Adam Smith and Malthus on high wages

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1. Introduction

Adam Smith, Malthus and other ‘classical’ political economists may be conceived to have constructed much of their analysis in terms of a common macrodynamic model of a closed, agricultural economy: Samuelson’s (1978) ‘Canonical Classical Model’. The historiographic benefit of using a common model is that one may explain analytical differences among authors in terms of their differing assumptions about the range of its parameters. It is my purpose in this article to employ a modified version of Samuelson’s model to show how Smith’s recipe for high wages (the accumulation of capital) rested on the eighteenth-century assumption that only masters initiated and that ‘labourers and servants’ responded passively, merely biologically; whereas Malthus’s recipe (delayed marriage) was based on the new, nineteenth-century assumption that the lower orders were capable of assuming control over their own destiny. Delayed marriage implies a higher target zero-population-growth (ZPG) wage, $s$. When the parameter $s$ is allowed to vary and the accumulation parameter, the degree of parsimony, $\pi$, is assumed constant, Smith’s recipe is turned on its head. Now it is high accumulation that produces low wages, and vice versa. These results are illustrated.

2. The issue

Adam Smith favoured a regime of high wages for three reasons. It improves social welfare (‘No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable’; WN, I:...
Justice requires it (‘It is but equity . . . that those who feed, cloath and lodge the whole body of the people should . . . be themselves tolerably well fed, cloathed and lodged’; WN, I: viii.36). And it raises labour productivity (‘The liberal reward of labour, as it encourages the propagation, so it increases the industry of the common people’; WN, I: viii.44; see also WN, I: viii.57). Robert Malthus agreed up to a point, especially with the first two reasons. ‘There is no one that more ardently desires to see a real advance in the price of labour than myself’ (Malthus 1989a [1803], I: 355). But he was more cautious about the putative benefits of ‘propagation’. For high wages can produce ‘two very different results’: either ‘a rapid increase of population’ with no advance in living standards, or ‘a decided improvement in the modes of subsistence, and the conveniences and comforts enjoyed, without a proportionate acceleration in the rate of increase’ (Malthus 1989b [1820], I: 250). Which of the two possible results would come about depended upon ‘the Habits of the Labouring Classes’ (Malthus 1989b [1820], I: 247). And if the latter produced the first of these outcomes, then the ‘propagation’ that Smith identified (see also WN, I: viii.42) would defeat his objectives of improved social welfare and distributive justice. It will also appear that Malthus and his contemporaries and successors were cautious about the positive effect of accumulation on the productivity of labour.

Smith’s prescription for high wages was a sustained accumulation of capital (WN, I: viii.21, 22, 27, 40, 43 and 52). Here again Malthus agreed, but only up to a point. The price of labour will indeed be at, above or below the ‘subsistence’ (i.e. stationary-population or ZPG) real wage ‘according to the state of the real funds for the maintenance of labour, whether stationary, progressive or retrograde’ (Malthus 1989a [1803], I: 356). But there are two important qualifications.

In the first place, as noted above, the ZPG wage will depend upon the habits of the labouring classes. If these change so as to determine a higher actual and prospective family real income at a stationary population, and if this be realized – for example, through a voluntary delay of marriage and (therefore) procreation – then wages will be higher at any equilibrium rate of accumulation including the stationary state. Smith’s prescription is not a necessary condition of high wages.

1 WN stands for Smith (1976 [1776]). Exact photographic reproduction of the foregoing in Liberty Classics (Indianapolis: Liberty Fund, 1981). All references to this source list book number, chapter number and paragraph number.

2 It seems clear that Smith himself believed that accumulation was necessary for high wages. ‘The demand for those who live by wages . . . necessarily increases with the increase in the revenue and stock of every country, and cannot possibly increase
In the second place, if we abstract from any change in the habits of the labouring classes and from any induced changes in labour productivity, sustained accumulation may be checked and eventually defeated by falling marginal product when land is scarce. And:

when the capital of a country comes to a stop from the continued progress of accumulation and the exhaustion of the cultivable land, both the profits of stock and the wages of labour must have been gradually diminishing for a long period. (Malthus 1989a [1803], II: 45; emphasis added; see also Malthus 1989b [1820], I: 298–9)

In the absence of induced gains in productivity or of exogenous technical progress, attempted accumulation in face of land scarcity eventually defeats itself and brings wages down to the ZPG (and stationary-state) level. Therefore Smith’s prescription is not a sufficient condition\(^3\) of high wages.

These two fundamental qualifications belong to the Lakatosian ‘hard core’ of the new ‘classical political economy’ that the English School (Waterman 2008) assembled from tidied-up (sometimes too tidied-up) bits and pieces of Wealth of Nations. For although the Whiggish ‘followers of Dr Smith’ (Edinburgh Review October 1837: 77) believed they owed much ‘at present [1803] to the superstitious worship of Smith’s name’ and were ‘reluctant to expose Smith’s errors before his work has operated to its full effect’ (Horner 1843, I: 229), they were in no doubt that those errors had to be corrected if the new science was to advance. Malthus regarded himself as Smith’s most faithful disciple and most authoritative interpreter (see James 1979: 245–9). He had first encountered Wealth of Nations in 1782 as a 16-year-old schoolboy at Warrington Academy (Pullen and Parry 1997, 2004; see Waterman 2006); and in his last months at Cambridge, when he was supposed to be preparing for diaconal ordination, he signed the book out of his

without it’. ‘It is not the greatness of national wealth, but its continual increase which occasions a rise in the wages of labour’ (WN, I: viii.21 and 22).

3 Smith considers such factors as increasing returns to scale (IRS) important in contributing to the wealth of nations and high wages; also increasing capital intensity, induced improvements in the quality of labour and induced technical progress. But none of these things can take place unless the economy is already growing. In a stationary economy no new economies of scale are being realized because scale is unchanged; there is no increase in capital intensity because the degree of parsimony is merely sufficient to maintain the status quo; no induced improvement in labour quality or production techniques because wages are at subsistence, and no prospect of a growth in demand that might make innovation profitable. (Exogenous technical progress is another matter, but Smith says very little about this in WN.) In other words, for Smith the rate of growth of ‘the funds which are destined for the payment of wages’ (WN, I: viii.18) is alone sufficient to explain why wages are high when the economy is growing, and vice versa.
college library along with the usual works of Anglican divinity (Waterman 1991: 90). Yet each of these qualifications, which together were to change the course of economic thinking for nearly a century, appears in his first work, the *Essay on Population* (Malthus 1798). The first underlies the movement for Poor Law reform, and the prolonged campaign by Malthus, Thomas Chalmers, J.B. Sumner, Harriet Martineau and others for ‘moral and religious education’ of the lower orders. The second, stated more completely and more rigorously by Malthus (1815), Sir Edward West (1815), David Ricardo (1815) and Robert Torrens (1815) 17 years later, became the finger-print – or DNA test – of what Paul Samuelson (1978) has aptly christened ‘the canonical classical model of political economy’. Although Malthus later parted company with other members of the English School on some important analytical matters, in these two he was the first to identify the issue and was generally followed by his successors.

In what follows I shall first outline a simple common model of accumulation and wage determination, previously developed in full in another paper (Waterman 2009), and use it to explicate Smith’s well-known doctrine of the ‘natural wage’. The two following sections deploy the model to analyse Malthus’s qualifications and some of the implications of these. A final section contains concluding remarks.

3. A simple common model: capital accumulation and wage determination

There is much more in Smith (and Malthus) on wage determination than the macrodynamics of *WN* (I: viii; II: iii). Such matters as bargaining power, the positive effect of wages on productivity, and the relation of these to the division of labour are important, although unintegrated, features of Smith’s grand narrative. I abstract ruthlessly from all these complications at first. They are not to be found in those passages of *WN* that I wish to model, and they were not matters over which Malthus and Smith disagreed. After the principal results are established, I consider how far the story might be modified by allowing the increasing returns to scale (IRS) consequent upon the division of labour.

In any production period, in Adam Smith’s eighteenth-century economy, a certain proportion of the total work force is capable of producing exactly the same output as in the preceding period. If this proportion is employed in the production of goods that can be used as inputs into next period’s production (and if productivity remains unchanged), the economy will neither grow nor decline. If a larger proportion is employed ‘productively’,
the economy will grow; and vice versa. The actual proportion employed ‘productively’ in this way depends upon the ‘parsimony’ of masters, who are assumed to own the whole of last period’s output, and who must decide what proportion to spend in the current period on ‘productive’ employment and what proportion on ‘unproductive’ employment – in personal services, consumer goods, religion, education, government and national defence. Let the degree of parsimony, understood as the fraction of their income that masters decide to spend on productive employment, be \( \pi \) where \( 0 \leq \pi \leq 1 \). Suppose that output of a single, homogeneous subsistence good (‘foodstuff’) be \( F_t \) in period \( t \). Let the capital stock in period \( t \) (i.e. ‘funds destined for the maintenance of productive labour’; WN, II: iii.11), consisting wholly of circulating capital measured in units of ‘foodstuff’, be \( K_t \). Then:

\[
K_t = \pi F_{t-1}
\]

(1)

It is this lag between the last period’s production and the current period’s circulating capital (which determines current production) that imparts an inescapably dynamic character to all Smithian and classical macroeconomics. Suppose production in the current period is:

\[
F_t = a N^p_t,
\]

(2)

where \( a \) is a technical parameter and \( N^p \) is the population of productive workers, fully employed at all times. Note that \( a \) the average product of labour in \( F \)-goods production, may itself be a function of other variables such as \( N \), the total population as we shall later see. If \( w \) is the real wage-rate measured in units of ‘foodstuff’, then the employment of productive workers in period \( t \) made possible by \( K_t \) is:

\[
N^p_t = \frac{K_t}{w_t}.
\]

(3)

When \( (K_t – K_{t-1})/K_{t-1} \) is regarded as a satisfactory approximation to the logarithmic (or proportionate) continuous growth-rate \( d/dt(\ln K) \equiv gK \), it appears from Equations (1), (2) and (3) that the rate of accumulation is a decreasing function of the real wage:

\[
gK = a\pi/w - 1,
\]

(4)

which is identical (save as to notation) to the growth-rate equation of circulating capital proposed by Walter Eltis (2000: 94, equation 3.9). It is obvious from Equation (4) that an increase in parsimony \( \text{ceteris paribus} \) will increase the rate of accumulation, and vice versa, and that when \( \pi = w/a \) the
economy will be stationary. Equations (1)–(4) summarize what with hindsight we may now identify as the macrodynamic analysis in WN (II: iii.1–18). It is apparent from his *Principles* (chapter I, section ii, and chapter VII, especially section iii; Malthus 1989b [1820], I: 29–50 and 351–6) that Malthus fully understood and accepted Smith’s conception of accumulation as driven by parsimony.

Stating what seems to have been commonplace in eighteenth-century economic thought, Smith postulated that ‘every species of animals naturally multiplies in proportion to the means of their subsistence’. Where there is little or no natural scarcity, as in ‘the British colonies of North America’, populations of the human species are found to ‘double in twenty or twenty-five years’ (WN, I: viii.39, 23; see also I: xi.b.1). This is evidently the source of Malthus’s (1798: 21) geometrical ratio of unconstrained population growth:

\[ gN = mw/s, \tag{5} \]

where \( N \) now stands for total population, assumed to be equal to (‘productive’ + ‘unproductive’) work force, \( m > 0 \) is the speed of adjustment of population to excess subsistence, and \( s > 0 \) is the ZPG wage rate, which may be merely biological but which may be culturally determined in human populations.

Because Smith (WN, II: iii.18) assumed that the portion of masters’ incomes not spent on productive employment is spent without remainder on unproductive employment, then \( \pi = N^p/N \) and therefore \( gN^p = gN \) for any given degree of parsimony. Hence Equations (4) and (5) afford simultaneous solutions for the steady-state rate of balanced growth, \( g^* = gK = gN \), and the equilibrium wage rate, \( w^* \). Because Equation (4) is a rectangular hyperbola, there will be two solutions for each variable corresponding to the quadratic form of the equations for \( g^* \) and \( w^* \). Steady state is dynamically stable, since when \( gK > gN \), \( w \) will rise as demand for labour exceeds supply, so reducing \( gK \) and increasing \( gN \), and vice versa.

[See Waterman (2009), which provides a complete account of the mathematical properties of this model; which analyses the effects of all parametric changes; which generalizes it to include fixed capital; and which relates it to previous Smithian growth models of Barkai (1969), Eltis (2000), Hollander (1984), Negishi (1989) and Samuelson (1977, 1978).] Equations (4) and (5) constitute a common model that sets out the analytical framework within which both Smith and Malthus conceived the relation between accumulation and wages, and which enables us to identify differences in their interpretation of that model in terms of the variously assumed ranges and possible shifts of its parameters \( z, \pi, s, \) and \( m \).
We may rewrite Equation (4) with \( w \) as a function of \( gK \) on the LHS to obtain Equation (6), and rewrite Equation (5) with \( w \) as a function of \( gN \) on the LHS to obtain Equation (7):

\[
w(gK) = \frac{\alpha \pi}{1 + gK}
\]

and

\[
w(gN) = s + \frac{gN}{m}.
\]

When Equations (6) and (7) are graphed in \( gw \) space – and when the economically irrelevant, third-quadrant branch of the hyperbola is ignored – the vertical intercept of the \( w(gK) \) locus of Equation (6) is \( \alpha \pi \); and the \( w(gN) \) locus of Equation (7) will have a slope of \( 1/m \), a vertical intercept of \( s \) and an horizontal intercept of \( -ms \). The simplest version of such a diagram appears in Hollander (1997: 45, Figure 1.1). Equations (1)–(7) above are its mathematical rationale.

Any negatively-sloped locus of Equation (6) intersects in the first or fourth quadrants with any positively-sloped locus of Equation (7) to determine \( w^* \) and \( g^* \). In Figure 1, three parallel, negatively-sloped \( w(gK) \) loci have been drawn to correspond to three different values of \( \pi \). As line

**Figure 1 Accumulation and Wages: Adam Smith’s View**
segments of the hyperbolae over a narrow range of $g$ (say $\pm 0.05$), they will be approximately linear and are depicted as straight lines. Each intersects with a single, positively-sloped $w(gN)$ locus to illustrate the ‘natural wage’ (dynamic-equilibrium real) in Adam Smith’s ‘progressive’, ‘stationary’ and ‘declining’ states, respectively.

It is evident from Figure 1 that Smith’s analysis of the determination of wages rests upon the assumption that only masters initiate change, and that ‘labourers and servants’ (Smith’s usual labels for productive and unproductive labour, respectively) respond passively, merely biologically, to those changes.

At a high degree of parsimony, $\pi_1 > w^*_1/\alpha$, the $w(gK,\pi_1)$ locus intersects the $w(gN)$ locus in point A, thus determining a positive equilibrium rate of accumulation, $g^*_1$, and an equilibrium wage $w^*_1 > s$. This represents Smith’s ‘chearful and hearty state’ in which, while ‘society is advancing to the further acquisition . . . of riches’ the ‘condition of the labouring poor . . . seems to be the happiest and most comfortable’ (WN, I: viii.43).

When the degree of parsimony just sufficient to reproduce the current rates of output, investment and employment is $\pi_2 = s/\alpha = w^*_2/\alpha$, the $w(gK,\pi_1)$ locus intersects the $w(gN)$ locus on the vertical axis: the economy is stationary and the real wage $w^*_2 = s$ is at the ZPG level. In this ‘dull’ state, the ‘lowest class of labourers . . . notwithstanding their scanty subsistence, must some way or another make shift to continue their race so far as to keep up their usual numbers’ (WN, I: viii.43, 25).

Should the degree of parsimony ever be so low as to result in an absolute decay of capital, that is $\pi_3 < w^*_3/\alpha$, the $w(gK,\pi_3)$ locus intersects the $w(gN)$ locus in point B, thus determining a negative equilibrium rate of accumulation, $g^*_3$, and an equilibrium wage $w^*_3 < s$. In this ‘melancholy’ state:

Every year the demand for servants and labourers would, in all the different classes of employment, be less than it had been the year before . . . The lowest class being not only overstocked with its own workmen, but with the overflowing of all the other classes, the competition for employment would be so great in it, as to reduce the wages of labour to the most miserable and scanty subsistence of the labourer. Many would not be able to find employment even upon these hard term, but would either starve, or be driven to seek a subsistence either by begging, or by the perpetration perhaps of the greatest enormities. Want, famine, and mortality would immediately prevail in that class, and from thence extend themselves to the superior classes, till the number of the inhabitants in the country was reduced to what could easily be maintained by the revenue and stock which remained in it . . . (WN, I: viii.43, 26)

In summary:

The liberal reward of labour . . . as it is the necessary effect, so it is the natural symptom of increasing national wealth. The scanty maintenance of the labouring poor, on the other hand, is the natural symptom that things are at a stand, and their starving condition that things are going fast backwards. (WN, I: viii.27)
It was the analytical basis of this famous judgement that Malthus completely subverted by his ground-breaking attention to ‘the Habits of the Labouring Classes’.

4. Malthus’s first qualification: operation of the ‘prudential check’

Perhaps Dr Adam Smith . . . has not stopped to take notice of those instances, where the wealth of a society may increase (according to his definition of wealth) without having any tendency to increase the comforts of the labouring part of it. (Malthus 1989a [1803], I: 380)

Suppose that the desire of masters to consume a certain proportion of their annual income, and hence the degree of parsimony, remains constant whatever else is happening, and that there is no change in the technical parameter, \( \alpha \). Suppose instead that the ZPG wage varies exogenously. Consider three possibilities: a low \( s_1 < \alpha \pi \); a medium \( s_2 = \alpha \pi = w^*; \) and a high \( s_3 > \alpha \pi \). These possibilities are illustrated in Figure 2.

When \( s = s_1 < \alpha \pi \), the \( w(gN, s_1) \) locus intersects the \( w(gK) \) locus in point C, thus determining a positive equilibrium rate of accumulation, \( g^* \), and a low equilibrium wage rate \( w^* \). When \( s_2 = \alpha \pi \), the \( w(gN, s_2) \) locus intersects the \( w(gK) \) locus on the vertical axis: the economy is stationary and the wage rate

![Figure 2 Accumulation and Wages: Malthus’s View](image-url)
$w^*_2 > w^*_1$. When $s_3 > \pi$, the $w(gN, s_3)$ locus intersects the $w(gK)$ locus in point D, thus determining a negative equilibrium rate of accumulation $g^*_3$, and a high equilibrium wage rate $w^*_3$. [Note that at low levels of $s$, where, in the absence of the preventive check, marriage and procreation will begin at an early age, the speed of population adjustment, $m$, is likely to be high, and vice versa. Thus the slopes of the $w(gN, s_i)$ loci would be steeper the higher $s_p$ and the horizontal intercept $-m s$ would shift to the left. Hence the effect upon $g^*$ and $w^*$ of changes in $s$ would be even greater than shown in Figure 2, which for simplicity has been drawn upon the assumption that $m$ is constant.]

It appears from Figure 2 that when masters maintain a constant degree of parsimony, and respond merely passively to changes in labour supply produced by exogenous changes in ‘the Habits of the Labouring Classes’, the effect of those changes is to turn Smith’s analysis of wage determination upside down. The ‘liberal reward of labour’ is now a consequence of the fact that ‘things are fast going backwards’. And although ‘the scanty maintenance of the labouring poor’ is still ‘the natural symptom that things are at a stand’, a ‘starving condition’ of ‘the labouring poor’ is now a ‘necessary effect’ – if not a ‘natural symptom’ – of ‘increasing national wealth’.

With the possible exception of the passage quoted at the head of this section, there is no textual evidence that the cautious Malthus ever envisaged (or at any rate ever publicly acknowledged) so dramatic a repudiation of ‘Dr Smith’s’ famous doctrine. Yet the outcomes I have analysed are the logical consequence of a strict reversal of Smith’s contingent, class-based behavioural assumptions. And although it is evident that in reality masters continued to make autonomous decisions, the revolutionary idea that the poor, both as individuals and as a class, might also make decisions changed the whole picture. (In terms of the figures, we may imagine both loci capable of shifting autonomously.) For as late as the mid-eighteenth century it was still conventional to conceive of the working poor, almost all of whom outside a few great cities were then ‘peasants’ upon some construal of that term (Waterman 2004: chapter 9), as little different from the animals they tended or destroyed. Cantillon’s well-known dictum exemplifies the perception of their inferiors entertained at that time by the educated elite: ‘Les hommes se multiplient comme des Souris dans une grange, s’il ont le moyen de subsister sans limitation’ (Cantillon 1931 [1755]: 82).

But by the early decades of the new century the world had changed. The American and French Revolutions had come and gone. Industrialization engineered by the omnicompetent ‘bourgeoisie’ was ‘rescuing’ ever-increasing numbers in Western Europe from ‘the idiocy of rural life’ (Marx and Engels 1959 [1848]). Pope Pius VIII had issued a pastoral in 1797 showing that ‘Liberté, Égalité, Fraternité’ was consistent with Christian doctrine (Hales 1960: 106–10). The last Scottish serfs were emancipated in
1799; and slavery was soon to be abolished throughout the British Empire. In Britain the influential, distinctly plebeian voices of William Godwin, Robbie Burns, Tom Paine and William Blake were now joined to those of the aristocratic patrons of radical reform among Foxite Whigs; and the plebeian radicalism of Francis Place, William Cobbett and ‘Orator’ Hunt was dangerously influential among the lower orders. Although Thomas Chalmers was no revolutionist and (after a youthful infatuation with Godwin) had no truck with radicalism of any kind, he truly loved the poor and thoroughly understood the new spirit of the times. ‘The comfort and independence of the working classes’, he declared, ‘are in their own hands’ (Chalmers 1844: 32). Their means for achieving comfort and independence, Chalmers believed, were neither Luddism nor Chartism but deliberate use of the preventive check to population; that is to say, what became ‘moral restraint’ in the second Essay: abstinence from marriage ‘not followed by irregular gratifications’ (Malthus 1989a [1803], I: 18).

Since it was assumed at that time both that procreation follows unchecked after marriage and also that it is insignificant outside marriage, the effect of widespread and successful moral restraint – by reducing the number of offspring per marriage ceteris paribus – would be to reduce the rate of population growth, \( gN \), associated with any given real wage \( w \) and speed of adjustment \( m \). It follows from Equation (5) that:

\[
\frac{\partial s}{\partial gN} = -1/m < 0.
\]

Thus an increase in moral restraint is analytically equivalent, as it is psychologically related, to an increase in the ‘target’ or expected ZPG wage, \( s \), that workers have in mind when they make lifetime plans. We may observe its effect with Figure 2. Suppose the system is initially in dynamic equilibrium at point C, with \( g = g^*_1 \) and \( w = w^*_1 \). Suppose that a widespread adoption of moral restraint now raises \( s \) from \( s_1 \) to \( s_2 \). The \( w(gN, s) \) locus shifts upward, and if there is no change in productivity or parsimony it will intersect the \( w(gK) \) locus on the vertical axis at \( w^*_2 = s_2 = \pi \). The equilibrium real wage rises and the equilibrium rate of accumulation falls. Accumulation is evidently not a necessary condition of high wages.

Malthus, Chalmers, and J.B. Sumner wrote much in the first three decades of the nineteenth century to explain the effect and to encourage the spread of moral restraint among the working poor (Waterman 1991: chapters 4–6; 2004: chapter 9). Their contemporaries of the English School fully accepted the analytical point. Ricardo spoke for all:

The friends of humanity cannot but wish that in all countries the labouring classes should have a taste for comforts and enjoymens, and that they should be stimulated by all legal means in their exertions to procure them. There cannot be a
better security against a superabundant population. (1951 [1817]: 100; emphasis added)

Nine years later however, the youthful J.S Mill got into trouble by advocating the *illegal* means of contraception as a more reliable way of raising $s$. A recent article in this *Journal* (Opocher 2010) has shown that the Malthusian vision of ‘improving’ the poor was alive and well in England down to the time of Alfred Marshall.

Only J.R. McCulloch (1832: 52–72; see Waterman 1991: 237–9) protested in print against Chalmers’s (1832) exaggerated account of the particular importance of ‘moral and religious education’. For if $s$ can become endogenous, as Malthus himself had recognized, a prolonged episode of economic growth with above-ZPG wages could be quite as effective in raising $s$ as all the sermons and pamphlets of middle-class clergymen and their female coadjutors such as Jane Marcet and Harriet Martineau (Huzel 2006). For ‘when the resources of a country are rapidly increasing’ the labourer is able to obtain many ‘conveniences and comforts’, so ‘will acquire a taste for these conveniences, and his habits will be formed accordingly’ (Malthus 1989b [1820], I: 248–9). Assume that masters make no change in their expenditure decisions during such an episode. Then in terms of Figure 1, beginning with dynamic equilibrium at point A and $w = w^*_1 > s$, the $w(gN)$ locus will gradually shift upward as $s$ increases, approaching a new equilibrium on the vertical axis at which $g^* = 0$ and $(w^*_4 > w^*_1) = (s_2 > s) = \pi_1$. To save unnecessary clutter, the new values, $w^*_4$ and $s_2$, are not depicted in Figure 1.

It might seem from this, after all, that Adam Smith’s recipe for high wages gets smuggled back in through the back door of an endogenous $s$. For although accumulation eventually stops as $w^*$ approaches $\pi_1$, wages are even higher than would otherwise have been the case, and the cause is a sustained high level of parsimony. However, this argument is ruled out by Malthus’s second qualification.

5. Malthus’s second qualification: scarce land and diminishing returns

Since we may assume that each productive worker comes equipped with his share of working capital (i.e. his wages for the current production period), we can follow Samuelson (1978) and interpret the technical parameter $z$ as the average product of the joint ‘labor-cum-capital’ variable factor. If capital per head remains constant, which was implicit in Equation (2), then $N^p$ counts not only the number of productive workers employed but also the
number of units of the joint variable factor, hence $F/N^{\phi} = \pi z$; and since $N^{\phi} = \pi N$, output per head of total population is $f = F/N = \pi z$.

It was the central claim of the first Essay on Population (Malthus 1798) that as $N$ rises, $f$ tends to fall. Given the degree of parsimony, this implies that $z$ is not a constant (which must be assumed if Smith’s macrodynamic wage determination is to work as set out in WN, I: viii) but rather is a decreasing function of $N$. The underlying assumption is implied by Malthus’s much derided, little understood, arithmetical ratio (1798: 21).

Malthus postulated that if population (and labour inputs therefore) actually grew geometrically, then food supplies could grow only arithmetically at best, although ‘certainly far beyond the truth’ (Malthus 1798: 22). Malthus illustrated his conjecture numerically in terms of falling average rather than marginal product: if $N$ was to grow as 1, 2, 4, 8 ... over successive 25-year periods, and if $F$ was consequently to grow as 1, 2, 3, 4 ... as increasing population was applied to food production with scarce land, then $f$ would decline as 1, 1, 0.75, 0.5 ... (Malthus 1798: 23–4). The first to formulate a Malthusian production function was Paul Samuelson (1947: 297) and he strictly followed Malthus’s own reasoning:

$$f = \varphi(N), \varphi'(N) < 0. \quad (9)$$

But continuously falling average product implies falling marginal product over at least some part of the range of $N$; and soon after, George Stigler (1952: 190) saw that the ‘ratios’ may be integrated to afford a production function of logarithmic form that exhibits ‘sharply diminishing returns’ over virtually the whole range of $N$:

$$F = L \cdot \ln N^{\phi}, \quad (10)$$

where $L$ is a shift parameter that summarizes the availability and quality of land, and the state of agricultural technique. [Differentiation of Equation (10) with respect to $t$ when $L$ is constant produces the ‘geometrical’ and ‘arithmetical’ time paths of $N(t)$ and $F(t)$, respectively.] It turns out that this is the only mathematical reconstruction that satisfies all three hermeneutical requirements imposed by Malthus’s text (Waterman 1992).

Now all that is strictly necessary in order to model Malthus’s analysis is a twice-differentiable production function that exhibits diminishing returns, such as $F = F(L, N^{\phi})$, $F_1 > 0$, $F_2 > 0$, $F_{22} < 0$. But since the logarithmic function is easily tractable, and since the strong results represented by the inequalities of Equations (12), (15) and (16) could be obtained from such a function, what follows will be derived from Equation (10).
Since $N^\phi = \pi N$, and $a = F_i / N^\phi$ from Equation (2), it follows from Equation (10) that

$$a = L \ln(\pi N) / (\pi N),$$

(11)

and hence that:

$$\partial a / \partial N = L / \pi N^2 [1 - \ln(\pi N)] < 0 \text{ for } \pi N > (e \approx 2.7)$$

(12)

As $N$ increases, that is to say whenever $gN > 0$, then $a$ falls: which implies that the $w(gN)$ locus in Figure 1 shifts downward, and continues to shift so long as $gN$ is positive. Beginning with a transitory equilibrium at position A, for example, in which accumulation is positive and wages high at $w^*_1$, a constant degree of parsimony $\pi_1$ causes the system gravitate to a state of rest at which the $w(gN)$ locus intersects the $w(gK)$ locus on the vertical axis, where $gK = gN = 0$ and $w = w^*_2 = s$, the ZPG level. Wages can only remain high at $w^*_1$ if other causes are operating to offset the effect of falling average product: an autonomous or induced rise in $s$ for example, or factors that by themselves would raise $a$ as $N$ increased. Although $w^*_1$ remains a function of $g^*$ throughout this process, and hence strictly speaking the (falling) natural wage is still determined by the (falling) rate of accumulation, wages cannot be maintained at a high level by the unchanged expenditure decisions of masters alone. In this sense, accumulation is not a sufficient condition of high wages.

Since with the logarithmic production function falling average product means falling marginal product then as $N$ increases, the marginal product of the composite variable factor:

$$\partial F / \partial N^\phi = L / N^\phi$$

(13)

must decline – unless land-reclamation (e.g. the draining of the Fens in East Anglia; Darby 1940) or technical progress in agriculture (e.g. Jethro Tull’s Horse-Hoeing Husbandry, Tull 1731, ‘Turnip’ Townsend’s four-year crop rotation), or both, increase the parameter $L$ correspondingly.

Under competitive conditions the marginal product will be equal to the sum of wages and profits. Hence if capital per head is $w$ and the rate of

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4 In Waterman (1992) it is shown that the logarithmic segment of the production function only appears after that value of $N$ at which land becomes scarce. Up to this point, the graph of the function in $(N, F)$ space is a ray from the origin, hence the anomaly produced by $N < e$ does not arise.
profit $r$, wages are $w$ and profits $rw$ and the total return to owners of the composite factor is:

$$w(1 + r) = L/N^p.$$  (14)

Wages and profits must fall as growth, raising $N^p$, proceeds. How they fall relatively to one another was a matter of dispute at the time. Samuel Hollander (1984; 1997: chapter 10) has provided the definitive account of these disputes, and of the many complications introduced by different measures of the wage-rate that I have ignored in this article by working with only ‘foodstuff’ or ‘corn’ wages. But on one thing, all of Malthus’s contemporaries and successors were agreed: unless there is continual technical progress, capital accumulation drives the economy to a stationary state in which $w=s$, and $r$ is at some minimum value at which investment is merely sufficient to replace capital used up in the previous period (i.e. $\pi=s/\alpha$). Only John Stuart Mill (1909: 749–51) regarded this destiny as at all desirable, and he was only able to do so because of the assumption that a high $s$ would make life tolerable for all.

Since rent of the scarce factor, land, is $R=F-N^p.(\partial F/\partial N^p)$:

$$\frac{\partial R}{\partial N^p} = \frac{L(1+N^p)}{(N^p)^2} > 0;$$  (15)

and since the share of rent in total product is $R/F$, then:

$$\frac{\partial (R/F)}{\partial N^p} = (N^p)^{-2}[L(1+N^p) + RL N^p] > 0. $$  (16)

As wages and profits fall with increasing employment of productive labour and capital but constant land, both rent and the share of rent in total product rise. It is evident from Equations (15) and (16) that any (‘land-augmenting’) technical progress that raises $L$ will increase both the absolute value and the relative share of rent.

These implications of Malthus’s ‘arithmetical ratio’ gradually became apparent to the nascent ‘scientific community’ (O’Brien 2004: chapter 1) between 1798 and 1815, and were canonized in Ricardo’s $Principles$ (1951 [1817]). Together with Malthus’s analysis of the ‘Habits of the Labouring Classes’ that had also been thoroughly assimilated by this date, they sufficed to supersede Adam Smith’s prescription for high wages – parsimony of the

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5 However, Ricardo’s arithmetical tables implied a quadratic production function (Blaug 1997: 115–18), theoretically less satisfactory than the logarithmic function implied by Malthus’s ratios.
masters, by a totally different programme – the embourgeoisement of their labourers and servants.

6. Concluding remarks: some loose ends

Did Adam Smith know all about land scarcity and diminishing returns, and did he allow for these in his account of wage determination? How does Smith’s account of the division of labour, and consequent economies of scale, affect Malthus’s second objection? And what happens to the argument if technical progress becomes endogenous, as Malthus himself recognized that it might?

Paul Samuelson’s (1978) influential account of the ‘canonical classical model’ finds textual evidence in Wealth of Nations of Smith’s awareness of land scarcity and diminishing returns, and interprets Smith’s analysis as fully consistent with that of his successors. His sophisticated and powerful ‘vindication of Adam Smith’ as a theorist (Samuelson 1977) requires a determinate rental cost of production, which he obtains by assuming a stationary state equilibrium – in which the natural wage is simply $s$ (as in Ricardo 1951 [1817]: 93). Hollander (1980) contested Samuelson’s interpretation. Despite occasional sightings of diminishing returns by other eighteenth-century authors – for example, Franklin (1755), Steuart (1767), Turgot (1970), Anderson (1777) – Malthus, West, Ricardo and Torrens believed that the ‘Ricardian rent’ they simultaneously identified in 1815 as a consequence of land scarcity was something quite new. Each was an acute student and critic of Wealth of Nations. None recognized his own theory in that work. The explanation, I believe, is that although there is some textual support for Samuelson’s view as Hollander conceded, diminishing returns are not integrated into Smith’s analysis. For if they were, his macrodynamic account of wage determination would have to be drastically modified in ways that Smith ignored.

There is important collateral support for Hollander’s position in the very different way in which theological commentators regarded the new political economy of the English School in contrast to that of Smith and other eighteenth-century authors. Until about 1803, political economy was seen as wholly compatible with Christian theology: after that date it was perceived by most as diametrically opposed (Waterman 1991: chapters 4 and 5; 2004, chapter 7). Southey’s (1803) hostile review of Malthus’s second Essay inaugurated a ‘bitter argument between economists and human beings’ (Winch 1996: 6; 2009 passim) that persisted into the twentieth century. Malthus and Ricardo, it was believed, had ‘tended to lead the public away from the true path of inquiry’, and to make of political
economy ‘a hideous chain of paradoxes at apparent war with religion and humanity’ (Eclectic Review, January 1832: 9). The early American economist, Henry Carey (1837, III: iv), opposed the ‘harmony’ apparent in Wealth of Nations to the ‘discord’ introduced by Malthus and Ricardo. The ‘harmony’ that was seen to characterize eighteenth-century economic thought, including that of Smith, depended on an implicit assumption of free land. Malthus’s first Essay made land scarcity central, and so began a century-long mutation of ‘political economy’, the optimistic science of wealth, into ‘economics’, the pessimistic science of scarcity.

The generally optimistic view of economic life presented by Smith owes much to his account, in Book I of Wealth of Nations, of ‘the improvement in the productive powers of labour’ to be seen among ‘civilized and thriving nations’ (WN, I: Introduction, 4 and 5). First and foremost among the causes of this improvement are IRS produced by the division of labour (WN, I: i). In terms of the analysis of this article, \( n = n(N) \), \( n' > 0 \). Suppose that in Figure 1 we begin at a transitory position of dynamic equilibrium at A. Since \( gN > 0 \), the vertical intercept \( \pi_1 \) will increase if there is no offsetting decline in parsimony, and the \( w(gN, \pi_1) \) locus will shift upward. Wages and the rate of growth will therefore increase at an ever-accelerating rate. This effect is the formal opposite of that produced by land scarcity and diminishing returns, and even if the latter was in operation could serve to stabilize the economy at point A (if the two effects exactly cancelled out) and so vindicate Smith’s prescription of accumulation as the recipe for high wages. Moreover, any increase in \( s \) would now have a relatively adverse effect upon wages. Suppose that the \( w(gN) \) locus in Figure 1 shifts up to intersect the vertical axis at \( w = \pi_1 \). There would be a once-for-all rise in wages, but no further increase since with accumulation checked there would be no more economies of scale and the \( w(gK, \pi_1) \) locus would remain stationary. When the effect of IRS on \( n \) dominates that of diminishing returns, it might seem that Smith was (vaguely) right after all and Malthus was wrong: accumulation is both necessary and sufficient, not for high wages to be sure, but at any rate for continually rising wages.

However, although Smith was undoubtedly correct in identifying IRS as an important feature of growth, it would appear – as in the case of diminishing returns – that he did not integrate the concept into his analytical framework. It seems clear from WN (I: vii.33) that Smith associated any particular equilibrium rate of accumulation with a stationary ‘natural price’; and there is nothing in the following chapter (WN, I: viii) to suggest that IRS consequent upon accumulation may ever cause accumulation and wages to rise continually. Even more problematic, if IRS was in fact integrated into Smith’s macrodynamics, this would create an anomaly that Smith never contemplated or even hinted at. For if \( gK \) was
negative, the possibility of which Smith explicitly considered (WN, I: viii.26), then the rate of decay would accelerate in exactly the same way as the rate of accumulation would accelerate when $gK > 0$. The stationary state would be dynamically unstable. Slight displacement either way would lead to a cumulative departure from stationarity. There is no trace of any recognition of this anomaly in Wealth of Nations; nor for that matter, is there in the work of any of the modern commentators who have purported to analyse Smith’s growth theory (see Waterman 2009: 54–5). Whether for these reasons or some other, Malthus and his successors tidied up this particular bit of Wealth of Nations after the usual fashion of their housemaids: by sweeping it under the rug. There are a few scattered references to division of labour in Malthus’s Principles (1989b [1820]) but he makes no analytical use of the concept, and in his testimony to the Parliamentary Select Committee on Artizans and Machinery he expressed reservations about the principle (1989b [1820], I: li).

Walter Eltis (2000: 169–70) has argued persuasively that Malthus recognized that technical progress could become endogenous. If this was the case, then a transitory dynamic equilibrium at point A in Figure 1 might produce an increase in $z$ and consequent upward shift of the $w(gK, \pi_1)$ locus exactly as in the case of IRS. Smith is back in business. But Smith himself had no such conception, and Malthus made no analytical use of it. Nor did any of his contemporaries and successors ever suggest that Smith was right after all in his insistence upon the unique importance of accumulation in getting and keeping wages high.

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References


6 IRS was disinterred in the twentieth century by J.A. Hobson (1909), Piero Sraffa (1926) and Allyn Young (1928). It has proved at least as much of an embarrassment to neo-classical microeconomics as it is to any attempt at a rational reconstruction of classical macroeconomics.
Adam Smith and Malthus on high wages


Franklin, Benjamin (1755). *Observations Concerning the Increase of Mankind and the Peopling of Countries*. Pennsylvania.


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Adam Smith and Malthus on high wages


Abstract

For Adam Smith, capital accumulation was necessary and sufficient for high wages. But for Malthus it is not necessary because if workers choose to delay marriage the equilibrium real wage will rise even if the economy will be stationary; it is not sufficient because land scarcity causes wages and profits to fall with accumulation in the absence of technical progress. The first qualification signals a post-Revolutionary recognition that the lower orders have it in their own power to improve their condition. The second qualification is the defining assumption of the new, ‘classical’ political economy of the English School.

Keywords

Adam Smith, Malthus, wages, moral restraint, diminishing returns