Unemployment out of nowhere

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Abstract

Unemployment is usually explained with reference to the equilibrium of supply and demand in the labor market. This approach rests on specific behavioral assumptions that are formally expressed as axioms. The standard set of axioms is replaced in the present paper by a set of structural axioms. This approach yields the objective determinants of employment. They consist of effective demand, the actual outcome of price formation, structural stress as determined by the heterogeneity within the business sector and the income distribution. Sudden changes of employment are effected by latent relative switchers that are hard to spot empirically.

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> These savants, as Galileo put it, first decided how the world should function in accordance with their preconceived principles. ... He openly criticized scientist and philosophers who accepted laws which conformed to their preconceived ideas as to how nature must behave. Nature did not first make men's brains, he said, and then arrange the world so that it would be acceptable to human intellects. (Kline, 1982, p. 48)

Theory building consists, roughly, of two separate acts. First the overwhelming complexity of reality is reduced to the almost-nothingness of some *tentative* elementary propositions or, as Schumpeter put it, to 'hypotheses or axioms or postulates or assumptions or even principles' (1994, p. 15). Then, from this almost-nothingness the multitude of phenomena is logically reconstructed with the expectation that theoretical conclusions shall find their exact counterpart in reality. There is, though, no guarantee that this iterative best practice works for all subject matters or at all times. A self-evident hazard is that reality gets lost in the process. Galileo's critique refers to the habitual inclination to ignore the tentativeness of the theoretical starting point and to force preconceived ideas upon reality.

It seems that this has happened not only on occasion in physics but also with the marginal principle in economics. The production function is a case in point. Profit maximization works only with decreasing returns. When we assume for the moment that increasing, proportional and decreasing returns are equally probable for industrial production then the marginal principle exerts a strong pressure either to ignore two-thirds of reality or to apply the principle where it is in most cases not applicable.

Marginalism is a behavioral principle and it is embodied in the axioms of standard economics. There is nothing wrong with marginalism except that an assumption about human behavior necessitates one to make a specific assumption about the production process. This turns the relation between subjectivity and objectivity upside down. The general thesis of the present paper is that human behavior does not yield to the axiomatic method, yet the axiomatization of the money economy's fundamental structure is feasible. By choosing objective structural relationships as axioms behavioral hypotheses are not ruled out. On the contrary, the structural axiom set is open to *any* behavioral assumption and not restricted to the standard optimization calculus.

The case for structural axiomatization has been made at length elsewhere (2011b) thus we can start the analysis of the *objective* determinants of employment without further methodological preliminaries. In the following the minimalistic formal frame that constitutes the pure consumption economy is set up in section 1. Thereby the premature specification of behavioral assumptions is forestalled. Then, in section 2, profit as the pivotal concept for the analysis of the market system is derived from the axiom set. In sections 3 to 5 the properties of the structural employment equation are discussed in detail and the full employment conditions are established. It is shown that actual employment depends on the expenditure

ratio and the factor cost ratio. This implies *two* types of unemployment that require different responses. The inverse relation between employment and the profit ratio is derived in section 6. Structural stress is introduced in section 7 by differentiation of the business sector and it is shown how it depends on the heterogeneity among firms and how this affects employment. Finally the relation between employment and the income distribution is established in section 8. It turns out that the economic system as given by the structural axiom set incorporates several latent relative switchers which effect sudden changes of employment that at first sight have no discernible 'cause'. The properties of a latent switcher are elaborated in section 9. Section 10 concludes.

1 Axioms

The first three structural axioms relate to income, production, and expenditures in a period of arbitrary length. For the remainder of this inquiry the period length is conveniently assumed to be the calendar year. Simplicity demands that we have for the time being one world economy, one firm, and one product (the consistent differentiation of the axiom set is carried out in 2011c).

Total income of the household sector Y is the sum of wage income, i.e. the product of wage rate W and working hours L, and distributed profit, i.e. the product of dividend D and the number of shares N.

$$Y = WL + DN \quad |\text{t} \tag{1}$$

Output of the business sector O is the product of productivity R and working hours.

$$O = RL \quad |\text{t} \tag{2}$$

Consumption expenditures C of the household sector is the product of price P and quantity bought X.

$$C = PX \quad |\text{t} \tag{3}$$

The axioms represent the pure consumption economy, that is, no investment expenditures, no foreign trade, and no taxes or any other government activity.

2 The overall profit ratio

Profit is the pivotal concept for the analysis of the market system. The business sector's financial profit Q_{fi} in period t is defined with (4) as the difference be-

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tween the sales revenues – for the economy as a whole identical with consumption expenditures C – and costs – here identical with wage income Y_W[1]:

$$Q_{fi} \equiv C - Y_W \equiv PX - WL \quad \Leftarrow \quad Y_W \equiv WL \quad |t \tag{4}$$

For the business sector as a whole to make a profit consumption expenditures C have in the simplest case to be greater than wage income Y_W. So that profit comes into existence in the *pure consumption economy* the *household* sector must run a deficit at least in one period[2]. This in turn makes the inclusion of the financial sector mandatory. An economic theory that does not include at least one bank that supports the concomitant credit expansion cannot capture the essential features of the market economy (2011b, pp. 11-14).

From (4) and (1) follows for the relation of profit and distributed profit:

$$Q_{fi} \equiv C - Y + Y_D \quad \Leftarrow \quad Y_D \equiv DN \quad |t \tag{5}$$

Definitions are supplemented by connecting variables on the right-hand side of the identity sign that have already been introduced by the axioms. To the definitions in (4) and (5) three structural ratios are added now. With (6) the expenditure ratio ρ_E, the sales ratio ρ_X, and the distributed profit ratio ρ_D is defined:

$$\rho_E \equiv \frac{C}{Y} \qquad \rho_X \equiv \frac{X}{O} \qquad \rho_D \equiv \frac{Y_D}{Y_W} \quad |t \tag{6}$$

From (5), the first axiom (1), and the definitions (6) one gets for total profits that it depends on the key ratios ρ_E and ρ_D and the absolute amount of income:

$$Q_{fi} \equiv \left(\rho_E - \frac{1}{1+\rho_D} \right) Y \quad |t \tag{7}$$

To get rid of all absolute magnitudes the profit ratio ρ_Q is defined with (8) and this gives a succinct summary of the *structural* interrelations of the profit ratio, the expenditure ratio, and the distributed profit ratio for the business sector as a whole:

$$\rho_Q \equiv \rho_E (1+\rho_D) - 1 \quad \Leftarrow \quad \rho_Q \equiv \frac{Q_{fi}}{Y_W} \quad |t \tag{8}$$

The overall profit ratio ρ_Q is positive if the expenditure ratio ρ_E is *>1* or the distributed profit ratio ρ_D is *>0*, or both. Neither the capital stock, for example, nor the degree of monopolization on both the product and the labor market plays any role. And if the wage rate, which is a component of the distributed profit ratio ρ_D, and the dividend always move in lockstep, then neither of them affects the overall profit ratio of the economy under consideration[3].

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[1] Profits from changes in the value of financial and nonfinancial assets are excluded here to streamline the analysis. For details see (2011d, p. 9).

[2] It needs hardly emphasis that in the investment economy the process of profit generation appears more complex. For details see (2011d).

[3] The full implications of the profit definition are far-reaching. For details see (2011b, pp. 16-17)

3 Employment

The first relation that is derived from the axioms and definitions is the structural employment equation:

$$L = \frac{Y_D}{PR\dfrac{\rho_X}{\rho_E} - W} \quad |t \tag{9}$$

In this form the axioms now imply the *additional* assumption that employment as dependent variable is determined by the rest of the system. This is an assumption about the direction of dependency in a system with complex and mutual interrelations and this *add-on* assumption is no constituent of the axiom set which is clearly open to various dependency interpretations. Dependency is conceptually different from causality (see section 9).

The employment equation states – with the other variables unaltered in each case:

(i)   An increase of the wage rate leads to *higher* employment, i.e. to a lower unemployment rate.

(ii)   A price increase is conductive to *lower* employment.

(iii)   Provided that wage rate, price and distributed profit all change with the same rate there is no effect on employment.

(iv)   If the configuration of price and wage rate changes is such that the denominator remains unchanged then employment stays where it is, no matter how large wage rate and price changes are. In this case perfect wage–price flexibility has no impact on employment.

(v)   An increase of the expenditure ratio ρ_E leads to higher employment. An expenditure ratio $\rho_E > 1$ presupposes the existence of at least one bank.

(vi)   A productivity increase leads to lower employment.

(vii)   As the difference in the denominator approaches zero employment goes (formally) off to infinity. This singularity is an implicit property of the economy as given by the structural axiom set. When this point of discontinuity is approached the system's behavior changes in unpredictable ways (see section 9).

(viii)   Distributed profits exert a positive influence on employment.

Statements (i) to (viii) follow without regress to any behavioral assumptions from the axiom set and the 'laws of algebra' (Shaik, 1980, p. 83). Employment moves around on the employment surface, which is depicted in Figure 1, when all variables
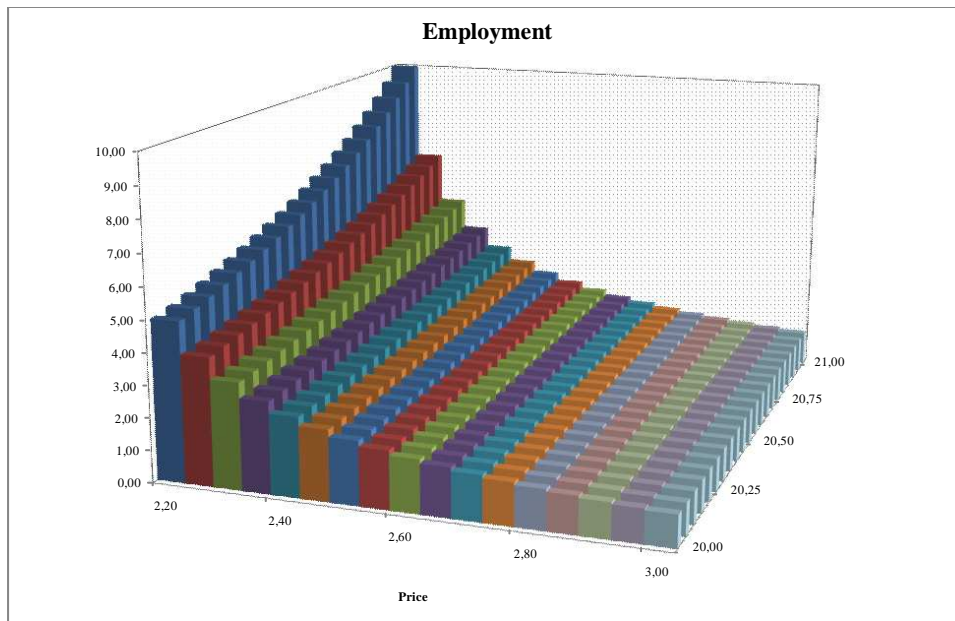
Figure 1: Employment surface above the wage rate–price plane (approximated by columns)

except wage rate and price are kept constant. If the axioms capture reality the logical implications are observable. Equation (9) is the structural axiomatic version of the Phillips curve and contains the original (Phillips, 1958) as special case.

With regard to the process of adaptation of employment to changes of the independent variables (9) implies that the independent variables have to be fixed at the beginning of the period under consideration. Since the period length is arbitrary no great distortions arise from this idealization if the length is conveniently chosen.

4   Full employment conditions

The standard key variable for the establishment of full employment is the real wage *W/P* which has to fall (Keynes, 1973, p. 17). There is a conspicuous unanimity among economists of all shades on this point:

> We economists have all learned, and many of us teach, that the rem-
> edy for excess supply in any market is a reduction in price. If this is
> prevented by combinations in restraint of trade or by government regu-
> lations, then those impediments to competition should be removed. Ap-
> plied to economy-wide unemployment, this doctrine places the blame
> on trade unions and governments, not on any failure of competive
> markets. (Tobin, 1997, p. 11)

The structural axiomatic approach asserts that in the consumption economy employment is determined by the expenditure ratio ρ_E and the factor cost ratio ρ_F of which
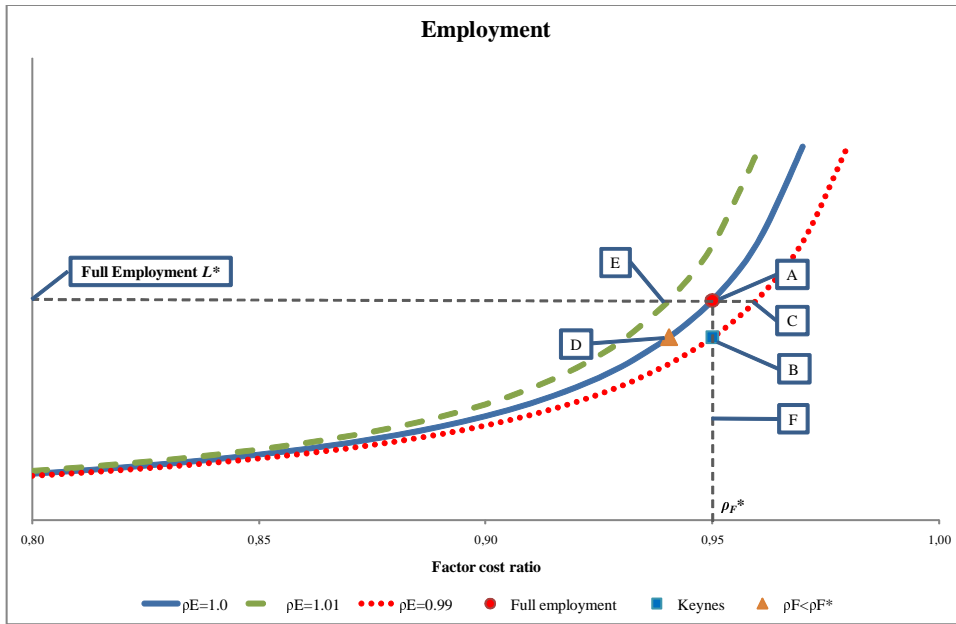
Figure 2: Structural relationship between factor cost ratio and employment

the real wage is a constituent. This follows from (9) under the conditions that the product market is cleared, i.e. $\rho_X = 1$, and that the relation of dividend to wage rate ρ_V is held constant. After the addition of the two definitions:

$$\rho_F \equiv \frac{W}{PR} \qquad \rho_V \equiv \frac{D}{W} \tag{10}$$

the employment equation reduces to its simplest form:

$$L = \frac{\dfrac{DN}{PR}}{\dfrac{\rho_X}{\rho_E} - \dfrac{W}{PR}} = \frac{\rho_V N}{\dfrac{\rho_X}{\rho_E \rho_F} - 1} = \frac{(\cdot)}{\dfrac{1}{\rho_E \rho_F} - 1} \quad \text{if} \quad \rho_X = 1 \quad |t \tag{11}$$

According to (11) employment depends in the pure consumption economy on ρ_E, i.e. the structural axiomatic expression of Keynes's effective demand (Keynes, 1973, pp. 23-24), and the outcome of the market price formation ρ_F.

Under the conditions that the product market is cleared, i.e. $\rho_X = 1$, and the household sector's budget is balanced, i.e. $\rho_E = 1$, a higher factor cost ratio ρ_F means higher employment as shown in Figure 2. The curve entails that there is no such thing as a natural rate of unemployment or some kind of unemployment equilibrium. Any level of employment can be realized *in principle,* that is, when the fullness of microeconomic coordination problems like qualitative or local mismatches is excluded for the moment.

There exists a unique factor cost ratio ρ_F*, and by consequence a unique real wage, that is consistent with full employment (however defined). From (11) follows that condition (12) must be satisfied:

$$\rho_F^* = \frac{1}{\dfrac{(\cdot)}{L^*}+1} \quad \text{if} \quad \rho_X = 1; \rho_E = 1 \quad |t \tag{12}$$

The numerical value of L^* depends on the actual definition of full employment. If (12) is satisfied the product and the labor market are cleared and the budget is balanced. Since this result follows without regress to behavioral hypotheses directly from the axioms it would be conceptually inappropriate to refer to this configuration as full employment equilibrium. Equilibrium would in addition require some behavioral mechanism which guarantees that ρ_F speedily approaches ρ_F*. No such mechanism is known. Nor does it follow from the axiom set without additional behavioral assumptions. We refer to the $\rho_X=1;\rho_E=1$–full employment factor cost ratio ρ_F* as warranted market price configuration.

In the general case the expenditure ratio ρ_E is different from unity and the weaker condition for full employment reads:

$$\rho_F \rho_E = \frac{1}{\dfrac{(\cdot)}{L^*}+1} \quad \text{if} \quad \rho_X = 1 \quad |t \tag{13}$$

Full employment can, at least in the short run, be realized with *any* combination of the expenditure ratio and the factor cost ratio that satisfies (13) which in turn entails both, Keynes's principle of effective demand and the outcome of the actual market price formation. Figure 2 shows the basic cases for period t with points *E, A, C* situated on the full employment line according to (13).

A $\rho_X=1$, i.e. market clearing; $\rho_E=1$, i.e. budget balancing; $\rho_F=\rho_F$*, i.e. warranted market price configuration; $L=L^*$, i.e. full employment } best of all possible economic worlds;

B $\rho_X=1$; $\rho_E<1$, i.e. saving; $\rho_F=\rho_F$*; $L<L^*$, i.e. unemployment } Keynes's case, insufficient nominal demand, no improved market price coordination required;

C $\rho_X=1$; $\rho_E<1$, i.e. saving; $\rho_F>\rho_F$*, i.e. unwarranted market price configuration; $L=L^*$, i.e. full employment } compensatory market price configuration, cannot last indefinitely, a nominal demand increase *and* an improved market price coordination is required;

D $\rho_X=1$; $\rho_E=1$; $\rho_F<\rho_F$*, i.e. unwarranted market price configuration; $L<L^*$, i.e. unemployment } unsatisfactory market price coordination, no additional nominal demand required;

E $\rho X{=}1$; $\rho E{>}1$, i.e. dissaving; $\rho F{<}\rho F^*$, unwarranted market price configuration; $L{=}L^*$, i.e. full employment } compensatory dissaving, cannot last indefinitely, nominal demand cuts *and* improved market price coordination is required.

It has to be emphasized that the product market is – by assumption – cleared in all cases. The buildup and cutback of an inventory of finished products is not of interest at this point. By consequence there is never a *real* shortage of demand. Since the output is always fully absorbed by the household sector due to the condition $\rho X{=}1$ it can be said that Say's law holds also at *B*. Hence Keynes's case is characterized by insufficient *nominal* demand. This additional demand is needed to absorb the *additional* output at full employment, where Say's law holds again. It would obviously not help much to lower the wage rate in Keynes's case. To the contrary, this would lower ρF, drive the pure consumption economy down the dotted curve, and *increase* unemployment. Hence downward-stickiness of the wage rate is *not* the problem. If stickiness is a problem at all then it is *upward*-stickiness. From the structural axiomatic perspective both, the fuss about Say's law and about money illusion, is entirely beside the point.

Cases *B* to *E* would be of no further concern if it were possible to prove that the invisible hand could be relied upon to always speedily move the pure consumption economy to point *A* and to make $\rho E{=}1$ *and* $\rho F{=}\rho F^*$. It is not sufficient, though, to prove that a state with all desired properties like point *A* exists.

As a matter of fact we have no a priori reason to expect that point *A* acts as some kind of attractor, or more so than the other points. Likewise, we have no reason to expect that the *right kind* of 'market force' is spontaneously put to action. There are two different kinds of unemployment, the first depends on ρE and the second on ρF, and each demands its own response. Hence, to begin with, all points in Figure 2 have to be treated equally. There is no such thing as a full employment equilibrium or, for that matter, a Keynesian unemployment equilibrium. Keynes's case is one among others and he rightly insisted that it requires additional nominal demand. However, since we have to distinguish between two different kinds of unemployment, Keynes's prescription is not the proper one to deal with case *D* for example. The movement from *D* to *A* implicates ρF to *increase* and this can be done in quite different ways.

5   Relative adjustments

In order to achieve an increase of the factor cost ratio ρF a *relative* change of wage rate and price is required at any given productivity. Figure 3 shows the possible ways to move from point *D* on the line that is defined by $\rho F1$ to a new configuration on the line that is defined by ρF^*.

At A_1 the wage rate is higher and the price remains unchanged. At A_2 the wage rate remains unchanged and the price is lower. Point A_3 represents all combinations
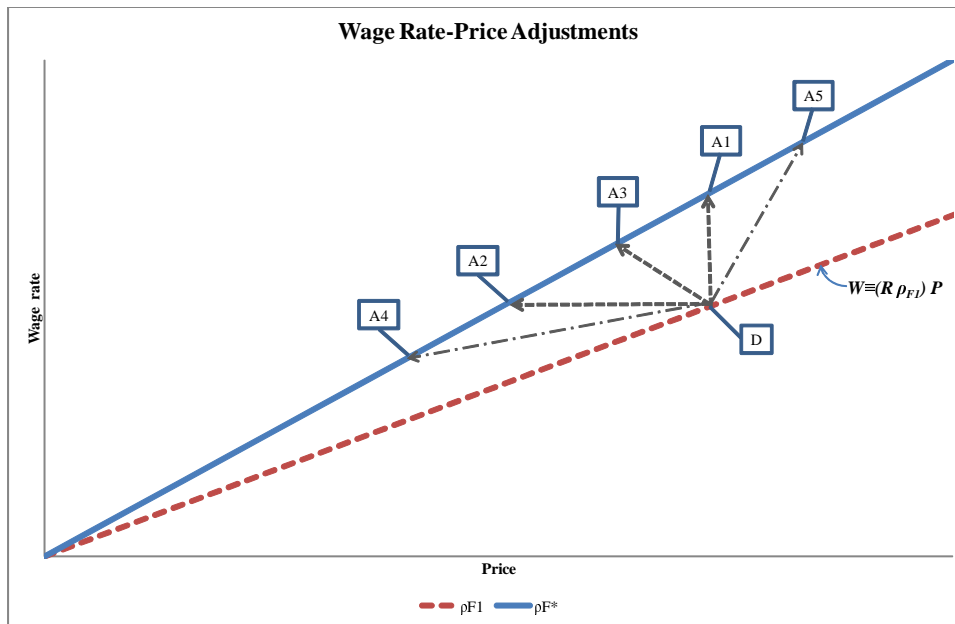
Figure 3: Alternative wage rate–price adjustments to achieve an increase of the factor cost ratio with a given productivity

of higher wage rate and lower price that lead to the same result. Both, wage rate and price may also fall, it is only necessary that the price decrease is greater than the wage rate reduction as at point *A4*. Mutatis mutantis for wage rate and price increases at point *A5*.

Hence it does not matter much whether the economy moves through an inflationary or deflationary phase or whether one of the variables is more sticky than the other. The direction and absolute magnitude of the wage rate or price change is, with regard to employment, immaterial; what counts is their relative movement (Leijonhufvud, 2009, p. 750). With a given productivity the real wage must rise on the route from *D* to *A*. This, of course, is against conventional wisdom.

The counter-intuitive property (from the accustomed perspective) of the employment equation is that a wage rate reduction, which lowers the real wage, coincides with *lower* employment. The microeconomic optimization calculus and Marshall's pair of demand/supply scissors – designed for the isolated partial market – simply do not apply to the economy as a whole. The point to emphasize is: since the structure that is given by the axiom set does not adapt to behavior, behavior has to adapt to structure. For the economy as a whole the behavioral real-wage/marginal-productivity condition is inapplicable and has to give way to (12).

When the real wage has to rise to get the pure consumption economy out of an unemployment situation that is due to a market price configuration $\rho_F < \rho_F*$ how, then, is profitability affected?
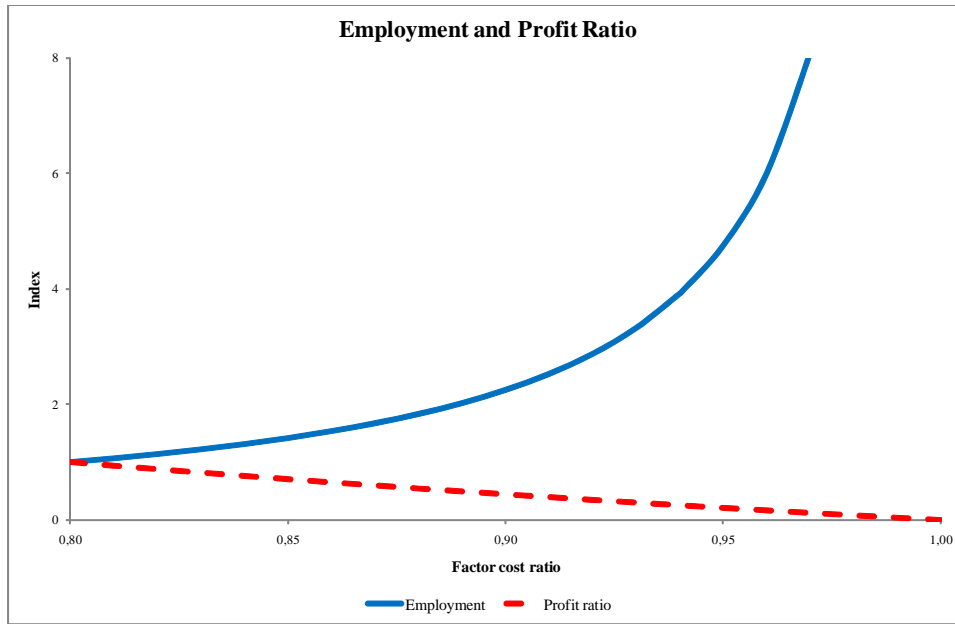
Figure 4: Employment and profit ratio in relation to the factor cost ratio

6 The employment–profitability trade-off

In order to establish full employment business has to accept a lower profit ratio. The relation of the firm's profit ratio and the factor cost ratio follows from (4), (2) and definition (10) and is formally equivalent to the overall profit ratio (8):

$$\rho_Q \equiv \frac{1}{\rho_F} - 1 \quad \text{if} \quad \rho_X = 1 \quad |t \qquad (14)$$

The profit ratio is the inverse of the factor cost ratio. It can be said, then, that full employment is never prevented by a 'high' wage rate W or a 'high' real wage W/P but by a 'high' profit ratio ρ_Q. It is the profit ratio that has to fall as long as there is unemployment of the $\rho_F < \rho_F*$–type in the pure consumption economy. The relation between employment and the profit ratio is depicted in Figure 4.

From the firm's perspective things look different. By deriving (14) from (4) employment L drops out of the equation. When the direct structural interdependencies are blanked out the profit ratio *appears* to be independent of employment. The individual firm cannot directly see the interrelation that is shown in Figure 4. In explicit form (14) reads:

$$\rho_Q \equiv \frac{R}{\dfrac{W}{P}} - 1 \quad |t \qquad (15)$$

According to the firm's close-up view the profit ratio depends on the configuration of wage rate, price and productivity; and these magnitudes are given to a small firm

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by the market and the state of technology in period *t*. Taking these variables as parameters the profit ratio does, according to (15), *not* depend on the individual firm's level of employment. At a higher employment the firm's absolute profit is higher but not the profit ratio. Given the market and technology parameters the individual firm therefore tends to expand employment until it reaches some internal capacity limit, because, given the productivity, no profit maximum or profit ratio maximum exists.

There is no foothold for marginalism. The application of the marginal principle presupposes the introduction of a well-behaved production function. Methodologically this amounts to putting the cart before the horse. What makes this approach definitely unacceptable is that increasing returns are implicitly ruled out. Reality is molded to fit the analytical tool. Standard theory is arbitrarily confined to a special case and the claim of generality is therefore vacuous.

In order to reproduce the neoclassical result *for the sake of argument* we have to add the following assumptions to (15). Productivity *R* has to fall with increasing employment. This happens only if the familiar production function with falling marginal productivity is a valid approximation of the real world production conditions. In addition, the real wage has to fall faster than productivity. This is achieved by the assumption that unemployment motivates workers to accept a lower real wage. Only this combination assures that the profit ratio rises and this in turn is the *behavioral* condition that the firm raises employment until the profit maximum is reached. As we do not intend to force the marginal principle upon reality there is no rationale for these additional assumptions. Our formal minimalism is in full accordance with the economic principle applied to theoretical economics itself.

The call for wage cuts to overcome unemployment is ultimately a logical consequence of assuming a well-behaved production function. It has no factual justification. The standard recipe therefore rests in equal measure on a distorted production theory and on a flawed profit theory.

According to (15) an increase of the wage rate lowers the profit ratio and thus necessitates an employment expansion to realize the same absolute amount of profit. The general relationship between total profit and the factor cost ratio follows from (4) in combination with the employment equation (9) and is given by:

$$Q_{fi} \equiv \frac{1 - \rho_F}{\dfrac{1}{\rho_E} - \rho_F} Y_D \quad \text{if} \quad \rho_X = 1 \quad |t \tag{16}$$

If the expenditure ratio ρ_E is *unity* then the effects of a higher factor cost ratio (lower profit ratio) are always exactly compensated by a higher employment and the overall impact on total profit is nil. Profit is invariably equal to distributed profit. With regard to total profit business, taken as a whole, could in this case be indifferent between different employment levels. When the *relation* between dividend and wage rate ρ_V is kept constant, as in (11), then distributed profits Y_D and by consequence profits Q_{fi} rise and fall with the wage rate, i.e. $Y_D = (\rho_V N)W$.

The distributed profit ratio, however, is independent of the wage rate and falls with rising employment:

$$\rho_D \equiv \frac{Y_D}{WL} \equiv \frac{\rho_V N}{L} \quad |t \tag{17}$$

Hence absolute profits on the one hand and the profit ratio on the other may produce contradictory signals. The firm, then, first of all has to make a *choice among signals* before it can determine its course of action. Decision making depends on the prior decision about the *relevant* reality. With regard to employment it is more favorable when the firm acts on absolute profits than on the profit ratio. What is more: if the variables in (15) are taken parametrically by the firm the profit ratio simply provides no clue for a decision about the firm's level of employment because it is equal on all levels.

In the last instance it is the decreasing ratio of number of shares N to employment L that makes that the real wage is higher at a higher employment level. From (12) follows for the real wage:

$$\frac{W}{P} = \frac{R}{\frac{\rho_V N}{L} + 1} \quad \text{if} \quad \rho_X = 1; \rho_E = 1 \quad |t \tag{18}$$

The real wage depends positively on the productivity and the level of employment. This result is modified when we add the assumption that the productivity falls with rising employment. If this effect is substantial the net outcome is of course that the real wage wage falls with rising employment. In general, though, this assumption does not hold. In fact, increasing returns are more probable (and indeed certain if Adam Smith's fundamental principle holds). It is therefore in any case advisable to keep the employment and the productivity impact on the real wage analytically wide apart and to treat them separately.

From the structural axiom set follows without additional behavioral assumptions that the real wage rises and the profit ratio falls with increasing employment if *ρX=1*, *ρE=1* and *ρV* is constant. This relation, however, does *not* tell anything about the *distribution of output* (for details see 2011a, pp. 8-12).

It goes without saying that employment does not move smoothly along the curve given by *ρE=1*. During the business cycle the economy may move, for example, from *D* to *E* in Figure 2 and then directly from *E* to *B*. This implies wide swings of the profit ratio. Hence the inverse relationship between employment and the profit ratio that holds for movements *along* the curve at any given expenditure ratio is blurred and barely visible to a single firm. The trade-off is a structural fact.

7   Structural stress

Since employment is materially affected by the heterogeneity of firms the business sector is now split up into two firms in order to determine the effects in detail. The respective profits are derived from (4) as:

$$Q_{fi1} \equiv P_1 X_1 - W_1 L_1 \quad |t$$
$$Q_{fi2} \equiv P_2 X_2 - W_2 L_2 \quad |t \tag{19}$$

It is assumed that the price is equal for both firms; the firms operate in the same market. From (19) and axiom (2) then follows:

$$Q_{fi1} \equiv PR_1 L_1 \left(1 - \frac{W_1}{PR_1}\right) \quad \rho_{X1} = 1 \quad |t$$

$$Q_{fi2} \equiv PR_2 L_2 \left(1 - \frac{W_2}{PR_2}\right) \quad \rho_{X2} = 1 \quad |t \tag{20}$$

Profit is zero for each firm if the factor cost ratio is unity. Here firm$_2$ is appointed the role of the marginal firm which has an economic disadvantage compared to firm$_1$ and has to make a profit of at least zero in order to be able to stay in the market. The condition for zero profit in firm$_2$ reads:

$$\frac{W_2}{PR_2} = 1 \quad |t \tag{21}$$

From (20) then follows for the profit of firm$_1$ under the minimum condition for firm$_2$:

$$Q_{fi1}^{min} \equiv \left(\frac{\rho_R}{\rho_W} - 1\right) W_1 L_1 \quad \text{with} \quad \rho_R \equiv \frac{R_1}{R_2}; \rho_W \equiv \frac{W_1}{W_2} \quad |t \tag{22}$$

Under the preliminary conditions $\rho_W = 1$ the profit of the more productive firm$_1$ (22) must be the higher the greater the productivity disparity between the two firms is. The degree of heterogeneity is expressed by the productivity ratio ρ_R. If profit for the business sector as a whole is below this minimum profit the structure of the business sector is bound to change. Hence structural stress is a function of the profit for the business sector as a whole and the degree of heterogeneity within the business sector. When profit for the business sector is greater than the structural minimum profit all firms are making profits. A straightforward gauge of structural stress is given by:

$$\zeta \equiv \frac{Q_{fi1}^{min}}{Q_{fi}} \quad |t \tag{23}$$

If $\xi = 0$ and $Q_{fi1} > 0$ all firms make a profit relative to their size. If $\xi = 1$ the profit of the marginal firm is exactly zero, the whole profit accrues in firm$_1$, and with $\xi > 1$ structural change sets in. In an economy with two firms of equal size for example employment drops by 50 percent. When the structural minimum profit is given then structural stress varies inversely with the development of profits for the business sector as a whole. Conversely, with any given total profit the stability of the economy increases with the degree of homogeneity.

Since productivity differentials are a normal and enduring feature of the economy (Kaldor, 1985, p. 41-44) profit must be greater than zero in the pure consumption economy and this entails $\rho_E>1$ and/or $\rho_D>0$. Under the condition that the household sector's budget is balanced, i.e. $\rho_E=1$, it must hold that $Y_D \geq Q_{fi1}^{min}$ or else employment drops from point A in Figure 2 to point F. In this case a nominal demand increase, i.e. $\rho_E>1$, is required first to bring profits above the minimum profit. Subsequently structural stress has to be taken out of the system by the gradual reduction of heterogeneity between the firms. The straightforward measure is a productivity catching-up of firm$_2$.

Yet structural stress is also lowered when the wage ratio ρ_W adapts to the productivity ratio ρ_R according to (22). So, either the wage rate in the marginal firm falls or it rises in the firm with the higher productivity or a combination of the two. In the limiting case the ratio of wage rates ρ_W thus becomes equal to the ratio of productivities ρ_R. Then structural stress ξ is zero and the distribution of profits between both firms is proportional to their size. The marginal firm is out of the zone of immediate danger. To exclude side effects this wage adaptation process should in the ideal case take place in such a manner that total income remains constant. This happens if the average wage rate remains constant for the given distribution of employment between the firms. The required wage rate increase in firm$_1$ for any wage reduction in firm$_2$ follows from the definition of the average wage rate for $W=constant$:

$$W \equiv W_1 \frac{L_1}{L} + W_2 \frac{L_2}{L} \quad \text{|t} \tag{24}$$

To lower the wage rate in the marginal firm only makes sense if it is compensated for by an appropriate increase in firm$_1$ otherwise the average wage rate falls. This in turn lowers the factor cost ratio and leads according to (11) to a lower overall employment. A partial wage cut can stabilize the marginal firm but only to the detriment of overall employment. The advantage of partial wage reductions is that unemployment can be more evenly spread over the whole economy and a sudden irreversible collapse of one firm can be avoided. This reduces the risk of a chain reaction. The marginal firm is indispensable for the perpetuation of the actual employment level. To keep it in the market without negative employment effects in the rest of the economy requires a compensatory wage increase in the rest of the economy.

The relation between the overall factor cost ratio and employment in (11) is continuous only as long as structural stress ζ is not greater than unity. Since overall profits and the minimum profit vary independently a discontinuity may occur at short notice without a clearly identifiable cause since ζ depends indirectly on the ratio of the two ratios ρ_R and ρ_W. When all depends on relative magnitudes the notion of a definite cause loses its meaning; it cannot be located in one firm or the other but only in the no man's land between them. This is the reason why it escapes partial analysis. It is not a rare event that economic policy proposals are derived from partial analysis which appeals especially to empiricists and experienced practitioners. The idea that

a wage cut helps to avoid unemployment is a good one for a single firm and it has all the empirical evidence on its side a positivist may ask for; ultimately it falls prey to the fallacy of composition.

8 Distribution

What we finally need to reach point *A* in Figure 2 is an expenditure ratio *ρE=1*. In general the expenditure ratio is not identical for spending out of wage income and spending out of distributed profits. When the recipients of wage income and distributed profits belong to two separate groups with different spending behavior the general definition of the expenditure ratio is given as the weighted average of the groups individual expenditure ratios:

$$\rho_E \equiv \rho_E^W \frac{Y_W}{Y} + \rho_E^D \frac{Y_D}{Y} \quad |\text{t} \tag{25}$$

The shares of output that the receivers of wage income and distributed profits absorb with their respective expenditure ratios is not of interest here (for details see 2011a, p. 11). It is usually assumed that the expenditure ratio for wage income is higher than that for distributed profits. Let us assume for simplicity that the latter is zero. In this case the condition *ρE=1* demands:

$$\rho_E^W = \frac{1}{\frac{Y_W}{Y}} \quad |\text{t} \tag{26}$$

The expenditure ratio of the receivers of wage income must be the higher the smaller their share of total income is. This is not impossible for a long stretch of time[4] but presupposes that *both* households and banks are willing to expand credit. To arrive at a configuration that is not dependent on substantial credit expansion over a longer time span it would be necessary either that the share of wage income rises to unity or that the expenditure ratio for distributed profits rises to unity, or something in between. If neither happens the business sector will find itself on a curve below the benchmark curve *ρE=1* in Figure 2.

If the share of wage income is unity and the expenditure ratio ρ_E^W too then profit is zero. This configuration therefore presupposes that structural stress is permanently zero which is obviously not feasible because productivity or wage differentials occur at random. Full employment demands that *both* the expenditure ratio for wage income ρ_E^W and that for distributed profits ρ_E^D is unity in the pure consumption economy and that $Y_D \geq Q_{fi1}^{min}$. It cannot be maintained in earnest that there exist 'market forces' that speedily realize all these conditions or that the invisible hand can do the trick. The price mechanism, which is incorporated in ρ_F, cannot compensate for *ρE<1* or for $Y_D < Q_{fi1}^{min}$ over a longer time span.

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[4] When the purchase of long lived consumption goods, e.g. houses, is correctly subsumed under consumption expenditures there arises no problem with regard to collateral for the banking industry and a sound credit expansion may proceed for an indefinite time in the pure consumption economy.

What we need, then, for the economy to move in the direction of full employment are two biases. It is favorable, first, when the expenditure ratio is more often than not above unity and, second, when there exists a light but continuous wage push and at the same time a retard on price increases which in combination exert an upward drive on the factor cost ratio. Hence it is not harmful when competition in the product market is somewhat more intensive than in the labor market. On the contrary, as already J. S. Mill recognized, it is 'a necessary instrumentality of that free market' (Mill, 2006, p. 932).

9 Latent relative switchers

Since Ricardo asserted that 'corn is not high because a rent is paid, but a rent is paid because corn is high' (Vickers, 1995, p. 71) the question of causality returned repeatedly at critical junctures in theoretical economics. Disputes over economic policy hinge on causal beliefs and this poses the problem that it is difficult, to say the least, to ascertain empirically whether the causality runs, for example, from money to prices or, equally debatable, from saving to investment, or just in the opposite direction (Hoover, 2001). Moreover, the notion of causality itself 'has been hard to understand' (Hausman, 1992, p. 294). And finally, 'agents may forecast the variable constituting the cause and act in anticipation of it' (Blaug, 1995, p. 35). Causality, which implies the notion of force[5], is not a constituent of the structural axiomatic approach because 'deductive chains of reasoning cannot on their own establish the existence of causal processes in the real world' (Hodgson, 2001, p. 76). In the structural axiomatic context we can speak of directionality but not of causality. By consequence we have to replace the common sense notion of a cause by the notion of a switcher or, more precisely, by the notion of a latent relative switcher.

In the foregoing analysis we have met relative switchers on several occasions. The first made its appearance in the employment equation. According to (11) employment is dependent on the expenditure ratio ρ_E and the factor cost ratio ρ_F. Both ratios vary independently. It is obvious from the equation, however, that, if the configuration $\rho_E = 1/\rho_F$ occurs, employment goes formally off to infinity, i.e. the normal directionality that is established by (11) no longer holds. The system becomes indeterminate. This event is neither due to some definite value of the expenditure ratio nor of the factor cost ratio. Both variables may have assumed the

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[5] "This word 'force' indicates a specification of the general notion of cause, namely a measurable cause, expressible in figures" (Born, 1949, pp. 11-12). A well-known example of borrowing from physics is Adam Smith's concept of the natural price as a center of gravity that is reached through the operation of inexorable market forces. The operation of these forces is not an issue in general equilibrium models and therefore no urgent need was felt to determine market forces (which have a name and an address) in great detail. Causality, force, law are used in economics mainly as metaphors to fill the logical gaps in an argument and have not much in common with their counterparts in physics. Strictly speaking causality does not exist at all in standard economics: "In a general equilibrium model there is no real sense in which one factor causes another: everything is determined simultaneously by the whole collection of relationships" (Foley, 2003, p. 500).

critical values many times before but not in the same period. Hence it is difficult or even impossible to spot any anomaly by looking at the respective time series. The event may repeat itself albeit with a quite different configuration of the independent variables. These are inauspicious preconditions for empirical research.

It is, of course, improbable that the factor cost ratio is *exactly* inverse to the expenditure ratio. Systemic instability increases already when the the two ratios approach each other more than usual. The latent switcher is surrounded by a zone of danger.

The factor cost ratio is itself a latent relative switcher. According to the employment equation (11) we will find either a stable relation between the absolute wage rate and employment in the data over a stretch of time or not. Roughly the same holds for the relation between the real wage and employment. Seen from the structural axiomatic perspective both hypotheses are unqualified for a significant empirical test. A stable correlation cannot appear before the *ratio* of wage rate, price *and* productivity is taken into account and placed in the context of (11). A switch from employment expansion to contraction then depends on the relative changes of the three independent variables. Hence imperceptible changes of any underlying variable may either cancel out and thereby contribute to stability or lead *in combination* to a sudden change of direction. The relative switcher is a perfectly deterministic device but hidden between the time series of its component variables. All this follows directly from the structural axiom set and there is no need to resort to catastrophe or chaos theory for explaining economic events that seem to have no palpable 'cause'. They have, but it is not of the accustomed kind.

Structural stress, finally, is the most complex switcher so far because it contains structural and distributional determinants. From (23), (22), (7) and (25) follows explicitly:

$$\zeta \equiv \frac{\dfrac{\rho_R}{\rho_W} - 1}{\rho_E^W \dfrac{Y_W}{Y} + \rho_E^D \dfrac{Y_D}{Y} - \dfrac{1}{1+\rho_D}} \frac{Y_{W1}}{Y} \quad |\mathrm{t} \qquad (27)$$

This switcher determines the point where employment drops from the actual smooth curve of Figure 2 to a lower one. This drop happens in the limiting case with unaltered magnitudes at the macro level through relative changes within the business or the household sector. Equation (27) indicates for example that wholesale demand management runs the risk of being counteracted by the interplay of structural and distributional alterations.

As the economy approaches the switch from $\zeta<1$ to $\zeta>1$ the marginal firm's existence becomes progressively jeopardized. When we start from full employment the risk of unemployment increases and has to be weighted with the relative size of the marginal firm. The firm can influence only the denominator of ρ_R and ρ_W, the rest hinges on luck or, what almost amounts to the same, on actual macroeconomic policy.

Since Veblen (1961) and the German Historical School it has repeatedly been asserted that the notion of an economic 'law' or, even more fundamentalistic, that the axiomatic method is incompatible with the historical specificity of the economic process (e.g. Hodgson, 2001). This is true for general equilibrium theory, but this approach cannot, for good methodological reasons, be taken as a benchmark. What has to be emphasized is that the structural axiom set and the embodied latent relative switcher is consistent with both the common sense notion of a 'law' and historical specificity. Equation (27) can be taken as the testable structural axiomatic 'law of default' that explains, first, why the marginal firm defaults and, second, why this default is not predictable. The 'cause' of the default and the increase of unemployment is not a single event but an unknown number of latent *critical configurations* of which *one* becomes manifest in historical time. This implies that we cannot, in the proper sense, learn from economic history because the same outcome can be produced by an arbitrary number of critical configurations. Story-telling and *Verstehen* are a popular pastime yet no substitute for a theory that is formally based on a set of – structural – axioms.

10 Conclusions

Behavioral assumptions, rational or otherwise, are not solid enough to be eligible as first principles of theoretical economics. Hence all endeavors to lay the formal foundation on a new site and at a deeper level actually need no further vindication. The present paper suggests three non-behavioral axioms as groundwork for the formal reconstruction of the evolving money economy and applies these to the theory of employment.

The main results of the structural axiomatic inquiry are:

- The expenditure-income asymmetry is the indispensable prerequisite for favorable business conditions and prolonged growth. This holds for the elementary consumption economy and the complex investment economy in equal measure.

- The key variables for the attainment of full employment are the expenditure ratio ρ_E, i.e. the structural axiomatic version of Keynes' effective demand, and the factor cost ratio ρ_F, i.e. the configuration of wage rate, price, and productivity as outcome of market price formation.

- There is a structural trade-off between employment and the profit ratio. It is not a 'high' nominal or real wage that prevents full employment but a 'high' profit ratio.

- Structural stress increases with the heterogeneity between firms with regard to productivity and wage rate, and decreases with overall profits. A value of the structural stress gauge of $\zeta > 1$ indicates the default of the marginal firm and a sudden increase of unemployment that depends on the firm's size. The

switch from $\zeta < 1$ to $\zeta > 1$ is effected by structural and distributional changes within the business and household sector.

- The economic system as given by the structural axiom set incorporates several latent relative switchers that assume the role of a 'cause'. The defining property of a switcher is that *relative* changes of two or more independent variables effect sudden changes of direction of the dependent variable. There is an unknown number of critical configurations of the independent variables that lead to the same outcome. One of the multiple latent 'causes' becomes manifest in historical time. Since a switcher is composed of two or more variables the critical configurations are hardly visible in particular time series and sudden changes seem to come out of nowhere. In fact they are precisely defined.

- Employment depends on effective demand and the outcome of price formation on the one hand and on structural stress which in turn depends on the heterogeneity of firms and the relation of wage income to distributed profits on the other.

The level of employment and sudden changes of employment can be derived in direct lineage from the structural axiom set. 'Forces' that move the economy toward full employment are not invoked as an explanation. The structural axiomatic approach is consistent with the common sense notion of an economic 'law' and with historical specificity.

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