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INEQUALITY, DEBT AND TAXATION: THE PERVERSE RELATION BETWEEN THE PRODUCTIVE AND THE NON-PRODUCTIVE ASSETS OF THE ECONOMY

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Inequality, debt and taxation:the perverse relation between the productive and the non-productive assets of the economy

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Abstract

The explosion of the global financial crisis in 2008 and its transmission to the real economies have been interpreted as calling for new kinds of regulation of the banking and the financial systems that would have allowed reestablishing a virtuous relation between the real and the financial sectors of the economy. In this paper we maintain the different view that the financial crisis and the ensuing real crisis have roots in the strong increase in incomes inequality that has been taking place in the Western world in the last thirty years or so. This has created an all around aggregate demand deficiency crisis that has strongly reduced prospects and opportunities for investments in productive capacities and shifted resources toward other uses, thus feeding a perverse relation between the productive and the non-productive assets of the economy.
In this context the way out of the crisis is re-establishing the right distributive conditions: which cannot be obtained by a policy aimed at relieving the weight of private debts but calls for a redistribution through taxes on the incomes of non-productive sectors, according to a fine tuning that should prevent from excessive taxations transforming positive into negative effects.

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1. Introduction

Money and financial assets have traditionally been regarded as allowing the real economy to run smoothly and faster. In this light financial liberalization has been almost unconditionally welcomed as a good reform that would have reduced the "frictions" (due to "information asymmetries") that hampered growth. Thus in the last decades world economies have gone through a thorough financial liberalization that has transformed the international financial system from a government-led to a market-led one.

Experiences of low growth and financial mess, however, have shown a much less comforting reality. The explosion of the global financial crisis in 2008 and its transmission to the real economies, especially in the Western world, have been interpreted as calling for new kinds of regulation of the banking and the financial systems that would have allowed reestablishing a virtuous relation between the real and the financial sectors of the economy.

In this paper we maintain the different view that the financial crisis and the ensuing real crisis have been essentially the result of a perverse relation that has its roots in the real economy: namely, in the strong increase in incomes inequality that, following fiscal, deregulation and privatization policies (Levy and Temin 2007, Stiglitz 2011), has been taking place in the Western world in the last thirty years or so. As a matter of fact the living conditions and real wages and salaries of both low and middle class workers have decreased substantially while profits and, in general, earnings of top 1% earners have increased impressively, especially since the 2000s (Piketty and Saez 2006, Eckstein and Nagypál 2004).

The excessive decrease of the median wage with respect to the average productivity has created an all around *aggregate demand deficiency* crisis that has strongly reduced prospects and opportunities for investments in productive capacities and shifted resources toward other uses, thus feeding a perverse relation between the productive and the non productive assets of the economy.

This paper is a first step in the analysis of this relation, in particular between finance and the real economy, trying to sketch out their interaction in the context of an economy where the increase in income inequalities and the resulting negative effects on final demand have substantially reduced growth rates or even brought the economies to stagnation, and where deflation rather than inflationary pressures appears as the main problem to be faced.

To this purpose we will consider an economy made up of two sectors, the definition of which expands on the usual distinction between a 'real' and a 'financial' sector[4].

4. This definition draws on S.Bruno (2011).

Sector 1 will be assumed to deal with assets and commodities that have to do with current or future production, including securities issued in a given period to finance real investments aimed at creating productive capacity.

Sector 2 to deal with assets and commodities that already exist in a given period and that can be considered, and exchanged, as stores of value: like residential houses, real estates, art objects, precious materials, oil, and so forth. But also financial assets like securities issued in the past whose exchange has not to do with the creation of productive capacity but only implies a redistribution of property rights and hence of wealth (as it is also the case of most of the purchases of financial assets issued by purely financial corporations).

A main implication of this distinction is that, since the transactions concerning the wealth assets constructed or issued in any period are a very small part of the transactions concerning similar assets produced or issued in the past, the monetary demand for these assets in the period is larger than their supply, which results in an increase in their prices, producing capital gains and rents. This represents a strong incentive to invest in sector 2, attracting resources from sector 1, which offers low incentives to investment in productive capacities: thus feeding a perverse relation whereby 'finance' in more general terms no longer sustains the growth of the real economy but rather impoverishes it.

In this paper this perverse relation appears as the engine of the crisis defined as a process of interacting disequilibria over time, stirred by a change in the distribution of incomes that increases the existing inequality. This results in a shrinking of final demand for the sector 1, and hence in the reduction of the incentives to invest in production technologies that, through vast economies of scale, would allow the realization of significant increases in productivity.

We will show that the main factor of this out-of-equilibrium process, the one determining its path-dependence, is the existence of involuntary stocks, both real and financial (including unsustainable leverage), which allow fossilizing and transmitting the economic disequilibria over the successive steps that make up the process itself.

The focus will be in particular on the accumulation of stocks of debt, as the result of a credit activity first aimed at reducing the recessive effects of the ongoing crisis, and which might lead to a collapse of the economy. The analysis carried out proves that even transforming the private debt into a public debt could not be a solution to this problem.

We will finally show that the way out of the crisis is represented by measures that reverse the effects of the increase in the inequality of the distribution that stirred the crisis itself, like e.g. a public intervention taxing incomes out of profits.

2. The model

We consider a sequential model, characterized by finite periods and exhibiting both an intra period and an inter periods sequence. The model will be used to simulate the dynamics involved by a greater incomes inequality as brought about by a decrease in wages. The dynamic behaviour of the system will depend on interactions between the variations of prices, expectations, adjustments of productive capacity, and the emergence of money balances. The relevance of the time dimension of production processes on these interactions will be stressed by a Neo-Austrian representation of the production technology of the economy (Hicks 1973, Amendola and Gaffard 1998), which allows showing the evolution of the age structure of productive capacity.

According to the level of the parameters, the system will be stable, i.e. reaching an equilibrium, or instead unstable, driving to a final crash. In the stable cases, we can analyse the equilibrium relationships that characterize a long-run equilibrium, although this equilibrium cannot be always fully characterized, in the sense that the relationships that make it up are not fully known *ex ante*. This is the case when, as we will discuss in the next sections, a path dependency emerges, with the consequence that some of the parameters that define the equilibrium relationships may change as the result of the above-mentioned processes. In particular, we shall see, one of the main changes will concern the final level of private and public indebtedness.

We consider the benchmark of a steady state, not a steady growth. In this context, however, we will not carry out a comparative dynamic analysis but see how a shock will lead from the original level to the final level (if any, that is, if the economy does not collapse along the way) of the relevant variables. In particular we will investigate what will determine the amount of the fall in production and employment caused by an increase in incomes inequality, i.e., the difference in the levels of these variables from the moment in which the shock takes place up to the time at which the specific change ensuing will be complete.

The model is grounded on two general hypotheses: the first is that wage earners (and the public sector) on one side and profit earners on the other, consume two distinct goods; the good produced in sector 1 and that produced in sector 2, respectively. The second is that the good produced in sector 2 has a fixed quantity and a flexible price. This assumption reflects the consideration made in the introduction according to which in sector 2 the transactions carried

out in any period concern a very small part of the total amount of assets issued or constructed in the past, thus resulting in significant fluctuations in prices. We simplify therefore by assuming fix-quantity and flex-price. The opposite characterizes sector 1, where we assume flex-quantity and fix-price[5].

These hypotheses imply that an increase in production and employment can only occur by means of an expansion of the first of the two sectors. Thus, although we could relax the assumption of consumption polarization and fixed quantity in sector 2, in the economy considered everything directly or indirectly able to shift the income distribution towards the consumers of sector 1 is finally assumed to have a positive effect on overall production and employment (and vice versa).

Although in the model a negative shock on real wages will always bring about a worsening of economic conditions, we shall be able to throw light on the following issues:

— Stability: what can drive the economy affected by a distributive shock on an explosive path

— Path dependency: when cumulative processes take place (in particular in cases allowing for indebtedness), what are their final effects

— Transition dynamics: specific evolution of the main variables along the transition, including particular phases that may affect the speed of the adjustment

— Policies: what may be the effect of policies affecting the distribution of income.

Technology

The economy portrayed in the model is made up of two sectors (i=1, 2), sector 1 producing a basic good and sector 2 a secondary good, as defined in the introduction. The production of each good is based on fully vertically integrated production processes. Each process, with labour as the only primary factor, goes through a construction phase of productive capacity, characterized by a constant labour input coefficient l_c^i and a length of z periods, and an infinite utilization phase in which the input coefficient l_u^i and the output coefficient b^i both decrease at a constant

5. However, since we assume that wages are given along the transition (they vary only as a consequence of the initial shock at t=1), the hypothesis of fix prices in sector 1 corresponds to taking real wages as fixed since the shock onward. This is equivalent to excluding nominal effects due to prices and wages inflation and focus only on the effect of a one shot change in income distribution. The only price that may vary is the price of the good produced in sector 2, which we can interpret as a variation of relative prices in the two sectors.

rate δ keeping fix their relative share[6]. Aggregate variables are thus:

$$B_t^i = \sum_{j=z+1}^{\infty} x_t^i(j) b_j^i = \sum_{j=z+1}^{\infty} x_t^i(j) b^i (1-\delta)^{j-z-1}, i = 1,2 \quad (1)$$

$$L_t^i = \sum_{j=1}^{\infty} x_t^i(j) l_j^i = \sum_{i=1}^{z} x_t^i(j) l_c^i + \sum_{i=z+1}^{\infty} x_t^i(j) l^i (1-\delta)^{i-z-1}. \quad (2)$$

where B_t^i and L_t^i are the aggregate output and labor input, and $x_t^i(j)$ is the number of processes of age j (activated at t-j) at time t.

Demand

Workers (w) and capitalists (k) face the respective budget constraints:

$$D^W = W_t + H_t \quad (3)$$

$$D^K = \Pi_{t-1} + F_t \quad (4)$$

where W_t are current wages, Π_{t-1} the previous period profits (sales minus wages), and H_t and F_t are the money balances of wage earners and capitalists, respectively, that may result both from the accumulation of idle balances (if any) along the out-of-equilibrium evolution of the economy, and from other income sources like the credit system and transfers between the public and the private sectors. The functional distinction of income sources would determine the structure of final demand in the case the two classes of income earners had different preferences. Here to begin with we consider instead the extreme case in which there is a complete polarization of consumption, that is:

$$D^1 = W_t + H_t \quad (5)$$

$$D^2 = \Pi_{t-1} + F_t \quad (6)$$

6. The hypothesis of a fix input/output coefficients ratio in the utilization phase implies that the age structure of production processes in that phase is not relevant since we can aggregate all processes in an aggregate 'capital' dimension in which each process is 'ð weighted' according to its age.

Prices

Prices change in time according to the disequilibria in the respective markets, with a given elasticity ß^i:

$$\frac{p_t^i}{p_{t-1}^i} = \beta^i \frac{D_{t-1}^i}{B_{t-1}^i p_{t-1}^i} \quad (7)$$

Production decisions

In each sector, firms form expectations about final demand according to an adaptive rule:

$$eD_t^i = \alpha^i D_{t-1}^i + (1-\alpha) eD_{t-1}^i \quad (8)$$

The decisions concerning how many already existing production processes to use and how many new processes to activate, are taken coherently with such expectations. If the expected demand is lower than the potential output BP, which depends on the total number of processes in the utilization phase, less of these processes will be activated ($x_t^i(j)<x_{t-1}^i(j-1)$ for some stages $j>z$)[7].

Investment decisions, concerning the starting of the construction of new production processes ($x_t^i(1)$), intend to fill the gap between effective potential output and expected real demand[8]:

$$x_t(1) = \gamma \left(\frac{eD_t^i}{p_t^i} - BP_t^i\right) + \sum_{j=z+1}^{\infty} x_t(j)\delta^{j-z-1} \quad (9)$$

where the second term is equal to the depreciation of capital such that when productive capacity is at the desired level, it is maintained in time at this level (net investments are null and gross investments equal obsolescence). We further make the hypothesis that all processes in the construction phase ($x_t(j)$ with $1<j<z+1$) keep being carried out up to the reaching of the utilization phase.

Once the number of processes in all stages is determined, employment and total wages are also determined, given the wage rate w and the labour coefficients l^i_u and l^i_c [9]

7. We assume that the processes possibly not activated are the older ones.
8. We assume that the processes in the utilization phase not activated are not truncated but put aside to be possibly used in the future. Truncation would speed up a downward adjustment of productive capacity.
9. We assume that labour supply always allows matching its demand.

Price reallocation effect

A reallocation effect of investments between the two sectors can take place due to expectations of capital gains resulting from variations of relative prices

$$x_t(i) = \gamma\left(\frac{eD_t^i}{p_t^i} - BP_t^i\right) + \delta\sum_{j=z+1}^{\infty} x_t(j)\delta^{j-z-1} - \zeta_i \frac{p_t^{-i} - p_{t-1}^{-i}}{p_{t-1}^{-i}} \frac{p_{t-1}^i}{p_t^i - p_{t-1}^i} \quad (10)$$

Disequilibria specification

The outcome of each market Y_t^i is the lowest value between the demand in real terms D_t^i/p_t^i and the production B_t^i. While quantity excesses are supposed not to be storable, demand excesses are transferred to the next period in terms of F_{t+1} (demand excesses in the market of sector 2) and H_{t+1} (demand excesses in the market of sector 1) as additional demand sources. Thus:

$$H_t = ED_{t-1}^1 = max\left(0; \frac{D_{t-1}^1}{p_{t-1}^1} - B_{t-1}^1\right) \quad (11)$$

$$F_{t-1} = ED_{t-1}^1 = max\left(0; \frac{D_{t-1}^2}{p_{t-1}^2} - B_{t-1}^2\right) \quad (12)$$

The sequence of events in each period takes place as follows: production decisions are taken; wages are paid; final markets open. At the end of the period, expectations and prices change according to the current disequilibria.

3. Equilibrium

We consider the benchmark of a steady state of the economy in which expectations are realized and the markets are in equilibrium. All variables are constant and the number of production processes $x_t^i(j)$ is constant at the equilibrium level x_E^i in every stage. For a given set of technological parameters, an equilibrium is fully characterized by: the wage rate *w* that defines the nominal scale, and the two processes intensities x_E^1 and x_E^2 that define the real scale and implicitly the distribution of real income. Indeed, according to eq. 1 and 2, taking $x^i(j) = x_{eE}^j$ for all j, we have:

$$B_E^i = \frac{b^i}{\delta^i} x_E^i \quad (13)$$

$$L^i_E = (zl^1_c + \frac{l^i_u}{\delta^i}) x^i_E \quad (14)$$

and since the age structure of capital is fixed, the average unit costs of production are constant and can be defined as[10]:

$$c^i = \frac{wL^i}{B^i} = w\frac{\delta^i zl^1_c + l^i_u}{b^i} \quad (15)$$

The prices have to make the real and the nominal distribution of income compatible. If the price p^i_* is set according to the mark-up μ^i_* on unit production costs, the equilibrium in the final markets – in the case without credit and the public sector – implies the following distributive condition[11]:

$$\mu^1_E c^1 x^1_E = c^2 x^2_E \quad (16)$$

that is, the profits gained in the basic sector equal the costs of production in the other sector. As shown in the Appendix, the hypothesis of complete polarization of consumption implies that μ_2 will not influence the equilibrium variables, since the price of good 2 can be set at any level given that the profit margin in sector 2 is a matter of income redistribution between the capitalists of the two sectors.

Initial and final equilibrium in the case of a distributive shock

Let us consider an initial equilibrium of the economy *E* (w_0, x_0^1, x_0^2) without external funds (H=F=0), and a given uniform equilibrium profit margin ($\mu^1=\mu^2=\mu$):

$$\mu^1_0 = \mu^2_0 = \frac{c^2_0}{c^1_0}\frac{x^2_0}{x^1_0} \quad (17)$$

Furthermore, for the reasons explained in the first two sections, we assume fix-quantity and flex-price in sector 2, and flex-quantity and fix-price in sector 1.

Let us then analyse the effect of a one-shot wage reduction $w < w_0$ that corresponds, for a given

10. Note that c^i_E is a technical parameter and does not depend on the level of production. It corresponds to the inverse of labour productivity when this is measured on a constant population of production processes, or to the ratio between the un-weighted sums of the streams of output and input flows of a production process along its whole duration. See Amendola and Gaffard (1998).

11. See the Appendix.

level $\bar{p}^1$, to an increase in the profit margin of good 1, $\mu^1 > \mu_0^1$. Whatever the dynamics involved by this shock, we have two general possible outcomes: explosive dynamics or the convergence to a new equilibrium. And, in the case the dynamics are stable, we can analytically derive the final effect of the shock.

Indeed, since x^2 and the new level of μ^1 are given, rearranging the equilibrium condition 16 we have:

$$x_E^1 = \frac{c_E^2}{c_E^1}\frac{x^2}{\mu^1} \quad (18)$$

It is easy to show that the shock on wages does not affect the ratio between the parameters c^i, since they are both proportional to the wage rate. Thus substituting eq. 17 and eq. 18, we obtain:

$$x_E^1 = x_0^1\frac{\mu_0^1}{\mu^1} \quad (19)$$

As a consequence, as anticipated above, in the new steady state equilibrium (whenever it will be reached) the decrease in the production in sector 1 will be proportional to the increase in the profit margin in the same sector resulting from the reduction in the wage rate. (Note that while the distributive condition in 18 depends on the fix price hypothesis in sector 1, equation 19 depends on the fix quantity hypothesis in sector 2). Since the production in sector 2 is fix, the variations of overall employment and production depend on what happens in sector 1.

4. Credit

We consider the possibility of capitalists making loans to wage earners, to alleviate the effects of the assumed wages reduction. To this purpose, we introduce a stock variable CD_t representing the stock of workers' cumulated debt.

We assume that the sums available for credit to consumers are a result of the excesses of demand in sector 2, ED^2, which, as specified in section 1.5, result in cumulated idle balances in the same sector. We also assume that the newly issued credit is equal to a share σ of the excesses of demand in sector 2:

$$NCD_t = \sigma\, ED_t^2$$

The increase in the workers debt position expressed as the ratio of the debts to the wage bill $d_t = CD_t/W_t$ may be permanent or transitory. We consider the general hypothesis that workers react to indebtedness changes reimbursing a share ρ of the debt exceeding a desired level d

$$RCD_t = \rho(CD_t - d\, W_t) \quad (20)$$

Assuming a positive ρ implies that whenever the system reaches a steady state, the level of debt will always come back to its level before the shock (null, in case we start without debt as in the benchmark case).

If we want to take into account a permanent increase in the debt position, we can put $\rho=0$. Thus the level of indebtedness becomes path dependent as it increases when demand excesses in sector 2 occur.

As to the modelling of credit we assume that after production has taken place and wages have been paid, the market of sector 2 opens first, then (when possible demand excesses in this market may have occurred) new credit is issued, and interest and reimbursement are paid; then, once the workers budget constraint is set, the market of good 1 opens. The variation in workers debt is:

$$\Delta CD_t = CD_{t+1} - CD_t = NCD_t - RCD_t = \sigma\, ED_t^2 + \rho(CD_t - d\, W_t) \quad ((21)$$

and corresponds to an external demand source for sector 2. Thus, taking r as the interest rate on wage earners' debt, we obtain the correspondent of eqs. 11 and 12.

$$H_t = ED_{t-1}^1 + NCD_t - RCD_t - rCD_t \quad (22)$$

$$F_t = (1-\sigma)\, ED_{t-1}^2 + RCD_t + rCD_{t-1} \quad (23)$$

In the steady state equilibrium we will have:

$$H = -rCD = -r\, d\, W$$

$$F = r\, CD = r\, d\, W$$

The external sources equal the interests on debt.

The equilibrium condition becomes

$$x_E^1 = \frac{c_E^2}{c_E^1}\, x^2\, \frac{1 - rd}{\mu^1 + rd} \quad (24)$$

where *r* and *d* play the same role of the distributive parameter.

5. Public Sector

We consider a public sector demanding and consuming good 1, and obtaining its resources by raising taxes from wages and profits with rates t_w and t_P, respectively, and borrowing funds PD_t from capitalists at the rate r_{PD}.

$$PD_{t+1} = PD_t + NPD_t - RCD_t \quad (25)$$

Similarly to the case of private debt, we assume that newly issued NPD_t is equal to a share σ_P of the possible excess demand in sector 2 and that the reimbursement of the public debt RPD_t (if any) is equal to a share ρ_P of the debt exceeding the desired level of debt (defined as a quota d_{P0} of the wage fund). If ρ_P=0 the debt cumulates involving path dependency.

Then the money balances contributing to the demand of goods 2 and 1, respectively, besides profits and wages, are

$$H_t = ED^1_{t-1} + (\sigma + \sigma_P) ED^2_t + NCD_t + NPD_t - RCD_t - RPD_t - rCD_t - r_P PD_t + t_p \Pi_{t-1} \quad (26)$$

$$F_t = (1 - \sigma - \sigma_P) ED^2_{t-1} + RCD_{t-1} + RPD_{t-1} + r CD_{t-1} + r_P PD_{t-1} - t_p \Pi_{t-1} \quad (27)$$

The sequence of the period, including the public sector, is now the following: expectations and prices update according to current disequilibria; production decisions are taken; wages and taxes on past profits are paid; taxes on wages are paid; market 2 opens; new credit is generated both to the public sector and to workers interest and repayment of public and private debt are paid; market 1 opens.

At the steady state equilibrium we have:

$$H = - rCD - r_P PD + t_p \Pi$$

$$F = r CD + r_P PD - t_p \Pi$$

The equilibrium condition becomes

$$x^1_E = \frac{c^2_E}{c^1_E} x^2 \frac{1 - rd - r_P d_P + t_P \mu^2}{\mu^1 (1 - t_P) + rd + r_P d_P} \quad (28)$$

r_{PD}, d_{PD} and t_P play the same role of the distributive parameter. Note that in this case the rate of profits in sector 2 matters and has a positive impact. Indeed, while in the case without taxation the profits in sector 2 only redistribute incomes between the capitalists in the two sectors, having no impact on the distribution of the demand, in this case higher profits in sector 2 have a positive effect through the public demand in sector 1 that comes from the taxes on these profits.

6. Numerical simulations of transition dynamics

We shall now analyse the effects on the economy of an increase in the inequality of the distribution of income due to a reduction of the wage rate.

The benchmark case

A lower wage rate with a fix-price p^1 entails a higher mark-up μ^1. In sector 1 we shall hence have a smaller wage bill and a lower demand for good 1. The resulting excess supply of good 1, given adaptive expectations, will lead to less output and less employment, further falls in the wage bill and hence a negative evolution in sector 1. The fall in output decelerates, though, because the dynamics of the demand for good 1, on which production plans depend, puts an increasing brake on this fall. As a matter of fact, only one component of this demand, that depending on the sector bill of sector 1, falls in accordance with the output. The demand coming from sector 2, after the first reduction in the wage rate, remains constant, as the output and hence the employment and the wage bill of sector 2 are fixed. Thus on the whole the demand for good 1 falls less rapidly than its production, putting an increasing brake on the fall of the last. The system will thus converge to a new equilibrium, worse than the initial one.

At the same time, the money saved from wages will be used by capitalists to increase the demand of good 2, which, given the fix supply, will result in an excess demand and an increase in the price p^2. However, as the output of good 1 keeps falling, total profits, notwithstanding the higher mark-up, decrease, and the dynamics of p^2 decelerates: also the price system will then converge to a new equilibrium.

FIGURE 1: The benchmark case

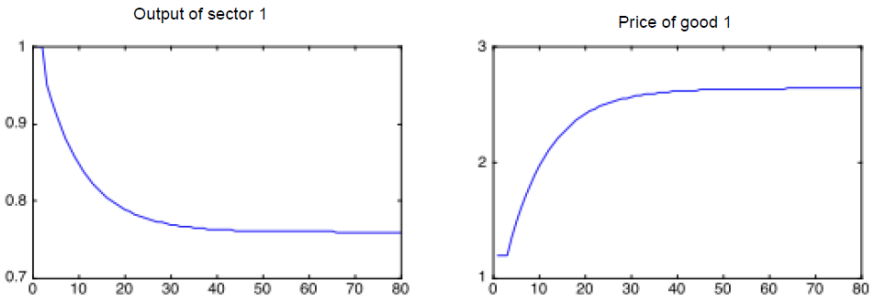


Figure 1 shows the dynamics of the output of sector 1 and the price of sector 2 for a given set of parameters. However, these and the next results can be obtained analytically. Simulations have mostly a illustrative character.

Consider now the possibility of capitalists making loans to wage earners, to alleviate the effects of the assumed wages reduction. We may have two cases.

Short term credit

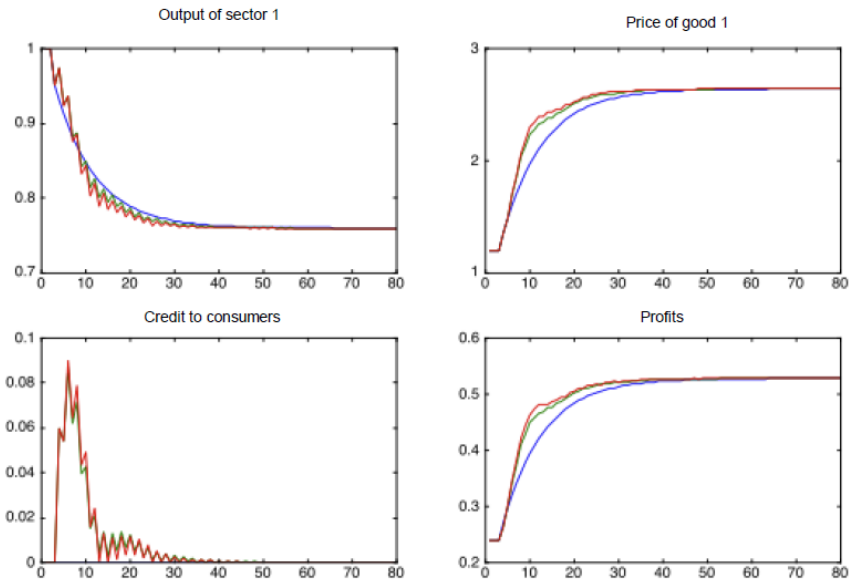
The credit received in each period is completely repaid in the next period with an interest *r*.

The first effect of the credit is to slow down the reduction of the demand for good 1, and hence the fall in output and unemployment. However, since the reimbursement in each period is higher than the credit received as it also includes the interest rate, this implies a reduction in the demand of good 1, of output and employment that is greater than the increase associated with the corresponding credit (as shown in the successive periods in Figure 2, where red lines compare this case with the blue lines of the benchmark case).

This also implies that the amount of credit available in each period tends to fall (as shown by the gradual slowing down of the excesses of demand of good 2 – the source of the sums available for the credit to wage earners - reflected by the decelerating dynamics of the price p^2) as the profits received in sector 1 decrease after a while, when the higher mark-up on each unit of product is more than compensated by the gradual fall in the number of units over which the mark-up is realized. The moment comes when there is no longer room for credit as both markets have come back into the same equilibrium of the case without credit.

In conclusion short-term credit has a positive effect in the short period, worsens the crisis in the medium period, but has no long run effects.

FIGURE 2: Dynamics with short-term credit



Long-term credit

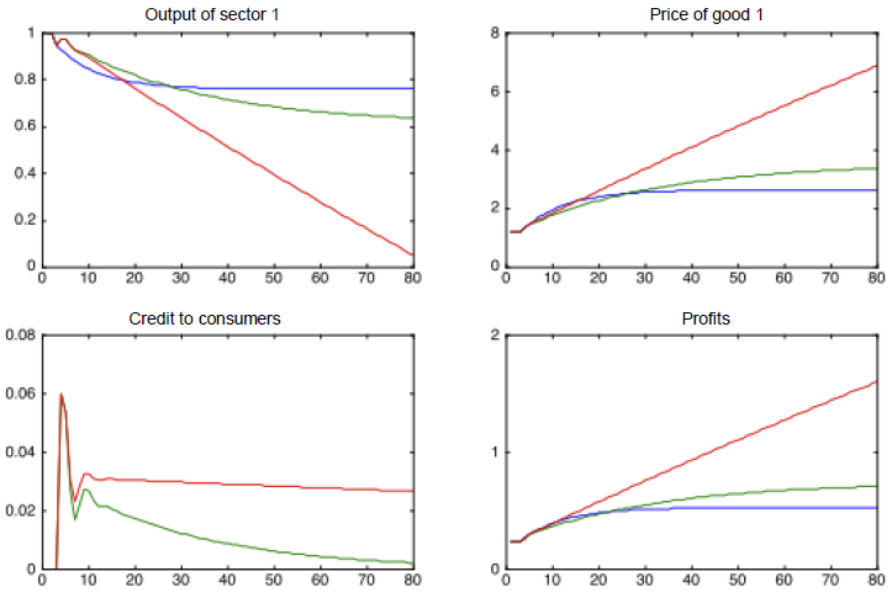
In each period only the interest on the debt is repaid, so that there is an accumulation leading to the appearance of a *stock of debts* variable ***G***.

In this case, although there are some short term advantages in that the fall of output and employment is slowed down with respect to the case without credit, the accumulation of a stock of debts leads in the long run to completely different results: a worse equilibrium level in the case of a low interest rate (green lines in Figure 3), but even a collapse of the economy when the interest rate is higher (red lines)[12]. This latter case happens because the interest over the cumulated stock of debts absorbs the whole wage bill. This can be better understood looking at the equilibrium conditions with $H_* = -rG$. There is a cut off value of *r* that can be determined.

It is the existence of stocks that determines the path-dependence of the out-of-equilibrium process stirred by the initial change in the distribution and that results in further changes in the distribution (increases in the inequality) aggravating the results of the crisis or even leading to the collapse of the economy.

12. A lengthening of the construction period of productive capacity increases the instability of the economy anticipating the moment of its collapse. Simulations of the effects of changes in the length of this period are disposable on the request.

FIGURE 3: Dynamics with long-term credit



Investment reallocation effect

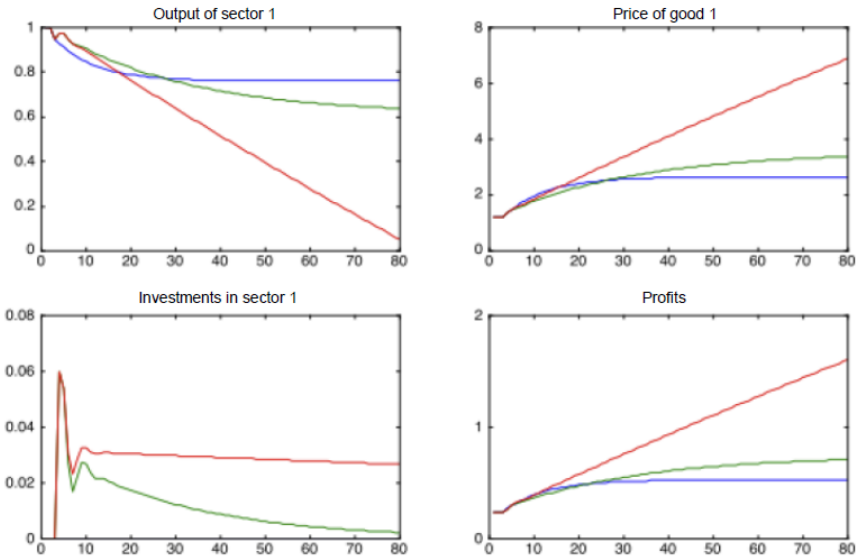
A further negative effect that substantiates the perverse relation between the two sectors of the economy is the crowding out of resources, subtracted from investment in sector 1 to be employed in sector 2, as the result of the higher rewards due to the increasing prices in that sector (see section 1.4.1 above)

Equation (10) then becomes:

$$x_t(1) = \gamma(\frac{^{e}D_t^i}{p_t^i} - {}^{*}B_t^i) + \delta \sum_{j=z+1}^{\infty} x_t(j)\delta^{j-z-1} - \zeta\frac{p_t^2 - p_{t-1}^2}{p_{t-1}^2}$$

The negative effect, present more or less strongly in the short run according to the lower (green lines) or the stronger (red lines) shift of resources due to a lower or stronger sensibility to price changes, does not affect however the final equilibrium level of output and employment in sector 1, as shown in Figure 4, due to the absence of stocks that make path-dependent the process stirred by the initial disequilibrium.

FIGURE 4: Dynamics with price reallocation effects



The role of the public sector

The debts of the public sector, which is assumed to use its resources to demand and consume good 1, have the same effect on the economy as the debts of the private sector. In the same way taxing wages to finance the public sector doesn't change the evolution of the economy as it represents just a shift of resources from the private to the public that leaves unchanged the amount of the demand for good 1, which is the factor actually determining both real production and employment.

Taxes on profits, instead, shift incomes from the consumers of good 2 towards the consumers of good 1, thus actually affecting the evolution of the economy.

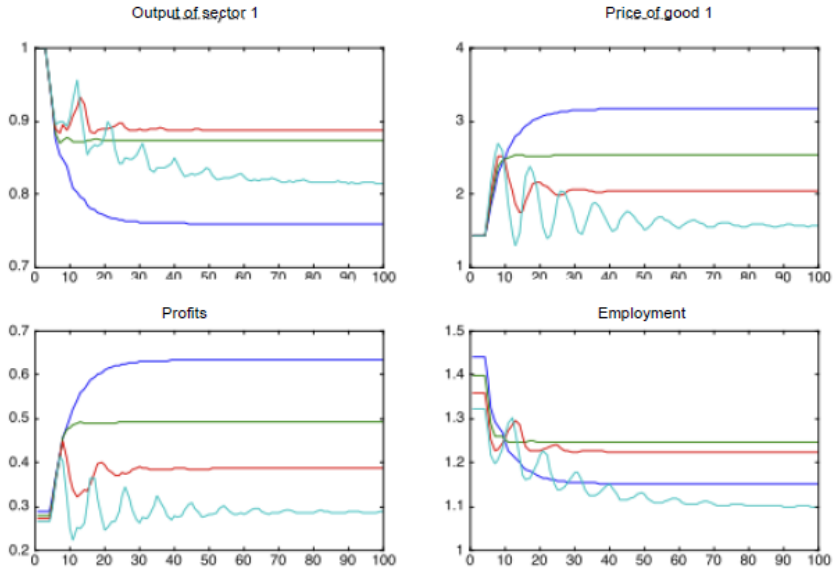
As a matter of fact, taxes on profits have a double effect. On the one hand, they bring about an increase in the demand of good 1, and hence in its production and in the amount of profits realized in sector 1. On the other, they reduce the profits realized in sector 2, and hence in the demand of the goods of sector 2, slowing-down the inflation in this sector.

As long as the first effect prevails over the second, the amount of resources obtained by the government from taxation, and hence its demand of good 1, increases, thus counter acting the negative effect on the economy of the initial reduction in wages: as shown in Figure 5 by the evolution of the output of sector 1 and of the employment, as traced by the green line (case with

a tax on profits) with respect to the blue line (benchmark case without a tax on profits).

Whether this happens, that is, whether the first effect prevails over the second one, depends on the tax rate; a higher tax rate in fact, we have seen, increases the profits realized in sector 1 but reduces those realized in sector 2. Thus the higher the tax rate the greater is the chance that the second effect prevails over the first one. There is a cut off value of this rate: up to this value an increase in the tax rate goes on reducing the negative effect on output and employment of the initial wages reduction. A higher tax rate reduces instead this positive effect. In Figure 5 this cut off value is the one associated with the evolution of the economy traced by the red line, as concerns the effect on employment, while a still higher tax rate affects also the dynamics of production, as is the case of the evolution of the economy traced by the light blue [13].

FIGURE 5: Dynamics with a tax on profits



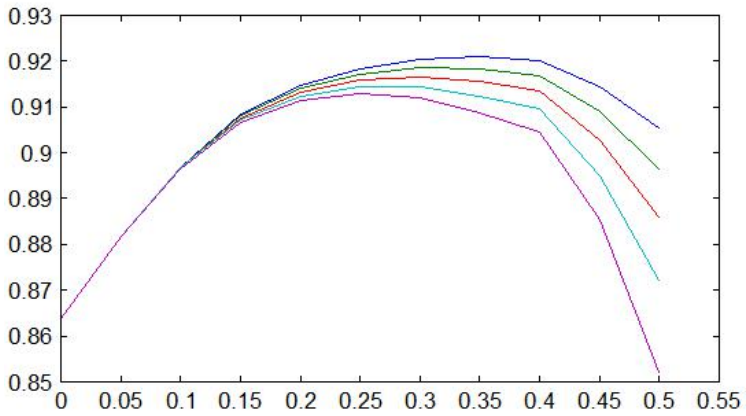
A tax on profits may also affect the viability of the economy in presence of a crowding-out effect, that is, a shift of investments from sector 1 to sector 2 due to expectations of capital gains resulting from variations of relative prices. In Figure 6, different crowding-out effects on the evolution of output due to different sensibilities to prices changes are shown by the different

13. In the simulation the green lines are associated with a tax rate of 15%, the red lines with one of 30% and the light blue lines with one of 40%.

colours of the functions: from the blue – the benchmark case without crowding-out – to the violet: the higher effect.

Up to a certain value of the tax rate on profits, measured along the horizontal axis, this tax has no effect on the spreading of the crowding out effect, but from a certain value on (around 10% in the Figure) increasing tax rates widen this spread, cast increasing doubts on the viability of the economy.

FIGURE 6: Final output of sector 1 as a function of the tax rate on profits for different levels of the crowding-out.



7. Conclusion

We have shown how an increase in incomes inequality may substantially reduce the growth of the economy and its employment rate due to an aggregate demand deficiency that reduces prospects and opportunities for investments in productive capacities and shifts resources toward what we have defined as the non-productive sector of the economy. This takes place through an out-of-equilibrium process, whose path-dependence depends on the emergence of involuntary stocks, both real and financial (including unsustainable leverage), which allow fossilizing and transmitting the economic disequilibria over the successive steps of the process itself.

The focus has been put in particular on the accumulation of stocks of debt, as the result of a private credit activity first aimed at reducing the recessive effects of the crisis stirred by the original change in the distribution. The option of indebtedness has been proved to slow down the effects of the crisis in the short run, but have a permanent negative effect due to the implicit further redistribution of incomes represented by the interest to be paid on the debts, the stronger the higher the interest rate. The analysis carried out also proves that transforming the private indebtedness into a public indebtedness does not change the results obtained.

The role of the government is then not to be a substitute for the private sector but to restore the right distributive conditions. A powerful tool is a tax on profits, standing for all incomes originating a demand for the goods of the non-productive sector. As a matter of fact, taxing wages to finance the public sector doesn't change the evolution of the economy, as it represents just a shift of resources from the private to the public sector that leaves unchanged the amount of the demand, for the goods of the productive sector, which is the factor actually determining both real production and employment.

Tax on profits instead shift incomes from the consumers of non-productive goods towards the consumers of productive goods, to whom the government is assimilated thus actually affecting the evolution of the economy.

As a matter of fact, taxes on profits have a double effect. On the one hand, they bring about an increase in the demand of productive good, and hence in its production and in the amount of profits realized in the productive sector. On the other, they reduce the profits realized in the non-productive sector, and hence in the demand of the non-productive goods, slowing - down the

inflation in this sector. Whether the first effect prevails over the second one, depends on the tax rate. Beyond a certain value, in fact, it reduces the total amount of profits to tax, and hence the demand of productive good financed by this tax.

A tax on profits may also affect the viability of the economy in presence of crowding-out effect, that is, a shift of investment from productive to non-productive sector due to expectations of capital gains resulting from variations of relative prices. A tax rate higher than a certain value, in fact, widens progressively the spreading of crowding-out effect in relation to different sensibility of price changes, with negative effects on the evolution of the economy.

In a crisis due to an increasing incomes inequality, and hence to a shift of demand from productive to non-productive sector, the way-out is re-establishing the right distributive conditions, which cannot be obtained by a policy aimed at relieving the weight of private debts but calls for a redistribution through taxes on the incomes of non-productive sectors according to a fine tuning that should prevent from excessive taxations transforming positive into negative effects.

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Appendix

Proof of equilibrium conditions (eq. 16, 24 and 28)

At equilibrium the value of production equals the nominal demand in each sector:

$$p^i B^i = D^i$$

if prices are set according to a markup μ on average unit gross costs c^i_E and considering equations 5 and 6 we have:

$$(1+\mu^1) c^1_E B^1 = W_t + H_t$$

$$(1+\mu^2) c^2_E B^2 = \Pi_{t-1} + F_t$$

steady state implies that all variables are constant, including profits, thus by the definition of c^i_E in eq. 15 we have:

$$(1+\mu^1) W_1 = W_1 + W_2 + H$$

$$(1+\mu^2) W_2 = \mu^1 W_1 + \mu^2 W_2 + F$$

rearranging:

$$\mu^1 = \frac{W^2 + H}{W^1}$$

$$\mu^1 = \frac{W^2 - F}{W^1}$$

we already prove that $H = -F$, thus the two conditions are identical. Note that as long as the margin in the second sector is not included in the determinants of *H*, the equilibrium does not impose any constraint on the margin in the second sector.

To find the solution we recall the broader definition of *H* in eq. 26, including taxation and debt, proving the equilibrium condition in eq. 28. At equilibrium, excess demand are null and no new credit is issued and payed back beeing at the desired indebteness levels *d* an d_p.

$$\mu^1_E = \frac{W^2}{W^1} + \frac{-rCD - r_P PD + t_p(\mu^1 W^1 + \mu^2 W2)}{W^1} = \frac{W^2}{W^2}$$

Rearranging and applying the definition in eq.15 we obtain:

$$\mu_E^1(1-t_p)+rd+rd_p=\frac{c^1x_E^1}{c^2x_E^2}+(1+t_p\mu^2)$$

solving for x^1_E we obtain eq.28.

Taking $t_p=0$ and $d_p=0$ we obtain eq. 24 and if we also take $d=0$ we easily have eq. 16.