Essentials of Constructive Heterodoxy: Aggregate Demand

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Abstract

Heterodoxy has left not one stone unturned and has unraveled a plethora of errors/mistakes/contradictions of Orthodoxy. The outcome of this prolonged critical and self-critical process is that there is actually no acceptable and accepted theoretical economics. The need of a paradigm shift is irrefutable. There is less need of further debunking exercises. For Constructive Heterodoxy follows that the subjective axiomatic foundation of Orthodoxy has to be replaced. All economic conceptions have to be consistently reconstructed. What comes to mind first are phenomena like market, profit, money, employment or aggregate demand. The latter is dealt with in the following.

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1 The irrefutable need of a paradigm shift

> So we really ought to look into theories that don't work, and science that isn't science. (Feynman, 1974, p. 11)

Heterodoxy has left not one stone unturned and has unraveled a plethora of errors/mistakes/contradictions of Orthodoxy. The outcome of this prolonged critical and self-critical process is that there is actually no acceptable and accepted theoretical economics. While Heterodoxy knows in great detail what is wrong it is also clueless about what the correct theory of the market economy looks like.

The goal of theoretical economics is to explain how the monetary economy works. In political economics the discussion consists in the main in an exchange of opinions about the merits and defects of the market economy in general or about an actual crisis in one of the major economies. Political economics has no sound scientific foundation. Speculations about the rational or irrational behavior of agents have not led and will not lead to a better understanding about how the economy we happen to live in works.

Who has come to the conclusion that economics is a failed science needs no further debunking. It is a matter of indifference whether an approach is abandoned because of one inconsistency or many.

The pivotal defect of Orthodoxy is that it is based on behavioral axioms. But no specific behavioral assumption can, for compelling methodological reasons, serve as a starting point for economic analysis. For a constructive Heterodoxy follows as first priority that this subjective axiomatic foundation has to be replaced.

> What particular reality is described by a given theory can be ascertained only from that theory's axiomatic foundation. (Georgescu-Roegen, 1966, p. 361)

Based on a new set of objective premises all economic conceptions have to be consistently reconstructed. What comes to mind first are phenomena like market, profit, money, employment or aggregate demand. It is the latter which is scrutinized with fresh eyes in the following.

Section 2 gives the formal description of the most elementary economic configuration, that is, the pure consumption economy. From these minimalistic premises follows in Section 3 the market clearing price as result of the Structural Law of Supply and Demand. In Sections 4 and 5 profit/loss and money/credit are taken into the picture. The new formal apparatus is in Sections 6 to 8 applied to the analysis of alternative scenarios of stabilizing aggregate demand. It turns out that this stabilization is a vital necessity in the market system – not because of imperfections in the price mechanism, but because of insufficient overall profit. Section 9 concludes.

2 Elementary

> I think we have to admit that most successful scientific theories are lucky over-simplifications. (Popper, 1994, p. 173)

Because it is impossible to directly observe the actual economy in its totality, the first task is to create a simplified mental representation. As a matter of fact, what is needed for good methodological reasons is the simplest possible description of the monetary economy.

The correct formal starting point is given with the most elementary economic configuration. The pure consumption economy is defined by:

$$Y_W = WL \tag{1}$$

wage income Y_W is equal to wage rate W times working hours L,

$$O = RL \tag{2}$$

output O is equal to productivity R times working hours L,

$$C = PX \tag{3}$$

consumption expenditure C is equal to price P times quantity bought/sold X.

The first three equations relate to income, production, and expenditure in a period of arbitrary length. The period length is conveniently assumed to be the calendar year. Simplicity demands that we have for the beginning one world economy, one firm, and one product.[1]

For the graphical representation of the pure consumption economy see Figure 1.

At any given level of employment L, the wage income that is generated in the consolidated business sector follows by multiplication with the wage rate. On the real side, output follows by multiplication with the productivity. Finally, the price follows as the dependent variable under the conditions of budget balancing, i.e., $C = Y_W$ and market clearing, i.e., $X = O$. Note that the ray in the southeastern quadrant is *not* a linear production function; the ray tracks *any* underlying production function. Note also that it is methodologically inadmissible to take the assumption of decreasing returns into the premises. Note finally that W is the *average* wage rate if the individual wage rates are different among the employees, which is normally the case.

[1] The three equations are a subset of the complete structural axiom set, see (2014a, Sec. 2.2). The present analysis does not include distributed profit.

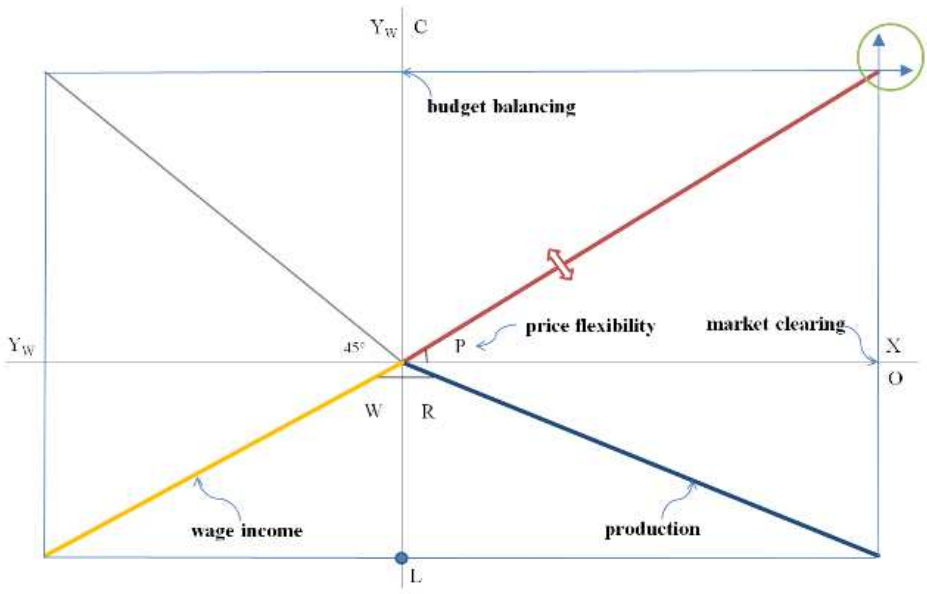

Figure 1: Pure consumption economy with market clearing and budget balancing

If the wage rate W is lowered, the market clearing price P falls. If the number of working hours L is increased the price remains constant, provided productivity R does not change. If productivity decreases the price rises. If productivity increases the price falls. If wage rate and productivity vary in lockstep the price stays put. All this can be directly read off from the four-quadrant graphic.

In any case, labor gets the whole output, and profit for the business sector as a whole is zero. All changes in the system are directly reflected by the market clearing price.

We know, of course, that the firm sets a price which is different from the unknown market clearing price. This case has to be dealt with separately (2014a, Sec. 4). We first determine the market clearing price that depends on purely objective factors.

3 The product market

> A good explanation of price determination, whether in a particular market or in a whole economy, requires a well-articulated theory of how markets determine prices. No such theory exists. (Hausman, 1992, p. 49)

The sales ratio is defined as:

$$\rho_X \equiv \frac{X}{O}. \tag{4}$$

A sales ratio $\rho_X = 1$ indicates that the quantity bought/sold X and the quantity produced O are equal or, in other words, that the product market is cleared.

The expenditure ratio is defined as:

$$\rho_{EW} \equiv \frac{C}{Y_W}. \tag{5}$$

An expenditure ratio $\rho_{EW} = 1$ indicates that consumption expenditures C are equal to wage income Y_W, in other words, that the household sector's budget is balanced.

From the first three equations and the two definitions follows the price as dependent variable:

$$P = \frac{\rho_{EW}}{\rho_X} \frac{W}{R}. \tag{6}$$

Under the condition of market clearing this reduces to:

$$\begin{gathered} P = \rho_{EW} \frac{W}{R} \\ \text{if} \quad \rho_X = 1. \end{gathered} \tag{7}$$

This is a rather elementary version of the Law of Supply and Demand for the pure consumption economy with one firm. In brief, the price equation states that the market clearing price is always equal to the product of unit wage costs $\frac{W}{R}$ and the expenditure ratio. Employment is not a determinant of the price (nor is the quantity of money). The price formula is testable in principle and fully replaces supply-function–demand-function–equilibrium.

In Figure 1 we had both market clearing *and* budget balancing, hence the price is given by:

$$\begin{gathered} P = \frac{W}{R} \\ \text{if} \quad \rho_X = 1, \rho_{EW} = 1. \end{gathered} \tag{8}$$

The price in Figure 1 is equal to unit wage costs; it increases with a rising wage rate and decreases with rising productivity. This is the most elementary case of the objective Law of Supply and Demand.

The period values of the variables are formally connected by the familiar growth equation.

$$Z_t = Z_{t-1}\left(1+\dddot{Z}_t\right)$$

or

$$Z_t = Z_0\,(1+\dddot{Z}_1)\,(1+\dddot{Z}_2)\ldots(1+\dddot{Z}_t) = Z_0\prod_{t=1}^{t}(1+\dddot{Z}_t)\,. \tag{9}$$

with

$$Z \leftarrow W, L, D, N, R, P, X, \ldots$$

The path of the representative variable Z_t is determined by the initial value Z_0 and the discrete rates of change $\dddot{Z}_t$ for each period. The three dots indicate that the rate of change refers to a period of predefined length. The dots do not symbolize the third derivative. Each path has three segments past, present, future. The past rates of change are known and can be inserted in (9). The future rates are unknown and their values follow from assumptions that have a high degree of plausibility.

Since we focus here on aggregate demand the wage rate W, the productivity R, and employment L are kept fix. It is, in addition, assumed that the pure consumption economy is initially at full employment and that employment does not chance until further notice.

Remains the expenditure ratio. It is initially set to $\rho_{EW} = 1$ and we assume for a start that it changes randomly in each period. The respective probability distribution of the change rates is given in general form by:

$$Pr\left(l_\rho \leq \dddot{\rho}_{EW} \leq u_\rho\right) \tag{10}$$

With this, the formal apparatus is complete. The defining equations, conditions and the probability distribution constitute a simulation. A simulation is a well-defined mathematical object. It replaces the set of equations that has been the chief analytical tool since Walras (Arrow and Debreu, 1954, p. 265).

Before the formalism can be applied a concrete assumption about the upper (u) and lower (l) bounds of the probability distribution has to be made. It is assumed then that the the expenditure ratio varies symmetrically around unity with the lower bound at -1 percent and the upper bound at 1 percent. Accordingly, the expenditure ratio varies randomly within the range $0,99-1,01$, that is, the budget of the household sector is never exactly balanced. Consumption expenditures are either above or below wage income. These demand variations affect the market clearing price according to eq. (7); all other price determining factors have been frozen for the moment.

Figure 2 is the graphical representation of the product market. It shows one aspect of the total simulation. The rest of the formal apparatus is implicit in the selected picture.

The supply quantity is fix because employment and productivity are fix; the output path O runs parallel to the horizontal time axis. Real demand X is equal to supply O.

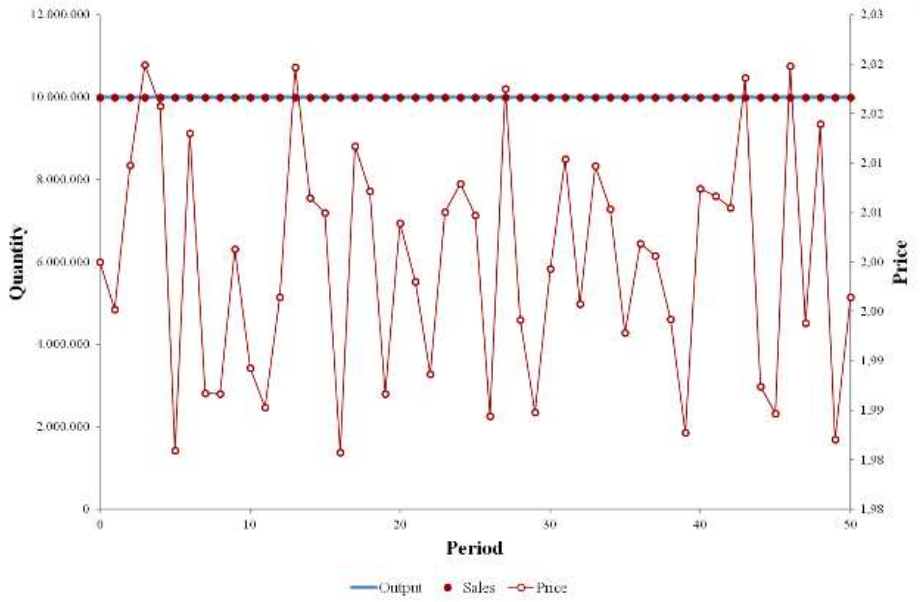

Figure 2: The three dimensional product market: supply and demand quantities (left axis), market clearing price (right axis), time (horizontal axis). The congruent paths of output O and quantity sold/bought X indicate market clearing over the whole time span of observation. The price is throughout the market clearing price. This representation replaces the obsolete two dimensional supply-function–demand-function cross.

Both paths are perfectly congruent, which is the graphical expression of market clearing. The price variations depend alone on the variations of nominal demand which are determined by the symmetric random variations of the expenditure ratio. The symmetry condition makes that the market clearing price oscillates around a stable average, which is anchored by the constant unit wage costs.

Figure 2 is the correct representation of the product market and replaces the unacceptable supply-demand-cross of the textbooks.

Conditional price flexibility is, clearly, an algebraic concept. Nothing is said about the price setting behavior of the firm. The formal system is fully determined without any assumption about human behavior. Speculation about the agents' rational or irrational behavior has been the bane of socio-psychological economics and has to be avoided whenever possible. The emancipation from folk psychology and sociology is overdue.

4 Profit/loss

> And thus we arrive at Mr. Ricardo's principle, that profits depend upon wages; rising as wages fall, and falling as wages rise. (Mill, 1874, IV.12)

Monetary profit/loss Q_m of the business sector as a whole is defined as the difference of consumption expenditure C and wage costs Y_W:

$$\begin{gathered} Q_m \equiv C - Y_W \\ \text{or} \\ Q_m \equiv (\rho_{EW} - 1)\, Y_W . \end{gathered} \tag{11}$$

Monetary saving of the household sector S_m as a whole is defined as the difference of income and consumption expenditures:

$$\begin{gathered} S_m \equiv Y_W - C \\ \text{or} \\ S_m \equiv (1 - \rho_{EW})\, Y_W . \end{gathered} \tag{12}$$

From these two definitions follows as a corollary:

$$Q_m = -S_m . \tag{13}$$

In the elementary consumption economy monetary profit and monetary saving always move in opposite directions. That is, the complementary notion to saving is loss; profit is the complementary of dissaving. Figure 3 makes this systemic relationship visible.

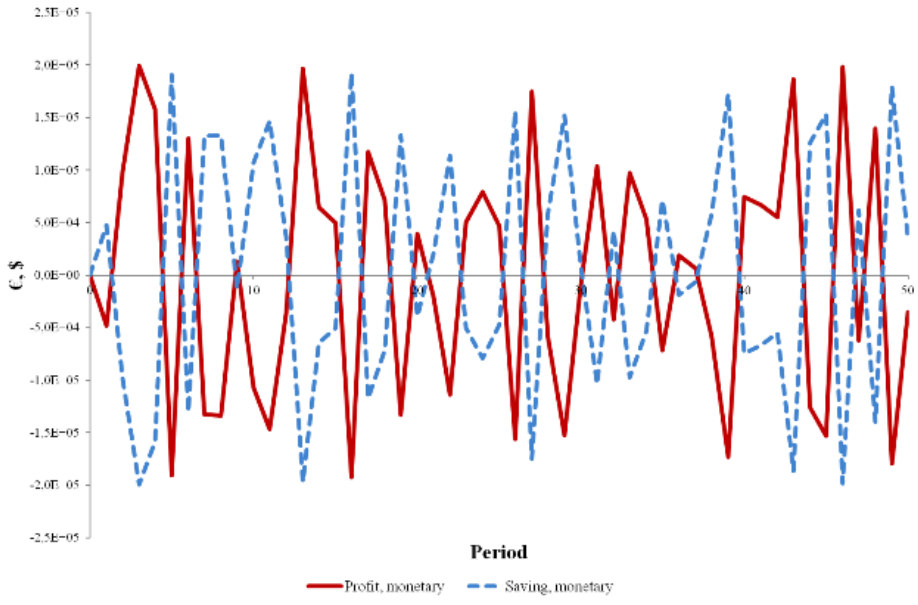

Figure 3: The complementary relationship of profit/loss and dissaving/saving (the paths are the discrete first derivatives of Figure 4)

It is worth noting that eq. (13) provides a refutation of Mr. Ricardo's principle and all profit theories that came after him (see also Desai, 2008).

We now have perfect market clearing in the product market over time as shown in Figure 2 and – by assumption – full employment in the labor market. For a start, the elementary consumption economy functions quite satisfactorily under the condition that the business sector does not react with employment changes to profit/loss. The random changes of consumption expenditures reflect the optimal consumption path of the household sector which consists of many agents of different age and preferences. The heterogeneity of agents makes itself felt as symmetrical random variation of the expenditure ratio.

5 Money and credit

> Currently prevailing orthodoxy in macroeconomics looks to Walrasian general equilibrium theory for its microeconomic foundations, and this has led to grave difficulties when it comes to the analysis of money. (Laidler, 1997, p. 1222)

If income is higher than consumption expenditures the household sector's stock of money increases. The change in period t is defined as:

$$\Delta\bar{\mathsf{M}}_{\mathbf{H}} := Y_W - C := (1-\rho_{EW})\,Y_W. \tag{14}$$

The alternative identity sign := indicates that the definition refers to the monetary sphere. There is no change of stock if the expenditure ratio is unity.

The stock of money $\bar{\mathsf{M}}_{\mathbf{H}}$ at the end of an arbitrary number of periods $\bar{t}$ is defined as the numerical integral of the previous changes of the stock plus the initial endowment:

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{H}t} + \bar{\mathsf{M}}_{\mathbf{H}0}. \tag{15}$$

The interrelation between the expenditure ratio and the households sector's stock of money, is then given by:

$$\bar{\mathsf{M}}_{\mathbf{H}t} \equiv \sum_{t=1}^{t} (1-\rho_{EWt})\,Y_{Wt} \quad \text{if} \quad \bar{\mathsf{M}}_{\mathbf{H}0} = 0. \tag{16}$$

The household sector's actual stock of money ultimately depends on the preceding sequence of expenditure ratios.

The changes in the stock of money as seen from the business sector are symmetrical to those of the household sector:

$$\Delta\bar{\mathsf{M}}_{\mathbf{B}} := C - Y_W. \tag{17}$$

The business sector's stock of money at the end of an arbitrary number of periods is accordingly given by:

$$\bar{\mathsf{M}}_{\mathbf{B}t} \equiv \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_{\mathbf{B}t} + \bar{\mathsf{M}}_{\mathbf{B}0}. \tag{18}$$

The development of the household or business sector's stock of money follows without further assumptions formally directly from the elementary formalism.

In order to reduce the monetary phenomena to the essentials it is supposed that all financial transactions are carried out without costs by the central bank. The stock of money then takes the form of current deposits or current overdrafts. Initial endowments can be set to zero. Then, if the household sector owns current deposits according to (16) the current overdrafts of the business sector are of equal amount according to (18) and vice versa if the business sector owns current deposits. Money and credit are symmetrical; the stock of money of each sector can be either positive or negative. The current assets and liabilities of the central bank are equal by construction. From its perspective the quantity of money at the end of an arbitrary number of periods is given by the absolute value either from (16) or (18):

$$\bar{\mathsf{M}}_t \equiv \left| \sum_{t=1}^{t} \Delta\bar{\mathsf{M}}_t \right| \quad \text{if} \quad \bar{\mathsf{M}}_0 = 0. \tag{19}$$

The symmetrical development of the household and the business sector's stock of money is shown in Figure 4.

The households save in the first period and this effects the initial increase of their money stock. This corresponds to the decline of the market clearing price in Figure 2. Note that all paths (price, profit/loss, dissaving/saving, stocks of current deposits/overdrafts and the quantity of money) are determined by the expenditure ratio ρ_{EW}. This is the key variable.

The quantity of money is represented by the path segments above the x-axis. The ownership of current deposits changes between the household and the business sector. Therefore, the relationship between market clearing price and quantity of money, although both dependent on the expenditure ratio, is not as simple as the classical quantity theory suggests. We pursue this relationship not further here (see 2011b; 2011c).

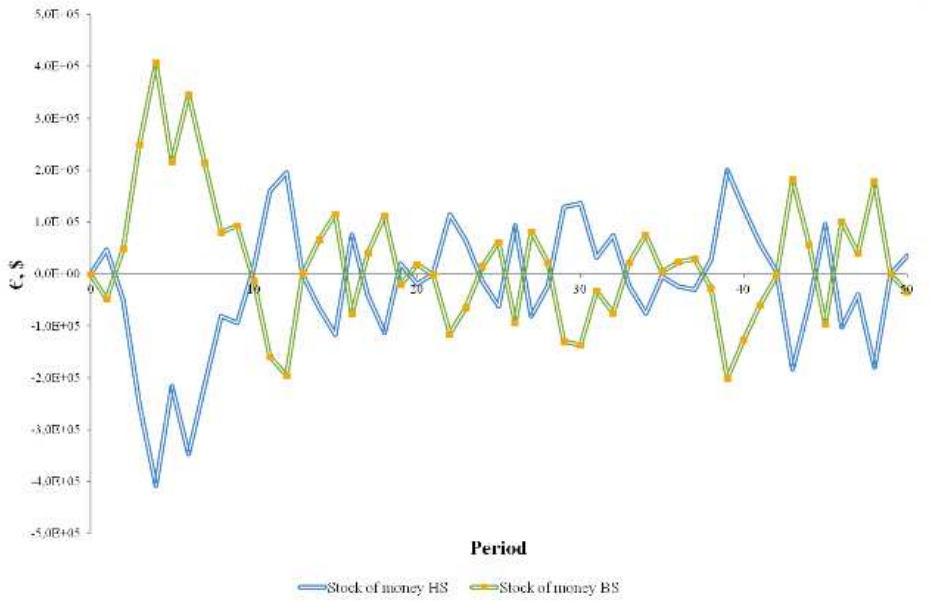

Figure 4: Household and business sector's stock of money as derived from the paths of wage income and consumption expenditure which are interconnected by the randomly varying expenditure ratio (the paths are the discrete integrals of Figure 3)

6 Suggested extensions

> No existing economic model provides us with a zeroth order starting point for understanding how real markets function. (McCauley, 2006, p. 17)

With eq. (7) flexible price adaptation has been formally established. The reason for this methodological procedure is simple: price flexibility is considered to be the crucial property of the market system. However, eq. (6) suggests an alternative mode of adaptation to demand variations. Let, for the sake of argument, the sales ratio ρ_X in (6) vary in perfect tandem with the expenditure ratio ρ_{EW}, such that the quotient is always equal to unity. This means, if the expenditure ratio falls below unity the sales ratio assumes the same value, that is, if the households save, a certain part of output is taken into stocks. Vice versa, if the expenditure ratio is greater than unity the business sector sells additional quantities from inventory. With this quantitative adaptation the price remains constant throughout as long as unit wage costs remain constant.

The important consequence for price theory is this: quantity changes can fully take over the signaling function of price changes and move the economy to the same endpoint.

If the inventory changes cancel out over time quantitative adaptation leads to market clearing 'in the long run'. If the product market is cleared in both cases in some

period t, then quantitative adaptation is an alternative to price adaptation. Whether it is even superior in some or all cases requires a separate analysis. The single-minded advocacy of price adaptation and instant market clearing is in any case misplaced, apart from the fact that inventories are a highly visible empirical phenomenon. The market clearing condition $\rho_X = 1$ in effect assumes this phenomenon away.

In a pure consumption economy where the wage rate follows productivity, such that unit wage costs are stable, and where the sales ratio follows the expenditure ratio, such that the quotient is always unity, the market clearing price remains unchanged over any stretch of time. In this economy there is only quantitative adaptation to the symmetric random variations of nominal demand. Clearly, with flexible quantitative adaptation the economy could in principle function just as well as with flexible product price adaptation.

Figure 4 shows the development of the central bank's balance sheet. Deposits and overdrafts grow and shrink as a result of the varying nominal demand of the household sector. By assumption, the central bank behaves passively and does not restrict the growth of overdrafts. The development of the quantity of money is entirely determined by the spending behavior of the household sector. There is no such thing as a monetary policy. Money and credit are spontaneously created and destroyed trough the transactions between household and business sector. Or, in other words, the quantity of money is entirely determined by 'the market' and not exogenously fixated.

Credit in the form of overdrafts from the central bank is only the logically first step of a financing relationship. Let us assume the household sector owns the demand deposits then it suggests itself that the household and the business sector establish a *direct* credit relationship. It can take, for instance, the form of commercial bonds. When the households buy with their deposits bonds from the business sector both sides of the central bank's balance sheet shrink by the same amount, in the limiting case to zero. In this case, the quantity of money and the liquidity of the household sector become zero. Through redemption of bonds the process is reversed. With the purchase of interest bearing bonds from the business sector the households reduce their liquidity. With the purchase of bonds from the households the central bank increases the liquidity of the household sector.

In order to simplify the argument it has been assumed that the central bank carries out all operations without costs. Because of this, there was no interest on overdrafts. Bonds, of course, bear interest. The interest payments of the business sector can be treated analogous to wage income. More precisely, they have the same effect as a wage increase. For now, interest is left out of the picture (see 2011b; 2011c).

Figure 4 shows that the stocks of deposits and overdrafts return repeatedly to zero until the end of the time span of observation, i.e., until $t = 50$. The crossing of the x-axis of the deposit and overdraft paths means that the budget is balanced in some period $t < 50$. This balancing is achieved by the symmetric random rates of change

of the expenditure ratio. And this balancing in turn means that profits and losses add up to zero. By the same token, cumulated savings/dissavings add up to zero.

Figure 4 tells us that in period 50 the budget is (virtually) balanced and the product market is cleared. Nevertheless, despite of the satisfactory outcome 'in the long run' there is a problem because the agents cannot know this in period 10, for instance. Beginning with this period, the variations of the expenditure ratio produce losses and the involved agents do not know whether they cancel out in the sequel. There is neither market failure nor price stickiness, the households act in full accordance with their time preferences, yet, with losses the system comes under stress. The 'temporary' lack of nominal demand brings the business sector in an awkward position vis-à-vis the central bank. Neither the business sector nor the central bank knows how long 'temporary' may last and how bad it may get.

Under these conditions, the business sector probably resorts to wage rate and employment cuts. These can reduce the absolute amount of loss, but ultimately do not help because the loss stems from an expenditure ratio less than unity which in turn reflects the household sector's time preference. We do not pursue this train of thought further here but assume that all agents keep their nerves and thus all plays out as shown in Figure 4.

The point to take home is: even if it were certain that the system arrives 'in the long run' (here in period 50) at market clearing and budget balancing the temporary lack of nominal demand could be sufficiently long and/or severe so that the economy plunges into unemployment/depression. This has nothing to do with a malfunctioning of the price mechanism but with the occurrence of loss. The temporary lack of aggregate demand is sufficient to derail the otherwise perfectly functioning economy. To overcome the temporary distress requires that loss-making firms (i) are kept afloat with credit and (ii) refrain from job and wage rate cuts. This is the less probable the longer 'temporary' lasts. The probability approximates zero when the central bank is replaced by a normal commercial bank. The functioning of the market system requires not so much flexible prices and wage rates as flexible credit under adverse conditions. This is something that does not come naturally to any bank management. Hence there is no spontaneous self-correcting mechanism to end a 'temporary' decline of nominal demand.

So, even if the agents could be reasonably sure that the market clears and the budget balances 'in the long run' it may happen that the 'temporary' lack of nominal demand cannot be absorbed by the banking system. It is not sufficient that the price mechanism works. It is necessary that all firms are kept above the zero profit line, otherwise the initial state of full employment cannot be maintained. Profit/loss for the business sector as a whole, though, depends on whether the expenditure ratio is above or below unity. This in turn depends on how the household sector as a whole distributes saving/dissaving over time (see also 2014b). What may be an optimal saving/dissaving sequence from the viewpoint of the households can plunge the business sector into distress.

7 Stabilizing aggregate demand

> Keynes offered a theory of depression economics that asserted, famously, that the market mechanism could not be relied upon to spontaneously rebound from a slump, and that advocated public spending, preferably involving a deficit in the government budget, to stimulate demand. (Woodford, 1999, p. 5)

It is now assumed that total consumption expenditure consist of the private and public households' expenditures:

$$C \equiv C_W + C_G. \tag{20}$$

Hence the overall expenditure ratio is given by:

$$\rho_E \equiv \rho_{EW} + \rho_{EG}. \tag{21}$$

In the initial period consumption expenditures are equal to wage income, i.e., $C_W = Y_W$. It is assumed next that the private households start to save in period 1, i.e., $C_{W1} < Y_{W1}$. In this case the public households step in and compensate exactly the fall of private demand, i.e., $C_{G1} = C - C_{W1}$ and $C = Y_W$. Under the formal condition of $\rho_E = 1$ the market clearing price in eq. (7) remains constant and profit is zero. The stabilization measure directly benefits the business sector and indirectly stabilizes employment.

What the public households do with their share of output can be left open for the moment. The options are to take it on stock, to give it away to a selected group of the population for free, or to throw it away.

The public households take up credit with the central bank. The amount of the public households' overdrafts is exactly equal to the private households' saving. The central bank's balance sheet resembles Figure 4 except for the fact that the public households now take the role of the business sector.

It is possible at any time that the public and private households establish a direct credit relationship. All it takes is that the public households sell bonds to the private households. In this case current deposits and overdrafts at the central bank are reduced or vanish completely. With immediate and full securitization the quantity of money is not at all affected by the public households' purchases on credit.

If the saving of the private households continues for some periods the public households' debt increases. It is assumed that each new issue of bonds can be sold to the private savers hence there is no problem to finance the public debt which is always exactly equal to the private households' cumulated savings. Technically, any debt of whatever magnitude can be financed by cumulated savings because saving

has 'caused' the period deficits in the first place. The money is always there, the question is whether the private households are prepared to transfer it to the public households.

It is assumed next that the private households stop saving for some periods. Consumption expenditures are again exactly equal to wage income. For the business sector only the faces of customers change, all else remains unchanged, in particular nominal demand and the market clearing price. The public households' total debt remains steady on the attained level.

The public households pay interest to the private households. The total income of the private households consists now of wage income and interest income. In order to exclude distributional effects it is assumed at first that all private households receive the same wage and interest income. In order to pay interest on outstanding bonds the public households tax all private households with the same amount. Hence interest income and tax cancel out for each household. The net income is in this special case equal to wage income. Normally, however, there are savers which buy the government bonds, and non-savers. In this case a redistribution takes place. The net income of the non-savers is reduced through taxation and the net income of savers is increased because the individual interests on bonds are higher than the tax. In the following, interest payments are taken out of the picture.

Next, the private households are supposed to dissave. This then requires a complicated maneuver from the public households. To recall, consumption expenditures C should remain constant. In order to achieve this it has to be assumed that an income tax is imposed. The amount of the tax must be exactly equal to the dissaving of the private households. As a result, consumption expenditures are equal to current wage income $C = Y_W$ and the private households pay the tax by dissaving. The consumption expenditures of the public households are zero, that is to say, their saving is equal to the amount of the income tax. With this, the public households are in the position to pay off the public debt. So, we have come full circle. The whole process takes place at a constant market clearing price and zero profit. It is obvious that the combined taxing-redemption maneuver cannot be carried out with the precision that has been assumed here in order to keep the argument transparent. Taken the process as a whole, the compensatory actions of the public households saved the life of the business sector and maintained full employment.

Of course, the public households need not wait until the private households decide to dissave. Let us assume an income tax is imposed in some period t which yields exactly the amount of the public debt. The private households spend their current income on consumption as before and pay the tax by fully dissaving. With this, we come again full circle. This time, though, by ignoring the private households' original saving/dissaving plans.

As an alternative scenario it can be assumed that the households fully dissave in a period of their own choice. Private consumption expenditures are now greater than current wage income. This pushes the market clearing price up and increases

the business sector's profit. It is now necessary to tax profit with 100 percent. The amount that is then transferred from the business sector to the public households is exactly equal to the public debt. While it is possible to come full circle in this way price neutrality cannot be maintained and, of course, a 100 percent profit tax is hard to sell, even if it can be fully justified.

This brings us finally to the economically most satisfying scenario. It is supposed that the public households have taken their share of output into stock during the saving phase of the private households. When the private households decide to dissave these stocks are brought to market. This keeps the market price unchanged because real demand and supply move in step. By selling the inventory the public households get the amount that is necessary to redeem the public debt. No taxation is needed. With the saving/dissaving sequence the private households in effect shift real consumption into the future and the public households provide the service of keeping the inventory over the desired time span (see also 2013b). While this scenario is feasible in principle it is obvious that practical problems arise if the time span between saving and dissaving becomes longer and longer. Nevertheless, this scenario becomes the benchmark, because it is economically the most unproblematic, nay, beneficial. Note that public debt is at any time 'covered' by inventory. Note also, that the benchmark case implies a refutation of Ricardian equivalence.

8 Alternative scenarios

8.1 Reversing the sequence

We have considered the case that the household sector's saving comes first and the dissaving later. It is always possible, however, that the households' optimal intertemporal consumption plans lead to the inverse sequence. Thus, the household sector starts with dissaving, i.e., $\rho_{EW} > 1$. The market clearing price rises according to (7) and the business sector makes a profit according to (11). Hence, all is fine for the time being. The deposits of the business sector increase according to (17) and the overdrafts of the household sector increase according to (14). This may go on for a while. It is assumed that before reaching a credit limit or ceiling this process stops. There is no credit restriction or crisis or market malfunctioning of any sort. The households execute their optimal consumption plans unhindered.

Then, in some period t the households start to save and to pay off debt. The market clearing price falls according to (7) and the business sector starts making losses. At the end of the dissaving cumulated profits/losses sum up to zero. Employment is during the whole process by assumption fixated at full employment. What happens is that the profits of the first part of the process are wiped out in the second part. The households are not negatively affected. Their cumulated expenditures are exactly equal to their cumulated wage income at the end of the process and their debt at the central bank is fully repaid.

While this scenario is feasible in principle, the process will not unwind smoothly (2011a; 2014c). After the first periods of overall loss some firms are shut down and unemployment increases successively. This does not eliminate losses for the business sector as a whole and continues as long as the household sector does not return to an expenditure ratio of at least unity. So, the beginning of the household sector's saving and redemption triggers breakdown/stagnation. There is no mechanism of self-regulation in place to prevent this. To the contrary, it is perfectly rational for firms and banks to declare a loss making firm sooner than later bankrupt.

8.2 How long is 'temporary' and what comes then?

All of the scenarios we have discussed sum up 'in the long run' which is here the 50th period. This does not prevent temporary calamities that are due to insufficient aggregate demand. Most economists agree that there are no compelling arguments against temporary compensating measures of the public households. The problem is that one cannot know how long temporary lasts.

With continued saving of the private households and perfect compensation of insufficient aggregate demand public debt increases continuously. All depends on how long the saving phase of the households lasts. Temporary can mean two things. The process stops before any legal or psychological limits are reached. Or the process goes on until the lenders become more and more reluctant to buy government bonds.This may result in a rising interest rate.

In this situation, the public households may be driven to the conclusion that the compensation of lacking private demand is no longer feasible. When they act accordingly the market clearing price falls, the overall zero profit turns into a loss, and this triggers a slower or faster breakdown sequence (2013a).

A more benign scenario is that the households switch to $\rho_{EW} = 1$ before any credit ceiling comes into sight. In this case the growth of public debt stops. The task of the public households reduces to servicing the debt. In the most benign case with equal distribution of wage income and interest bearing bonds the individual households pay interest to themselves, their net income remains unaffected. Otherwise, a continuous process of redistribution sets in. This process stops only if – in the limit – the interest on government bonds becomes zero. An alternative could be that the central bank buys all government bonds and the cumulated savings are then held by the households in liquid form as current deposits which bear no interest. In this form the debt can be carried forward for an indefinite time without any redistributive effects.

8.3 Avoiding the problem in the first place?

In the pure consumption economy, the problem of insufficient aggregate demand has its roots in the nature of money. If the households realize in each period $\rho_{EW} = 1$ no

problems ever occur (under the additional condition that the business sector consists of one firm; for a differentiated business sector see 2011d).

Since money is not time-stamped the individual households are given the option to shift consumption via monetary saving-dissaving from the present to a future period. It is important to see that what is feasible for an individual household does not work in real terms for the household sector as a whole under the condition of price flexibility and market clearing in each period (see also 2013b).

Compensatory deficit-spending of public households would be unnecessary if a way could be found to realize the condition $\rho_{EW} = 1$ for the household sector as a whole. This implies that there is always a group of dissaving individual households for a group of saving households, such that the sums cancel perfectly out and there is not net effect on the overall expenditure ratio (2014b). All this does not happen spontaneously. Neither can flexible prices achieve this feat. What happens spontaneously is that consumption expenditures and wage income are unequal in each period, i.e., $\rho_{EW} \neq 1$. There is no mechanism in operation in the market system to prevent this.

To assume that $\rho_{EW} = 1$ is an 'equilibrium' and that there are 'forces' that push and pull the economy inexorably into this final state is wishful thinking, animism, and storytelling, or what Feynman called cargo cult science.

8.4 Investment

The solution that suggests itself is that the lack of aggregate demand for consumption goods in the pure consumption economy is made up by the demand for investment goods, such that aggregate demand remains unchanged at the level that is compatible with full employment. All that is necessary is that the savings of the household sector find their way into the hands of investors. In this case, the composition of final output changes and labor input has to move from the consumption good industry to the investment good industry. This reallocation is steered by the price mechanism. We let this assertion stand for the moment because allocation is not the issue here.

The switching to a capital accumulating economy shifts the problem only to a level of higher complexity. Generally speaking: if it is possible in the pure consumption economy that nominal demand C falls short it is also possible that the combined demand $C + I$ falls short. The problem of insufficient demand morphs into the problem of insufficient growth.

Monetary profit in the investment economy is given by (2014d, eq. (18)):

$$\begin{aligned} Q_m &\equiv I - S_m \\ \text{if} \quad Y_D &= 0. \end{aligned} \tag{22}$$

In the pure consumption economy the inequality of consumption expenditure C and wage income Y_W gives rise to profit/loss according to (11); in the investment economy the inequality of investment I and saving S_m does the same according to (22). The fact of the matter is that investment and saving never has been equal and never will be. The temporary lack of aggregate demand now takes the form of $I < S_m$ and produces a monetary loss (for the complete investment cycle see 2011e). With regard to the effects of losses there is not much difference between the consumption or investment economy. As a matter of principle, the price system cannot cope with the problem of a shortfall of aggregate demand because price flexibility cannot prevent losses. Note that the equality of saving and investment implies a zero profit economy (under the condition of zero distributed profit). No such economy has ever existed on this planet.

What economists have constantly overlooked is that the economy needs a structural minimum of total profit in order to function properly. This minimum is in any case greater than zero. Not much thought has been given to the question of how this minimum can be secured at all times. This problem cannot be solved by perfect price flexibility and optimal allocation. The solution presupposes that economists understand the difference between income, profit, and distributed profit. After more than 200 years in the darkness, there is a real chance that this happens soon.

9 Conclusion

The main results of the systemic analysis of aggregate demand are:

- While it is true in a very general sense that 'supply and demand' determine the product price there is no such thing as supply-function–demand-function–equilibrium. Orthodoxy got the formal representation of the markets and their interaction wrong.
- The Structural Law of Supply and Demand for the pure consumption economy with one firm states that the product price is equal to the product of unit wage costs and the expenditure ratio under the condition of market clearing.
- The crucial systemic fact of the pure consumption economy is that the budget is never balanced. Because the expenditure ratio is never exactly equal to unity there is profit/loss for the business sector as a whole. Profit/loss is exactly complementary to dissaving/saving. By the same token, there are continous endogenous changes of the quantity of money.
- Even if it were certain that the system arrives 'in the long run' at market clearing and budget balancing the temporary lack of nominal demand could be sufficiently long and/or severe so that the economy falls in depression. This has nothing to do with a malfunctioning of the price mechanism, stickiness

in particular, but with the occurrence of loss due to insufficient aggregate demand.

- What may be an optimal saving/dissaving sequence from the viewpoint of the households can plunge the business sector into distress. There is no spontaneous mechanism in operation in the market system to prevent this.
- To assume that an expenditure ratio of unity is an 'equilibrium' and that there are 'forces' that push and pull the economy inexorably to this final state is wishful thinking, animsism, and storytelling, or what Feynman called cargo cult science.
- As a matter of principle, the perfectly functioning price system cannot cope with the problem of a shortfall of aggregate demand. Compensatory actions of the public households are therefore indispensable. These consist of the complete sequence of deficit-spending, servicing the public debt, and eventual redemption.
- In the ideal case, (i) public debt can be redeemed without taxation, and (ii) the servicing of public debt has no redistributive effects. Almost needless to add that the ideal case seldom happens.
- The crucial factor is time. The 'temporary' lack of aggregate demand is 'too long' if the attendant growth of public debt comes close to predefined limits. How long 'temporary' actually is depends alone on the households' optimal intertemporal consumption plans.
- In the pure consumption economy, the stabilization of aggregate demand directly benefits the business sector through loss prevention and indirectly stabilizes employment at the given level. Taken the process as a whole, the compensatory actions of the public households save the life of the business sector and redistribute income from non-savers to savers, that is, to those who caused the chain reaction of problems in the first place.
- The whole process is a bit more complex but not essentially different in the general case of an investment economy with profit distribution.

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