \varepsilon_{ht} \qquad (1)$$

Equation (1) states that the fitness of strategy *h* in period *t* has two components: a deterministic part U_{ht}, and a random part ε_{ht} (the noise in the observed fitness of strategy *h* at date *t*).

The fraction λ_{ht} of individuals that choose strategy *h* is updated according to equation (1). Assuming that the noise ε_{ht} is IID across types and drawn from a double exponential distribution, the probability that an agent chooses strategy *h* converges to

$$\lambda_{ht} = \frac{exp(\beta U_{ht})}{\sum_h exp(\beta U_{ht})} \qquad (2)$$

Therefore, the probability of choosing strategy *h* is higher as the recent performance given by (1) is higher. Given ε_{ht}, the probability of choosing each strategy is less than 1 if β is less than ∞.[3]

In this model we assume that only two strategies are possible: the individuals can choose having rational expectations (*R*) about the determination of their income, but these expectations are costly; or they can choose to be trend followers (*TF*), which is costless.

The cost of buying rational expectations is defined as a function of the "macroeconomic complexity of the economy", a concept that I define in the following way.

Definition 1: *The macroeconomic complexity measure (CM) is defined as*

$$CM = \sum_t (\tilde{y}_{t_{SR}} - \tilde{y}_{t_{LR}})^2 \qquad (3)$$

where $\tilde{y}_{t_{SR}}$ *is the Hodrick-Prescott (HP) trend of the GDP per capita calculated for restricted samples of the series, and* $\tilde{y}_{t_{LR}}$ *is the HP trend calculated taking the whole time-series.*

[3] $\beta=\infty$ corresponds to the case without noise, and the optimal forecast is chosen with probability 1, while $\beta=0$ corresponds to the the case of noise with infinite variance, so each strategy is chosen with probability $1/H$.

The rationale behind this definition relies on the fact that the difficulty in forming correct expectations is not the same in different economies. Figure 1 shows that trends exhibit a uniform path in less volatile economies (e.g. Australia and US), while in more volatile ones (e.g. Argentina and Brazil) the trend changes when new data is added, i.e. when it is calculated recursively. According to this evidence, it is reasonable to assume that it is more difficult to form "correct" expectations in economies where a unique output trend is hard to identify than in the other ones.

Given definition 1, the cost of buying rational expectations is assumed to be:

$$C_t^R = k\,(CM) \tag{4}$$

with $k'(\cdot)>0$.

On the other hand, the individual may "follow the trend", which is assumed to be costless. In particular, the individual observes the last HP recursive trend, and chooses such value as her expectation for the evolution of her income in the next period. However, this strategy can lead individuals to make mistakes, and mistakes are costly. The cost of mistakes is defined as:

$$C_t^{TF} = (y_t^e - y_t^R)^2 \tag{5}$$

where y_t^R is the actual per capita income, and by assumption $y_t^e = \tilde{y}_{t_{SR}}$.

The objective of the individuals is to minimize costs. Applying the Brock and Hommes (1997) benchmark previously introduced, the probability of buying rational expectations, λ_t^R, is:

$$\lambda_t^R = \frac{exp\,(\beta(-C_t^R))}{exp\,(\beta(-C_t^R)) + exp\,(\beta(-C_{t-1}^{TF}))} \tag{6}$$

and the probability of being a trend follower is $\lambda_t^{TF} = 1 - \lambda_t^R$.

From (4) to (6), heterogeneous expectations in equilibrium are rationalized.

B. The optimal fiscal policy

In this section a model *à la Barro - Talvi and Végh* is presented, but where expectations are heterogeneous. The goal is to find the Ramsey policy. First, Barro's case is analyzed. Second, the TaV2005's case is analyzed. Finally, the Ramsey policy of the costly and heterogeneous expectations case is obtained.

It is assumed there is a large number of ex-ante identical agents. The economy is open to capital markets. Therefore, the real interest rate is exogenous (denoted by r). Income is ex-ante determined exogenously, but the government is capable of expanding or contracting income by means of fiscal policy. Let $F(x_t,r)$ be the process that generates income in the absence of government intervention (as stated before, is exogenous for individuals), where x_t is a set of exogenous variables. Then, the income in period t, Y_t, is given by

$$Y_t = F(x_t,r) + \alpha d_t \tag{7}$$

where d_t is the primary fiscal deficit and $\alpha \geq 0$ represents the effectiveness of fiscal policy ($\alpha = 0$ corresponds to the case of total ineffectiveness, and $0<\alpha<1$ corresponds to the case of partial effectiveness).

With no government intervention, the variance of the income is given by

$$Var(Y_t) = Var(F(\cdot)) \tag{8}$$

With government intervention, such variance is given by

$$Var(Y_t) = Var(F(\cdot)) + \alpha^2 Var(d_t) + 2Cov(F(\cdot),\alpha d_t) \tag{9}$$

If fiscal policy is countercyclical (procyclical) the covariance between the exogenous process that determines the income and the primary fiscal deficit is negative (positive). According to that, it is straightforward to prove that for a countercyclical fiscal policy

$$\alpha^2 Var(d_t) < 2\,|Cov(F(\cdot), \alpha d_t)| \tag{10}$$

and viceversa for a procyclical fiscal policy. Then, countercyclical (procyclical) fiscal policy diminishes (increases) the variance of the income.

It is assumed that taxes are the instrument for fiscal policy. In particular, there is only one tax (income tax) and it is distortive. As in TaV2005, public spending is determined by two components: an exogenous component determined by fundamentals ($\bar{g}$, that is, the level of public spending in Barro (1979) that results form an optimal fiscal policy model (as in Lucas and Stokey (1983)), and an endogenous component, that is a non-negative, increasing and convex function of primary surplus. Formally,

$$g_t = \bar{g} + f(t_t Y_t - g_t) \tag{11}$$

with $f(\cdot) > 0$, $f'(\cdot) > 0$, $f''(\cdot) > 0$. Primary deficit is defined as

$$d_t = -(t_t Y_t - g_t) \tag{12}$$

where t_t is the tax rate in the period t.

Equation (11) depicts a political distortion in the determination of public spending. According to the $f(\cdot)$ function, the higher the primary surplus, the higher the pressures from the private sector to the government to spend. The optimal response of the benevolent government to $f(\cdot)$ is to diminish the tax rate when the tax base increases in order to avoid such pressures, and viceversa during recessions.

The problem of individuals is the maximization of the present value of intertemporal utility:

$$max_{\{c_t\}} \sum_{t=0}^{\infty} \delta^t u(c_t) \tag{13}$$

subject to their budget constraint. The parameter δ denotes the individuals' discount factor, and c denotes consumption of the good.

It is assumed that the individuals know the budget constraint of the government, and they internalize it into their own budget constraint. Therefore, the budget constraint of the private sector is

$$\sum_t \frac{c_t}{(1+r)^t} = E\left\{ \sum_t \frac{[Y_t - k\,(CM)]\,\lambda_t^R}{(1+r)^t} + \sum_t \frac{[Y_t - (\tilde{y}_{t_{CP}} - y_t)^2]\,\lambda_t^{TF}}{(1+r)^t} - \sum_t \frac{[\,\bar{g} + f(-d_t) + h(t_t)]}{(1+r)^t} \right\} \tag{14}$$

where $h(t_t)$ is the function of taxes distortions, with $h'(\cdot) > 0$, $h''(\cdot) > 0$ (cf. Barro (1979)). The government maximizes the social welfare, which is equivalent to solve:

$$min_{\{t_t\}} E\left\{ \sum_{t=0}^{\infty} \frac{k\,(CM)\,\lambda_t^R + (\tilde{y}_{t_{CP}} - y_t)^2\,\lambda_t^{TF} + [\bar{g} + f(-d_t) + h\,(t_t)]}{(1+r)^t} \right\} \tag{15}$$

That is, the government chooses the sequence of taxes that maximizes the social welfare by means of minimizing social costs.

Given that the government can influence the evolution of the sequence of incomes through fiscal policy, then it can influence the value of CM (and consequently, the proportions λ_i, $i = R,TF$). The corollary 2 of the following proposition shows this fact.

Proposition 1 *Let's assume that there are two economies, A and B, such that $\tilde{y}_{LT_A} = \tilde{y}_{LT_B}$. Moreover, without loss of generality, let's assume that $\tilde{y}_{LT_i} = 0$, $i = A, B$.*[4] *Let's assume that the cycles of both economies are coincident, and that $Var(\tilde{y}_{LT_A}) > Var(\tilde{y}_{LT_B})$, which implies $|\dot{g}_{A_t}| > |\dot{g}_{B_t}|$ in every t, where $\frac{1}{N}\dot{g}_i$ is defined as the rate of growth of the economy i in one period. Then, $CM_A > CM_B$.*

Proof 1 *Let N be the maximum number of consecutive periods in which the economy i is in expansion or recession (by assumption of coincident cycles, this value is the same for both economies), that is assumed identical to the number of periods used to define the short run. Then, in each period for which $\tilde{y}_{t_{ST}}$ is calculated we have the following possibilities: a) accumulated growth is equal to $\dot{g}_i$ (situation in which the last N periods were expansionary); b) accumulated growth is equal to $(\frac{N-2}{N})\dot{g}_i$ (situation in which in $N-1$ of the last N periods were expansionary and the another one was recessive); c) the same logic applies to general situations in which $N-j$ out of N last were expansionary and the others j were recessive, until is accumulated growth equal to $-\dot{g}_i$. Therefore, there are $N+1$ possible situations, each one associated to a probability of $\frac{1}{N+1}$.*

Then, we have

$$CM_i = T\,\frac{1}{N+1}\,\dot{g}_i^{\,2}\sum_{j=0}^{2N}\left(\frac{N-2j}{N}\right)^2 \tag{16}$$

where T is the number of times in which the cycle is "closed" (that is, the economy returns to $\tilde{y}_{t_{ST}}$). Therefore, if $|\dot{g}_{A_t}| > |\dot{g}_{B_t}|$, it is concluded that $CM_A > CM_B$.

Corollary 1 *The reduction of the volatility of the economy implies a reduction of the value of CM.*

Corollary 2 *If $\alpha > 0$, countercyclical fiscal policy diminishes the value of CM.*

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[4] This assumtion only makes the proof easier. In fact, it is only necessary to assume equality.

However, problem (15) shows that reducing *k* is not the only objective of fiscal policy. To solve the optimal fiscal policy, the overall problem (15) is solved in stages. Firstly, Barro's problem is analyzed. Then, the political distortion proposed by TaV2005 is added. Finally, problem (15) is solved, that is, the "costly expectations" case. The optimal fiscal policies corresponding to each case are then compared. In each proposition the assumptions made previously hold.

Proposition 2 *(Barro 1979). Let*

$$min_{\{t_t\}} \sum_{t=0}^{\infty} \frac{h(t_t)}{(1+r)^t} \qquad (17)$$

be the problem of the government. Then, the optimal fiscal policy is acyclical.

Proof 2 *From (17), the first order condition is:*

$$h'(t_t) + \mu h'(t_t) - \mu = 0 \qquad (18)$$

where $\mu \geq 0$ is the Lagrange multiplier associated to the budget constraint of the government. Then,

$$h'(t_t) = \frac{\mu}{1+\mu} \qquad (19)$$

That is, the sequence of taxes is independent of the product, being the optimal fiscal policy acyclical.

Proposition 3 *(Talvi and Végh (2005)). Let*

$$min_{\{t_t\}} \sum_{t=0}^{\infty} \frac{f(t_t Y_t - g_t) + h(t_t)}{(1+r)^t} \qquad (20)$$

be the problem of the government. Then, the optimal fiscal policy is procyclical.

Proof 3 *From (20), the first order condition is:*

$$(1+\mu)\, h'(t_t) + f\,'(t_t Y_t - g_t)\, Y_t = \mu \tag{21}$$

Differentiating (21) with respect to Y, it is obtained

$$(1+\mu)\, h''(t_t)\,\frac{dt}{dY} + f\,''(t_t Y_t - g_t) Y_t^2\,\frac{dt}{dY} + f\,'(t_t Y_t - g_t) = 0 \tag{22}$$

Then, it is concluded that

$$\frac{dt}{dY} = -\frac{f\,'(t_t Y_t - g_t)}{(1+\mu)h''(t_t) + f\,''(t_t Y_t - g_t) Y_t^2} < 0 \tag{23}$$

That is, the optimal response to an increase of the product is to lower the tax rate, and viceversa. Then, the optimal fiscal policy is procyclical.

Proposition 4 *(Behavior of fiscal policy with costly expectations). Let (15) be the problem of the government:*

$$min_{\{t_t\}}\; E \left\{ \sum_{t=0}^{\infty} \frac{k(CM)\lambda_t^R + (\tilde{y}_{t_{CP}} - y_t)^2 \lambda_t^{TF} + [\dot{g} + f\,(-d_t) + h(t_t)]}{(1+r)^t} \right\}$$

with the probabilities of choosing both types of expectations previously determined. Let's assume that the fiscal policy is effective to smooth out the level of fluctuations of the income (i.e., $\alpha > 0$). Then, the optimal fiscal policy is not necessarily procyclical. Particularly, we have:

(a) $k''(CM) \geq 0$

(a.1) if $f\,'(\cdot) > 2\lambda_t^R |k'(\cdot)\,\frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then the optimal fiscal policy is procyclical.*

(a.2) if $f\,'(\cdot) = 2\lambda_t^R |k'(\cdot)\,\frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then the optimal fiscal policy is acyclical.*

(a.3) if $f\,'(\cdot) < 2\lambda_t^R |k'(\cdot)\,\frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then the optimal fiscal policy is countercyclical.*

(b) $k''(CM) < 0$

(b.1) if $(1+\lambda)\, h''(t_t) + f\,''(t_t Y_t - g_t) Y_t^2 > \lambda_t^R\, |k''(\cdot)|\, [(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}]^2$ *then the optimality is determined analogously to the case (a).*

(b.2) if $(1+\lambda)\, h''(t_t) + f''(t_tY_t - g_t)Y_t^2 < \lambda_t^R\, |k''(\cdot)|\, [(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}]^2$ *then the optimality is determined inversely to the case (a).*

Proof 4 *From (15), the first order condition is* [5]*:*

$$\lambda_t^R k'(\cdot)\, 2\, (\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}(t_t) + (1+\mu)\, h'(t_t) + f'(t_tY_t - g_t)Y_t = \mu \qquad (24)$$

Differentiating (24) with respect to Y, simplifying and rearranging, we get:

$$\lambda_t^R k''(\cdot)[2(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}(t_t)]^2 + 2\lambda_t^R k'(\cdot)\, \frac{d\tilde{y}_{tCP}}{dY}\frac{dy}{dt}$$
$$+(1+\lambda)\, h''(t_t)\, \frac{dt}{dY} + f''(t_tY_t - g_t)Y_t^2\, \frac{dt}{dY} + f'(t_tY_t - g_t) = 0 \qquad (25)$$

where $2k'(\cdot)\, \frac{d\tilde{y}_{tCP}}{dY}\frac{dy}{dt} < 0$ *, because* $k'(\cdot)>0$, $\frac{d\tilde{y}_{tCP}}{dY} > 0$, *and* $\frac{dy}{dt} < 0$ *by assumption.*

Therefore, it is concluded that

$$\frac{dt}{dY} = \frac{-f'(t_tY_t - g_t) - 2\lambda_t^R k'(\cdot)\, \frac{d\tilde{y}_{tCP}}{dY}\frac{dy}{dt}}{(1+\lambda)\, h''(t_t) + f''(t_tY_t - g_t)Y_t^2 + \lambda_t^R k''(\cdot)[2(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}(t_t)]^2} \qquad (26)$$

(a) $k''(CM) \geq 0$

(a.1) if $f'(\cdot) > 2\lambda_t^R |k'(\cdot)\, \frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then* $\frac{dt}{dY} < 0$*;*

(a.2) if $f'(\cdot) = 2\lambda_t^R |k'(\cdot)\, \frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then* $\frac{dt}{dY} = 0$*;*

(a.3) if $f'(\cdot) < 2\lambda_t^R |k'(\cdot)\, \frac{d\tilde{y}_t}{dY}\frac{dy}{dt}|$ *then* $\frac{dt}{dY} > 0$*;*

(b) $k''(CM) < 0$

(b.1) if $(1+\mu)\, h''(t_t) + f''(t_tY_t - g_t)Y_t^2 > \lambda_t^R\, |k''(\cdot)|\, [(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}]^2$ *the denominator in (26) is positive and the optimality is determined analogously to the case (a).*

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[5] Second order effects are excluded.

(b.2) if $(1+\mu)\, h''(t_t) + f''(t_t Y_t - g_t) Y_t^2 < \lambda_t^R\, |k''(\cdot)|\, [(\tilde{y}_{t_{CP}}(t_t) - \tilde{y}_{LP})'\, \tilde{y}'_{t_{CP}}]^2$ *the denominator in (26) is negative and the optimality is determined inversely to the case (a).*

Therefore, it has been proven that when (a) expectations are costly, (b) fiscal policy is at least partially effective to smooth the fluctuations of income and (c) the cost of buying rational expectations is an increasing function of the macroeconomic complexity of the economy, then the optimal fiscal policy is not necessarily procyclical, even when there are political distortions *à la Talvi and Végh*. In fact, when the marginal benefits of avoiding the political distortions do not outweigh the marginal costs of higher instability, the optimal fiscal policy is countercyclical.

III. Concluding remarks

Building an agent-based framework in which heterogeneous expectations are introduced, this paper shows that a previous result of the literature about optimal behavior of fiscal policy may be modified. The central result lies on proposition 4, which shows that when there are two types of expectations, both associated to costs, the optimal behavior of fiscal policy cannot be univocally determined. Particularly, there are scenarios in which, unlike Barro (1979) and Talvi and Végh (2005), the optimal behavior of the government could be to pursue a countercyclical fiscal policy.

There is an issue that still remains unsolved. If it is optimal for a country to set a countercyclical fiscal policy and, however, the fiscal policy happens to be procyclical: Why is this so? A plausible hypothesis for future research is that, as well as individuals do not always succeed in forecasting their permanent income, and this task might be particularly difficult in contexts of high complexity (an hypothesis with antecedents in Galiani et al (2003), Heymann et al (2001) and Leijohufvud (1973) among others), the same forecasting difficulties might apply to a government. It might be the case that a government overestimates its permanent income and consequently it decides a fiscal policy that based on that estimation is considered as countercyclical, but based on the ex-post realization of the permanent income is revealed to be procyclical. If this is the case, procyclicality would not be optimal, but it would be the outcome of misperceptions, an outcome that ex-post can be classified as suboptimal.

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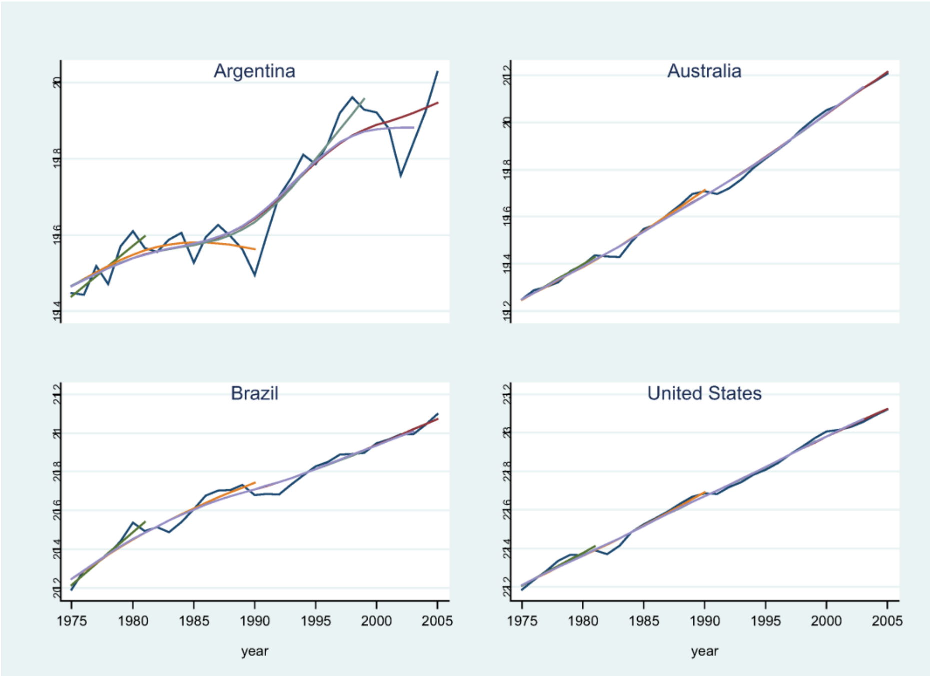
Figure 1
GDP per capita in constant dollars, HP recursive trends



Source: Own calculations based on OECD and Inter American Development Bank data.