

# **The Purchasing Power Argument – Could Rising Wages Foster Employment?**

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**by**

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## ***Abstract***

*The so-called purchasing power argument of wages (PPA), suggesting that rising wages could increase employment instead of reducing it, is examined within a general theoretical framework. While the demand side is modelled by means of a path-dependent Keynesian model with a Kaldorian saving function, a neoclassical production function is assumed on the supply side. It is shown that there is a core of truth in the PPA, if real wages are lower than marginal productivity of labour. While a temporary demand shock could indeed be overcome by rising wages, it is not possible, however, to outweigh a permanent slump in total demand by that way. Moreover, in contrast to conventional fiscal policy, wage rises according to the PPA imply both a rising price level and the danger of neoclassical unemployment. In an open economy, the relevance of the PPA is generally further reduced.*

## 1. Introduction

The so-called purchasing power argument of wages (PPA) suggests that a rise in wages could increase employment through raising total demand. While this argument is frequently used by unions and left-wing politicians, it is regularly either ignored or summarily dismissed by economists. Ludwig von Mises (1958, ), for instance, called it the purchasing power *fable*, and Gustav Cassel (1935, p. 66) spoke of “charlatan teachings”. Only recently, Hans-Werner Sinn (2007) rejected the PPA as “incorrect even for logical reasons: A wage increase is identical to a profit decrease, and to the same extent to which wage increases boost the purchasing power of the employees, they lower those of the employers. The existing purchasing power is simply distributed in a different way.”

Surprisingly, however, attempts to subject the PPA to a rigorous theoretical analysis are rare. This is particularly surprising, as the argument has a long tradition, tracing back to the works of Marschak (1927), Lerner (1951) and Kalecki (1971). Nowadays, proponents of the PPA frequently refer to Keynes (1936), although no such proposition can be found in *The General Theory*.<sup>1</sup> The post-war Keynesian literature on the subject provided either mere descriptive arguments or incomplete analytical frameworks, e.g. ignoring the supply side and price reactions (e.g. Malinvaud 1977).

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<sup>1</sup> In Chapter 19 Keynes (1936, p. 262) actually warns that “the transfer from wage earners to other factors...is likely to diminish the marginal propensity to consume”. “Nowhere, however, does Keynes support the proposition that *rising* wages may lead to higher employment.” (Jerger/Michaelis, 2003, p. 437). Rather, he praised the unions for resisting nominal wage reductions, but nevertheless accepting reductions in real wages by way of a rising price level (Keynes, 1936, p.14). As we will see later, the theoretical analysis indeed suggests an asymmetric assessment of rising compared to declining wages in a Keynesian depression. The same is true for nominal wage cuts, as compared to declining wage rates due to rising prices, as the former use to happen in a depression, whereas the latter occur regularly within a prospering economy.

Much of the literature on the PPA is in German.<sup>2</sup> This might have to do with the traditionally prominent role of unions in Germany and also with its specific historical experience of wage deflating policy in the Great Depression of the 1930s.<sup>3</sup> Most of these contributions are descriptive, or at best, provide rather heuristic theoretical or empirical arguments. Hence, unsurprisingly, particularly if one takes the language boundary into account, these contributions rarely entered the international debate. Most Anglo Saxon standard works on labour market theory, such as Layard et al. (1991), do not even mention the PPA, and there are few articles on the subject in international economic journals. As an exception, Pagano (1990) is occasionally cited, although he does not really deal with the purchasing power argument, but develops a spatial OLG-model exhibiting multiple equilibria, where a higher wage may be linked with higher employment. Dunlop (1938, pp 423) refers repeatedly to the PPA, quoting, for instance, an employer who argues according to the PPA as early as 1739. Yet, in Dunlop's contribution, no deeper discussion of the argument can be found.

Only recently, some more sophisticated theoretical articles on the subject have been published. Rohwedder/Herberg (1984) provide a model with a Kaldorian saving function and an IS-LM-framework on the demand side, while on the supply side, they use a production function which allows for either a decreasing or an increasing marginal productivity of labour. They do not find an unequivocal answer, but make several qualifications concerning the validity of the PPA. According to their results, a nominal wage increase is more likely to raise employment (i) the weaker the induced price increase, (ii) the more the workers' (and pensioners') saving rates exceed the saving rate of capital holders, and (iii) the larger the concomitant money supply increase (Rohwedder/Herberg 1984, pp 594). Their ultimate

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<sup>2</sup> Amongst many others, there are several contributions by the German Council of Economic Advisors, mostly rejecting the PPA. For a brief overview, see e.g. Rohwedder/Herberg (1984, p. 586).

<sup>3</sup> There was also a discussion on the PPA in the USA following the Great Depression, dealing with the consequences of the then National Recovery Administration and the Fair Labor Standards Act. For a brief overview, see, for example, Sargent (1939, pp 423).

conclusion remains somewhat vague, stating that “anyone using the Purchasing Power Argument to propose a nominal wage increase during a recession ought to take into account the current attitude of the monetary authorities” (p. 597).

Gros and Hefeker (1999) use a similar model, but assume equality of the real wage rate and the marginal productivity of labour.<sup>4</sup> According to their study, the validity of the PPA necessarily requires (i) a workers saving rate which exceeds that of the owners of capital, and (ii) a special - rather curious – relationship between the elasticity of labour demand and the price level (Gros/Hefeker, 1984, p. 22). They do not find an economically interpretable and sufficient condition for the PPA to apply.

Jerger/Michaelis (2003) use a similar, but much more sophisticated model, applying a micro-grounded Kaldorian saving function. On the supply side, they use a CES-function, allowing for different degrees of price stickiness and also for different degrees of capital stock flexibility. They conclude that the PPA is the more likely to apply (i) the less flexible the prices, (ii) the shorter the relevant period and therefore the less flexible the capital stock, and (iii) the more the workers saving rate exceeds the saving rate of the capital owners. However, they cannot generally rule out the possibility that the PPA may also be valid with both completely flexible prices and capital stock. Lastly, they refute the PPA-argument on the grounds of empirical implausibility of the specified conditions (Jerger/Michaelis 2003, p. 454).

Krüger (2004) also rejects the KKPT within the common Keynes-Kaldor framework, which he examined very precisely in his masters dissertation by using both static and dynamic analysis. However, he provides a rather original argument in favour of the PPA within an

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<sup>4</sup> We show below that, with this assumption, the PPA immediately collapses, irrespective of whatever assumptions on the demand side are made.

OLG-context, where the older generation holds the bulk of the capital stock, but has a lower saving rate than the younger generation. Hence, if a wage hike were to benefit younger more than older workers, the average saving ratio would rise and thereby promote both growth and employment. However, apart from the very special assumptions necessary for this model to work, the argument is not really a specification of the PPA, because a supply-side effect and not a demand-side one drives output and employment. In the short term, total consumption is even reduced instead of being boosted, due to the rising rather than declining savings rate.

### **1. A Simple Neoclassical Synthesis Model**

In the sequel we assume a neoclassical production function  $Y(N)$  with diminishing marginal product of labour and, hence, a downward sloping labour demand curve. Hence, if real wages  $W/P$  equal the marginal product of labour  $dY/dN$ , a rise in real wages definitely cannot result in increasing employment  $N$ , irrespective of any effect on total demand  $Y$ . With a given labour demand curve, the result could rather be a rise in both nominal income and the price level  $P$ .

Yet the equality of real wages and marginal labour productivity is questioned by the proponents of the PPA. For in a Keynesian unemployment equilibrium, total commodity demand is rationed by definition. Therefore, recruiting stops before its neoclassical

equilibrium and hence  $dY/dN > W/P$ . Therefore, a rise in wages might, on the one hand, raise total demand and, on the other hand, do no - or minimal - harm on the supply side, finally resulting in rising employment.<sup>5</sup>

For a closer examination of this argument we employ a simple Keynesian model, where  $G$  denotes autonomous demand (including autonomous investment) and  $Q = WN/(YP)$  denotes the wage ratio. Following the literature cited above, we adopt a Kaldorian saving function, such that

$$(1) \ Y = \frac{G}{S_w Q + S_\pi (1 - Q)} \quad 0 \leq S_w \leq S_\pi \leq 1$$

where  $S_w$  and  $S_\pi$  denote the saving rates from labour income and capital income respectively.

In contrast to conventional Keynesian models, we assume that autonomous investment is divided in two parts, namely investment  $I_b$ , providing for basic consumption, and investment  $I_h$ , providing for high quality consumption. On the assumption that, in a recession, luxury consumption is omitted first,  $I_h$  is relevant only if total demand exceeds a critical level  $Y_c$ . From that accrues a path-dependency of the model, resulting in two different equilibrium levels of both  $G$  and  $Y$ : If total demand happens to fall short of  $Y_c$  in any period, its equilibrium level drops to  $Y_b$  with  $G = G_b$ . However, yet a one-time rise in any other component of total demand could, in principle, lead to an enduring return to the upper equilibrium  $Y_h$  with  $G = G_h$  in this model. This “jump start”-approach appears to reflect the

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<sup>5</sup> Most of the theoretical literature assumes deviations from marginal cost pricing at the commodity side to create a situation where the PPA could work, see Jerger/Landmann (2003), Rohwedder/Herberg (1984). It appears more convenient and less arbitrary, however, simply to assume that  $\delta Y / \delta N > W / P$ , for whatever reason.

arguments of both the proponents of the PPA and Keynes himself much better than a conventional static multiplier approach.

## 2.1. The True Core of the PPA

In any equilibrium, whether with full employment or not, pure profits must be zero, such that

$$(2) \quad YP = WN + KR$$

with  $K$  denoting the capital stock and  $R$  being the interest rate on debt. In a Keynesian depression,  $KR$  is nearly constant in the short run, because neither interest payments on debt nor the capital stock can immediately be reduced according to the collapsing demand. Hence, we have for  $Y < Y_h$ :

$$(2i) \quad N(W) = \frac{YP(W) - \overline{KR}}{W}$$

where the demand side effect of rising wages - given by the numerator - is c.p. positive, while the cost effect in the denominator is negative. The resulting sign of  $dN/dW$  in this model can be found by setting (1) equal to the production function  $Y(N)$  and solving for  $G$ :

$$(3) \quad G = Y[(S_w - S_\pi)Q + S_\pi] \quad \text{with} \quad Y = Y[N(W)] \quad \text{and} \quad Q = Q[N(W); W; Y; P]$$

By using (2i), we find

$$(4) \quad Q = \frac{WN}{WN + \overline{KR}} \quad \text{with} \quad N = N(W) \quad .$$

After some manipulation of terms, by inserting (4) into (3) we find

$$(5) \quad \frac{\partial N}{\partial W} = \frac{(S_\pi - S_w)N\overline{KR}}{S_w \left( \frac{\partial Y}{\partial N} WNP + W\overline{KR} \right) + S_\pi \left( \frac{\partial Y}{\partial N} * YP^2 - \frac{\partial Y}{\partial N} WNP - W\overline{KR} \right)}$$

With  $0 \leq S_w < S_\pi \leq 1$  both the numerator and the first summand in the denominator of (5) are positive. The same holds true for the second summand in the denominator with our assumptions  $\partial Y / \partial N > W / P$  and  $YP = WN + \overline{KR}$ , because then the second bracket in the denominator can be written as

$$(6) \quad P \left[ \frac{\partial Y}{\partial N} (YP - WN) - \frac{W}{P} \overline{KR} \right] > 0$$

Hence in the Kaldorian case  $S_w < S_\pi$ , with the real wage rate being below the marginal productivity of labour and pure profits being zero,  $dN/dW$  definitely has a positive sign, i.e. the PPA then apparently holds true!

Note that (2i) is also satisfied, i.e. pure profits are still zero. For, because of the constant capital costs, the rise in total wage costs is exactly the same as the rise in total demand.

Indeed, the *real* value of interest payment  $KR/P$  declines, because of the rising price level.

However, that will not regularly affect entrepreneurs, unless interest is automatically linked to

inflation. Moreover, with  $W/P < dY/dN$ , the real interest rate  $R/P$  must have exceeded  $\delta Y / \delta K$  anyway.<sup>6</sup> Therefore, its decline after the wage rise is nothing more than a normalization.

It is often argued by the opponents to the PPA, that only part of the additional wage sum would result in higher commodity demand, another part being saved by the workers.

However, this argument is clearly false. For, without the wage increase, an even greater amount of income would have been saved by the entrepreneurs, because of  $S_w < S_\pi$ . Hence, total output actually rises, and so does total employment.

## 2.2. Limits of the PPA

The necessary assumptions for the PPA to work are that (i) non-consumption demand  $G$  and (ii) rental income  $KR$  are constant, that (iii) the saving rate from wage income is lower than that from interest income and (iv) that real wages are below marginal labour productivity. All of these conditions may certainly be fulfilled in a typical Keynesian depression, at least in the short run. Even then, however, there are definite limits of its power to reduce unemployment. This can be seen by deriving from (2), (3) and (4) the expansion path of  $N$ :

$$(7) \quad N = N(W/P) = \frac{G - S_\pi Y}{(S_w - S_\pi) \frac{W}{P}}$$

Partial derivation of (7) yields

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<sup>6</sup> From (2), it follows that  $\left(\frac{W}{P} - \frac{\delta Y}{\delta N}\right)N = \left(\frac{R}{P} - \frac{\delta Y}{\delta K}\right)K$ , if Euler's theorem  $Y = \frac{\delta Y}{\delta N}N + \frac{\delta Y}{\delta K}K$  is met.

Therefore, it is generally true that  $\frac{R}{P} > \frac{\delta Y}{\delta K}$  if  $\frac{W}{P} < \frac{\delta Y}{\delta N}$  and vice versa.

$$(7i) \frac{\partial N}{\partial (W/P)} = \frac{S_{\pi} Y - G}{S_w \left( \frac{W}{P} \right)^2 + S_{\pi} \left( \frac{\partial Y}{\partial N} \frac{W}{P} - \frac{W^2}{P^2} \right)}$$

which is clearly positive with our assumptions  $\partial Y / \partial N > W / P$  and  $S_{\pi} > S_w$ .<sup>7</sup> Hence (7)

describes an upward sloped curve in figure 1, where the commodity market is in equilibrium and pure profits are zero:

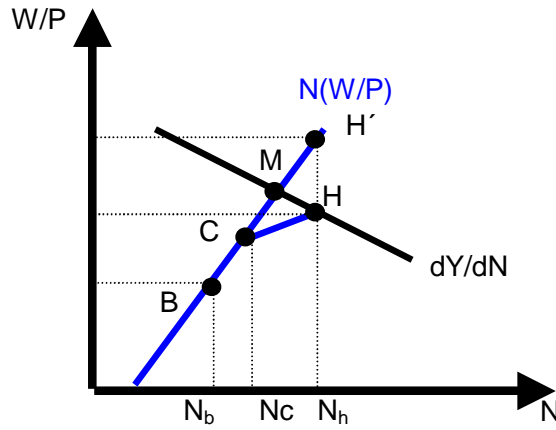


Figure i

Starting from the lower equilibrium point B in figure (i), the unions could indeed foster employment by enforcing higher real wages, thereby moving upwards along the  $N(W/P)$  curve. Whether the full-employment-point H could be reached depends, however, on the nature of the slump: If it is only caused by a mere temporary disturbance, such that total output has happened to fall below its critical level  $Y_c$ , increasing wages could indeed lead back from B via C to full-employment equilibrium H. In case of a more fundamental depression with decreasing autonomous demand  $G_b$  or  $G_h$ , however, rising wages definitely cannot regain full employment. They would rather lead to a medium point like M in figure (i),

<sup>7</sup> From (7), it immediately follows that the numerator of (7i) is positive if  $S_{\pi} > S_w$ .

where the real wage rate equals marginal labour productivity again, but is at the same time above of its full employment level H.

The latter can be proved as follows: Assume that, due to any negative demand shock, former full employment output  $Y_h$  has declined to  $Y_b$ . Suppose that  $G_h = aG_b$  with  $a > 0$ , and that the unions try to outweigh the demand gap by a higher nominal wage  $W_b = bW_h$  with  $b > 0$ , in order to realize  $Y_h$  again. Then it follows from (1) that

$$(li) \ Y_h = \frac{G_h}{(S_w - S_\pi) \left(\frac{W}{P}\right)_h \frac{N_h}{Y_h} + S_\pi} \stackrel{!}{=} \frac{G_b}{(S_w - S_\pi) \left(\frac{W}{P}\right)_b \frac{N_h}{Y_h} + S_\pi}$$

From the zero-profit-condition (2i), it follows that

$$(2ii) \ \left(\frac{W}{P}\right)_b = \left(\frac{W}{P}\right)_h + \frac{\overline{KR}}{NP_h} - \frac{\overline{KR}}{NP_b}$$

Combining (1i) and (2ii) finally yields

$$(8) \ \left(\frac{\overline{KR}}{NP_h} - \frac{\overline{KR}}{NP_b}\right) = \frac{a-1}{a} \left( \frac{S_\pi}{S_\pi - S_w} \frac{Y}{N} - \left(\frac{W}{P}\right)_h \right)$$

With our assumptions  $\delta Y / \delta N > W / P$  and  $S_\pi > S_w$ , equation (8) clearly has a positive sign.

From that and (2ii), it follows that  $Y_h$  could only be realized by a real wage which exceeds the former full employment wage rate as indicated by point H' in the figure. That would mean, however, to replace Keynesian by neoclassical unemployment.

### 2.3. Alternative Options to Fight a Keynesian Slump

Is it really sensible to raise the wage rate in order to foster employment? Regarding the rather narrow conditions for this policy to work, it seems more appropriate to rely on traditional fiscal policy. In contrast to the PPA, the latter would even work in case of a permanent decrease of autonomous demand. Moreover, unlike, the PPA, traditional deficit spending does not imply the danger of inducing neoclassical instead of the original Keynesian unemployment. Hence, in case of doubt, it actually turns out to be the better advice.

On the other hand, according to (5), in a Keynesian depression, a further wage cut would reduce  $N$  even more. This occurs, because the induced fall in aggregate demand  $\Delta YP$  must exceed the induced cost reduction  $\Delta(WP + \overline{KR})$  and hence, without dismissals, pure profits would inevitably become negative.<sup>8</sup>

Could decreasing prices be a substitute of rising nominal wages? After all, it is odd that, in our Keynesian depression model, all wages are below marginal labour productivity and yet no new workers are hired. Surely, the proponents of the PPA would answer that there is simply no need for more personnel, due to the slumped commodity demand. Yet, while this seems a valid argument in the aggregate model, it does not necessarily apply at the microeconomic level. Indeed, with the assumptions made above, the single firm does actually have both a

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<sup>8</sup> The latter can be proved as follows: From (7), it can be seen that pure profits are

$$\Pi = YP - W\bar{N} - \bar{R}\bar{K} = \frac{\bar{G}P + (S_\pi - S_w)\bar{N}W}{S_\pi} - W\bar{N} - \bar{K}\bar{R} \Rightarrow \frac{\partial \Pi}{\partial W} = \frac{\bar{G}}{s_\pi} \frac{\partial P}{\partial W} + \frac{S_\pi - S_w}{S_\pi} \bar{N} - \bar{N}$$

It can also be derived from (7) that  $\frac{\partial P}{\partial W} = \frac{(S_\pi - S_w)\bar{N}}{YS_\pi - \bar{G}}$ , the insertion of which finally yields

$$\frac{\partial \Pi}{\partial W} = \frac{1}{S_\pi} \left[ \frac{\bar{G}(S_\pi - S_w)\bar{N}}{YS_\pi - \bar{G}} - S_w \bar{N} \right]. \text{ Furthermore, it follows from (7), that } YS_\pi > \bar{G} \text{ if } S_\pi > S_w \text{ and vice}$$

versa. From this equation it is possible to derive that the term in squared brackets and hence also  $\partial \Pi / \partial W$  is always positive if  $S_\pi > S_w$ , i.e. a wage *reduction* will also reduce pure profit  $\Pi$ , q.e.d. It can equally be shown that generally,  $\partial P / \partial W > 0$  must hold for  $S_\pi > S_w$ .

strong incentive and the ability to raise its production and also its employment. This is easy to see by deriving the individual profit function with respect to  $N$ , where  $P$  and  $W$  are now held constant, because of the only marginal effect the single producer has on both the price level and the wage level:

$$(9) \quad \Pi = \bar{P}Y - N\bar{W} - \bar{K}\bar{R} \quad \Rightarrow \quad \frac{\partial \Pi}{\partial N} = \bar{P} \frac{\partial Y}{\partial N} - \bar{W} > 0 \quad \text{for} \quad \frac{\bar{W}}{\bar{P}} < \frac{\partial Y}{\partial N}$$

According to the positive sign of  $\partial \Pi / \partial N$ , the individual firm can easily sell all its output by reducing its prices marginally, even with constant total demand. Because this is true for all individual firms, they will all have an incentive to hire new staff and expand their output, until real wages equal marginal productivity of labour. They thereby create themselves the multiplier effects which are necessary to raise total demand and total wages. Therefore, a kind of a Keynesian invisible hand seems to appear in a Keynesian depression which raises employment and production anyway.

Unfortunately, however, that does not help a lot. For in the new equilibrium, where  $W/P = \partial Y / \partial N$  must hold again, pure profits are negative. This follows immediately from deriving (2) with respect to  $P$ , yielding

$$(10) \quad \frac{\partial \Pi}{\partial P} = \frac{\partial N}{\partial P} \left( \frac{\partial Y}{\partial N} P - \bar{W} \right) + Y = Y > 0$$

In other words, while the price level seems to be constant for the single firm, in reality it decreases with rising output, thereby indeed increasing real wages and total demand, but also making pure profits decline. Hence, we are left with a remarkable paradox: While, in a Keynesian depression, nominal wage increases could foster employment and real wage increases without inducing losses for the entrepreneurs, the same rise in real wages and

employment, created by the market mechanism of falling prices, would result in permanent losses and, hence, in an unstable situation.<sup>9</sup>

## 2.4. A Numerical Example

A numerical example might be helpful to understand the dynamics of the model. Suppose an economy with  $S_w = 0.25 < S_\pi = 0.75$ , a capital stock  $\bar{K} = 100$  and a production function  $Y = \sqrt{NK}$ . Assume that  $G_b = 50$ ;  $G_h = 10$  with  $Y_c = 70$ ,  $W = 0.5$  and  $R = 0.5$  in the initial equilibrium point H.<sup>10</sup> Then  $Y_h = N_h = 100$ ,  $P_h = 1$  and – according to (2i) - pure profits are zero.

Now let  $G_b$ , due to any event, drop temporarily from 40 to 20 in the following periods, such that  $Y_c$  is undercut and, hence,  $G_h$  is now zero instead of 10. Accordingly, the economy shrinks to its lower equilibrium point B with  $Y_b = 67.34$  and  $N_b = 45.35$ .

Here it is where the PPW can develop its full merits: A mere rise in nominal wages from 0.5 to 0.6 would be sufficient to push up total demand above  $Y_c$  within a few periods and, hence, make  $G_h$  recover to 10 again.<sup>11</sup> The new equilibrium is then equal to the original point H, apart from a 20% rise in both the nominal wage rate and the price level (see columns i and ii in the table below).

<sup>9</sup> See also the numerical examples in the following section.

<sup>10</sup> Note that  $R$  is constant at 0.5 only if  $dY/dN < W/P$ , but could readily exceed that level if the entrepreneurs are no longer constrained by an insufficient commodity demand; see also the appendix.

<sup>11</sup> For the dynamic modelling in detail see the appendix.

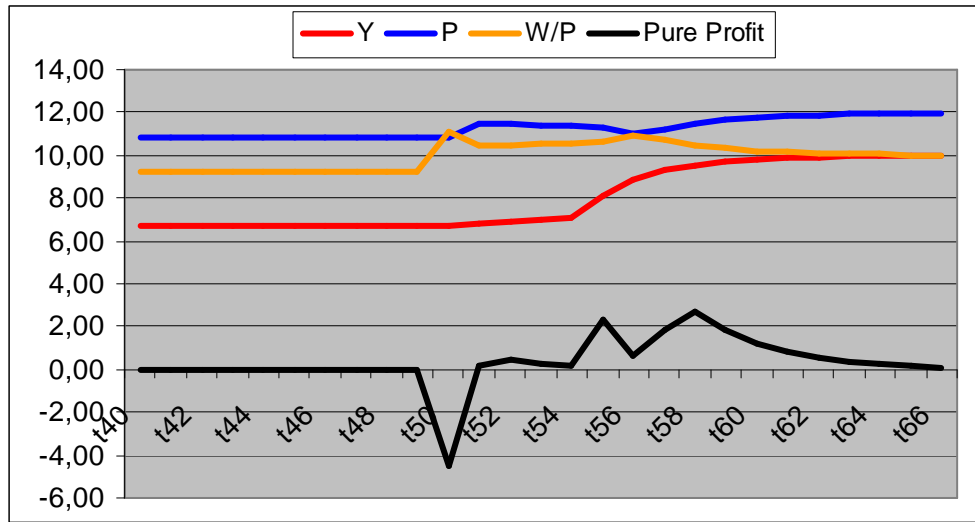


Figure (ii)

Figure (ii) shows the dynamics of the model, with the full employment-levels of  $Y$ ,  $P$  and  $(W/P)$  being normalized to 10 and pure profits being depicted at their absolute value. The wage rise indeed reduces profits at first, but it also increases total demand. Therefore, profits recover and become even positive in the following periods, because of rising prices and an improving degree of capital utilization. Finally, after some cyclical movements, both pure profits and the real wage rate are the same as in the initial equilibrium  $H$ , with full employment  $N_h$  being regained.

	Initial full employment equilibrium (i)	Equilibrium after temporary slump (ii)	Equilibrium (ii) after wage rise (iii)	Equilibrium with per- manent slump (iv)	Equilibrium (iv) after rising nominal wages (v)	Equilibrium (iv) after falling prices (vi)
$G_b$	40.00	40.00	40.00	30.00	30.00	30.00
$G_h$	10.00	0.00	10.00	0.00	0.00	00.00
$W$	0.50	0.50	0.60	0.50	1.39	0.50
$Y$	100.00	67.34	100.00	45.07	60.00	60.00
$N$	100.00	45.35	100.00	20.32	36.00	36.00
$P$	1.00	1.08	1.20	1.33	1.67	0.60
$Q$	0.50	0.31	0.50	0.17	0.50	0.50
$\Pi$	0.00	0.00	0.00	0.00	0.00	-32.00
$dY/dN$	0.50	0.74	0.50	1.11	0.83	0.83
$W/P$	0.50	0.46	0.50	0.37	0.83	0.83

Table: Different Strategies for Raising Employment

As it has already been shown by equation (8), things are different in case of a permanent fall of autonomous demand  $G$  (see columns iv and v of the table). After a permanent fall in autonomous demand from 40 to 30, even a wage rise which makes labour costs equal to their marginal productivity does not lead back to full employment  $Y_h$ . It rather results in a point like M in figure (i), where the real wage exceeds its full employment value and, hence, labour demand is then limited by the supply side rather than by total demand.

The results of falling prices, as an alternative to rising nominal wages, are shown in column (vi) of the table. As was argued above, with a constant nominal wage, a fall in prices would lead to a similar medium equilibrium as point M in figure (i), but creates permanent losses. The same does apply to any combination of both lower nominal wages and lower prices.

## 2.5. The PPA in an open economy

The simple multiplier in (1) applies only in a closed economy, where the additional demand which is generated by rising wages benefits domestic suppliers only. In an open economy, however, the latter would only partly gain from the rising demand but have to face the full rise in costs. While this objection to the PPA is frequently raised verbally, it has never been proved formally.

We introduce exports  $X(P)$  and imports  $M(Y; P)$  into our model from section 2.2., still assuming that the real wage rate is lower than marginal labour productivity. Expanding the left-hand side of (3) by  $(X - M)$  and differentiating with respect to  $W$  yields:

$$(3i)(S_w - S_\pi) \left[ \frac{\partial Y}{\partial N} \frac{\partial N}{\partial W} Q + \frac{\partial Q}{\partial W} Y \right] + S_\pi \frac{\partial Y}{\partial N} \frac{\partial N}{\partial W} + \frac{dM(Y; P)}{dW} - \frac{\partial X(P)}{\partial W}$$

with

$$\frac{\partial Q}{\partial W} = \frac{\left( N + W \frac{\partial N}{\partial W} \right) \overline{KR}}{(YP)^2}$$

$$\frac{dM}{dW} = \frac{\partial M}{\partial Y} \frac{\partial Y}{\partial N} \frac{dN}{dW} + \frac{\partial M}{\partial P} \frac{N + \frac{dN}{dW} \left( W - \frac{\partial Y}{\partial N} P \right)}{Y}$$

$$\frac{\partial X}{\partial W} = \frac{\partial X}{\partial P} \frac{N + \frac{dN}{dW} \left( W - \frac{\partial Y}{\partial N} P \right)}{Y}$$

By using (4) we finally find

$$(5i) \quad \frac{dN}{dW} = \frac{(S_\pi - S_w) \overline{KR} + \left( \underset{(-)}{XE_{X;P}} - \underset{(+)}{ME_{M;P}} \right) NP}{(S_w - S_\pi) \left( \frac{\partial Y}{\partial N} WNP + W \overline{KR} \right) + S_\pi \frac{\partial Y}{\partial N} * YP^2 + M \underset{(+)}{E_{M;Y}} \frac{\partial Y}{\partial N} P^2 - \left( \underset{(-)}{XE_{X;P}} - \underset{(+)}{ME_{M;P}} \right) \left( W - \frac{\partial Y}{\partial N} P \right) P^2}$$

where the  $E_{i;j}$  denote the elasticities of exports and imports with respect to P and Y.

Other things being equal, the numerator in (5i) is clearly smaller than in the closed-economy case. Hence it seems, in perfect accordance with economic intuition, that  $dN/dW$  is the more reduced the greater total exports and total imports are, and the greater are the respective (absolute) elasticities  $E_{X;P}$  and  $E_{M;P}$ .

However, the change in value of the denominator in (5i) is ambiguous. While it is raised by the first additional summand in comparison with (5), it is diminished by the second one,

because of our assumption  $W/P < \delta Y / \delta N$ . Therefore, the PPA could principally even work in an open economy, although one has to make rather extreme assumptions for that to apply.

The following example shows why this is the case. Assume that initially  $S_w = S_\pi = 0.1$ ,

$\bar{K} = 100$ ,  $Y = \sqrt{NK}$ ,  $\bar{G}_0 = 1$ ;  $W_0 = 0.2$  and  $\bar{R} = 0.5$ . For simplicity, we assume that

$M_0 = 0$  and  $\delta M / \delta Y = \delta M / \delta P = 0$ . The export-function is assumed to be

$$(11) \quad X = \bar{X}p^{-\beta} \quad \beta > 0$$

with  $\bar{X} = 4.64$  and  $\beta = 1.80$ . Then it can be calculated by numerical methods that  $X_0 = 4.60$ ,  $N_0 = 31.36$ ,  $Y_0 = 56.00$ ,  $P_0 = 1.00$  and  $\delta Y / \delta N = 0.89 > W/P = 0.20$  (all values rounded to two decimal places). Equation (2i) is met, i.e. there are neither pure profits nor losses. From (5i) it then follows that  $\delta N / \delta W = 346.95$ , i.e. the PPA appears to work. If, for example, the nominal wage rate rises to  $W_1 = 0.21$  in period  $t_1$ , total employment, real income, and the real wage rate all increase to  $N_1 = 35.96$ ,  $Y_1 = 59.97$ , and  $(W/P)_1 = 0.22$  respectively, while profits are still zero.<sup>12</sup>

Note that there is no Kaldorian effect in this example because of our assumption  $S_w = S_\pi$ , and yet the PPA seems to work. This applies because in period  $t_1$  the price level  $P_1 = 0.96$  is lower than it is in period  $t_0$ . This leads to a higher demand from abroad, which in turn allows for raising output and employment without reducing total profits. One has to ask, however, why

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<sup>12</sup> Generally, with  $S_w = S_\pi$  and  $E_{M;P} = E_{M;Y} = 0$ , the denominator in (5i) is negative and, hence,  $\delta N / \delta W > 0$ , if the following condition is met:

$$\frac{G}{M - X} < 1 + E_{X;P} \left( 1 - \frac{W/P}{\delta Y / \delta N} \right)$$

It is really hard, however, to find realistic numerical examples for this condition to apply.

the entrepreneurs should wait with the price cuts until nominal wages are raised by the unions. Hence, the dynamics behind condition (5i) are more convincingly interpreted just the other way round: With a high share of exports in total demand, a national depression could eventually be overcome by cutting national prices and thereby making it possible that not only total output and employment, but also the real wage rate rises as a result of the rising exports. Therefore, the power of the PPA is certainly reduced substantially in an open economy.

### **3. Conclusion**

In recent times, the PPA has been subject to several theoretical analyses, which have provided an array of different - and sometimes peculiar - conditions for the argument to hold. While it is unanimously regarded as necessary that the saving rate of workers must be lower than that of capital owners, the outcomes relating to sufficient conditions for the PPA have turned out to be either vague or barely interpretable in an economic sense. However, as was shown above, much of the cumbersome case differentiation in that literature could have been avoided. In particular, while the PPA is definitely invalid if the wage rate is equal to or even above marginal productivity of labour, it could work in principle if wages are below marginal productivity. However, simple deficit spending by the government appears to be a far better approach due to its lower or at least delayed cost effect. Indeed Keynes, to whom the proponents of the PPA frequently but erroneously refer, saw it this way. It has also been a result of our model, that neither a deflation policy is appropriate to cope with a Keynesian slump, nor does the market mechanism automatically lead back to full employment.

The PPA becomes much less powerful in an open economy, because the demand effect of a wage increase then spreads among several countries, while the cost effect only impacts on

one. While it cannot be ruled out generally, that the PPA might even work in an open economy, the conditions for that to apply turned out to be extreme and far away from reality.

Apart from the qualifications which have already been made above – in particular the closed economy assumption – some more and quite fundamental objections can be raised against our analysis. In general, one has to be very cautious with pure macroeconomic analysis that is based largely on national account identities and aggregate functions for production and saving decisions. Moreover, our analysis has been mainly static. In particular, the assumption of an “autonomous” investment demand appears highly questionable, at least in the long run. A more detailed dynamic analysis would at least have to take repercussions from pure profits on investment into account. Moreover, the role of expectations of both consumers and entrepreneurs should be a central element of a more sophisticated model. A correspondingly extended analysis is, however, beyond the scope of this paper.

## Appendix

The dynamic model underlying figure (ii) in section 2.4. is based on the following lag-structure (with variables without a time-index denoting period t):

$$(A1) \ Y_s = \sqrt{N\bar{K}}$$

$$(A2) \ Y_d = G + C(Y) = G_b + G_h + \frac{W_{t-1}N_{t-1}(1-S_w) + (\bar{K}R_{t-1} + \Pi_{t-1})(1-S_\pi)}{P}$$

$$(A3) \ N = \min \begin{cases} Y_d^2 / K \\ 0.25(P/W)^2 K \end{cases}$$

$$(A4) \ R = \max \begin{cases} \bar{R} \\ (Y_{t-1}P_{t-1} - W_{t-1}N_{t-1}) / \bar{K} \end{cases}$$

While (A1) is simply the production function, (A2) denotes total real demand, where autonomous demand  $G$  is defined in real terms and real consumption depends on nominal incomes of the proceeding period and the current price level. According to (A3), labour demand is either derived from marginal productivity (see the lower term) or from the restricted commodity demand (see the upper term). (A4) implies that  $R$  tends to normalize pure profits to zero unless it undercuts its lower limit.

If  $dY/dN = W/P$ , the equilibrium price level for  $Y_d = Y_s$  can be calculated from (A1), (A2) and the lower term in (A3) as

$$(A5) P = \frac{(G_b + G_h)W}{K} \pm \sqrt{\left(\frac{(G_b + G_h)W}{K}\right)^2 + \frac{W_{t-1}N_{t-1}(1-S_w) + (\bar{K}R_{t-1} + \Pi_{t-1})(1-S_\pi)}{0.5K/W}}$$

If  $dY/dN > W/P$ , it is assumed that the entrepreneurs seek to realize zero profits, i.e. they set the prices such as to satisfy

$$(A5i) \ P = \frac{W_{t-1}N_{t-1} + \bar{K}R_{t-1}}{Y_{t-1}}$$

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