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2007

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MPRA Paper No. 28012, posted 11 Jan 2011 21:37 UTC

A model of Cognitive Capitalism: a preliminary analysis

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1. Introduction

The aim of this paper is twofold. Firstly we shall describe the main features of the accumulation paradigm that many scholars have not hesitated to name as *Cognitive Capitalism* (henceforth CC) [Vercellone 2006, Fumagalli 2007, Moulier-Boutang, 2007] (§ 2). Secondly we shall attempt to provide a theoretical framework of it (§ 3). In § 4, we shall attempt to discuss stability and instability conditions of the model. CC is a forms of accumulation without a viable mode of regulation among entrepreneurs and workers about knowledge exploitation and capital gains allocation. On demand side, the increasing polarization of income distribution - in absence of suitable welfare policies - risks to penalize not only aggregate demand, but even knowledge-learning process and network economies. A too high share of precarious works can negatively affect social productivity, with the risk to worsen financial gains. On the contrary, a constant realization of capital gains and their fair allocation provided by financial markets, should guarantee a stable growth of CC. Unfortunately the recent history of financial markets shows their imperfections, such as those generated by asymmetric information which lead to breakdowns in markets. Because instability of CC turns out to be structural, it is necessary to propose a viable economic policy able to contrast the instability generated by the present form of accumulation (§5).

2. The peculiarity of Cognitive Capitalism

The generation of knowledge and its spatial diffusion through the learning and the network processes are the basic features of CC. Under CC, the process of wealth

creation is no long based upon homogeneous and standardized scheme of labour organization. The productive activity is performed according to new organizational modalities, where net-shaped structures, benefiting from the development of both linguistic and non linguistic communicative commodities, become predominant. As the most recent literature underlines,¹ within a new growth regime driven by information and communication technology, knowledge has become the key variable for understanding the recent structural changes. Differently from the Fordist phase, the present diffusion of knowledge no longer depends merely upon technological transfers of machineries, but rather upon relational *flows* generated by immaterial process. In this context, the hypothesis of decreasing returns of scale plays no role [Nelson and Romer 1998]. If knowledge is the basis of accumulation, it becomes unavoidable to analyze how its exchange and diffusion affect the dynamics of productivity. Due to the fact that it is not exhausted by consumption, the *cumulativeness* of knowledge and the speed of its diffusion necessarily implies increasing returns of scale.

The peculiarities of CC are its ability to enlarge both knowledge-learning process (λ) and network economies (k). The variable λ depends on the degree of *cumulativeness*, *opportunity* and *appropriability* [Nelson and Winter 1982]. Here, *opportunity* is defined as the expected rate of profit (P^e) and, therefore, the higher the expected profit in adopting a new technology, the higher is speed of its diffusion. *Cumulativeness* and *appropriability* represent the capacity of a new knowledge to generate further innovation whilst avoiding the possibility of its imitation, thanks to the existence of intellectual property rights (IPR). The variable k depends on the level of income (Y) and positive externalities (E). When λ is constrained by IPR, the consequence is that the greater is the degree of *appropriability* of knowledge, the smaller becomes its capacity of diffusion – affecting, *de facto*, its ability to generate positive effects on the associated productivity². To a higher level of knowledge corresponds, in terms of its generation (λ) and diffusion (k), more innovative technologies. From a systemic perspective, an innovation is a change in the economic process caused by the investment activity. This depends on how much investment is devoted to the already existing technology or to new technologies. The crisis of Fordism led to a new investment activity based on new sources of growth (electronic marketing, informational goods, encoding software, control over the quality of information, branding, control over the lifestyles, ...). Investment policies in a social system of innovation and production depend by the R&D strategies and the “learning by doing” process. In CC the impact of new ICT based on computer science and micro-electronics and the new productive organizations (just-in-time, zero stock) speed up the “learning by doing” process, spreading it out of the firm

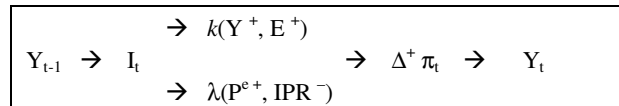
¹ See Zanini and Fadini (ed.) 2001, Boyer 2004b, Aglietta 2006, Mohoud 2006, Zachariadis 2006. About the Cognitive Capitalism hypothesis see Corsani A., Dieuaide P., Moulier-Boutang Y., Paulré B., Vercellone C. 2001, Azais C., Corsani A., Dieuaide P., (ed.) 2001, Vercellone (ed.) 2003, Moulier-Boutang 2007.

² This argument can be presented in terms of *tacit* and *codified knowledge*, see Malerba, Orsenigo 2000.

[Venturini 2006]. Complementarily part of the R&D process is organized between the territories according to their competencies. The location of activities is mainly determined by the research of advantages in the development of firms competencies [Mouhoud 2006, p. 300]. Consequently the productivity entailed by the exchange of knowledge cannot be assimilated to material productivity. Borrowing the so-called *Workerist* approach (*operaismo*), we shall refer to the social productivity of *general intellect*³. In our context, *general intellect* is defined by the combination of dynamic learning economies ($\dot{\lambda}$) and dynamic network economies (\dot{k}), whose intensity varies according to the distribution of both codified and tacit knowledge. Under CC the life cycle of knowledge comprises three phases: from tacit to codified, to exploited codified knowledge [Fumagalli, 2007]. It is reasonable to assume that the greater the share of codified knowledge dedicated to the accumulation activity, the higher is the achievable level of social productivity. But, when social productivity is subsumed to the accumulative needs of capital, the ill-outcome is that «the cooperation among all those engaged in the economic activity [does not] allow each of them to contribute to the prosperity and management of the community itself» [Orsi, 2006: 66]. It should be emphasized that there is a trade-off between the social productivity generated by *general intellect* and the tacit knowledge itself. Under CC the origin of productivity gains is based on learning processes and network economies.

Table 1 presents the virtuous circle generated by the interplay between investment and output by means of codified knowledge.

Table 1. *The virtuous circle of codified knowledge*



³ *General intellect* is a crucial term in the debate about Post-Fordism. It appears in Marx's *Fragment on Machines*, section of the *Grundrisse*. This is an attractive metaphor for referring to the knowledge that makes up the epicentre of social production and preordains all areas of life [see Virno in Zanini and Fadini (ed.) 2001: 181-185]: «The development of fixed capital indicates to what degree general social knowledge has become a direct form of production and to what degree, hence, the conditions of the process of social life itself have come under the control of the *general intellect* and been transformed in accordance with it» [Marx 1973: 706]. The interpretation of Marx's *Fragment* gave rise to many considerations in the so-called Italian *Workerist* approach [see Panzieri 1964, Tronti 1972, Negri 1979]. In the last years, this approach led to investigating the capital-language *nexus*. This *nexus* is considered as the real turning point of the socio-economic system in the Cognitive Capitalism [Zanini and Fadini 2001]. Fumagalli [2005, 2007] defines the *general intellect* social productivity as *bioeconomic* productivity.

The realization of production is compensated by financial markets that act as the multiplier of aggregate demand, and by the processes of globalization (delocalization, outsourcing, lower labour costs).

The efficiency of the system is assured by both the growth of financial markets – primary source of surplus distribution – and by massive process of outsourcing and delocalization characterizing advanced countries (which are by definition the places where the accumulation of knowledge occurs more intensely).

In this context, the capital-labour compromise, based on the connection between productivity gains and real wage dynamics, is declining, with subsequent effects on polarization of income distribution. In other words, the absence of a fair social compromise determines the instability of this finance-led growth regime.

Secondly, an income distribution that penalizes workers, negatively affects learning and network economies. Consequently, the loss of productivity gains reduces the efficiency of the system.

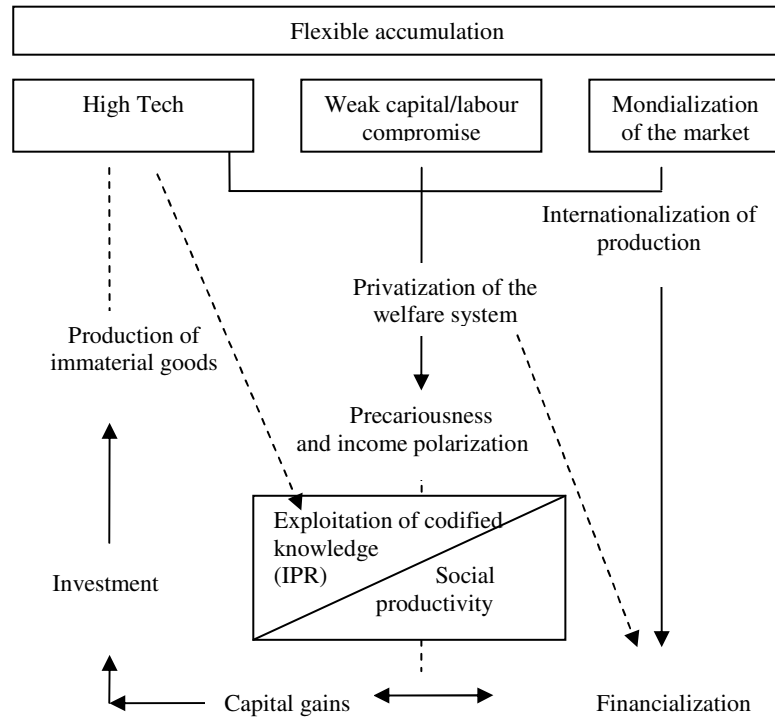
The high degree of precariousness, on the one hand represents the necessary precondition for perpetrating a situation of exploitation and command within the relationship between capital and labour, on the other it represents an obstacle to the development of knowledge.

In such a context, a new form of the capitalistic exploitation is the production of political lines in order to improve the financialization of social production. In this respect, exploitation in cognitive capitalism has been defined as «the seizure, the centralization, and the expropriation of the form and the product of social cooperation», «the political sign of domination above and against the human valorisation of the historical/natural world», the «command above and against productive social cooperation» [Negri 1997].

An enduring uncertainty deeply affects the learning process of the individual and his relational ability, with the result to reduce the impact of dynamic economies upon productive returns.

Figure 1 describes the unstable circle of CC.

Figure 1. *The unstable circle of Cognitive Capitalism*



Flexible accumulation is mainly based upon the globalization of financial markets, utilized by the investors both for financing the economic activity and for stimulating investments via the increased financialization of the productive activity. Whilst the investments in production and transmission of knowledge (education, training, R&D, management, that is immaterial goods) increase, we assist to a significant reduction of the costs of codification, transmission and acquisition of knowledge, due to the generation and diffusion of linguistic and communicative technologies (ITC, Internet, and the like).

Being independent form space and time, not only knowledge has become an increasingly mobile resource, but also, and above all, codifiable [Rodriguez, 2000, Rullani, 2004], and therefore exploitable by means of IPR. In a context within which the final goal is the exploitation of knowledge, the labour market becomes even more fragmented because the shift from mechanical-repetitive to linguistic-communicative technologies (high tech) irreversibly modifies both quality and modality of the performed work. It allows the exploitation of individual knowledge and relational skills, generates technological unemployment and work precariousness. *Vis à vis* the levels of remuneration, this process has led to the

individualization of wages with a wage dynamics even more dis-linked both from productive gains and working hours. At the same time, as a result of the dismantling of the Welfare system, increased quota of postponed salary are expropriated, favouring the growth of the quotas of income to be allocated to the financial market.

The actually prevailing tendency to privatize the Welfare system embodies the irrelevance of the intervention of the State in economy and the diminishing regulatory and distributive role of public function.

In the above framework, aggregate demand is influenced both by the dynamic of the financial markets and by the capital gains deriving from the internationalization of production. With the weakening of the wage-productivity nexus, these dynamics had a greater impact on consumption and the investment activity. In a finance-led economy in order to avoid a demand crisis, the wage regulation ought to be based upon the distribution of capital gains. However, firstly in a context of precariousness knowledge loses its generative capacity, given the widespread uncertainty. Secondly, as there is no guarantee that the overall produced wealth will be re invested into the financial market or elsewhere, a finance-led growth is always at risk of instability.

As far as supply side is concerned, changes in the ability to generate new knowledge, as a basic condition for the spread of new technologies, depend on the characteristics of the environment in which R&D activities are organized. This environment is positively affected by the income level and by a set of variables, such as education, an overall macroeconomic and political stability, a fair wealth redistribution, a balance between material and immaterial activities, and the existence of a good system of infrastructures, which we define as positive externalities.

3. The model

In our formalization, we shall follow the literature of the French Regulation Theory (see Boyer 2004a, Boyer 2004b). On this respect, we shall highlight firstly the dynamic function of productivity as key variable of the supply side and, secondly the dynamic function of aggregate demand, composed of private consumption, increase in investment and public expenditure as autonomous variable. Generation of knowledge, its spatial diffusion and financialization affect open economies, including third world economies, but here we have chosen to deal only with the pure case of the closed economy in which knowledge-learning process, network economies and financial dynamics develop entirely in the domestic arena. In such a context, we will clarify under which conditions productivity and aggregate demand dynamics are able to provide a stable rate of growth.

The model is described by a linear differential equations system (Table 2). Equations from [1] to [4] describe supply-side dynamics, based on productivity. It is supposed, as already showed, that this latter mainly depends on dynamic scale economies:

- network economies (\dot{k}) are positively correlated to the level of production as proxy of the value of spatial diffusion of economic activities, and to externalities E, supposed to be exogenous;
- learning economies ($\dot{\lambda}$) as a positive function of investment activity and a negative function of exogenous intellectual property rights.

Productivity changes is related also to changes in volume of output (\dot{Y}): as the so called Verdoorn Law affirms, in the short run an increase in output can determine a more efficient use of labour, realizing static scale economies⁴. Finally, investment (I) is a primary source of productivity increases. It is composed by routine investment and by investment in innovation. Routine investment traditionally depends on demand expectations and on realized production level in the previous period ($\sigma\dot{Y}$). Investment in innovation is characterized by very high potential returns and, at the same time, by possible catastrophic losses. In presence of high degree of uncertainty, equity financing is much preferable (β)⁵. In CC financing is the domain of the venture capital funds, life insurance companies and investment funds⁶. Capital gains are supposed to be deriving by the dynamics of systemic productivity gains ($\dot{\pi}$)⁷. We assume the existence of a single product, thus we do not distinguish between material and intangible goods in the investment equation, even though we know this is a fiction. However, the present version of the model cannot deal with this phenomenon.

The second part of the model - from [5] to [8] - describes the demand side. In a very traditional Keynesian way, the aggregate demand is composed by consumption (C_n), investment (I) and exogenous public expenditures (G).

⁴ Our productivity equation $\dot{\pi} = a\dot{k} + b\dot{\lambda} + cI + d\dot{Y}$ is similar to the Sylos Labini's one $\dot{\pi} = a + b\dot{Y} + c\frac{\dot{w}}{P_{ma}(t-n)} + dI_{t-n} - eI$, where the w/P_{ma} ratio represents the incentive to save labour either absolutely or by introducing labour-saving machines (Ricardo's effect), I_{t-n} is the long-run effect and I the short-run effect of investment. The most relevant difference is that in our equation, which describe productivity in CC, we disregard the Ricardo's effect, which is relevant in Fordist capitalism. We also divide the Smith's effect ($b\dot{Y}$ in Sylos' equation) separating static economies ($d\dot{Y}$) from dynamic economies ($a\dot{k} + b\dot{\lambda}$). Sylos introduced his productivity equation for the first time in Sylos Labini 1983: 174.

⁵ As far as the parameters are concerned, it is interesting to note that σ and β are strategic parameters, which denote the behaviour of the firms in term of investments and allocation of capital gains. On the contrary, all the other parameters, a , b , c , d , e , h represent the characteristics of existing technology.

⁶ In the United States, investments in innovation can tap a large pool of venture capital [see Aglietta, 2006: 14].

⁷ In such a contest, *social productivity* represents the stock of cognitive resources activated by the cooperation, which are spread along the territory in a row. Changes in financing of investment activity - for instance the venture-capital boom - can be explained by the increasing relevance of social productivity [Marazzi 2005].

Consumption (C_n) is supposed to be dependent on the total labour income. Total labour income is not only intended as the wage mass but even as the earnings from financial activities. In CC a share of capital gains is, in fact, distributed to some categories of workers (especially high-skilled). The effect is to induce a sort of “financial income multiplier”⁸. We could also consider the segmentation of labour market between stable and precarious work by broking down into two parts equation (8). However, the present version of the model cannot deal with this phenomenon. Our principle aim is to represent the basic relations between cognitive and financial variables.

Equilibrium is defined by the equality between the rate of growth of output and the rate of growth of demand [see Boyer 2004a: 66].

Table 2. *A Cognitive Capitalism model: the basic relations*

<u>SUPPLY SIDE</u>		
$\dot{\pi} = a \dot{k} + b \dot{\lambda} + cI + d\dot{Y}$	[1]	
$\dot{k} = e\dot{Y} + E$	[2]	
$\dot{\lambda} = hI - IPR$	[3]	
$I = \sigma \dot{Y} + \beta \dot{\pi}$	[4]	$\dot{\pi}$ = rate of growth of productivity \dot{k} = dynamic network economies $\dot{\lambda}$ = dynamic learning economies I = investment activity IPR = intellectual property rights \dot{Y} = rate of growth of output σ = given parameter which defines the propensity to invest based on demand expectations and on realized profit level in the previous period. β = given parameter which defines the propensity to invest based on financial capital gains. $(1-\beta)$ = share of capital gains which is distributed to shareholders and to high-skilled workers, according to individual bargain. E = externalities (given and constant in the short run) \dot{D} = demand dynamics
<u>DEMAND SIDE</u>		
$\dot{D} = \dot{C}_n + I + G$	[5]	
$\dot{C}_n = \alpha \dot{W}$	[6]	
$\dot{W} = w \dot{N} - t \dot{Y} + (1-\beta) \dot{\pi}$	[7]	
$\dot{N} = \dot{Y} - \dot{\pi}$	[8]	

⁸ As the US situation in the ‘90s shows [Aglietta, 2006: 11-14], the financial boom has a double result: from one side, the positive dynamics of shareholder values favours the increase in aggregate consumption, from the other, because of its unequal allocation, leads to a distorted income distribution.

<p><u>EQUILIBRIUM</u></p> <p>$Y = D \quad \dot{Y} = \dot{D} \quad [9]$</p>	<p>\dot{C}_n = consumption dynamics</p> <p>G = parameter which denotes a constant dynamics of public expenditure</p> <p>\dot{W} = rate of growth of labour income</p> <p>\dot{N} = rate of growth of employment</p> <p>w = wage rate</p> <p>t = flat rate taxation</p>
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By simplifying and substituting where necessary, the system can be reduced to the two linear differential equation models [10] and [11] (Table 3). Productivity dynamics [10] is positive correlated to network economies and learning economies; moreover, the impact on productivity depends on the value of the social productivity multiplier ($1/\beta^*$), according to the level of the propensity to invest based on financial capital gains (β) and to the learning economies effects on productivity itself (bh). The financial markets fix the profitability norm. In line with Boyer (2000), CC can be considered as a “finance-led growth regime”, but in our model the first engine of the growth is the dynamic of social productivity. Stock-exchange evaluation is the best macroeconomic indicator of this accumulation regime. Positive expectations on financial activities partially depend on the efficiency of knowledge generation and diffusion (tacit and codified knowledge), according to the exploitation of learning and network economies (exploited codified knowledge). Therefore, the impact of what we can call at the moment “financial multiplier” ($1/\beta^*$) on productivity is as much stronger as greater are the impact of investment on learning economies (h) and the impact of the learning economies on productivity (b). For this reason, we prefer to define ($1/\beta^*$) as “social productivity multiplier”.

If we assume that $\beta^* > 0$, then the angular coefficient (B) of productivity line [10] is always positive.

The intercept of productivity line (A) is positive only if $aE > bIPR$.

Result 1. *As much higher is the negative impact of intellectual property rights on knowledge diffusion, as lower is the positive effect of network economies on productivity.*

As a result, the generation of knowledge and its spatial diffusion through the learning process are the basic features of cognitive accumulation.

As far as output line is concerned [11], there is a positive correlation between demand and productivity if and only if $\beta + \alpha(1-\beta) > \alpha w$. In order to discuss this condition, consider that :

- β defines the propensity to invest based on financial capital gains;

- $\alpha(1-\beta)$ is the consumption level only based on share of capital gains which is distributed to shareholders and to high-skilled workers, according to individual bargain;
- αw is the traditional Keynesian demand of consumption goods based on wage rate.

Result 2. *Output growth increases if the sum of investment and consumption deriving from capital gains allocation, is greater than consumption deriving from wage bargaining.*

We should emphasize that wage rate becomes the variable of adjustment to preserve the wealth effect finance-led growth regime.

At last, by analysing the intercept of output line (C), it is easy to note that it is always positive and increasing according to the level of public expenditure (G) and of the income multiplier ($1/\alpha^*$)⁹.

Table 3. *The Cognitive Capitalism model in reduced form*

$\dot{\pi} = A + B \dot{Y} \quad [10]$ $\dot{Y} = C + D \dot{\pi} \quad [11]$ <p>where:</p> $A = \frac{aE - bIPR}{\beta^*}$ $B = \frac{[(bh + c)\sigma + ae + d]}{\beta^*}$ $C = \frac{G}{\alpha^*}$ $D = \frac{\beta + \alpha(1 - \beta) - \alpha w}{\alpha^*}$	<p>A = incidence of network economies and IPR on productivity</p> <p>B = effects on productivity both of dynamic economies (network and learning economies) and of static economies</p> <p>C = public expenditure weighted by α^*</p> <p>D = trade-off effect on demand by investment on innovations and technological unemployment</p> $\frac{1}{\alpha^*} = \frac{1}{[1 - \alpha(w-t) - \sigma]} =$ <p>income multiplier</p> $\frac{1}{\beta^*} = \frac{1}{1 - \beta(1 + bh)} =$ <p>social productivity multiplier</p>
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⁹ Our income multiplier differs from the traditional Keynesian one, because of the presence of parameter σ (which defines the propensity to invest). This result derives from the fact that investment activity depends on output, according to the new-Keynesian tradition.

4. Is Cognitive Capitalism a stable system? A discussion of the model 's solutions

The analysis of stability or instability conditions is referred to the equilibrium point between productivity and output lines. The equilibrium level of output and employment are calculated in the following equations:

$$\dot{Y}^* = \frac{C+DA}{1-DB} \quad [12]$$

$$\dot{N}^* = \frac{C(1-B)+A(D-1)}{1-DB} \quad [13]$$

According to Boyer [2004a: 81], the condition of stable equilibrium for the economic system is first of all defined by a smooth increase in employment: $N^* > 0$.

Table 4 Condition of stability

$\dot{N}^* > 0$ <p style="text-align: center;">i.e.: $\frac{C(1-B)+A(D-1)}{1-DB} > 0 \quad [14]$</p>
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By mean of easy algebra it is possible to verify that condition [14] can be reworded as follows:

$$\alpha w + \alpha^* < \beta + \alpha(1-\beta) < \alpha w + \frac{\alpha^* \beta^*}{(bh+c)\sigma + ae + d} \quad [14^*]$$

Result 3. *The stability condition of the economic system depends on the propensity to invest and the wealth effect both produced by capital gains allocation¹⁰.*

¹⁰ See the Appendix.

It follows that the allocation of capital gains (subtracting wage rate) should be regulated:

1. it should be higher than the inverse of income multiplier (α^*);
2. it should be lower than the a positive combination of the two multipliers ($\alpha^*\beta^*$), weighted by the sum of the impacts of both investment $[(bh+c)\sigma]$ and externalities (ae), and static scale economies on productivity (d).

Consequently, consumption and the demand regime are directly affected by financialization. In order to avoid a demand crisis, the wage de-regulation ought to be compensated upon the wealth effect stimulating by capital gains.

On the other hand, knowledge effects on productivity must be preserved and financial norms should not have negative impact on social productivity multiplier. When financial gains misrepresent the real effects of investment, dynamic scale economies and static scale economies on productivity, then financial bubbles may emerge.

Without a mode of regulation that guarantees that the overall produced wealth will be re-invested into the dynamic learning and network economies and without a policy which controls financial bubbles, a finance-led growth is always at risk of instability.

5. Basic Income

A fair income distribution is the precondition for the development of a kind of social cooperation able to minimise the risk of dismissals. Seen from the opposite side, the entrepreneur's propensity to invest is based on high profit expectations and on the existence of property rights or high degrees of cumulativeness which allow super-profits. The novelty of CC is that whilst the unfair income distribution, or the lower income level, threatens to reduce the ability to generate knowledge, the excessive *appropriability* of technologies can lead to a lower diffusion of knowledge and learning. The inexistence of a viable social compromise on productivity gains distribution and the prevalence of individual bargain between employees and employers do not allow a long run valorisation of learning and network economies. In this scenario, the introduction of basic income (BI) would represent the first step towards a more viable mode of regulation [Fumagalli 2000, Fumagalli and Lucarelli 2008]. Assuming BI as a universal and unconditional economic intervention, without discriminating against anyone, paid on a regular and perpetual base, independent of the actual working activity, aimed at guaranteeing a decent standard of life to all members of a given community will show that together with juridical citizenship, it would contribute significantly to the full economic and social status of citizens and their complete enjoyment of civil liberties. The introduction of BI in the model changes productivity, investment and consumption equations. BI affects learning and network economies with positive effects on productivity rate of growth. The growth of productivity positively affects investment activity through a cumulative process in

which BI induces positive expectations both at the demand and supply side. BI is financed by an increase in taxes and it reduces the income blackmail in labour bargaining and the uncertainty of the socio-economic system. Nevertheless, it can negatively affect investment propensity, according to the way it is financed. This latter point requires a taxation system which does not tend to penalize investment in intangible goods but focuses on contrasting financial bubbles.

According to this framework the possibility to reach a stabilization process, even introducing BI, is not endogenously guaranteed (knife-edge equilibrium).

6. Concluding Remarks

In CC, the accumulation is more and more based on political extortion of the product of social cooperation. It is the result of an increasing socialisation of production, in which firms valorise in capitalistic sense the wealth produced by social networks activities. In such a context, capital becomes productive of value by the private appropriation of the “commons”, like tacit and codified knowledge. Exploitation is therefore the production of an armoury of instruments for the control of the time of social cooperation. Capital is valorised by controlling the life cycle of knowledge. Financialization and increasing individual bargaining of labour may be considered as instruments of the domination against the social cooperation.

In the long run, the exploitation of learning economies and network economies, and the central role of precariousness and subalternity, which prevents a new form of wages regulation, push the system into a zone of structural instability.

Social productivity depends on two factors which are inversely correlated. On the one hand there is capital's drive to extend IPR in order to be able to appropriate knowledge R&D outcomes via licensing and copyrighting. The effect of this is to limit the diffusion of knowledge, rendering it artificially scarce. On the other there is capital's need to create a “virtuous circle” of the circulation of knowledges and information and to increase their diffusion in order to accelerate the generation of new innovations and knowledges and the codification of hidden knowledges. The implicit incompatibility between IPR and the diffusion of *general intellect* thus implies a trade-off which is currently unresolvable at the level of simple market exchange. A high degree of IPR (able to compensate the positive effects of externalities and learning process on productivity) can lead to a decrease of the rate of growth of productivity and then of output. At the same time, from the demand side, a relevant role is played by the allocation procedure of capital gains generated in the financial markets as proxy valorisation of social productivity increase, i.e. $\beta + \alpha(1 - \beta)$ in the model. As it is shown in condition [14], the dynamics of capital gains should be sufficient higher to allow a positive effect on aggregate demand, but lower than the general impact on productivity generated by investment activity propensity. In CC, as real wages are not indexed to productivity gains (as in Fordist paradigm, see Boyer 2004a: 61-68) there is no fair compensation for precariousness of the labour force. In fact, the absence of a fair social compromise determines the instability of this finance-driven growth. A distribution of the productivity gains (β)

that penalizes workers, negatively affects learning and network economies. Consequently, the loss of productivity gains reduces the efficiency of the system. The turnaround is largely endogenous: precariousness → decrease of network and learning economies → decrease of productivity and output.

A partial compensation of this drift may be a regulation in allocating capital gains among employers, as substitution of the Fordist relation between wages and productivity gains. But this measure is not always assured. It can not last: first of all, because capital gains dynamics is unstable and uncertain; secondly, because capital gains allocation only to high-skilled workers, leads to a distortion of income distribution which arise the degree of instability of the economic system.

Appendix

Proof of Result 3. Condition [14] is theoretically verified if both the numerator and the denominator are positive.

The numerator is positive if :

$$\frac{G}{\alpha^*} \left[1 - \frac{(bh+c)\sigma + ae + d}{\beta^*} \right] + \frac{aE - bIPR}{\beta^*} \left[\frac{\beta + \alpha(1-\beta) - \alpha w}{\alpha^*} - 1 \right] > 0 \quad [C1]$$

In order to verify [C1], three sub-conditions must be assessed:

a. $\frac{1}{\beta^*} < \frac{1}{(bh+c)\sigma + ae + d}$

The impact of social productivity multiplier on output must be greater than the sum of the impacts of investment activity, externality and static scale economies on productivity.

b. $aE > bIPR$

If externality positive effect on productivity is more powerful than IPR, then the economic system has more probabilities to be stable.

c. $\beta + \alpha(1-\beta) > \alpha w + \alpha^*$

The denominator is positive if:

$$1 - DB > 0$$

i.e.

$$\beta + \alpha(1-\beta) < \alpha w + \frac{\alpha^* \beta^*}{(bh+c)\sigma + ae + d} \quad [C2]$$

By combining condition C2 with sub-condition C1c, it follows:

$$\alpha w + \alpha^* < \beta + \alpha(1-\beta) < \alpha w + \frac{\alpha^* \beta^*}{(bh+c)\sigma + ae + d} \quad [14^*]$$

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