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A NOTE ON THE PROLETARIANIZATION OF THE
AFRICAN PEASANTRY IN RHODESIA

by

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ABSTRACT

In this paper the introduction of a capitalist wage sector into a peasant economy is considered in the context of a simple utility maximization model. Family decision-making and positive migration costs are incorporated into a model where the family chooses the amount of labor allocated to the production of village output and to a capitalist sector where wages are earned. In an attempt to provide insight into the early colonial Rhodesian economy, the implications of the model are shown to be consistent both with much of the evidence on the economic behavior of the African peasantry in Rhodesia and with economically rational behavior of the British capitalist sector. In doing so, an example of the importance of the decision-making unit and the conditions in the region of the origin when analyzing migratory processes is provided.

RESUME

Cette note de recherche porte sur l'introduction d'un secteur salarié capitaliste dans une économie paysanne vue à travers un modèle simple d'optimisation d'utilité. Le processus familial de prise de décisions et les coûts positifs associés à la migration sont incorporés à ce modèle où la famille décide de la quantité de main d'oeuvre à allouer à la production villageoise d'une part et au secteur capitaliste monétarisé d'autre part.

En visant à fournir quelques éclaircissements sur l'ancienne économie coloniale rhodésienne, on note que les conclusions tirées de l'interprétation du modèle correspondent en grande partie à l'expérience observée de la paysannerie africaine en Rhodésie et au comportement économique rationnel du secteur capitaliste britannique.

Tout ceci fournit un exemple de l'importance qu'on doit attacher à l'unité de décisions et aux conditions dans la région d'origine lorsque l'on analyse les procédés migratoires.

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In this paper the introduction of a capitalist wage sector into a peasant economy is considered in the context of a simple utility maximization model. At the risk of gross oversimplification, it is used in an attempt to provide insight into the early colonial Rhodesian economy. The implications of the model are consistent both with much of the evidence on the economic behavior of the African peasantry in Rhodesia and with economically rational behavior of the British capitalist sector. The analysis relies heavily on information and insights provided in Giovanni Arrighi's article, "Labor Supplies in Historical Perspective: A Study of the Proletarianization of the African Peasantry in Rhodesia". In the development of the model, an example of the importance of the decision-making unit and the conditions in the region of origin when analyzing migratory processes is provided.

The model used incorporates family decision-making and positive migration costs (either psychic or monetary) into a model where the family chooses the amount of labor allocated to the production of village output and to a capitalist sector where wages are earned. It is shown that for a range of relative prices and wages, the labor supply response to an increase in the migrant's wage is likely to be small if not negative, while at the same time the supply response to output prices is likely to be quite large.¹ In addition, it is shown that the size of the migrant labor force will increase in response to other economic changes, such as a decrease in the returns to village labor or an increase in taxes.

The major economic phenomenon to be explained in the early to middle colonial period is the persistence of excess demand for labor coinciding with a period of apparently "sticky upward" wages. Other, non-wage mechanisms were instead used by the British in attempts to increase the supply of labor. Barber, Arrighi's main contender, argues that the Africans exhibited a low responsiveness to wage increases due to a delay in responsiveness to market opportunities. Thus, an increase in wages would not solve the labor shortage problem.

¹The idea of a backward bending labor supply curve, particularly for African peasantry, is not new. Berg (1961), for example, shows that the labor supply curve may be backward bending if there are psychic costs to migration and the peasant has a target income. Here neither a target income nor a lack of availability (or desire for) purchased goods is assumed.

In the early days of Western penetration into the African interior, the case for indifference of the indigenous peoples to new economic opportunities could be given strong support.Initially, the positive inducements of wage employment, in the form of a cash income and the collection of goods which it could command, were seldom sufficient to draw forth labor in volume.¹

Arrighi, however, points to evidence on the substantial responsiveness to other new economic opportunities during the same period, particularly in the sale of grain, cattle, and beer.² He suggests that,

.... if 'little' labor-time was sold on the labor market, this was more likely to be due to the fact that the effort-price of cash income earnable through the sale of produce was lower than that earnable through wage employment, rather than to an alleged lack of African response to market opportunities for increasing their incomes.⁴

The lack of wage increases is attributable to an apparent lack of rationality on the part of the British.

.... market mechanisms were largely discarded in the determination of wages, and the real wage rate came to be customarily fixed at a level that would provide for a subsistence of a single worker while working in the capitalist sector and a small margin to meet the more urgent of the cash income requirements of his family (which continued to reside in the peasant sector). The problem then became one of expanding the supply of labor to match demand at this customary level of wages.³

Here a third possible explanation of sticky upward wages in a period of excess demand for labor is provided. It relies on neither a low market responsiveness of the peasantry nor on a capitalist sector that sets wages according to tradition. A model is presented that shows that a) the British capitalists may have resorted to non-wage mechanisms to increase the supply of labor at least partially because of a low or even negative response to wage increases by the African peasantry; and b) the low response to an increase in wages in the capitalist sector is consistent with an African peasantry that is quite responsive to other market opportunities.

¹ Barber, p. 238 -

² Arrighi, p. 185.

³ Ibid., p. 187.

The Model

In the model a family maximizes a Benthamite welfare function additive in the utilities of both family members that migrate to the capitalist sector and those that remain in the village.¹ Individual utility is derived from both consumption and leisure. In addition, there may be some disutility derived directly from migration, either from poor conditions in the capitalist sector (independent of leisure and consumption), or simply from the geographic separation of family members. Saving takes place through the buying or retention of productive assets. They are composed in this case primarily of land, cattle, and ploughs.² Assets are treated in an aggregate form, assuming that families adjust their allocations within total asset holdings to changes in economic conditions. A function of the value of assets at the end of the maximization period is an additional component of total utility.

Income is derived from the production of village commodities, wage labor, and the sale of assets, while expenditures consist of consumption of both migrants and villagers, migration costs that must be incurred, and asset purchases.³ It is assumed that the production of village commodities is a function of both asset holdings and labor.

The family chooses the level of consumption (c) and leisure (e) for each worker type, the change in the stock of assets ($A_1 - A_0$) and the fraction of the family that will migrate to work in the capitalist sector (ϕ). There is an upper bound less than one for this fraction, since generally women and children do not migrate. It is assumed that ϕ is a continuous variable, since workers can spend any fraction of total time as migrants.⁴

First the structure of the model is outlined, and the general framework for the analysis shown. Then the proletarianization of the Rhodesian peasantry is considered in three phases: a) the introduction of wage labor (approximately

¹This follows a formulation by Sen (1966) and Lucas (1977).

²Asset accumulation is discussed by Arrighi, pp. 203-204. Kuper, et al. report that "cattle are the Standard Bank of the Ndebele," p. 58. See p. 90 for further discussion. See p. 27 for the importance of cattle as an asset for the Shona.

³Expenditures need only be implicit; the family could in fact consume all of its own production and never participate in any market activity.

⁴Some discussion of the peasant economies and tribal and family decision-making is available in Kuper, et al.

1896-1903); b) the transition period of the peasant-migrant households, where only a fraction of available adult male labor works for wages (approximately 1903-1921); and c) the appearance of the proletarian African household in which all available adult male labor is sent to work in the capitalist sector (the early 1920's).

A. A Formal Description of the Model.

Formally the model can be stated as:

$$(1) \quad \max (1 - \phi)U(c^V, e^V) + \phi U(c^m, e^m) + G(P_A A_1) - u\phi$$

subject to,

$$a) \quad w_A A_0 + w^V(1 - \phi)(1 - e^V) + \phi w^m(1 - e^m) - (1 - \phi)c^V \\ - \phi(c^m + m) - P_A(A_1 - A_0) - T = 0$$

$$b) \quad 0 \leq \phi \leq \bar{\phi}.$$

Notation is listed in Table I.

Family size is normalized to equal one. U and G are assumed to be concave in their arguments, and c and e are assumed to be normal goods.

It is assumed that within the village, labor is combined with productive assets so as to equate the marginal products of labor.¹ Aggregated peasant output is a function of total asset holdings (\bar{A}) and village labor supply (\bar{L}). Thus, if \bar{N} is the total number of families in the village, and family size is constant across families, then,

$$(2) \quad \bar{L} = \sum_{i=1}^{\bar{N}} (1 - \phi_i)(1 - e_i^V).$$

Total output is expressed as $F(\bar{A}, \bar{L})$, a constant returns to scale production

¹The terms "family" and "village" are used loosely here. The family unit corresponds to the smallest decision-making unit where labor and consumption decisions are made. There is some evidence of an informal labor market in the form of "beer-drinks" and "work-parties" for both the Ndebele and the Shona. (See Kuper, pp. 28, 51, 80.) This larger group, in which labor is allocated according to productivity, corresponds to the village.

TABLE I

DEFINITION OF SYMBOLS

\bar{A}	=	total initial stock of assets in the village
A_0	=	initial real stock of assets owned by the family
A_1	=	final real stock of assets owned by the family
c	=	per capita consumption, by worker type (i)
e	=	per capita leisure, by worker type (i)
F	=	production function for total village output
G	=	utility function for value of final assets
\bar{L}	=	village labor supply
m	=	monetary migration costs
\bar{N}	=	number of families in the village
T	=	lump sum tax
u	=	psychic migration costs
U	=	individual utility
w	=	wage, by worker type (i)
w_A	=	return to assets
P	=	price of village output
P_A	=	price of assets
ϕ	=	fraction of family that migrates
$\bar{\phi}$	=	maximum fraction of family that can migrate
λ	=	household's marginal utility of income

Superscripts (i):

v	=	village worker
m	=	migrant worker

function. Implicit factor prices are:

$$(3) \quad w_A = PF_A \quad \text{and} \quad w^V = PF_L .$$

Maximization, holding prices and factor returns constant, yields the following first order conditions:

$$(4) \quad U_c^V = U_c^m = \frac{U_e^V}{w^V} = \frac{U_e^m}{w^m} = G'(P_A A_1) = \lambda$$

$$(5) \quad -U(c^V, e^V) + U(c^m, e^m) - u + \lambda[-w^V(1-e^V) + w^m(1-e^m) + c^V - c^m - m]$$

$$= 0 \text{ if } 0 < \phi < \bar{\phi}$$

$$\leq 0 \text{ if } \phi = 0$$

$$\geq 0 \text{ if } \phi = \bar{\phi} ;$$

Under the assumptions that U and G are concave, it can be shown the the second order conditions for a maximum are satisfied.

The first condition, (4), states the standard result that the value of the marginal utility is equated across goods. In this case, the price of leisure is equal to w^V for the village worker and w^m for the migrant. The prices of consumption goods are assumed equal to one.

The second condition, (5) determines the fraction of the family that migrates, given that (4) holds. If $0 < \phi < \bar{\phi}$, the family sends migrants until the benefits are just equal to the costs, both measured in utils. The benefits consist of the utility of the migrant and the value of the migrants earnings, plus the saved rural consumption, or $U(c^m, e^m) + \lambda[w^m(1-e^m) + c^V]$. The losses include the lost rural utility, the additional disutility due directly to migration, the additional migrant consumption, and the additional costs of migration, or, $U(c^V, e^V) + u + \lambda[w^V(1-e^V) + c^m + m]$.

This condition implies that if either psychic or monetary migration costs are positive, then the migrant's wage must exceed the implicit wage of the village worker for migration to occur. If migration does occur, then family utility maximization implies that the utility and leisure of a family member residing in the village will both exceed those of the migrant. This is shown formally in the Appendix, but can be seen more easily by, for the moment, allowing the utility function to take the form: $U(c) + V(e)$. Then, since $U_c^V = U_c^m$, villager and migrant consumption are always equal. Let $f(e) = V(e) + V_c(1-e)$.

From concavity of V , $f'(e)$ is less than zero. The first order condition for a positive level of migration can be rewritten as,

$$f(e^m) - f(e^v) \geq u + \lambda m \text{ with equality if } \phi < \bar{\phi}.$$

Since f is decreasing in e , and $(u + \lambda m)$ is assumed to be positive, e^v must exceed e^m . Thus the migrant's wage must exceed the villager's for condition (4) to hold, and the villager's utility and leisure exceeds the migrant's.

B. A Framework for Analysis.

Before proceeding with the comparative static exercises, a framework for the analysis is presented. It is convenient to first write demand functions for leisure and consumption by both worker types and for final asset holdings as functions of prices and the marginal utility of income (λ), holding the fraction migrating constant. Differentiation of (4) yields the following:

$$(6) \quad c^i = c^i(\lambda^-, w^{i-}), \quad i = v, m$$

$$(7) \quad e^i = e^i(\lambda^-, w^{i-}), \quad i = v, m$$

$$(8) \quad A_1 = A_1(\lambda^-, P_A^-)$$

Signs of partial derivatives are indicated above the variable. Full expressions are listed in the Appendix.

Next the first order condition for an interior solution for ϕ , (5), is differentiated to give:

$$(9) \quad g \, d\lambda - du - \lambda(1-e^v) \, dw^v + \lambda(1-e^m) \, dw^m - \lambda dm = 0,$$

$$\text{where } g = -w^v(1-e^v) + w^m(1-e^m) + c^v - c^m - m.$$

Since $U(c^v, e^v) > U(c^m, e^m)$ and $u \geq 0$, the first order condition implies that g is positive, or that the surplus (wage earnings minus implicit expenditures on consumption, leisure, and migration costs) of the migrant worker exceeds that of the villager.

For comparative statics, the only step remaining is to fully differentiate the budget constraint. Here, it will only be noted that an increase in λ , holding ϕ and prices constant, relaxes the budget constraint. Since all expenditures (except for migration) decrease with an increase in λ , the derivative of the budget constraint with respect to λ is positive for a given ϕ .

It can be seen that the system of differential equations (6) - (9) and the differentiated budget constraint take a block recursive form. If ϕ is chosen between zero and the maximum, then any change in λ can be calculated in equation (9). Substituting this and the exogenous parameter change into (6) - (8), the changes in demand can be found. Last, these solutions can be substituted into the budget constraint to find the change in ϕ .

If ϕ is constrained at 0 or $\bar{\phi}$, the problem becomes a standard utility maximization problem, and equation (9) is dropped.

II. The Historical Application.

A. Introduction of the wage economy (1896 - 1903).

The 1896 to 1903 period is characterized by a marked increase in migrant's wages as the demand for labor increased.¹ Peasant households made the transition from being composed completely of village workers to having some migrant workers. In this section it is shown that the model predicts that:

1) initial increases in wages above a "reservation wage" will unambiguously result in a transition from a complete village household to one that sends some migrants to the capitalist sector,

2) the "reservation wage" is higher for wealthier families,

3) the introduction of the wage economy has an equalizing effect on the standard of living of peasants within the village²; and

4) forced migration is likely to result in a decrease in the future voluntary supply of labor. The practice of forced labor was widely resorted to in the early days of settlement, according to Arrighi, but was "abandoned, at least in its crudest forms, in order to avoid a costly repressive apparatus."³

Statement (1) can be shown through examination of condition (5). Initially there is no migration, so that the marginal utility of sending the first migrant

¹Arrighi, p. 183.

²Unfortunately, to my knowledge there is no available information on which households sent migrants or on the impact on the income distribution in the village.

³Arrighi, p. 194.

is less than zero. The change in the marginal utility of sending the first migrant can be read from equation (9), and is seen to increase with an increase in w^m . When the marginal utility increases to zero, the reservation wage is reached, and the family begins to send migrants.

The reservation wage is higher for wealthier families, so that as the migrant's wage rises, poor families will begin to send migrants first. Holding the number of migrants at zero, the first order conditions and budget constraint show that an increase in assets results in a decrease in the marginal utility of income. Suppose that w^m is just equal to the reservation wage for a poor family. It can be seen from equation (9) that a family with a lower marginal utility of income must have a higher migrant's wage in order for migration to increase family utility.

Migration has a very strong equalizing effect on the villager's standard of living in this model. All households choosing ϕ between 0 and $\bar{\phi}$ will choose the same levels of village and migrant consumption and leisure, as well as holdings of next periods assets. This can be seen again first looking at equation (9). Holding wages and migration costs constant, λ must remain constant. Thus from (6) - (8), all consumption and leisure expenditures for both worker types are unaffected by an increase in assets. The only difference between richer and poorer households is that the poor send more migrants, given that the number of migrants is constrained neither by zero nor its upper bound for all households. Since the rich must sell (or buy fewer) assets in order to maintain expenditures without the higher migrant's wage, the next period asset holdings are identical across families.

Last, we can see that if, given initially small amounts of migrant labor, the Europeans attempted to increase the labor supply through force, this would lead to a lower supply of volunteer labor the next period than would otherwise occur. Suppose that initially ϕ is unconstrained, but that the British increase the number of migrants above its preferred level. Since a migrant's net earnings must exceed a villager's for any volunteer migration to occur, the further increase in the labor supply through force increases total family income. The higher income is allocated among consumption, leisure, and the final stock of assets. This increase in the stock of assets for the next period leads to a decrease in the number of volunteer migrants.

Throughout the analysis thus far both factor returns in the village and the price of village output have been held constant. Changes in these variables and parameters are considered in detail in the next section.

B. The Transition Period of Peasant - Migrant Households (1903 - 1921).

In this section it is assumed that peasant households send some migrants, but that the fraction is less than the feasible maximum. The households are in transition between an economy relying completely on village production and one based primarily on migrant wage earnings.

This period is generally characterized by an excess demand for labor and upwardly rigid wages in the capitalist sector, and little change in the fraction of the indigenous male population participating in the capitalist wage sector.¹ It is also a period characterized by a number of British non-wage policies aimed at increasing the labor supply. These include hut and poll taxes, rents, grazing and dipping fees, land and cattle expropriation, and governmental promotion of European agriculture.² Last, there were major changes in relative prices. Throughout the period, cattle prices appeared to rise dramatically. The price of maize dropped substantially from 1903-1911, but also rose for the remainder of the period due primarily to increases in external demand.³

It is shown here that under the assumptions of the model:

- 1) the responsiveness of the supply of migrants to increases in wages is likely to be small;
- 2) the non-wage policies of the British are likely to be much more effective ways of increasing the labor supply; and
- 3) the increase in the price of village commodities is likely to result in a large increase in production, and to counteract the impact of the British policies on the number of migrants.

1. The Impact of a wage increase. The initial impact of a wage increase on the number of migrants can be divided into two effects. First, from (9) it can be seen that the marginal utility of income falls as the migrant's wage

¹Arrighi, pp. 183, 189.

²Ibid., pp. 194-198.

³Ibid., pp. 204-206.

increases. This implies a positive income effect for all commodities, including leisure. As expenditures increase, the number of migrants must increase to finance them. Second, the wage of the initial migrants has increased, thus relaxing the budget constraint. This has the opposite effect of permitting the family to send fewer migrants to maintain their village and migrant standards of living. Thus, even with factor returns constant, the impact of an increase in the migrant's wage has an ambiguous impact on the number of migrants. The consumption and leisure of the village workers and the final stock of assets, however, will unambiguously increase.

Two further effects are likely, both of which will dampen any increase in the number of migrants that does occur. These are changes in factor returns in the village and the terms of trade effect for village production. Suppose that the distribution of assets has been equalized in the village, and that the increase in the migrant wage has induced the families to send more migrants. Since both ϕ and e^V have increased, the total village labor supply has fallen. With a constant returns to scale production function, this implies an increase in the returns to labor and decrease in the returns to assets. Holding leisure constant, this would have no impact on the families' income or their migration decisions; it would simply redistribute income from one factor to another. However, the increase in the implicit rural wage will induce village workers to work harder, increasing family income. The family can now afford to send fewer migrants.

Also, the relative gain from migration, or the difference between the migrant's and the villager's surplus, has decreased. This is a further disincentive to migrate. The decrease in income due to this additional decrease in migration is compensated by a fall in the consumption and leisure of those that continue to migrate, thus increasing per migrant remittances, and a decrease in the final holdings of assets. The impact of the change in factor returns is shown formally in the Appendix.

The second effect comes about if the initial decrease in village production results in an increase in its price.¹ As discussed in section B.3, this terms of

¹This is similar to the terms of trade effect suggested by Lewis (1954).

trade effect would also have a dampening effect on any increase in the number of migrants due to an increase in wages in the capitalist sector.

Thus, it is not surprising that in the early twentieth century British capitalists found that wage increases resulted in an increase in the wage bill but had little impact on the size of the migrant labor force. Other non-wage mechanisms were more likely to have a positive impact on labor supply.

2. Non-wage policies of the British. The major non-wage policies of the British during this period were the imposition of a hut or poll tax (an increase in T), of land rents and grazing and dipping fees (a decrease in w_A), as well as the expropriation of land and cattle (a decrease in A). Holding prices and wages constant, and assuming that the choice of the number of migrants is unconstrained, the analyses of these policies turn out to be very similar. In each case the fraction of the family that migrates unambiguously increases.

First, from equation (9) we know that the marginal utility of income is unchanged throughout any of these policy changes. Also, from equation (6) - (8), it can be seen that none of the above policy variables enter directly into the demand functions. Therefore, consumption, leisure, and saving patterns are unaffected by each of these policies. Differentiating the budget constraint, the impact of all of the above policies is to directly reduce income. In order to maintain the existing expenditure patterns the number of migrants must increase.

The increase in the number of migrants leads to a decline in the village labor supply, and thus creates the two potential counteracting forces of an increase in the village returns to labor and an increase in the price of village production. Asset expropriation, however, acts to decrease the returns to labor, thus helping to keep the implicit village wage low. The problem of an increase in the price of village output due to a decline in production was also confronted directly by the British administration through the promotion of a competing agricultural sector run by British settlers. The large increase in the external demand for village output, in addition to the increase in the demand for cattle by the British agriculturalists themselves seems to have prevented the British from successfully increasing the supply of labor.

3. An increase in the price of village output. An increase in the price of village output is reflected in the model in an increase in the returns to village labor and assets and directly in an increase in the price of assets, since cattle are a village commodity. Implicitly the composition of village

production is assumed to respond to relative price changes; during this period one would expect to see a shift from the production of maize to that of cattle. The price increases all act to increase village income, resulting in a decrease in the number of migrants. As noted before, the increase in the implicit rural wage also results in a decrease in leisure for both the migrant and the villager, along with a decrease in the migrant's consumption. The real stock of assets held at the end of the period declines, while the production of village commodities unambiguously increases. As with the composition of output, the composition of assets would presumably respond to price changes. The increase in the implicit wage would imply a shift to labor saving assets - probably a shift away from land towards cattle and ploughs.¹

The response described above differs sharply from that of a complete village household. In the standard analysis (setting $\phi = 0$), the impact of an increase in factor returns results in a positive income effect for consumption, leisure, and final asset holdings, and a substitution effect away from leisure. Thus consumption and final asset holdings unambiguously increase, while work and thus output may increase or decrease. Similarly an increase in the price of assets has a positive income effect for all goods if the family is a net seller, and a substitution effect away from real final asset holdings. In sum, the partially migrant family in general has a larger positive response to a price increase in terms of output, but a larger negative response in terms of investment or asset accumulation.

C. The Proletarian Africans (the early 1920's).

This period was initiated by a major slump in both cattle and maize prices, and a large increase in African participation in the labor market. Arrighi notes that as a percentage of total cash earnings of the indigenous African community, sale of produce fell from 70% in the early 1900's to 20% in 1932. He argues that,

¹The stock of African-held cattle during this period is reported to increase from 114,560 in 1905 to 854,000 in 1921. The number of ploughs in use by Africans increased from 440 in 1905 to 16,900 in 1921, (Arrighi, pp. 203-204). The proportion of the African population residing on reserves increased from 54% in 1909 to 59% in 1914 to 64% in 1922 (Arrighi, p. 202), indicating a significant decline in African land holdings.

....this change cannot be considered as merely a cyclical phenomenon. It rather was an 'irreversible' change in the sense that subsequent recoveries could not restore the previous position of the African peasantry vis-à-vis the capitalist economy.¹

He attributes this permanent change largely to a decrease in the stock of assets, primarily land, and a lack of surplus for investment.²

The sudden drop in the prices of village commodities indicated a major drop in the returns to village labor and productive assets. Also, the model predicts that the high prices of output in earlier years would result in a disincentive to accumulate assets, particularly land, with an increased reliance on the returns to village labor. These two effects, along with the non-wage policies imposed by the British, together imply a major increase in the number of migrants. It is during this period that the "proletarian African" really began to appear, where here we shall define a proletarian family as one which sends all available adult male labor to work in the capitalist sector. That is, ϕ has reached its upper bound.

For the proletarian family, further decreases in the price of village output lead to continued declines in the returns to assets and village labor. There is a negative income effect, leading to decreased consumption and leisure as well as an increase in the sale of assets. Since there is a substitution effect towards village leisure, the impact on output is unclear.

In later years, the proletarian family will respond quite differently from the migrant-village family to increases in the price of village production. The price increase results in an increase in the returns to assets and village labor, but the initial stock of assets and supply of village labor are small. Thus there is a positive but small income effect for consumption, leisure, and asset accumulation. Again there is a substitution away from village leisure, and thus an ambiguous impact on total output. The increased gross returns due to the price increase are too small to allow for substantive investment, and the income effect works against increasing current production.

¹Arrighi, p. 207.

²Ibid., pp. 208-209.

III. Conclusion.

Clearly the model omits many important and interesting aspects of the introduction of the capitalist wage economy into the Rhodesian peasant economy. Analyses including non-agricultural village production, changes in the division of labor between men, women, and children, the choices of particular types of asset holdings and commodities to produce, as well as the socio-political changes taking place within the village and the political goals of the British are only a few of those needed for a complete understanding. But, at this simple level there still may be lessons to be learned for those economies still in a transition period, and for policy-makers interested in the responsiveness of such communities to new economic policies.

Appendix

A. If $\phi > 0$, $e^v > e^m$ and $w^v < w^m$.

First define $f(c,e) = U(c,e) - U_c c + U_e(1-e)$. Then the first order condition for ϕ , where $\phi > 0$, is: $f(c^m, e^m) - f(c^v, e^v) \geq \lambda m + u$.

Next we examine changes in f with respect to e , holding the marginal

utility of c constant: $\frac{\partial f(c,e)}{\partial e} \Big|_{U_c = \bar{U}_c} = U_{ee}(1-e) - U_{ce}c - (U_{cc}c - U_{ce}(1-e)) \frac{dc}{de}$.

Since $U_{cc}dc + U_{ce}de = 0$, $\frac{dc}{de} = -\frac{U_{ce}}{U_{cc}}$.

Thus, $\frac{\partial f(c,e)}{\partial e} \Big|_{U_c = \bar{U}_c} = (U_{ee} - \frac{U_{ce}^2}{U_{cc}})(1-e) < 0$, from concavity of U .

Since the marginal utility of c is equated across village and migrant workers and $f(c,e)$ is decreasing in e , e^v must exceed e^m .

Also, $\frac{\partial U}{\partial e} \Big|_{U_c = \bar{U}_c} = (U_{ee} - \frac{U_{ec}^2}{U_{cc}}) < 0$, so that $U_e^v < U_e^m$.

Since the first order conditions require that $U_e^v/w^v = U_e^m/w^m$, w^v must be less than w^m .

B. If $\phi > 0$ and e is normal good, then $U(c^v, e^v) > U(c^m, e^m)$.

Differentiating the utility function,

$U(c^v, e^v) - U(c^m, e^m) = \int_{c^m}^{c^v} U_c dc + \int_{e^m}^{e^v} U_e de$. Since $U_c^v = U_c^m$, $\frac{dc}{de} = -\frac{U_{ce}}{U_{cc}}$, so

$U(c^v, e^v) - U(c^m, e^m) = \int_{e^m}^{e^v} (U_{cc}U_e - U_c U_{ce}) / U_{cc} de$, which is positive if e is a normal good.

C. A redistribution of income from assets to labor results in a decrease in migration if assets are distributed equally among families and $0 < \phi < \bar{\phi}$.

Consider the impact on ϕ of an increase in w^V and a decrease in w_A , given that $\bar{L} dw^V + \bar{A} dw_A = 0$.

First, $d\phi = \frac{d\phi}{dw^V} dw^V + \frac{d\phi}{dw_A} dw_A$. Differentiating the

budget constraint(B), and substituting:

$$d\phi = -\frac{1}{g} \left[\left(q \frac{d\lambda}{dw^V} + \frac{dB}{dw^V} \Big|_{\phi, \lambda} \right) dw^V + \frac{dB}{dw_A} \Big|_{\phi, \lambda} dw_A \right] \text{ which is equal to}$$

$$-\frac{1}{g} \left[\frac{q\lambda(1-e^V)}{g} - (1-\phi) \left\{ \frac{(w^V U_{cc} - U_{ce})}{(U_{cc} U_{ee} - U_{ce}^2)} - (1-e^V) \right\} dw^V - \frac{A_0 \bar{L}}{\bar{A}} dw^V \right],$$

where $q = \frac{dB}{d\lambda} > 0$. Since \bar{L}/\bar{A} is equal to $(1-\phi)(1-e^V)/A_0$ when

assets are distributed equally, then

$$d\phi = -\frac{1}{g} \left[\frac{q\lambda(1-e^V)}{g} - (1-\phi) \lambda \frac{(w^V U_{cc} - U_{ce})}{(U_{cc} U_{ee} - U_{ce}^2)} \right] \text{ which is}$$

less than zero as long as e is a normal good.

D. Demand functions for an exogenous ϕ .

$$dc^i = \frac{(U_{ce} w^i - U_{ee}) d\lambda + \lambda U_{ce} dw^i}{-(U_{cc} U_{ee} - U_{ce}^2)}, \quad i = v, m$$

$$de^i = \frac{(w^i U_{cc} - U_{ce}) d\lambda + \lambda U_{cc} dw^i}{(U_{cc} U_{ee} - U_{ce}^2)}, \quad i = v, m$$

$$dA_1 = -\frac{A_1}{P_A} dP_A + \frac{d\lambda}{P_A G''}$$

