PUBLIC FACTORS AND DEMOCRACY IN POVERTY ANALYSIS*

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1. Introduction

In his famous book “Transforming Traditional Agriculture” for which he received the Nobel Prize, T. W. Schultz (1964, esp. 196–197) explains poverty through political opposition to the provision of public factors by large landowners. These public factors—basic education and basic scientific research—are held to be necessary for the formation of human capital. According to this view people are poor because taxes are low. Clearly, if public factors could be provided efficiently under conditions where Lindahl pricing or golden rules with perfect compensation are possible there would be no reason for large landowners to oppose this process even if they can only be provided by the government. Therefore, model theoretic interpretation of Schultz’ explanation of poverty necessitates less idealistic assumptions.

The purposes of this paper is to provide a model that explains poverty—measured in terms of low wages—through tax resistance for which landlords may be an example, though not necessarily just landlords—although Schultz was mainly concerned with agricultural problems. The starting point are the Schultzian assumptions 1) that public factors are necessary for human capital formation and 2) that there is a central role for the government to provide them, because private supply could do this only in an imperfect manner. This paper does not question these assumptions but rather examines its consequences. Recent empirical evidence suggests that public factors in human capital formation is of outstanding importance in successful development strategies (H. Hughes, 1982, p. 233); yet up to now there exists no model which can provide a rationale for that. The line of the argument and the organization of the paper is as follows:

Section II sets out the basic model. Starting from the simplest neoclassical growth model without conventional technical progress—defined such that per capita income would increase even if there were no population growth—human capital is introduced in addition to physical capital and labor; a production function for human capital is added, in which public factors and labor—employed at given individually different labor-augmenting abilities—are necessary factors of production. Public factors by assumption are provided by the government—needless to say, without this assumption the problem posed by Schultz would not exist; as Lindahl taxation is infeasible because the government cannot know individual endowments and abilities, a flat-rate income tax is assumed. The non-rivalrous character

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of public factors produces the outcome that per capita output and real wages will grow at the rate of population growth multiplied by the elasticity of public factors in human capital production and the elasticity of human capital in output production. If population growth were zero and therefore the non-rivalrous character of public factors were not used at an increasing rate, (per capita) output would be constant due to the assumed absence of conventional technical progress. From a more technical point of view the ultimate reason for increasing real wages may be viewed in the increasing returns produced by the non-rivalrous character of public factors. Whereas population growth is a threat to per capita income growth in the neoclassical dual economy model (Jorgenson, 1961) with non-augmentable land, public factors are a phenomenon which alleviates this threat because they are non-rivalrous in character. This may be viewed as a reason why development economists have placed so much emphasis on public goods for decades and still do in population economics today (cp. Kelley, 1988).

So this paper contributes to the literature on growth under increasing returns to scale. Because of the central role played by public factors it is most similar to those papers where increasing returns arise because of externalities. Arrow's "learning by doing" (1962a) and the impossibility of keeping knowledge secret in Romer (1986) belong to this class. But an important distinction has to be made between them, namely that Arrows model exhibits increasing returns but diminishing marginal productivity of accumulated capital and therefore growth stops if population growth becomes zero, as in the model of this paper, whereas in Romer (1986) non-diminishing marginal productivity in cumulated knowledge ensures constant growth even without population growth. An entirely different class without externalities was initiated by Uzawa (1965) who endogenised technical progress in a manner which uses homogeneity of degree one and can be formulated such that all factors can be accumulated. Lucas (1988) has synthesized the contributions by Romer (1986) and Uzawa (1965). Constant growth results that are very similar to those found under non-diminishing marginal productivity due to externalities can be obtained through increased specialisation as formalized by Romer (1987) or in the model of intergenerational technology transfer by Prescott and Boyd (1987) which uses a production function that must be homogeneous of degree one (at least) in knowledge of the old workers, or through Barro's "government factors" (1988) and human capital (1989), both using constant marginal productivity of capital. In Barro's model, government factors are not explicitly non-rivalrous and the decision concerning investment in human capital is very similar to Uzawas specification—except for endogeneity of population growth—because both use a production function for average per capita human capital. Therefore different abilities play no role and no distributional conflict occurs, with the exception of a self-interested government imposed by mere assumption. What is entirely different in the model of this paper is the essential role of public factors which leads to an outstanding
role for economic policy that is different from the internalization problem in
the other papers because a distributional conflict occurs due to different
abilities and endowments of individual households. Obviously, all papers
model different aspects of technical progress. Section III discusses golden
rule taxation for the flat-rate income tax, Lindahl pricing, and the effect on
the level of wages if taxation deviates from these ideal situations under
alternative assumptions on the determination of the tax rate. A conventional
golden rule is derived for the rates of savings and taxation. It is shown that
for an individual with average income and average abilities, the tax burden
under golden rule and Lindahl pricing are equal. A median-voter, defined
as an individual with lower than average income per hour spent in
education, prefers higher than golden rule taxation and an individual with
higher than average income per hour spent in education prefers lower
taxation if compared to the golden rule. Whereas these preferences result
simply from the redistributive effects of the flat-rate income tax, the
consequence of lower taxation is a lower real wage, because the lower level
of public factor provision leads to lower labor demand for educational
purposes, thus increasing labor supply and therewith reducing real wages,
which completes the interpretation of Schultz's theory of poverty. Thus
emphasis in this paper is mainly on level effects of the distributional conflict.
Its impact on the rate of technical progress in the sense of Uzawa (1965) will
be analysed in a different paper.

2. Non-rivalrous common utilization of public factors in human capital
formation as a driving force of growth

To keep matters as simple as possible, the subsequent model uses
Cobb–Douglas functions throughout. One of the best known suggestions of
T. W. Schultz is that production of output $Y$ should not only be viewed as
produced by physical capital $K$ and labor $L_1$. Additionally, we should take
human capital $H$ into account (s. Schultz, 1961). Therefore, the first
essential assumption here is that the representative firm produces one good
under conditions of constant returns to scale:

$$Y = K^a H^b L_1^{1-a-b}$$  \hspace{1cm} (1)

Each individual [$i = 1,\ldots, N$] can spend total endowment of labor services $L_i$
by selling it in the labor market as unskilled labor ($L_1^i$) or using it in human
capital (skilled labor) formation ($L_2^i$):

$$L_1^i + L_2^i = L^i$$  \hspace{1cm} (2)

The $L_i$ are individually different endowments, which can not be observed by
the government.

Equilibrium in the labor market requires that firm demand $L_1$ equals the
sum of labor supplies:

$$L_1 = \sum_{i=1}^{N} L_1^i$$  \hspace{1cm} (8)
Human capital is produced by each individual using labor services $L'$, basic scientific research results $B$, which are public factors and individually different labor-augmenting abilities $e^i$. Abilities cannot be observed by the government. Human capital is completely depreciated each period because—unlike basic scientific research results, which can be inherited in written form—it can not be handed over to the next generation if an individual dies, because $H$ is contained in his brain, and complete depreciation is the simplest way to capture this:

$$H' = (e^i L'_i)^{\varphi} B^{1-\varphi} \quad (4)$$

This second essential assumption as summarized in (4) captures the predominant idea in Schultz (1964, pp. 75ff). Schultz relies on a paper by Nelson (1959), in which it is argued that basic scientific research should be viewed as a public good (apparently they did not distinguish between public factors and goods, but this is purely semantic), public provision of which is most efficient. Arrow (1962b) has provided justification for publicly financing basic research. T. W. Schultz (1964, p. 200) suggested including basic education because it reduces the information costs throughout the entire economy. And this is still the predominant view (cp. T. P. Schultz, 1988, pp. 585–586). As the labor endowments $L'$, capital endowments $K'$ and learning abilities $e^i$ are individually different and not observable, the government is not able to discriminate between the sources of income. Therefore, it cannot know the marginal contribution of the public factors which rules out the possibility of Lindahl taxation. The government is assumed to choose a flat-rate income tax $t$. This is summarized in the third essential assumption:

$$\dot{B} = tY \quad (5)$$

In equilibrium human capital demand of the firm $H$ equals the sum of human capital supplies $H^i$:

$$H = \sum_{i=1}^{N} H^i \quad (6)$$

Goods market equilibrium requires that the firm’s investment equals private savings out of net income:

$$\dot{K} = s(1-t)Y \quad (7)$$

where $s$ is the average saving rate, most easily obtained by assuming identical saving rates obtainable from a utility function with unit income elasticity of consumption and savings. Identifying the labor force with total population and assuming constant population growth at rate $n$ yields:

$$N = N(0)e^{nt} \quad (8)$$
Profit maximization of the firm results in

\[ r = \alpha Y/K \]  
\[ w = (1 - \alpha - \beta)Y/L_1 \]  
\[ q = \beta Y/H \]

where \( r, w, q \) are the rental rates for services of \( K, L_1 \) and \( H \) respectively.

Households maximize their income by choice of optimal labor allocation, which requires that the marginal value product of labor in human capital formation equals the real wage:

\[ w/L = \varphi e^{[B/(e^i L^i)]} \]  
\[ = \varphi H^i/L_2 \]

The second equation of (12) indicates that the human capital–labor ratio is identical for all individuals and therefore equal to the aggregate relation, because they are faced with identical \( w/L \) and abilities are labor-augmenting by assumption:

\[ H/L_2 = H^i/L_2 \]  
(12')

From (10) and (11) \( w/L \) is:

\[ w/L = [(1 - \alpha - \beta)H]/[\beta L_1] = [(1 - \alpha - \beta)H/L_2]/[\beta L_1/L_2] \]
(13)

Equating the right hand sides of (12) and (13) and making use of (12') implies:

\[ L_1/L_2 = (1 - \alpha - \beta)/(\varphi \beta) \quad \text{or} \quad \hat{L}_1 = \hat{L}_2 \]
(14)

"\( \hat{\cdot} \)" indicates "growth rates". This means that the allocation of total labor between the production and educational purposes is determined by their production elasticities in regard to final output which can be most easily seen after insertion of (12') and (4) into (1). As the allocation of labor is technologically determined the two kinds of labor services must grow at identical rates. If it is assumed that the population reproduces at a constant average labor endowment \( \bar{L}^i \), (2) and (3) imply

\[ L_1 + L_2 = N \bar{L}^i \]  
(2')

From (14) and (2') we find

\[ \hat{L}_1 = \hat{L}_2 = n \]
(2'')

Aggregated labor services in both occupations grow at the rate of population growth.

Writing (12), (12') and (4) in growth rates yields

\[ \hat{H} - \hat{L}_2 = \hat{H}^i - \hat{L}_2^i = (1 - \varphi)[\hat{B} - \hat{L}_2^i] = \hat{w} - \hat{q} \]
(4')
or using (2'')

\[ \hat{H} - n = (1 - \varphi)[\hat{B} - \hat{L}_2^i] = \hat{w} - \hat{q} \]
(4'')
The last equation implies that \( \tilde{L}_2 \) are equal for all individuals, because all other variables in (4") are equal for all individuals. Together with (2") this implies

\[
\tilde{L}_1 = \tilde{L}_2 = 0 \quad (4'')
\]

Constant shares of total labor for both purposes implies an unchanged individual allocation of labor. Both results are due to the labor-augmenting differences in individual abilities, constant income shares of factors and the assumed constant reproduction of average labor endowments; therefore no information or assumption is needed or revealed on the individual abilities of newly borne individuals. Computation of steady-state growth rates runs as follows. (4") and (2") can be used in (4') to obtain

\[
\dot{H} = (1 - \varphi) \dot{B} + n \quad (14'')
\]

Human capital per capita grows at a rate that is proportional to the stock of public factors. Writing (1) in growth rates and using (2") and (14") yields:

\[
\dot{Y} = \alpha \dot{K} + \beta (1 - \varphi) \dot{B} + (1 - \alpha)n \quad (1')
\]

Dividing (5) and (7) by \( B \) and \( K \) respectively, and rewriting them in growth rates using (1'), we obtain:

\[
\dot{B} = \alpha \dot{K} + (\beta (1 - \varphi) - 1) \dot{B} + (1 - \alpha)n \quad (5')
\]

\[
\dot{K} = (\alpha - 1) \dot{K} + \beta (1 - \varphi) \dot{B} + (1 - \alpha)n \quad (7')
\]

These differential equations can be most easily considered in the \((K, B)\)-plane. In this plane the \( B = K = 0 \)-lines are (cp. Fig. 1.):

\[
\dot{K} = [(1 - \beta (1 - \varphi))/\alpha - [(1 - \alpha)/\alpha]n \quad (5'')
\]

\[
\dot{K} = [\beta (1 - \varphi)/(1 - \alpha)] \dot{B} + n \quad (7'')
\]

(5'') has a steeper slope and a lower intercept than (7''). The two lines intersect at the equilibrium values:

\[
\dot{B} = \dot{K} = (1 - \alpha)n / [1 - \alpha - \beta (1 - \varphi)] > n \quad (15)
\]

Arrows in Fig. 1 indicate that this long-run equilibrium point is stable. If (15) is used in (1'), we find

\[
\dot{Y} = \dot{K} = \dot{B} = g \quad (1'')
\]

and therefore the rate of profit in (9) is constant over time. The rate of growth of human capital can be computed from (14'') and (15) and (1'')

\[
\dot{H} = n [1 - \alpha + (1 - \varphi)(1 - \alpha - \beta)] / [1 - \alpha - \beta (1 - \varphi)] > \dot{Y} = \dot{K} = \dot{B} > n \quad (14'')
\]

Human capital grows faster than the other variables because of the non-rivalrous character of \( B \). This leads to a fall in the real rental of human
capital which can be seen from (11), (1''), (15) and (14''):

\[
\dot{q} = \dot{Y} - \dot{H} = -(1 - \varphi)(1 - \alpha - \beta)n/[1 - \alpha - \beta(1 - \varphi)] < 0 \quad (11')
\]

From (10), (1''), (15), and (2'') we can calculate the growth rate of the wage rate:

\[
\dot{w} = n\beta(1 - \varphi)/[1 - \alpha - \beta(1 - \varphi)] = \dot{K} - n = \dot{B} - n = \dot{Y} - n < \dot{H} - n \quad (10')
\]

The wage rate, per capita income, and the capital-labor ratios grow at the same rate. The last inequality results from (14''). Therefore said rate plays the same role as the exogenous rate of technical progress in traditional neoclassical growth models in the sense that it increases per capita income and real wages. \(\beta(1 - \varphi)\) is the elasticity of production of public factors with respect to output. This can most easily be seen from (1') where the sum of the coefficients exceeds one by \(\beta(1 - \varphi)\) or equivalently, \(H\) from (12') in (1) and \(H^i\) according to (4) yield

\[
Y = K^{\alpha}L_2e^i[B/(e^iL_2)]^{(1-\varphi)}L_1^{1-\alpha-\beta} \quad (1'')
\]
The rate of population growth matters because of the non-rivalrous character of $B$, which is used all the more the larger the population is. This is due to the role of the household as a human capital producing firm according to Schultz’s theory. In this sense this growth model is a generalization of a comparative-static result by Boadway (1972), who presented a static first best model with an exogenous number of firms, because the model presented here is a dynamic second best growth model with the number of firms producing human capital equal to the number of households. From a more technical point of view the ultimate reason for increasing real wages may be viewed in the increasing returns produced by the non-rivalrous character of public factors: In $(1''')$ with constant value of $L'_2$ according to $(4''')$ the production function is homogeneous of degree $1 + \beta(1 - \varphi)$ in $K, L_2, B$ and $L_1$.

3. Golden rule, Lindahl pricing, and the role of democracy in real wage analysis

So far, the rates of savings and taxation have been exogenous. If the government chooses $t$ and the households choose $s$ so that aggregate steady-state consumption is maximized, the result is a golden rule for basic scientific research:

$$\max_{K, B} C = Y - gB - gK$$

yields

$$\alpha Y/K = g \quad \text{and} \quad \beta(1 - \varphi) Y/B = g \quad (16)$$

In the program above, $Y$ is an abbreviation for $(1'''')$ and $g$ was defined in $(1''$). (The government knows $L'$ defined before $(2')$ and can deduce the value of $L'_2$ from $(2')$ and $(14)$, and $H'/L'_2$ in $(1'''$) is identical for all individuals).

Writing $(5)$ and $(7)$ in the form

$$gB = tY \quad \text{and} \quad gK = s(1 - t)Y \quad \text{or} \quad Y/B = g/t \quad \text{and} \quad Y/K = g/[s(1 - t)]$$

inserting them into $(16)$ and solving for $t$ and $s$ yields

$$t = \beta(1 - \varphi) \quad \text{and} \quad s = \alpha/[1 - \beta(1 - \varphi)] = \alpha/(1 - t) \quad (17)$$

The golden rule for basic scientific research in this model says that the rate of taxation should equal the elasticity of production of public factors in final output.

Nevertheless, the implementation of such a golden rule is rather unlikely to occur. This will be explained in two steps: The first is to make explicit the redistributive character of this tax in comparison to a Lindahl equilibrium;
the second is to show that the welfare criterion which produced (16) will only be accepted in case of perfect compensation, which is impossible if the government does not know all the individual production functions (4). The consequence is that distributional conflict occurs, whose outcome is rather unclear.

Let’s compare the golden rule to Lindahl equilibrium, which is merely used as a standard of comparison because it allows to summarize the three differences in endowments $K^i$, $e^i$ and $L^i$ in one criterion, $Y'/L^2_2$, in (18) below. A Lindahl price $l'$ per unit of public factors $B$ would require that each individual pays the marginal product of $B$ in human capital formation, multiplied by the price for human capital:

$$l' = q(1 - \varphi)H'/B \quad (17)$$

In equilibrium we can replace $q$ via (11):

$$l'B = \beta(1 - \varphi)YH'/H = \beta(1 - \varphi)YL^2_2/L_2 \quad (17')$$

So, the Lindahl price equals the marginal increase in income measured in consumption units. If this individual payment is to equal (hypothetically) the burden imposed by the flat-rate income tax, so that there were no redistribution for this individual, we must have

$$\tau Y^i = l'B = \beta(1 - \varphi)YL^2_2/L_2 \quad (18)$$

For an individual with average income $Y^i = Y/N$ and average abilities $e^i$ [defined as an individual such that $L^2_2/L_2 = 1/N$] golden rule taxation $\tau Y^i = \beta(1 - \varphi)Y^i$ and Lindahl taxation $\beta(1 - \varphi)YL^2_2/L_2$ are equal payments, which means that there is no redistribution for him under a golden rule tax. For an individual who has c.p. lower (higher) income—say, due to lower capital endowments—or higher (lower) abilities [and therefore higher (lower) $L^2_2$; see (12)], the flat-rate income tax is a lower (higher) burden in case of golden rule taxation than the Lindahl price because he has to pay less taxes on capital income and is able to make better use of public factors respectively. Thus, in general the flat-rate income tax is clearly redistributive. Therefore it is clear that golden rule taxation is only agreed upon if the maximization of aggregate steady-state consumption is accompanied by the promise of compensation for the redistribution implied by golden rule taxation when compared to Lindahl pricing. Clearly, perfect compensation would yield the same tax burden as Lindahl prices.

In the literature, Lindahl prices are usually held to be unfeasible because the government would have to know all the production functions, and this informational requirement is assumed to be too difficult. The same argument applies when we discuss the inferiority of central planning. But precisely perfect compensation requires that the government know all the
production functions (4) and therefore has to be ruled out here due to prohibitive information costs. Without perfect compensation the implementation of the golden rule will not be agreed upon, and is as unfeasible as Lindahl pricing. Then the redistributive character of the flat-rate income tax may lead to distributional conflict: Those with c.p. higher income, out of higher capital (or labor) endowments, or lower abilities than average would vote for lower taxation and those with c.p. lower income or higher abilities than average would vote for higher taxation—if voting were possible. Negotiations upon non-linear tax schedules would suffer from the same informational problems, because those who have lower income or higher abilities than average would have to offer compensations to those with higher income and lower abilities if Pareto improvements were negotiated upon. The latter would then have an incentive to overstate their deviation from the average and the redistribution of the golden rule taxation. Unless the impact of the overstatement on the information of the government were zero, this would lead to lower taxation. Clearly this kind of overstatement is an element of the political bargaining process.

To summarize, if perfect compensation were possible it could be expected that the economy in our model would develop according to the golden rule. But if compensatory arrangements cannot be found, due to similar informational problems such as those which render central planning or Lindahl equilibria impossible, then we must expect a deviation from golden rule development.

Assume that the government maximizes the welfare of the median voter. As long as individuals are different, the distribution of \( Y'/L'_2 \) will in general be unequal. If individuals are ranked with respect to this criterion, which indicates the redistribution in comparison to a Lindahl equilibrium according to (18), the median voter \( i = m \), defined as an individual in comparison to whom 50% of the population have a higher (lower) or equal value of \( Y'/L'_2 \), will have a value of \( Y''/L''_2 < Y/L_2 \), because \( Y/L_2 \) is the average value of the criterion, which the median voter can only have in case of an equal distribution of the \( Y'/L'_2 \). Thus, for the median voter the golden rule taxation is below his subjective willingness to pay as expressed by the Lindahl price, which indicates that he would prefer a higher rate of taxation than the golden rule tax. On the other hand, those who have a higher income per labor unit spent in education than average would prefer lower than golden rule taxation and may therefore be uninterested in median voter democracy, as long as informational requirements inhibit the upset of compensatory arrangements. Therefore deviations from golden rule taxation are rather likely to occur.

In developing countries, it is well known that this deviation occurs in the form of low taxation (s. Mutén, 1985). This results not only in reduced aggregate consumption, but also in a lower steady state relation between public and private capital, because dividing, \( gB = tY \) through \( gK = s(i - t)Y \) yields \( B/K = t/[s(1 - t)] \), with \( g \) defined in (1').
Moreover it can be shown that steady-state wages will be lower too, if \( \beta < 1 - \alpha - \beta \). To show that \( \partial w/\partial t > 0 \) we have to reconsider the steady-state values of

\[
\begin{align*}
tY - gB &= 0 \quad \text{(5)} \\
s(1-t)Y - gK &= 0 \quad \text{(7)} \\
wL_2 - \varphi qH &= 0 \quad \text{(12)}/(12'') \\
\alpha Y - rK &= 0 \quad \text{(9)} \\
(1 - \alpha - \beta)Y - wL_1 &= 0 \quad \text{(10)} \\
\beta Y - qH &= 0 \quad \text{(11)}
\end{align*}
\]

For some point in time in the steady-state these are six equations for six variables \( B, K, H, w, q, r \), where \( L_1,2 \) are fixed values that can be computed from (2') and (14) and \( Y \) is an abbreviation for (1). Total differentiation of the system with respect to the exogenous tax rate and the endogenous variables leads to a system of the form

\[
A[\partial B/\partial t, \partial K/\partial t, \partial H/\partial t, \partial w/\partial t, \partial q/\partial t, \partial r/\partial t]' = [-Y, sY, 0, 0, 0, 0]' 
\]

where \( A \) is a 6 \times 6 matrix and the vectors are columns. Explicit computation produces

\[
\det A = |A| = -K(-H)(\varphi q)L_1gs(1-t)Y_K\{-q + \beta Y_H\} < 0,
\]

because \( q = Y_H = \beta Y/H \) in (11).

Application of Cramer’s rule yields

\[
\partial w/\partial t = |A_4|/|A|,
\]

where \( |A_4| \) can be computed as

\[
|A_4| = -K(-H)(-\varphi q)Yg\{-\beta Y_B + s\beta Y_K \\
+ (1 - \alpha - \beta)Y_B - s(1 - \alpha - \beta)Y_K\} \leq 0 \quad \text{as } \{\cdot\} \leq 0
\]

Using \( Y_K = \alpha Y/K \) and \( Y_B = \beta (1-\varphi)Y/B \), one finds that

\[
A_4 \leq 0 \quad \text{as } \beta(1-\varphi)/(s\alpha) \leq B/K, \quad \text{if } \beta > 1 - \alpha - \beta \\
\text{or} \quad \beta(1-\varphi)/(s\alpha) \leq B/K, \quad \text{if } \beta < 1 - \alpha - \beta
\]

In the steady-state we have \( B/K = t/[s(1-t)] \) and for the golden rule \( B/K = \beta(1-\varphi)/\alpha \). So the critical value for \( B/K \) is larger than that of the golden rule. For low values of \( B/K \) and \( t, \partial w/\partial t > 0 \) by \( A_4 < 0 \) can only occur for \( \beta < 1 - \alpha - \beta \). If there are poor countries for which this condition is not fulfilled although tax and wage rates are low, other explanations for poverty will have to be preferred. (See e.g. Jorgenson (1961) or Bardhan/Lewis (1970)). One should keep in mind that this result is only valid for steady-state wages. However, a similar result has been shown to hold outside the steady-state in the context of agents living for one period, who are intertemporally connected through a bequest motive, and a one-period government optimization (see Ziesemer, 1987, Chap. 10–13).
Democratization processes that start from low taxation and approach median voter democracy may in turn be viewed as a process towards the golden rule taxation and beyond. As this is rather likely to increases wages, Schultz's (1964, p. 196/7) view is supported here that provision of public factors and the democratic process is an effective way to alleviate the poverty of the poorest. If an increase of the flat-rate income tax occurs over time, inequality will be reduced. So this model does not support the view that there must be rising inequality in the initial phases of the development process.

4. Summary

1. The first conclusion of this paper is that the introduction of human capital produced by use of public factors which are financed in turn by a simple flat-rate income tax, leads to an interpretation of the elasticity of public factors in output production multiplied by the rate of population growth as the rate of growth of real wages.

2. Optimal taxation requires that the tax rate is equal to this elasticity.

3. For the median voter, defined as an individual with less than average income per labour hour spent in education, golden rule taxation is lower for him than one in Lindahl equilibrium. He therefore prefers higher than golden rule taxation. Therefore median voter democracy, defined as the application of taxation in accordance with the preferences of the median voter under a flat-rate income tax, leads to non-optimal growth.

4. Individuals with higher than average income per hour spent in education prefer a lower tax rate than that of the golden rule. If this preference is implemented by policy, aggregate consumption and real wages will be lower than under golden rule taxation.

5. The last two results suggest that the democratic process starting from low taxation first helps to approach the optimal growth path by removing tax resistance, and secondly moves on to a level of taxation that exceeds the golden rule level. Therewith poverty is reduced during the democratization process.

All these results have been obtained by formalizing some of the ideas of T. W. Schultz (1964, especially pp. 150–200) on the development process.

The main difference between this approach to real wage determination and other models discussed in the introduction is the outstanding role of economic policy in economic development, which is brought to the fore by the introduction of public factors. This then leads to the outstanding importance of democracy for the development process.

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