4. Income distribution and the interaction between cycles and growth*

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4.1. INTRODUCTION

Although the integration of demand and supply was present in the beginning of formal growth theory (see Harrod, 1939), it was largely absent in the mainstream growth models that followed (see also Dutt, 2006) and Palley, 1997). These models mainly focused upon the supply side and upon a deterministic trend (see, for instance, Solow, 1956). This one-sidedness, however, runs the risk of leading to paradoxes or to wrong conclusions. If a long-run time series of growth rates is considered, for example, the hypothesis of interdependence between short-run and long-run movements can be reasonably put forward, as is done by the stochastic trend hypothesis (see Prescott, 1986). Within this hypothesis, which has been largely supported by real business cycle theories (RBC), there is the tendency to attribute an acceleration of growth to technical change, while leaving decelerations largely unexplained, unless the possibility of negative technology shocks is admitted. The advent of endogenous growth theory (Romer, 1986) has helped remove these counterfactual features, for instance by allowing monetary aspects to have long-run effects (see Stadler, 1990). The persistence of shocks has an important role in these kinds of explanations.

Our thesis is that an effective way of dealing with the interaction between cycles and growth is through explicit consideration of the interplay between demand and supply. In this perspective, four points deserve to be stressed. The analysis is based upon a Keynesian model integrated with supply considerations, on the one hand, and a link connecting income distribution, financial and institutional aspects, on the other. It is based on a macro-model that is not strictly microfounded, but is compatible with other justifications (see, for instance, Akerlof, 2007). The analysis mainly refers to a medium-run period, rather than a long-run period, as is traditionally done, in which the analysis usually emphasizes the steady state. In this context, it is possible to detect both periods of rapid expansion and of relative decline that differ from those stressed in the business cycle literature and that are ignored by growth models. These phenomena are compatible with the existence of multiple equilibria, where there is dynamic regime switching and agents learn accordingly.

The analysis is carried out by means of simulations in the methodological spirit of Tesfatsion (2006). The results of the simulations show a variety of dynamic patterns that are particularly rich and complex because the model is not constrained to be linear. The simulations show that accelerations and decelerations are possible and that cyclical behaviour can be very persistent. In this context, one can distinguish between feasible and steady-state rates of growth. The former represent the averages that link cycles and growth and depend on the interaction between aggregate demand and supply. These averages can be far from the steady-state values that, according to the supply-side approach, necessarily lead to growth. This gap represents the role of business cycles and, through this channel, the impact of demand on growth dynamics. Its comparative dynamics are studied from an income distribution perspective.

The paper is structured as follows. Section 4.2 illustrates the main stylized facts from a medium-run perspective. Section 4.3 introduces the multiple equilibria and the regime-switching hypotheses. Section 4.4 presents the relationship between income distribution, debt and the consumption function. Section 4.5 introduces the remaining equations of the model. Section 4.6 discusses the steady-state properties, while Section 4.7 introduces expectations. Section 4.8 analyzes the results of the simulations, and Section 4.9 discusses the concept of feasible growth. Section 4.10 examines the dynamic role of income distribution, while the final section concludes.

4.2. MEDIUM-RUN STYLIZED FACTS

When considering growth in the advanced industrialized countries over a long period, it is clear that the actual performance of the economies is far from the steady-state path suggested by the literature on long-run dynamics. The US economy, for example, experienced sustained output growth during the 1960s. From the early 1970s to the early 1980s, however, output growth was low on average, while since the mid-1990s, there has been, for the most part, a return to strong growth.

Three points are worth stressing. The first is that these ups and downs pertain not only to the US economy, but also extend to such economies as those of Europe and Japan. Although the details differ, the experience of these two areas is characterized by similar ups and downs. In the second place, these ups and downs manifest themselves over a time span that is longer than that expected for statistical business cycles. In the third place, these movements seem to be more consistent than those identified at shorter frequencies.

Comin and Gertler (2006) have tried to link the high and medium frequencies. The purpose of this paper is to link the medium-run to lower frequencies. The possible link between medium-run fluctuations and growth is one of the least explored themes in the economic literature. One might wonder whether this is a relevant area of analysis since business cycles seem to be less relevant in recent experience. From a medium-run perspective, i.e. a longer time perspective than is considered in conventional business cycle analyses, the record shows that many industrialized countries have tended to oscillate between periods of sustained growth and intervals of relative stagnation.

These records suggest that the long-run rate of growth may not depend only on technology and a few other parameters that reflect the fundamentals, but also on the complex events that link economic policy, institutions and fundamentals.

4.3. MULTIPLE EQUILIBRIA AND REGIME SWITCHING

The oscillations between growth and stagnation can be studied with the hypothesis of multiple equilibria. In this perspective, the economy is characterized by a 'bad' state (state 1), with high unemployment and low growth and by a 'good' state (state 2), with the opposite situation of sustained growth accompanied by low unemployment. In order to obtain multiple equilibria, non-linear relationships are usually introduced (for this strategy, see for instance Evans et al., 1998). Alternatively, one might refer to a piecewise linear technique which assumes that certain functions change discontinuously when they reach a threshold. This is the strategy followed in this paper (see also Ferri et al., 2001).

It is important to stress that in a regime-switching model, growth depends on: i) what happens within each state and between the two states and ii) the time spent in each regime. In this case, history matters for the process of growth (see also Day and Walter, 1989) and hence for the relationships with income distribution.

In order to implement this approach, one needs to consider two further steps. First of all, a threshold must be identified. For instance, it can be represented by a particular rate of unemployment (u^{th}). [1] In this case, if

$$u_{t-1} > u^{th}$$

then the system enters Regime 1.

In the second place, one has to identify the equations that undergo changes when the threshold is reached.[2] In the present analysis, regime switching affects three equations:

i. labour productivity;
ii. income distribution;
iii. monetary policy.

The fundamental equation where the switch takes place is the dynamics of labour productivity which can be expressed in the following way[3]:

$$\tau_{tj} = \tau_{1j} + \tau_2 i_{tj} \tag{4.1}$$

where j = 1, 2 are the two regimes and i_{tj} represents investment as a share of output:

$$i = \frac{I_t}{Y_{t-1}}$$

It is assumed that:

$$\tau_{11} < \tau_{12}$$

which implies that the exogenous component of labour productivity growth increases when 'Regime 2' is entered. This means that a regime with lower unemployment stimulates capital–labour substitution and hence labour productivity growth (see also Dutt, 2006 and Tripier, 2006).

Regime switching, however, is not only determined by the technological equation. There are at least two more equations to be considered. The first refers to income distribution. Initially, it will be considered exogenous. However, the labour share (ω) may be assumed to have different steady-state values (always marked by a 0 after any variable) in the two regimes:

$$\omega_{01} \neq \omega_{02}$$

The sign of the inequality is not imposed *a priori* and this is a flexibility property of the analytical tool employed. Yet another switch may happen in monetary policy. Also in this case, one might start initially with the hypothesis that the two steady-state values of the monetary rate of interest (R_{0j}) are different in the two steady states:

$$R_{01} \neq R_{02}$$

so that a version of the Taylor equation can be written in the following way:

$$R_{tj} = R_j^* + \psi_1\left(\overline{E}\pi_{tj} - \pi_{0j}\right) + \psi_2\left(\overline{E}g_{tj} - g_{0j}\right) \tag{4.2}$$

where π and g represent, respectively, inflation and growth, a bar refers to expectations, and the subscript 0 refers to a steady state. This rule is strengthened by a regime-switching mechanism that is triggered by the deterministic threshold discussed above. [4]Changes in these steady-state values bring about variations in the steady state values of the other variables as well.

The dynamics of the model are generated by a non-linear system of equations supplemented by the regime-switching mechanisms described above. Technically, one should present two systems of equations, one for each state. However, in order to economize space, only the meta system will be presented, indexed by j =1, 2. Furthermore, only parameters that switch, along with the steady states, will be indexed with j, while the endogenous variable is only indexed by time.

4.4. INCOME DISTRIBUTION, DEBT AND THE CONSUMPTION FUNCTION

The model is based upon two fundamental Keynesian features: saving and investment equations refer to different decision makers, and the labour market does not clear. In particular, the model includes most of the non-neutralities described by Akerlof (2007), which can be justified by 'social norms' and by uncertainty (see, Ferri and Variato, 2007).[5]

Let us start from the equilibrium condition that aggregate demand equals supply. In dynamic terms, this equality implies that 1 plus the rate of growth of output (g_t) must be equal to the sum of the investment ratio ($i_t = I_t / Y_{t-1}$) and the consumption ratio (in a closed economy without Government). The latter is a positive function of past and expected incomes and a negative function of the interest rate on accumulated debt ratio (deflated by expected inflation):

$$g_t = i_t + c_1\left(1 + \overline{E}_t g_t\right) + c_2 - c_3 \frac{R_t d_t}{1 + \overline{E}_t \pi_t} - 1 \tag{4.3}$$

where c_1 and c_2 represent the propensity to consume past and forecast income, while c_3 measures the impact of debt.

This consumption function stresses the relationship between income distribution, financial aspects and institutional factors.[6] In this formulation, debt increases from interest and consumption and diminishes because of wages received. In terms of last year output, the debt ratio

$$d_t = \frac{D_t}{P_{t-1}Y_{t-1}}$$

evolves according to the following formula:

$$d_t = \frac{d_{t-1}(1+R_{t-1})}{(1+g_{t-1})(1+\pi_{t-1})} - \frac{i_{t-1}}{(1+g_{t-1})} + (1-\omega_{t-1}) \tag{4.4}$$

where R is the nominal rate of interest and ω stands for the labour income share. Since debt contracts are set in nominal terms, they may be affected by inflation. This is why π appears in the denominator.[7]

4.5. CLOSING THE MODEL

The interdependence between real and financial aspects is mainly concentrated in the consumption function because we wish to pay tribute to the *Zeitgeist*, namely the tendency of consumers to borrow. Consequently, the investment function has been somewhat simplified; it depends on both the accelerator and the cost of capital:

$$i_t = \eta_1 + \eta_2 \overline{E} g_t - \eta_3 (r_t - r_{0j}) \tag{4.5}$$

Since this equation is expressed in terms of Y_{t-1}, it implies that a normalized output–capital ratio is assumed throughout the analysis. The real cost of capital is related to the nominal rate of interest by the Fisher formula:

$$r_t = \frac{(1+R_t)}{(1+\overline{E}_t\pi_t)} - 1 \tag{4.6}$$

We next introduce the labour market equations. Labour demand is given by the following equation:

$$l_t = l_{t-1}\frac{(1+g_t)}{(1+\tau)} \tag{4.7}$$

Two aspects of this formulation should be stressed. First, 1_t represents the employment ratio, referred to a normalized labour supply. Hence unemployment (u_t) is given by

$$u_t = 1 - l_t \tag{4.8}$$

Finally, price inflation is determined by the following formula:

$$\pi_t = -\sigma_1\left(u_t - u^*\right) + \left(1-\varphi\right)\overline{E}_t\pi_t \tag{4.9}$$

where, as in Akerlof (2000), φ measures the percentage of people who are boundedly rational (In the current literature, φ measures nominal rigidities, while σ_1 measures (inversely) real rigidities).

Finally, also the equation relative to income distribution is introduced so that the model is ready for future developments:

$$\omega = \omega_j^* \tag{4.10}$$

For given expectations, the model contains ten unknowns $(d_t, i_t, g_t, l_t, u_t, \pi_t, \tau_t, R_t, r_t, \omega_t)$ in ten equations. This holds true for each regime $j = 1, 2$.

4.6. STEADY STATES

As stressed by Solow (2000), the medium run is a sort of no man's land that is worth analyzing. It does not belong to the Marshallian tripartite classification (see Leijonhufvud, 2006) and from a statistical point of view it occupies a range between high frequencies (short run) and low frequencies (long run). In economics terms, its steady state is defined by the fulfilment of expectations

$$\overline{E}g_t = g_t$$
$$\overline{E}\pi_t = \pi_t$$

the constancy of growth and of the main ratios. In this perspective, unemployment is constant, as are the debt ratio and the investment ratio.

Two caveats are worth stressing. The first is that the model does not consider the relationship between investment and capital, and it assumes a normalized labour supply. Both assumptions would be untenable in the long run. Secondly, there is no single steady state, since the model is distinguished by the presence of two regimes. In this context, the steady state of growth is given by:

$$g_{0j} = \frac{\tau_{1j} + \tau_2\eta_1}{1 - \tau_2\eta_2}$$

and since

$$\tau_{11} < \tau_{12}$$

$$g_{01} < g_{02}$$

where 0 refers to the steady state, while 1 and 2 represent, respectively, the 'stagnation' and 'exuberant' states. This dichotomy influences the remaining values. The steady-state value of inflation is given by

$$\pi_{0j} = \frac{B_j + (1 + R_{0j})}{1 + g_{0j}} - 1$$

where B_j is obtained by referring to equation (4.2),(4.3) and (4.6).

The steady state of unemployment is given by:

$$u_{0j} = u^* - \frac{1 - \varphi_1}{\sigma_1} \pi_{0j}$$

This is equal to the NAIRU when the sum of the coefficients φ is equal to 1. The real rate of interest is obtained in the Fisher equation (4.6).

4.7. MARKOVIAN EXPECTATIONS

In this two-regime system, the decision makers know that the economy experiences periods of 'high' and 'low' growth, along with phases of deflation followed by periods of inflation. We make the assumption that in forming their expectations they follow a two-state Markovian regime switching process (see Hamilton, 1989 and Jaimovich and Rebelo, 2006). In more detail, at the end of period *t* – 1, agents believe that the growth rate in period t will be

$$g_t^e = \alpha_1 + \beta_1 s_t + (\rho_1 + \mu_1 s_t) g_{t-1}$$

where s_t is a random variable that assumes the value 0 in the low state and 1 in the high state. It evolves according to the following transition probabilities:

$$\Pr(s_t = 0 | s_{t-1} = 0) = a_1$$

$$\Pr(s_t = 1 | s_{t-1} = 0) = 1 - a_1$$

$$\Pr(s_t = 0 | s_{t-1} = 1) = 1 - b_1$$

$$\Pr(s_t = 1 | s_{t-1} = 1) = b_1$$

Since s_t is not known at time *t*, the expected value, conditional upon s_{t-1}, is taken as a forecast. If $s_{t-1}=0$, the conditional forecasting rule is:

$$\overline{E}\left(g_t \middle| s_{t-1}=0\right)=\alpha_1+\left(1-a_1\right)\beta_1+\left[\rho_1+\left(1-a_1\right)\mu_1\right]g_{t-1}$$

where the operator *E* is written with a bar to indicate its subjective character, which is different from rational expectations. For $s_{t-1}=1,$ the conditional forecasting rule is:

$$\overline{E}\left(g_t \middle| s_{t-1}=1\right)=\alpha_1+b_1\beta_1+\left[\rho_1+b_1\mu_1\right]g_{t-1}$$

The general forecasting rule is given by:

$$\begin{aligned}\overline{E}g_t=E\left(g_t \middle| s_{t-1}\right)=\alpha_1+\beta_1\left[b_1 s_{t-1}+\left(1-a_1\right)\left(1-s_{t-1}\right)\right]+\\+\left\{\rho_1+\mu_1\left[\left(1-a_1\right)\left(1-s_{t-1}\right)+b_1 s_{t-1}\right]\right\}g_{t-1}\end{aligned}$$

With this formulation agents are supposed to form their expectations according to a particular form of bounded expectation (see Grandmont, 1998). Hommes and Sorger (1998) argue that expectations must be consistent with data in the sense that agents do not make systematic errors. This criterion implies that forecasts and data should at least have the same means and autocorrelations.

A similar forecasting rule can applied to inflation, where the random state variable is denoted by z. The forecast for this variable is

$$\begin{aligned}\overline{E}\pi_t=E\left(\pi_t \middle| z_{t-1}\right)=\alpha_2+\beta_2\left[b_2 z_{t-1}+\left(1-a_2\right)\left(1-z_{t-1}\right)\right]+\\+\left\{\rho_2+\mu_2\left[\left(1-a_2\right)\left(1-z_{t-1}\right)+b_2 z_{t-1}\right]\right\}\pi_{t-1}\end{aligned}$$

Although *s* and *z* are unobserved (latent) random variables that introduce regime switching, this does not imply that they have no economic meaning. Regime switching is interpreted as a convenient device to apply to the problem of forecasting and, in view of its popularity among forecasters, it may reflect their practices.

In the present model, we suppose that agents learn the value of these parameters by means of rolling regression,[8] which is another source of dynamics in the model. The assumption that all the agents have the same learning simplifies the coordination problem, as underlined by Howitt (2006).

4.8. DYNAMICS OF THE MODEL

The system of structural equations above, along with the forecasting rules, is non-linear and can be solved only by means of simulations. In this sense, our exercise is very close to the experiments suggested by Testfatsion (2006). It differs in that heterogeneity of agents is considered in a macro version, and it is based upon a functional distinction (consumers, investors, firms, labour) rather than microeconomic heterogeneity.

The parameters of the simulations are presented in Table 4.1, where the threshold has been set at $u_{02} + 0.02$.

Table 4.1. Simulation parameters

$u^* = 0.08$	$\varphi = 0.15$	$\sigma_1 = 0.03$	$\tau_{11} = 0.005$ $\tau_{12} = 0.01$	$\tau_2 = 0.022$
$\eta_1 = 0.201$	$\eta_2 = 0.35$	$\eta_3 = 0.60$	$C_1 = 0.40$	$c_2 = 0.405$
$c_3 = 0.15$	$\psi_1 = 1.80$	$\psi_2 = 0.4$	$\omega = 0.78$	$R^*_1 = 0.001$ $R^*_2 = 0.003$

Variables	a_j	b_j	β_j	μ_j	ρ_j
$\overline{E}g_t\,(j=1)$	0.4	0.6	0.001	0.43	0.55
$\overline{E}\pi_t\,(j=2)$	0.45	0.8	0.0002	0.48	0.48

The simulation results (the last 50 runs over N = 1000) are illustrated in Figure 4.1.

The dynamics of the model show persistent fluctuations in growth, unemployment and rate of interest in spite of the presence of a monetary rule that respects the Taylor principle. These fluctuations, however, do not explode but remain bounded after 1000 simulations. These complex results[9] depend on many factors that are worth considering.[10] First of all, they depend on the presence and the nature of the two regimes. In the present case, the values of the parameters guarantee the existence of two steady states with the desired characteristics, as appears from Table 4.2.[11] Secondly, the dynamics are a function of the value of the threshold, as will be discussed below. Thirdly, the dynamics are also a function of expectations. Since expected values are very close to the actual, the learning mechanism is working satisfactorily.[12] Finally, the role of endogenous forces generating the dynamics must be stressed.

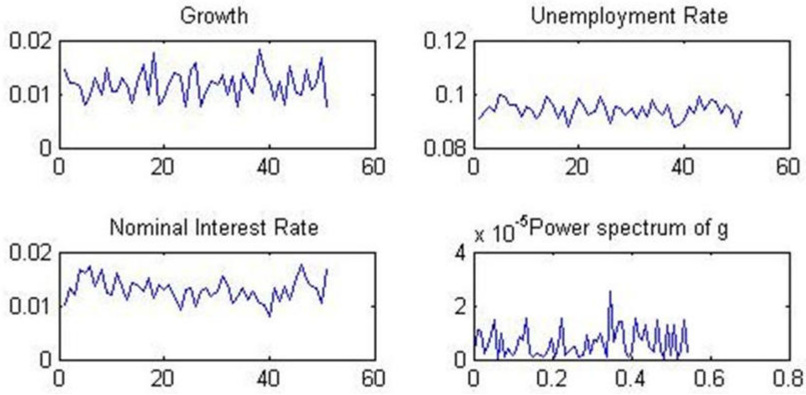

Figure 4.1. Dynamics of the mode

Table 4.2. Steady-state values of the two regimes

Regime	U	π	G
1	0.1184	–0.0077	0.0095
2	0.0739	0.0012	0.0145

4.9. THE FEASIBLE RATE OF GROWTH

Once fluctuations in growth that remain within bounds after a considerable number of runs have been obtained, some further discussion of the actual growth rate is worthwhile. For instance, the long-run rate of growth is hard to determine straightforwardly. It cannot be the steady-state value, because there are two of them. An alternative is to take a long-run average of actual growth rates to obtain 'a feasible rate of growth' (see Ferri, 2001). According to Solow (1997), one can argue whether 'it is best to think about the trend as passing through successive cyclical averages, defined one way or another, or best to think of it passing through cyclical peaks, or some other measure of 'potential' output' (p. 230). In the first alternative, there is a coupling between the short run and the long run. In other words, there is an interaction between cycles and growth. This is the strategy followed in the present paper.

The actual rate of growth depends on the dynamics of the model which, as has been already mentioned, depends on three factors: i) the values of the steady states that constitute a corridor within which actual rate of growth evolves; ii) the time spent in each regime[13]; iii) the actual values in each regime. Table 4.3 gives some hints on the first point.

Table 4.3. Steady-state values and actual growth

τ_{01}	τ_{02}	G
0.0095	0.0145	0.0138
0.0100	0.0145	0.0137
0.0010	0.0150	0.0146

The table shows that the actual rate of growth (i.e. the average of 1000 runs) depends on the rate of productivity growth in Regime 2, given τ_{01}, the value of productivity in Regime 1. It follows that the greater the range of productivity values, the higher is, *ceteris paribus*, the feasible rate of growth.

The caveat arises because feasible growth is not a supply-side concept that depends on productivity, but also on other elements, such as the value of the threshold (see Table 4.4), where a non-linear, non-monotonic relationship is obtained. The reasons behind this relationship must be identified in the interrelationship between supply, demand and policy measures.

In this sense, feasible growth depends on history with its interplay of demand and supply factors

Table 4.4: Growth and the threshold

Threshold	Growth	Regime 2: %
0.1139	0.0136	0.8260
0.0959	0.0139	0.870
0.0789	0.0138	0.8430

4.10. THE ROLE OF INCOME DISTRIBUTION

Exogenous changes to income distribution can be a privileged angle from which to further study the dynamics of the model. In the first place, it may facilitate understanding of how the system works. Secondly, it is a sensitivity exercise that ascertains the degree of structural stability of the dynamics.

Some points are worth making. First of all, sensitivity analysis, performed by changing the value of ω, shows that the model has structural stability, which is an important dynamic property that allows us to conduct exercises in comparative dynamics. In other words, by changing the values of ω within a certain range, fluctuations remain bounded. Secondly, in more economic terms, there is a non-linear negative relationship between labour share and growth, along with the percentage of times spent in Regime 2. This result stems both from the particular consumption function that was specified and the steady-state values of the model. An increase in the labour share impacts on debt and hence the steady-state value of inflation in Regime 2. This higher level of steady state inflation (π_{02}) increases the actual inflation rate which is related to unemployment and hence to the threshold.

Table 4.5. Growth and exogenous distribution

Labour share	G	Regime 2:%
0.78	0.0139	0.87
0.781	0.139	0.873
0.785	0.0138	0.836
0.79	0.0130	0.6980

Income distribution may be assumed to be endogenous. Endogenous income distribution can result from a wage dynamics that differs from inflation dynamics (see Asada et al., 2006). In this chapter, we theorize a reduced-form macro relationship of the kind:

$$\omega_t = \omega_{0j} - \gamma\left(u - u_{0j}\right)$$

The results are similar to those obtained with an exogenous income distribution (see Figure 4.2). This implies that regime switching is a robust phenomenon that resists a large variety of changes in both the values of the parameters and the specification of the equations.

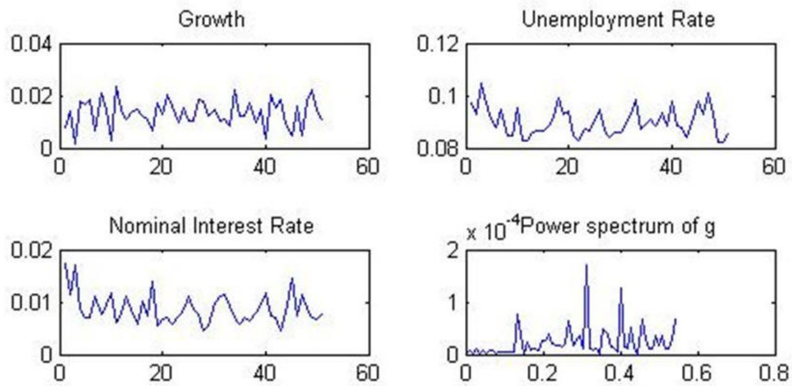

Figure 4.2. Growth and endogenous distribution

The new parameters are illustrated in Table 4.6, where different situations are contemplated.

Table 4.6. Different hypotheses about income distribution

ω_{01}	ω_{02}	γ (+)	γ (–)	g	Regime 2:%
0.7803	0.7798	0.1		0.0131	0.7120
			–0.1	0.0140	0.8810
0.7798	0.7803		–0.1	0.0141	0.8870
		0.1		0.0130	0.6950

In the present case, persistent oscillations can be obtained with the opposite hypothesis concerning the dynamics of the labour share. While its steady-state value in Regime 2 can be either greater or smaller than that in Regime 1, its link with unemployment can go in either direction. This flexibility can be helpful when dealing with empirical studies where income distribution seems to have less clear-cut stylized facts than those illustrated above for the process of growth.

Two further points are worth considering. The first is that in the case of endogenous income distribution the stability of the system depends crucially on the relationship between ω and γ, whereby any increase in the former must be accompanied by a simultaneous decrease in the latter if one wants to obtain the same kinds of persistent fluctuations. The reason for this negative relationship depends on the implicit constraints present in equation (4.4), where a worker-borrower situation is represented. The model does not consider a switch from a worker-lender to worker-borrower situation.[14]

The second point concerns the relationship between τ_2 and γ. This relationship is complex because it has both to consider the constraint of the worker-borrower and try to equilibrate aggregate supply and demand. In fact, what emerges is that changes in income share through an increase in γ can contribute to adjusting the system subject to endogenous technical change.[15]

4.11. CONCLUDING REMARKS

This chapter studied the interaction between cycles and growth. By means of a macro approach and within a medium-run horizon, the model contains multiple equilibria, where one regime is characterized by low productivity growth, high unemployment and deflation, while the other has the opposite properties. In this context, monetary policy reacts with a regime-switching policy. This has two impacts on the system. First, under the hypothesis of endogenous productivity growth, steady-state values are not independent of aggregate demand. Second, the regime-switching mechanism constitutes a check on endogenous dynamics, where consumers, investors and workers adjust expectations according to a Markov learning device.

The actual rates of growth can diverge from both steady-state values, which are the focus of most growth theories. Indeed, determination of actual growth is rather complex and depends, in addition to the steady-state values, on the time spent in each regime and on the economic factors that determine the growth rate within each regime. In particular, the results depend very much on the existence of a relationship between consumption, income distribution and debt. In this context, a higher labour share, both in the exogenous and endogenous versions of productivity growth, seems to lead to a smaller average rate of growth.

This average rate can be defined as the feasible rate of growth, a concept that is more compatible with a range rather than a single point and that depends on technological, economic, institutional and policy factors. The fact that average growth can differ from steady-state values indicates the importance of the interplay between business cycles and growth and therefore, indirectly, the role of aggregate demand beyond the very short run.

There is a different way to extend the analysis. First of all, one could extend the link between income distribution and debt to other functions (such as the investment function). Secondly, the relationship between income share, income inequalities, consumption and debt should be developed. This more disaggregated view can bring new insight into the recent developments of the economy. Finally, more long-run forces should be considered in order to move the medium-run horizon towards the long run. Physical capital along with human capital are the obvious candidates. In this perspective, also the problem of creative destruction, i.e. the cleansing mechanism present in recessions, along with the possible feedback from growth to cycle, could be considered. Schumpeterian concepts could enrich the multi-phase approach suggested by Day and Walter (1989) where different regimes under different institutional settings can produce complex dynamics in the long run.

NOTES

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1. In this medium-run model, an alternative threshold could be given by a longer-run rate of growth.

2. Changes can also be smooth as happens in the so-called STAR models. See Tong (1990).
3. On the relationship with Kaldorian hypotheses, see Ferri (2007). For a general discussion, see Aghion and Howitt (1998) and Velupillai (2004).
4. This behaviour is different from that suggested by Davig and Leeper (2007), where the switching is Markovian and refers to the values of the parameters φ.
5. Even though the origin of social norms and uncertainty is different, the effects may be similar. Indeed, both create some kind of 'conventional environment' where individuals can take meaningful decisions.
6. These relationships have been justified by Cynamon and Fazzari (2007) along the lines suggested by Akerlof (2007).
7. One must consider that this formula is different from the situation where the debt pertains to the firm and therefore to investment.
8. See Gilchrist and Saito for the use of a Kalman filter in the case of learning. For an introductory exposition, see Turnovsky (2000). It must be stressed that in our model the agents do not learn the probabilities, but this option can be accomplished.
9. On the different asymptotic results in the case of a non-linear system, see Kuznetsov (2004). On complex dynamics, see Arthur, Durlauf and Lane (1997).
10. Were the threshold given too high a value, it would be as if there were no regime switching. In this case, the dynamics become explosive.
11. In Regime 1, a steady-state nominal rate of interest equal to 0 was assumed, while in Regime 2 a steady-state real rate of interest of 0.001 was fixed.
12. The mean values of g and Eg are respectively 0.0130 and 0.0131, while for π and $E\pi$ *they* are 0.0066 and 0.0064.
13. The ergodic probabilities that govern this aspect differ according to the different hypotheses. For Markov regime-switching, see Hamilton (1994). In the case of regime-switching based upon different stochastic processes, see Tong (1990) The reason why the long-run rate of growth is not equal to the steady-state value of growth weighted by ergodic probabilities of the Markov process is due to the presence of deterministic regime-switching.
14. An alternative approach would consist in modifying the constant in the investment equation.
15. More specifically, if τ_2 increases, for instance, to 0.024, then γ can reach the value of 0.12 in order to obtain the same kinds of fluctuations. If τ_2 is assumed to be 0.024, then γ can be equal to 0.14.

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