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On Monetary Policy, Unemployment, and Economic Growth

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Abstract. Recognizing the possible relation between investments, economic growth and unemployment, and how there is not an established impact of an unlikely productive project failure on the secondly mentioned variables, we address such relation and asses theoretically the effect of different instruments of monetary policy on the mentioned macroeconomic indicators. To do this we build upon two models of economic growth considering the role of entrepreneurs, risk takers, and a monetary authority which is the average agent of the economy that is assumed to be aware of how the inflation can damage equally the individuals' life style, independently of their particular levels of income, finding that the impact of the monetary instruments depends on the behavior of the population, and endogenizing the money in circulation.
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1. Introduction

Why are the macroeconomic indicators important? Why are some goods more expensive in more developed regions? Why is there unemployment? Why is there poverty? Are the poor always unemployed? Are the unemployed always poor? Is unemployment always voluntary? Which is the relation between the aggregate investments and the unemployment in the short run? How could the inflation affect the life style of the individuals? Would the individuals with low incomes be affected equally by high inflation levels? After addressing these questions, we consider important the study of economic growth, and the emphasis on the understanding of the short run relations that involve variables like unemployment and inflation.

The relevance of economic growth, inflation, and unemployment on the life style of the individuals has motivated many authors who looked for establishing a commitment between these variables. Among the makers of theories which concern these indicators we find famous authors like J. M. Keynes (1883-1975), or A. W. Phillips (1914-1975).

More recently there were also important works that could be considered relevant in the understanding of the relation between the mentioned variables. Bernanke & Mihov (1998) developed a model-based methodology for measuring innovations in monetary policy and their macroeconomic effects, and proposed a new measure of the overall stance of policy. Boivin & Giannoni (2006) investigate the implications of changes in the structure of the U.S. economy for monetary policy, and find that responding more strongly to inflation expectations, monetary policy has stabilized the economy more effectively in the post 1980 period which

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seems to contradict the findings of Kuttner & Mosser (2002) about how monetary policy effects appear to be somewhat weaker than they were in past decades.

Unlike Chen (2007) who finds that empirical evidence suggests that monetary policy has larger effects on stock returns in bear markets, also showing how contractionary monetary policy leads to a higher probability of switching to the bear-market regime, in the present work, we look for pointing out under which conditions the policies of the monetary authority can be effective in increasing economic growth, and in reducing unemployment, which shall takes us to highlight the importance of entrepreneurs and risk takers in a decentralized economy. Furthermore, our findings can be considered as an accurate background for the positive relationship between bank credits and the firms' productivity which is found by Villalpando B. (2015).[1]

The work is composed by three parts: The first part deals with the relationship between monetary policy and economic growth, and the second part addresses the relationship between monetary policy and unemployment. Both of these parts consider how inflation can arise as a consequence of the actions taken by the monetary authority. Finally, the third part concludes.

Although some general assumptions and explanations which are usually done in the development of mathematical models of economic growth may not be so necessary to be mentioned, and could be taken for granted, we shall repeat them in the following.

We assume that the economy is closed. We accept that all the final product firms produce under perfect competition, and that supply is always equal to demand. The relative prices of the final products are given by the composition of the total output. Moreover, it may result important to mention that the second part will be developed under the assumption of each unit of capital being equally productive independently of the moment of its investment.

Probably we must also mention that different points have arisen from the employment of these usual modeling settings[2], which may result of high interest.

2. On monetary policy and economic growth

We will consider how the monetary authority can impact the economic growth of a region where the importance of the presence of entrepreneurs is recognized. We take into account the Schumpeterian idea of creative destruction[3], and build upon the model of quality levels in the technology done in Barro & Sala-i-Martin (2004), making it of variable scale change, and complementing it with a third sector[4] to address the relationship between economic growth and the monetary policy, which will allow us to endogenize at least part of the money supply.

The final goods' firms demand intermediate goods from the R&D firms, and use n varieties of these goods to produce. We accept that n remains constant over time.

It is considered a kind of equilibrium in which only the highest quality of an intermediate good is produced, and is the only one that is utilized. The R&D firms invest to improve the quality of the intermediate goods. A successful firm has the exclusive right of production over the good which is improved, such that it can sell it at the monopoly price. Therefore, the innovator eliminates the flow of benefits of his predecessor.

In order to invest in R&D, the firms analyze the possible temporal profits and its probable duration. Moreover, the entry depends on the presence of entrepreneurs that can be enhanced by the monetary authority due to increased credits, and a quality duration is aleatory because depends on the results of the competitors.

2.1. The model

The firm i has access to the technology $(Eq.1)$.

$$Y_i = AL_i^{1-\alpha} \sum_{j=1}^{n} \bar{x}_{ij}^{\alpha}$$

where L_i is the labor that is employed by this firm and $\bar{x}_{ij}$ denotes its employed quantity of the intermediate good j adjusted to its quality. We accept that $1 > \alpha > 0$.

The intermediate goods get depreciated completely after its employment.. We accept that all the innovators are distinct individuals and as we have previously mentioned there are property rights which allow these innovators to become the monopolist producer of the new intermediate good.

If x_{ij} is the quantity of the intermediate good j employed by the firm i, $\bar{x}_{ij} = F(N_j)x_{ij}$ is the quantity adjusted to the quality of this good when its best quality is a coalition of technological elements N_j, such that the previous versions of the good i had a quality $S \in 2^{N_j}$.

In this way the production of the firm i is

$$Y_i = AL_i^{1-\alpha} \sum_{j=1}^{n} \left(F(N_j)x_{ij}\right)^{\alpha}$$

Each firm in the economy maximizes benefits, and the first order conditions imply that the following condition is satisfied

$$\alpha AL_i^{1-\alpha_j} F(N_j)^{\alpha} x_{ij}{}^{\alpha-1} = p_j$$

By reorganizing this equation, we can sum all the individual demands and obtain the aggregate demand for the intermediate good $j(Eq.2)$.

$$x_j = \left[\frac{\alpha AF(N_j)^{\alpha}}{p_j}\right]^{\frac{1}{1-\alpha}} L \quad (2)$$

First the innovators decide if invest or not in R&D activities, and how much to invest. Secondly the successful ones set the price of the new intermediate good to sell it to the producers of final product.

The successful innovator of the invention k_j has the benefit

$$\pi(k_j) = [p_j - 1]x_j$$

and from the profit maximization we get that the optimal price for the new intermediate good j with quality $F(N_j)$ is

$$p_j = \frac{1}{\alpha}$$

which as we can see is constant. By substituting this price in $(Eq.1.2)$ we get the aggregate demand for the intermediate good j

$$x_j = \left[\alpha^2 AF(N_j)^{\alpha}\right]^{\frac{1}{1-\alpha}} L (Eq. 1.3)$$

From the demand $(Eq. 1.3)$ we can observe how the differences between the demanded quantities of the intermediate goods are given by the quality level of these goods $|N_j|$.

The flow of profits of the innovator is given by

$$\pi(N_j) = \bar{\pi} F(N_j)^{\frac{\alpha}{1-\alpha}}$$

where $\bar{\pi} = \left[\frac{1-\alpha}{\alpha}\right] \alpha^{\frac{2}{1-\alpha}} A^{\frac{1}{1-\alpha}} L$ is a constant over time if the population is also maintained constant. In this way the temporal profits which are obtained by a monopolist of higher quality are also higher.

A successful innovation in the sector j will agregate a new coalition S_j f technological elements. If t_{N_j} is the time in which the last innovation forming N_j was done, then $\pi(N_j)$ will be the innovator's profit of each period until $t_{N_j \cup S_j}$. The arrival of $t_{N_j \cup S_j}$ is influenced by the research decisions which were taken by the competitors, and therefore it is endogenous.

The time interval in which N_j is the best quality is given by

$$T(N_j) = t_{N_j \cup S_j} - t_{N_j}$$

This means that the current value of the profits of the inventor of the level N_j calculated in the time t_{N_j} is

$$V(N_j) = \int_{t_{N_j}}^{t_{N_j \cup S_j}} \pi(N_j) e^{-\bar{r}(v, t_{N_j})(v - t_{N_j})} dv$$

where

$$\bar{r}(v, t_{N_j}) \equiv \frac{1}{v - t_{N_j}} \int_{t_{N_j}}^{v} r(\omega)\, d\omega$$

is the average interest rate between the moments t_{N_j} and v. Observe that if the interest rate is a constant r over time[5], the actual value of the profits is

$$V(N_j) = \pi(N_j)\left[1 - e^{-rT(N_j)}\right](1/r)$$

From the monopoly price and the individual demands, we can get the quantity of the intermediate good j which is utilized by the firm i, x_{ij}, and by aggregating the individual productions we get the total production of the region

$$Y = \alpha^{\frac{2\alpha}{1-\alpha}} A^{\frac{1}{1-\alpha}} L \sum_{j=1}^{n} F(N_j)^{\frac{\alpha}{1-\alpha}}$$

Since n and L are constant in this model, the key of economic growth is the increase on the quality levels of the different sectors. The index of aggregate quality is

$$Q \equiv \sum_{j=1}^{n} F(N_j)^{\frac{\alpha}{1-\alpha}}$$

and therefore the total production is

$$Y = \alpha^{\frac{2\alpha}{1-\alpha}} A^{\frac{1}{1-\alpha}} LQ$$

In this way the increments on the quality will increase the index Q, which will result in an increase of the percapita production, and in an evident direction of the adjustment of the real wages.

2.2. The innovation process

$P(N_j)$ is the probability per unit of time of an external researcher increasing the level of quality of the sector j when the best quality is N_j. As in Barro and Sala-i-Martin (2004) this probability depends on the R&D investments, and for now is taken as given such that the event of a monopolist loosing its position of exclusive producer is given by a Poisson process.

This means that the expected value of the monopolist is given by

$$E[V(N_j)] = \pi(N_j)/(r + P(N_j))$$

The interpretation of this expression is intuitive, and we can see this by clearing r obtaining[6]

$$r = \frac{\pi(N_j) - P(N_j)E[V(N_j)]}{E[V(N_j)]}$$

As we can see, the market interest rate is equal to the rate of return of the R&D, where the negative part is the expected loss given by the possibility of the materialization of the next innovation.

$Z(N_j)$ is the aggregate flow of the investments of the possible innovators of the sector j when the quality is N_j. The probability $P(N_j)$is accepted to only depend on these investments such that a higher $Z(N_j)$ would increase the probability of success $P(N_j)$.

As in Barro & Sala-i-Martin (2004) for simplicity we accept that the probability of success changes according to the expression $(Eq. 1.4)$.

$$P(N_j) = Z(N_j)\phi(N_j)\ (Eq. 1.4)$$

where the function $\phi(N_j)$ captures the effect given by the actual position of the technology N_j.

2.3. The entrepreneurs

The principal difference of this application of the endogenous growth model and the one which was done by Barro & Sala-i-Martin (2004), a part from the possible variable scale increments, is that we consider how the individuals could not believe that the realization of a project is possible, and that could respond to certain variables. In particular, in this work we will focus on how a monetary authority could increase the loans that are given to these entrepreneurs, which would affect the entry of innovators, where this authority also considers variables such as the possible individuals' damage caused by short run inflation, and the risky nature of these investments.

We accept that there is free entry, however as we have mentioned, this could not be enough to make the net expected value per unit of time to be zero, i.e. the new condition that is satisfied is the following

$$P(N_j)E[V(N_j \cup S_j)]\eta_j(.) - Z(N_j) = 0$$

where $\eta_j(.)$ is a parameter that captures the entrepreneurial skills of the population in the sector j. This parameter is such that $0 < \eta_j(.) < 1$. $\eta_j(.)$ can respond to distinct factors like education, or as we have previously mentioned also to specific policies, and for now we prefer to take it as exogenously given. After substituting the probability $(Eq. 1.4)$ in this condition we get the following

$$Z(N_j)\,[\phi(N_j)\,E[V(N_j \cup S_j)]\eta_j(.) - 1] = 0$$

Considering only the cases with $Z(N_j) > 0$, the condition of free entry turns into

$$\phi(N_j)E[V(N_j \cup S_j)]\eta_j(.) - 1 = 0$$

In this way by substituting the expected value we get that the free entry condition is

$$r + P(N_j \cup S_j) = \phi(N_j)\bar{\pi}F(N_j)^{\frac{\alpha}{1-\alpha}}\eta_j(.)$$

We accept that it becomes less probable to innovate when the best quality is higher such that $\phi(N_j) = \frac{1}{\xi F(N_j)^{\frac{\alpha}{1-\alpha}}}$. For simplicity we accept that the entrepreneurs react equally in every sector[7] such that $\eta_j(.) = \eta(.)$ for any j. By substituting this term in the free entry condition we get that the probability of getting the innovation S_j is

$$P(N_j \cup S_j) = \frac{\pi\,\eta(.)}{\xi} - r$$

The change on the quality index is[8]

$$\dot{Q} = \Delta Q = P(N_j \cup S_j)\left[\sum_{j=1}^{n} F(N_j \cup S_j)^{\frac{\alpha}{1-\alpha}} - \sum_{j=1}^{n} F(N_j)^{\frac{\alpha}{1-\alpha}}\right]$$

We accept that the function $F(.)$ satisfies that

$$F(N_j \cup S_j)^{\frac{\alpha}{1-\alpha}} = F(N_j)^{\frac{\alpha}{1-\alpha}} D(S_j)^{\frac{\alpha}{1-\alpha}}$$

where it should be noticed that the union $N_j \cup S_j$ does not necessarily imply a given effect and it could be that $D(S_j) = F(N_j \cup S_j) - F(N_j)$.

There are infinite probable possibilities of innovation for a given stock of human capital, however, based on the central limit theorem and the law of large numbers, we can deduce a median innovation such that $S_j = S \; \forall j$.

The growth rate of the index of quality is given by[9]

$$\frac{\dot{Q}}{Q} = P(N_j \cup S)\left[D(S)^{\frac{\alpha}{1-\alpha}} - 1\right]$$

We can consider how the many R&D firms look constantly for innovating such that the quality level $F(N_j)$ does not go back to old practices of production, and thus it makes sense that a higher level of quality is always more productive[10] such that $D(S_j)^{\frac{\alpha}{1-\alpha}} \geq 1$.

Considering the solution of the growth of consumption, the interest rate can be obtained by solving the following system of equations

$$\frac{\dot{Q}}{Q} = \left[\frac{\overline{\pi}\eta(.)}{\zeta} - r\right]\left[D(S_j)^{\frac{\alpha}{1-\alpha}} - 1\right]$$

$$\frac{\dot{C}}{C} = \frac{1}{\theta}[r - \rho]$$

The market interest rate is

$$r = \frac{\left[D(S_j)^{\frac{\alpha}{1-\alpha}} - 1\right]\frac{\overline{\pi}\eta(.)}{\zeta}\theta + \rho}{1 + \left[D(S_j)^{\frac{\alpha}{1-\alpha}} - 1\right]\theta}$$

It is important to mention that this result comes from the fact of how the growth of consumption is equal to the one of the quality index, which can be verified by looking at the equilibrium restriction, considering that Y, X and Z depend linearly on Q.. Furthermore, this means that the rate of growth that contains the productive reactions of the firms to each of the newly improved share of the n inputs is the following

$$\gamma = \frac{\left[D(S_j)^{\frac{\alpha}{1-\alpha}} - 1\right]\left[\frac{\overline{\pi}\eta(.)}{\zeta} - \rho\right]}{1 + \left[D(S_j)^{\frac{\alpha}{1-\alpha}} - 1\right]\theta}$$

As we can see, an increase of the entrepreneurial propensity $\eta(.)$ would impact positively the interest rate and the economic growth of a region, because the probability of innovating would increase as well. Moreover, it can be observed how a higher technological step $D(S)$ would impact the growth rate in two different ways. The first would be given by the higher production, and the second by the increment on the innovation costs.

We previously mentioned that a given stock of human capital would change the innovation possibilities, and since we can expect it to vary over time, we could thus expect the technological steps $D(S)$ to vary as well.

An example of the technological steps is given by $F(N) = a^{|N|}$ where $D(S) = a^{|S|}$.

We could reject the assumption of each sector having the same entrepreneurial propensity, and get that the interest rate and the rate of growth are in function of a general entrepreneurial propensity index $\eta(.) = \sum_{j=1}^{J} \omega_j \eta(.)$, where ω_j is the share of sectors which have the same entrepreneurial propensity such that $\sum_{j=1}^{J} \omega_j = 1$.

In this way our representation has captured how not only the stock of human capital is important for economic growth, but its contents in terms of entrepreneurial skills as well, where more developed countries present a higher quality level $|N|$.

2.4. The monetary authority and the average agent

As we have seen, the entrepreneurs could increase or decrease, and this would affect the economic growth of a region due to changes on $\eta(.)$, however, which is the value of this parameter and how is it determined?

We consider how the banks verify that the entrepreneurial projects for which give credits satisfy some requisites, such that if are successful improve the quality of the intermediate good in the described scale. The monetary authority regulates the amount of credits, and we focus on how it regulates the credits that are given to the entrepreneurs also considering only this created money in the model. To focus on the effect of this actions of the monetary authority we assume that $\eta(.)$ has the following form

$$\eta(\kappa) = \begin{cases} \eta + \mu\kappa, & \kappa < \frac{1-\eta}{\mu} \\ 1, & \text{otherwise} \end{cases}$$

where η is an exogenous constant which depends on the behavior of the population, education, and other factors that we do not take as endogenously given, and that satisfies $0 < \eta \leq 1$. κ is the money which is created by the monetary authority to finance the entrepreneurs, and μ captures the reaction of the entrepreneurs to the created credits[11].

This means that this action of the monetary authority is distorting in the sense that the shmoos which are invested are more. The monetary authority is managed by the average agent which we accept to be aware of the consequences given by high inflation levels and of the investments' involved risk[12], such that it maximizes the welfare of the population.

The welfare of the population concerning this actions of the central bank is given by the following concave function

$$W = a\kappa^{\beta} - i\kappa$$

this function represents the judgement and intuition of the monetary manager who considers how the economic growth is an indicator of the life style of the population. a is an exogenous parameter that captures the estimation of the monetary authority in impacting entrepreneurs and creating the money that is necessary to keep functioning the daily transactions, also called Bayesian component. The function is concave such that $0 < \beta < 1$, and i captures how it is intuitive that the involved risks and inflation can result in a bad outcome for the population.

The maximization is the following

$$max_{\kappa} W = \alpha\kappa^{\beta} - i\kappa$$

From the first order conditions we obtain that the created credits are such that the ideal considered money in circulation for the monetary authority is

$$\kappa^* = \left(\frac{\alpha\beta}{i}\right)^{\frac{1}{1-\beta}}$$

2.5. Policy Implications

To focus on the effect of the entrepreneurs' credits, let's for now assume that the monetary authority only considers the impact of the possible changes on $\eta(.)$ and its possible odds in the increase of welfare. Moreover, let's accept that the authority can observe the function $\eta(\kappa)$.

This means that the optimal considered created money in circulation is

$$\kappa^* = min\left\{\left(\frac{\alpha\beta}{i}\right)^{\frac{1}{1-\beta}}, \frac{1-\eta}{\mu}\right\}$$

In this way we get that the impact of the monetary authority on the economic growth depends on the behavior of the population. We can distinguish between three cases in order clarify some policy implications:

Case 1$\eta(\kappa^*) < 1$.

This case happens when the behavior of the population is such that the entrepreneurs could increase more in the optimum, but the authority considers how the risks and the inflation can harm the welfare of the population.

Case 2 $\eta(\kappa^*) = 1$.

In this case, both the optimal considered money supply and the response of the agents to it, are such that the agents who entrepreneur a high quality R&D project fill the free entry until the expected profits are zero.

However, we can consider how some of the assumptions which we have done are not necessarily realistic in the short run, and with this we are of course referring only to how it would probably be very difficult for the monetary authority, to be able to observe the function $\eta(\kappa)$ at each moment[13], which leads us to remark the following case.

Case 3 $\eta = 1$ and $\mu = 0$.

In this case the optimal choice is not to increase the considered money supply because it would be purely inflationary[14], taking us to the intuition behind the concavity of the welfare function when it is also considered how increments on the money supply, may be necessary to allow the daily economic transactions[15].

It may be important to mention how we do not analyze the monetary policies of a social planner, because we consider how it has dictatorial attributions which allow it to control the R&D investments, and the qualitative comparison with the optimum of Pareto would be the same that is obtained in Barro & Sala-i-Martin (2004), with the difference that since the quantity of projects is an exclusive variable of the decentralized solution, then a higher η could contribute in possibly making the economic growth too high in comparison to the social optimum[16].

3. On Monetary Policy and Unemployment

In this section we deal with the short run relationship between the monetary policy and unemployment, recognizing the important role of the risk takers who invest on capital which is complemented by labor, increasing the immediate employment of a region.

To do this we will consider how there are usually certain changes on the composition of the total output that derive in short run fluctuations of macroeconomic variables.

Although our analysis is restricted to the quantitatively defined short run term, we consider important the clarification of this relationship because of its long run relevance in the life style of a population.

3.1. The model

We add a monetary sector to the neoclassical economic growth model of Solow (1956). We assume that all the population is constant, and that each individual wants to supply a unit of labor inelastically. The labor at each time is given by $\lambda(.)L$, where $\lambda(.)$ is a parameter that can be in function of different variables that for now we would like to take as given, and L is equal to the total population. Moreover, the parameter $\lambda(.)$ satisfies $0 < \lambda(.) < 1$, and we will later explain its interpretation.

Each firm i of the economy has access to the technology

$$Y_i = AL_i^{1-\alpha}K_i^{\alpha}$$

Since all the firms maximize benefits, employ factors of production according to the following condition

$$\alpha Ak_i^{\alpha-1} = r + \delta$$

From the previous condition we get that all the firms capital per worker matches such that $k_i = k$. By aggregating the individual productions, we get the region's total per capita production

$$y = \lambda(.)Ak^{\alpha}$$

The parameter $\lambda(.)$ represents how the changes on the general equilibrium leave a frictional unemployment of $(1-\lambda(.))L$ at each period of time, and therefore, it depends on certain factors.

We focus on the possible distorting effects which a specific kind of monetary policy can have in the short run, impacting the employment. This is, we focus on how the monetary authority can increase the credits that are given to invest in new firms and on firms' expansions, which creates new jobs in the immediate short run.

When getting the real wages

$$w_i = (1-\alpha)Ak_i^{\alpha}$$

and taking in to account that each capital-labor ratio k_i matches, we get that the wages are matching as well such that $w_i = w$. Moreover, since the marginal labor productivity depends on $\lambda(.)$, thus also the implied average worker probability of in.proving.

3.2. Production projects, risk takers and productive credits reaction

An increment of the money supply through the creation of the productive credits that we have already mentioned, would impact the employment depending on the presence of risk takers, and of production projects with the average productivity within a region.

Since we focus on the effect of this kind of monetary policy, we will take any other factor that could influence the very short run employment such as education as exogenously given, and the value of the parameter is the following

$$\lambda(\phi) = \begin{cases} \breve{\lambda} + \mu\phi, & \phi < \dfrac{1-\breve{\lambda}}{\mu} \\ \hat{\lambda}, & \text{otherwise} \end{cases}$$

where $\breve{\lambda}$ is a certain minimum level of employment which allows the individuals to survive that period and that we assume to be constant over time. Moreover, μ captures the response of the investments to the implied increments of the money supply, considering the risk involved in such kinds of actions. In this way, ϕ is the money that is created by the monetary authority due to the increments of the considered credits, and $\lambda \leq 1$ is the maximum response which is possible because of the existence of productive projects with certain minimum of productivity within the region[17].

3.3. The Monetary Authority and the Average Agent

Once again, the monetary authority is managed by the average agent who maximizes the welfare of the population considering the damages that can be caused by possible high inflation levels, and the risk that is involved in increasing the mentioned productive credits. Furthermore, the welfare function that considers the previously mentioned, how it may be necessary to increase the money supply to keep the daily transactions, and how these actions could increase the short run employment is given by

$$W = a\phi^{\beta} - i\phi$$

where as in the previous part a is the estimated Bayesian component, i captures the intuition of the average agent about the possible odds given by the presence of risk and high inflation, and β represents these previous aspects causing concavity to the function such that $0 < \beta < 1$. Therefore, the optimal considered created money is

$$\phi^* = \left(\frac{a\beta}{i}\right)^{\frac{1}{1-\beta}}$$

3.4. Policy implications

As in the second part, since some assumptions could not be done for the short run, and with this we of course mean that it would probably be very difficult for the monetary authority to observe the response of the risk takers to this increase on the money supply $\lambda(\phi)$, and the success of their projects, we get that the per capita capital changes according to the following differ.ential equation

$$\dot{k} = s\lambda(\phi^*)Ak^\alpha - \delta k$$

where s is the constant savings propensity.. From this equation we get the steady capital

$$k^* = \left(\frac{sA\lambda(\phi^*)}{\delta}\right)^{\frac{1}{1-\alpha}}$$

which can depend on the considered money supply depending on the behavior of the population, because as we have seen, increasing these credits could be purely or very inflationary[18]

4. Conclusions

We have analyzed how the monetary policies surely affect macroeconomic variables of interest in the short run, considering how extending our work to the reflection of a larger run, would not take us to gain a meaningful knowledge surplus in our results' qualitative terms which concern the avoidable possible odds caused by the implied policies.

Our representations considered how in order to invest the agents look for verifying the plausibility of the productive projects, and focused on the existent projects with a minimum of productivity to take into account how since the firms' production is homothetic by nature, the extra production could be lower than the created money due to a decrease on the real value of the new nominal putties, which is therefore translated in to sure inflation, despite the probability of the investments' success.

For now, we have considered that if we were able to endogenize the change on the population's reaction to monetary policies, it would be a heartlessly complicated theory, and instead we preferred to take the corresponding parameters as exogenously given.

We obtained that there is an optimal creation of the considered money for a monetary authority which takes into account how the population could be equally damaged by the hardly monitorable distributed inflation, independently of their personal incomes[19], where if it was possible to observe the agents' sure immediate responses to the monetary policies, there would also be an optimum of the considered money supply, but not an obvious implication for the possible employment, of different policy instruments. Moreover, we could say that the objectives of the monetary authorities reflect the judgement of those who we have referred to as the average agent.

We conclude by remarking the importance of any of the possible factors, which could stimulate the hope of entrepreneurs and risk takers to start productive projects, in this way reducing the average wait for employment calls, and allowing the so far experienced quality improvements, without forgetting to highlight the relevance of the focused specific monetary instruments in which we have preferred to inquire.

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Notes

[1] Barro & Sala-i-Martin (2004) find a positive correlation between the share of investments and economic growth.
[2] e.g. Petri (2009; 2013), Garegnani (2005), Mandler (2002; 2005), Lazzarini (2011).
[3] See Aghion & Howitt (1992).
[4] The monetary sector.
[5] As it will occur in equilibrium.
[6] The steps to obtain the previous expression of the expected value which are based on its aleatory nature, can be verified in Barro & Sala-i-Martin (2004).
[7] Or subregion.
[8] This probability is objective unlike the one addressed in Ackert et al. (2009), where the distinction of a probability judgement error from speculation in market bubbles has been studied.
[9] This rate considers the law of big numbers, and is the result of a change on the qualities of the intermediate goods.
[10] Impplies a lower relative price of final goods.
[11] This parameter could also depend on the education of the population and we take it as exogenously given.
[12] In other words, we accept it to possess the implied knowledge.
[13] How entrepreneurial are the competitive agents.
[14] Notice that we are only considering the possibility of economic growth.
[15] Notice that this concavity can be interpreted as a certain kind of risk aversion, in terms of the odds that can be caused by inflation.
[16] This also means that a government facing a descentralized economy with a very high (low) η, could also try to reduce (increase) it throughout a kind of standard run distorting subsidy modification, which would imply another sort of risk.
[17] As in the previous part, the response of $\lambda(.)$ could be thought-out in terms of a concentrating public subsidy involving a different kind of risk, but as we shall see in a posterior section, this would not distort a savings propensity.
[18] Despite the evident sign of μ.
[19] Whatever the income denomination i.e. wages, capital yields and its income shares.

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