Fear of Confiscation and Redistribution

Notes towards a theory of revolution and repression

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INTRODUCTION

The existence of redistributive taxation raises the question of the acquiescence in it of those groups from whom income is taken away, to be distributed to others. This acquiescence can be due to a number of causes, not necessarily mutually exclusive. One group of such causes, that of altruism in its various forms, has been treated quite intensively in the literature of the last decade or so.¹

Acquiescence, however, may reflect not altruism, but an attempt to ward off confiscation. In other words, it may be the result of a search for the lesser of two (or more) evils. Here, the literature is surprisingly meagre. Coming, probably, closest to dealing with the present problem is the (in many ways much more ambitious) work of Aumann and Kurz (1977), who tried to establish the general rules governing redistribution. Requiring a majority for imposing a tax, and letting the minority defend itself by the threat of abstaining from the production of income, they derive the tax rate at which any majority coalition that may emerge will tax the remaining minority. But their respective majority and minority are not grouped by pre-tax income: rather, their's is the case of the 'losers' in a power game being taxed by the 'winners'.

The results obtained by the 'altruism' literature depend crucially on the assumption of a decreasing marginal utility of income: only under this assumption will the optimum distribution provide some income to both self and others, rather than an either prefectly egoistic or perfectly altruistic corner solution. Similarly, the
Aumann and Kurz results rely on the incentive effect of taxation, to prevent a majority coalition from totally dispossessing the rest of the population.

In this paper we show that both voluntary redistribution, and limitation of the taxing power of a majority, may be derived without making use of either of these assumptions. We start from a given pre-tax income distribution, which divides the population into a Rich minority and a Poor majority. In Part I, plutocratic rule is assumed, and voluntary redistribution by the Rich is derived from an income maximizing model, given the threat of confiscation. Some further complications are introduced, and investigated, in Part II. In Part III, the rules of the game are changed, to investigate, in a similar vein, the voluntary restriction of the majority's power to tax the minority. Finally, the two sets of restrictions -- that on the Poor to tax the Rich, and that of the Rich to enjoy all their income -- are integrated into one model in Part IV.
I. FEAR OF CONFISCATION AS AN INCENTIVE FOR VOLUNTARY REDISTRIBUTION

1. We take as our starting point a given initial pre-tax income distribution, and divide the population into those with above-average incomes, the 'Rich', and those with below-average ones, the 'Poor'. With average income, $\bar{y}$, constituting the pivot of this division, total income is divided equally between the two groups. But, except in a symmetrical distribution, the two are not of equal size. In particular, with the income distribution skewed rightward $\bar{y} > y_{\text{median}}$, so that the 'Poor' constitute the majority of the population.

In this part of the paper we will be considering a society in which redistributive taxes can be imposed only with the consent of those who shall have to pay them. It is possible to envisage a number of constitutional set-ups in which this condition holds. To simplify matters, however, we will be speaking of this society as of a plutocracy, i.e., as being ruled by the Rich minority. We assume also that if the Rich decide voluntarily to transfer some of their income to the Poor, they will agree among themselves to contribute each an equal proportion of the excess of their income over $\bar{y}$, the level which constitutes the dividing line between the two groups.

Finally, as mentioned in the introduction, we will assume throughout that individuals are risk-neutral. Their preferences among various situations will be derived from comparisons of the corresponding incomes, rather than utilities.

Let there exist in this society a revolutionary party with a perfectly egalitarian ideology, so that if a successful revolution occurs everybody will receive the same per capita income, $\bar{y}$. We will distinguish between the probability of a revolution being
attempted, \( p \), and that of an attempted revolution being also successful, \( \gamma \). \( p \) is assumed to be an increasing function of the (relative) number of individuals in the Poor group preferring a revolution to any alternative regime available, \( N_r \). \( \gamma \) may be expected to depend mainly on non-economic factors; for the time being it is assumed to be given exogenously. We also assume that if the revolution fails, there will be repressions against all the Poor, it being impossible to distinguish in practice between those of them who supported it and those who did not. These repressions will take the form of all potential revolutionaries, i.e., everybody with \( y < \bar{y} \), having their income reduced by \( u_y \), say, to compensate for the loss of productive capacity due to the destruction of equipment, etc. (A successful revolution is tacitly assumed to carry no such loss.)

2. Consider now the alternatives facing the Poor. These are illustrated in Figure 1, where initial, actual, income is measured on the horizontal axis, and the incomes which can be expected under the different alternative regimes are measured on the vertical one. The 45 degree straight line from the origin corresponds to the continuation of the status-quo; the horizontal line at \( \bar{y} \) -- to a successful revolution; and the \( (1 - \alpha)y \) line -- to an unsuccessful one. For any \( y < \bar{y} \), the expected income if a revolution occurs is

\[
E_r(y_p) = \gamma \bar{y} + (1 - \gamma)(1 - \alpha)y
\]

(1)

For \( \gamma > 0 \), this is represented in Figure 1 by a straight line with a vertical intercept \( \gamma \bar{y} \) and a slope smaller than \( (1 - \alpha) \). The intersection of this line with the diagonal from the origin, at some in-
come \( z \), divides the Poor into two groups. Those with \( y < z \), for which \( E_r(y_p) > y \), prefer the risk of a revolution to the status-quo. The relative size of the revolutionary population is in this case equal to

\[
N_r = F(z) = \int_0^z f(y) \, dy
\]

(2)

where \( f(y) \) is the density function of the population by income.

Suppose now, however, that the Rich are ready to transfer part of their incomes to the Poor. In symmetry with the self-imposed tax rule of the Rich, let these transfer payments be distributed proportionally to the deficiency of the Poors' income with respect to \( \bar{y} \), \( T_p = \beta(\bar{y} - y) \). (For alternative transfer rules, see Part II, below.) Thus, with the transfer, the incomes of the Poor become

\[
y_{TP} = y + T_p = \beta \bar{y} + (1 - \beta)y
\]

(3)

represented in Figure 1 by a straight line with a vertical intercept \( \beta \bar{y} \) and a slope of \( (1 - \beta) \). If \( \beta > \gamma \), \( y < y_{TP} < E_r(y_p) \) for all \( y < \bar{y} \), and \( N_r = 0 \). If, however, as drawn in Figure 1, \( \beta < \gamma \), there will be some income level at which \( y_{TP} = E_r(y_p) \). Equating (1) and (3), this income level is seen to be

\[
z_T = \frac{\gamma - \beta}{(1 - \beta) - (1 - \gamma)(1 - \alpha)} \bar{y}
\]

(4)

In the absence of a transfer we would identify individuals with \( z < y < \bar{y} \) in socio-political terms as (middle class?) 'quietists', and those with \( y < z \) as 'revolutionaries'. To these there is now added a third group, that with \( z_T < y < Z \). These are 'revisionists', who, given no other choice, would prefer a revolution to the status-
quo, but can be bought-off with a transfer. By detaching the revisionists from the other non-quietists, the transfer reduced the revolutionary population from \( N_x = F(z) \) to \( N_T = F(z_T) \).

3. Consider now the alternatives facing the Rich. These are illustrated in Figure 2. Here, however, the incomes read off the 45 degree diagonal are not those expected by the Rich if the status quo continues, for in the absence of any change a revolution may occur. Their expected income in the latter case is

\[
E_x(y_R) = \gamma y + (1 - \gamma)\bar{y} \\
= y - \gamma(y - \bar{y})
\]  

which is described in Figure 2 by a straight line starting from the diagonal at \( \bar{y} \), and laying between \( y \) and \( \bar{y} \). The occurrence of a revolution is not, of course, a certainty. Taking into consideration the chances both of a revolution occurring, \( p \), and of its being successful, \( \gamma \), the expected income of the Rich becomes

\[
E(y_R) = pE_x(y_R) + (1 - p)y \\
= y + p\gamma(y - \bar{y})
\]  

The Rich may, however, decide voluntarily to transfer some of their incomes to the Poor, as such a transfer, as we have seen earlier, decreases the size of the revolutionary population, and thereby the probability of a revolution taking place. Given the rule of transfer assumed earlier as agreed upon among the Rich, \( T_R = \lambda(y - \bar{y}) \), their incomes in the absence of a revolution then become

\[
y_{TR} = y - T_R = \lambda\bar{y} + (1 - \lambda)y
\]
And their expected income, given the possibility of a revolution, now becomes

\[
E_t(y_R) = pE_r(y_R) + (1 - p)y_{TR}
\]

which is depicted in Figure 2 by the straight line laying between \(y_{TR}\) and \(E_r(y_R)\). It is reasonable to assume that in the event of a revolution being repressed, the transfer will be discontinued, so that the income associated with the probability of an unsuccessful revolution is in this case no longer identical to that associated with the probability of no revolution taking place. (This is also consistent with the income of the Poor in such an event being reduced to \((1 - \alpha)\).)

Thus, the transfer affects the expected income of the Rich in three different ways: it reduces the level of income retained if no revolution occurs; it increases the probability of this reduced income being, indeed, received; and it reduces the probability of the transfer being withdrawn (in the case of an unsuccessful revolution) and income reverting to its status-quo ante level.

4. The Rich will seek that value of \(\lambda\) which maximizes \(E_t(y_R)\).

The first-order condition for maximizing (8) is

\[
\frac{dE_t(y_R)}{d\lambda} = -(y - \bar{y})[(1 - p) + \lambda \frac{dp}{d\lambda}] = 0
\]

which is satisfied by

\[
\lambda^* = \gamma + (1 - p)/(dp/d\lambda)
\]

Substituting (10) into the second-order condition,

\[
\frac{d^2E_t(y_R)}{d\lambda^2} = -(y - \bar{y}) [(\gamma - \lambda) \frac{dp}{d\lambda} + \frac{d^2p}{d\lambda^2}] < 0
\]
reduces the latter to

\[ p < 1 + 2(\frac{\partial p}{\partial \lambda})^2 / (\frac{\partial^2 p}{\partial \lambda^2}) \]  

(12)

What can be said of the signs of \( \frac{\partial p}{\partial \lambda} \) and \( \frac{\partial^2 p}{\partial \lambda^2} \)? The relationship between a change in \( \lambda \) and the resultant change in \( p \) is given by

\[ \frac{dp}{d\lambda} = \frac{\partial p}{\partial T} \cdot \frac{\partial N_T}{\partial T} \cdot \frac{\partial x_T}{\partial \beta} \cdot \frac{\partial \beta}{\partial \lambda} \]  

(13)

Consider first the last component, \( \partial \beta / \partial \lambda \). The total sum distributed among the Poor cannot exceed that taken away from the Rich. We have already pointed out earlier that, with \( \bar{y} \) serving as the redistributitional pivot, pre-transfer income is divided equally between the two groups, so that, by definition

\[ \bar{y} \int_{0}^{\infty} f(y) dy = \int_{\bar{y}}^{\infty} f(y) dy \]

and the total excess, over \( \bar{y} \), of the incomes of the Rich, is equal to the total deficiency, with respect to \( \bar{y} \), of the incomes of the Poor. In the present framework, the former constitutes the tax-base, while the latter constitutes the poverty-gap. The budget constraint is, thus, given by \( \beta = (1 - c) \lambda \), where \( c \) is the cost of transfer per dollar transferred. Assuming, for convenience, \( c = 0 \), this becomes simply

\[ \beta = \lambda \]  

(14)

From equations (14), (4), and (2), respectively, we derive
\[
\frac{\partial \beta}{\partial \lambda} = 1 > 0
\]
\[
\frac{\partial z_T}{\partial \beta} = - \frac{(1 - \gamma)\alpha}{(1 - \beta) - (1 - \gamma)(1 - \alpha)^2} \gamma < 0
\]
\[
\frac{\partial N_T}{\partial z_T} = \frac{\partial F(z_T)}{\partial z_T} = f(y) > 0
\]

(15)

and, by assumption, \( \partial p / \partial N_T > 0 \). Consequently, \( \partial p / \partial \lambda < 0 \).

We may expect the marginal efficacy of transfers in reducing the risk of revolution to decrease (or, at least, not to increase) with the transfer rate. However, \( \partial^2 p / \partial \lambda^2 > 0 \), which is sufficient to satisfy (11), cannot be derived unambiguously from the underlying relationships.\(^4\) And it is clear from (12), that the conditions for a maximum may be satisfied even in the unlikely case of the marginal efficacy of transfer increasing with \( \lambda \).

In equation (10), the expected-income-maximizing transfer rate, \( \lambda^* \), has been expressed in terms of \( p \) which, in its own turn, is a function of \( \lambda \). The interrelationship between \( \lambda \) and \( p \) is illustrated in Figure 3. The negatively sloped curve there, \( \alpha \alpha \), describes the previously discussed dependence of \( p \) on \( \lambda \), drawn on the assumption that \( \partial^2 p / \partial \lambda^2 > 0 \). The other curve, \( \beta \beta \), plots the expression \( \gamma + (1 - p)/(\partial p / \partial \lambda) \) as a function of \( p \) — i.e., it consists of all the values of \( \lambda \) satisfying equation (10). It will be positively sloped provided that

\[
\frac{d}{d\lambda} \frac{1 - p}{\partial p / \partial \lambda} > 0 \quad (16)
\]

which can be shown to be satisfied by (12).\(^5\) The intersection of the two curves at point \( A \), determines the mutually consistent income-maximizing levels of the transfer rates and of the probability of a
revolution, \( \lambda^* \) and \( p^* \).

Under our assumption that both confiscation and taxation refer to the excess of \( y \) over \( \bar{y} \), \( \lambda^* \) is independent of the income level. The acceptance, by the Rich, of the redistribution rule postulated here leads, thus, to a consensus on the actual schedule of the voluntary tax they impose upon themselves.\(^6\) As \( \gamma \geq 0 \), and \( dp/d\lambda < 0 \), it follows that \( \lambda^* < \gamma \): The rate of transfer optimal for the Rich will always fall short of the probability with which they expect a revolution, once attempted, to be successful.\(^7\) As \( \gamma \leq 1 \), a perfectly egalitarian state will not be achieved voluntarily. On the other hand, \( \lambda^* = 0 \) cannot be rule out \textit{a-priori}. In terms of Figure 3, this corresponds to a corner-solution, in which the two curves intersect at some point on the horizontal axis. This is the case where, in view of the low probability of a revolution's success, the decline in the probability of its occurrence can never compensate for the necessary reduction in retained income. The Rich will then abstain from any transfer, preferring the risk of confiscation. More generally, to values of \( dp/d\lambda \) satisfying

\[
\frac{1 - p}{\gamma} < \frac{dp}{d\lambda} < \infty
\]

there will correspond some \( 0 < \lambda^* < \gamma \), with corresponding values of \( z_T^* \), \( N_T^* \), and \( p^* \), which may be regarded as optimal from the point of view of the Rich. At \( \lambda > \lambda^* \), the decline in the probability of a revolution is not sufficient to compensate them for the decline in after-transfer income required to achieve it; and \textit{vice-versa} at \( \lambda < \lambda^* \).

Figure 3 helps to illustrate the effect on \( \lambda^* \) of changes in the perceived risk of revolution or in the marginal efficacy of transfer
in reducing it. Such a change, say an autonomous increase in the
probability of a revolution associated with any given value of \( \lambda \),
shifts the aa curve upwards, to a'a'. This, by itself, would
have had the effect of raising \( \lambda^* \), though by less than the actual
vertical shift in aa, so that the optimal level of revolution risk,
p^*, would also have increased (point B in Figure 3). In other words,
enhanced risk perception would result than in the Rich deciding both
to transfer more of their income to the Poor and to take a higher
risk than before. However, as we have seen from equation (10), the
transfer rate satisfying the first-order maximum condition is a func-
tion also of \( \frac{dp}{d\lambda} \), i.e., of the slope of the aa curve. In
Figure 3 a'a' has been drawn throughout as steeper (with respect to
the vertical axis) than aa. Consequently, bb is shown there to
have shifted upwards, to b'b', with the new optimum corresponding
to point C in the figure: the increase in the marginal efficacy of
the transfer partly offsets, in this case, the increase in the optimal
risk level which the Rich would have been otherwise induced to take by
the rise in their risk-perception.

Increased risk-perception may, however, be associated also with
a decrease in the efficacy of transfer. This, for example, will be
the case if, at all values of \( \lambda \), some constant risk element is
added, represented in Figure 3 by a horizontally-parallel shift of
aa rightward. In this case, the absolute value of \( \frac{dp}{d\lambda} \) at any
given value of p is reduced, thereby pushing bb downwards, rather
than upwards. The optimal risk level taken by the Rich will then in-
crease, while the optimal transfer rate, \( \lambda^* \), may remain constant,
or even decline, despite their raised perception of risk.

Under our present assumptions, p is a function of the size of
the revolutionary population, given the transfer, \( N_T \), which, in its own turn, is a function of \( z_T \), the income at which \( \eta_{TP} = E_{\xi}(\eta_p) \). Differentiating (4) with respect to \( \gamma \) shows that \( dz_T/d\gamma > 0 \). Thus, as may have been expected, an increase in the probability of revolution being successful increases the chances of its being attempted, and may be one of the causes of the upward shift in \( aa \) considered here.
II. SOME FURTHER COMPLICATIONS

1. Suppose that the values of $\beta$ and $z_T$ in Figure 1 are in fact those corresponding to $\lambda^*$, the optimal rate of transfer for the Rich, given the rule postulated earlier, by which the transfer is distributed among the Poor. Inspection reveals that this rule, by which $T_p = \beta(\bar{y} - y)$, need not be the most efficient one from the point of view of the Rich. On the one hand it does not transfer enough to those with $y < z_T$ to make them prefer it to a revolution. On the other hand, to those with $y > z_T$ it transfers more than is necessary for them to prefer the transfer over alternative regimes; in particular, part of the transfer is used to increase the incomes of those with $z < y < \bar{y}$, who would prefer the status-quo, even without transfers, to the risk of revolution. If some or all of this 'transfer-surplus', could be eliminated without increasing $N_T$ (and, consequently $p$), the Rich could attain the same level of expected income at a lower value of $\lambda$.\(^8\) (Whether they would choose to do so, is another question: Such a change in the rule of transfer both reduces the level of $p$ corresponding to any given value of $\lambda$, and increases the absolute value of $dp/d\lambda$, so that the sign of the net result on $\lambda^*$ cannot be determined without further information.)

A number of such alternative rules come to mind. The transfer surplus could be eliminated altogether by restricting the transfer to any member of the Poor to

$$T_p \leq \frac{E(y_p)}{z_p} - y$$  \hspace{1cm} (17)

so that no individual would receive more than is just necessary for
him to prefer the transfer situation to revolution. If the highest possible transfer under this rule were given to all individuals with \( y < z \) , it would eliminate the risk of revolution altogether.\(^9\) The size of the transfer-surplus saved by this rule depends on the density function of the population by income between \( z_T \) and \( \bar{y} \). Assuming, for expository purposes, the distribution of incomes within the Poor group to be uniform (so that the number of income recipients is the same at all levels of \( y < \bar{y} \) ), this surplus would be represented in Figure 1 by the area CED. If this exceeds the area ABC there, which represents then the increased transfer to the \( y < z_T \) group, such a redistribution can be attained with \( \lambda < \lambda^* \) , i.e., at a lower cost to the Rich than that which would minimize \( p \) (but not eliminate it completely) under the transfer rule considered earlier.

A transfer system which would just fulfill condition (17) requires a fine-tuning mechanism which may not be feasible in practice, so that some transfer surplus may be unavoidable. Practical considerations may dictate that the transfer rule does not require the identification of a whole segment of the \( E_{rP} \) line, but requires only a rough estimate of some point on it. Thus, with a transfer of \( T_P = z - y \) to all \( y < z \) , the risk of revolution would be totally eliminated.

In the case of an uniform distribution, if the area CED in Figure 1 exceeds the area AzG there, the total sum transferred will be smaller than the optimal one under the proportionate transfer. More generally, such a poverty-line may be set at any income level between \( \gamma \bar{y} \) and \( z \) . For it to be less costly, from the point of view of the Rich, than the proportionate transfer considered earlier, it requires, in the general case, that the poverty level, \( z_P \) , be set so that
\[ \lambda^* > \frac{\int_0^{z_p} (z_p - y) f(y)\,dy}{\int_0^{-y} (y - y) f(y)\,dy} \quad (18) \]

Note that the numerator on the R.H.S. of (18) is a measure of the poverty-gap given \( z_p \) as the poverty-level, and the denominator is a similarly constructed measure of the overall income inequality between the Rich and the Poor. If (18) holds, the poverty-line rule will be the more efficient one if the resultant reduction in the size of the population preferring revolution to alternative regimes is not smaller than under the \( \lambda^* \) policy. Note that in this case, even if the size of the revolutionary population remains constant, its identity changes. Instead of consisting of those with \( y < z_T \), it will now consist of those with \( z_p < y < z_T \). In particular, if this transfer rule is substituted for an already operating proportional one at rate \( \beta \), the Rich may be tempted to set the level of the poverty-line at \( z_T \), those with incomes below it being known in this situation to have a revolutionary preference. With \( z_p = z_T \) the preferences of this group will, indeed, be reversed. But so will be also those of the group in the \( z_T < y < z \) range, so that the revolutionary population will not be eliminated altogether, and may, in fact, increase.

In this discussion so far we have tacitly assumed \( p \) to be proportional to \( N_r \), which allowed us to identify changes in the probability of revolution with those in the size of the revolutionary population. But with \( \frac{\partial^2 p}{\partial N_r^2} \neq 0 \), and in particular if the relationship is not monotonic, a change in the identity of the class of individuals constituting \( N_r \) may increase \( p \) despite their total number remaining constant, or even decreasing.\(^{10}\)
2. Until now we have assumed $\gamma$, the probability of a revolution being successful, to be exogenously given. This need not, of course, be the case. It seems reasonable to think that $\gamma$ will be affected by the sum spent by the Rich on police surveillance of the Poor, etc. If this is the case, the self-levied tax on the Rich at rate $\lambda_1$ may be thought of as consisting of a transfer-tax at rate $\lambda_1$ and of a 'police tax' at rate $\lambda_2$. Differentiating equation (8) with respect to the two tax rates, we obtain the first-order conditions for the maximization of $E_t(y_R)$

$$\frac{dE_t(y_R)}{d\lambda_1} = -(y - \bar{y})[(1 - p) + (\gamma - \lambda) \frac{dp}{d\lambda_1}] = 0$$ (9a)

$$\frac{dE_t(y_R)}{d\lambda_2} = -(y - \bar{y})[(1 - p) + p \frac{dy}{d\lambda_2}] = 0$$ (9b)

where $dp/d\lambda_1 < 0 > dy/d\lambda_2$. The second order conditions are

$$\frac{d^2E_t(y_R)}{d\lambda_1^2} = -(y - \bar{y})[\gamma - \lambda] \frac{d^2p}{d\lambda_1^2} - 2 \frac{dp}{d\lambda_1} \frac{dp}{d\lambda_1} < 0$$ (11a)

$$\frac{d^2E_t(y_R)}{d\lambda_2^2} = -(y - \bar{y}) p \frac{d^2y}{d\lambda_2^2} < 0$$ (11b)

A decreasing marginal efficacy of outlays on police surveillance and similar measures satisfies (11b); and, as has already been observed earlier, a similarly decreasing marginal efficacy of transfer payments satisfies (11a).

From equations (9a) and (9b) we obtain the following relationship between the optimal values of the total tax rate, the probability of a revolution, and that of its being successful
\[
\frac{\gamma^* - \lambda^*}{\theta^*} = \frac{dy/d\lambda_2}{dp/d\lambda_1}
\] (19)

This expression reflects the optimization requirement that, at the margin, the values of \( \lambda_1 \) and \( \lambda_2 \) be set so as to equalize the effects on expected income of a dollar spent on security measures and of a dollar transferred to the Poor. Both types of expenditure decrease the income retained by the Rich if revolution is not attempted, but their effects on expected income are not identical. Outlays on security, by lowering \( \gamma \), increase the chance of a suppressed revolution, \( p(1 - \gamma) \), in the wake of which the Rich will be able to enjoy their status quo ante incomes. Redistribution, on the other hand, by lowering \( p \), decreases the chance of a failed revolution, but at the same time increases the probability that they will be able to enjoy their post-redistribution incomes.\(^{11}\)

Substituting for \( p \) from either (9a) or (9b), we obtain

\[
\lambda^* = \gamma^* - \frac{(dy/d\lambda_2)/(dp/d\lambda_1)}{1 - (dy/d\lambda_2)}
\] (20)

Unlike in equation (10), here the probability of a revolution being successful is not given, but is determined simultaneously with \( \lambda^* \), to be mutually consistent with the latter. Nevertheless, the optimal tax rate will still be set so as to fall short of the former. As can be seen from (20), the difference between the two will be greater, the smaller the absolute value of \( dy/d\lambda_2 \), and the higher that of \( dp/d\lambda_1 \) -- i.e., the greater the marginal efficacy of redistribution in reducing the probability of a revolution being attempted, and the lower that of police expenditures in reducing the probability of its being successful. However, the values of \( \gamma^* \) and \( \lambda^* \), and the distribution of the latter between \( \lambda_1 \) and \( \lambda_2 \) cannot be established
without postulating more specific relationships between $p$ and $\lambda_1$
and between $\gamma$ and $\lambda_2$, than has been done here.

A possibly more realistic assumption regarding $\gamma$ may be that it is a function of the police expenditure per revolutionary. The size of the revolutionary population has been shown in Part I to be a negative function of the transfer tax rate. Consequently, we may expect that, in such a case, the optimal ratio of police expenditures to redistribution will be lower than when $\gamma$ depends on the total security outlay.
III. FEAR OF REPRESSION AND REDISTRIBUTION UNDER MAJORITY RULE

1. A broadly speaking similar model can be constructed for the alternative scenario, under which the Poor, constituting the majority, can impose redistribution upon the Rich. Let the rules of this redistribution be identical with that considered in Part I above, so that, given the tax rate, \( t \), after-tax income becomes

\[
\begin{align*}
    y_{TR} &= y - t(y - \bar{y}) & \text{for } y > \bar{y} \quad (21a) \\
    y_{TP} &= y + t(\bar{y} - y) & \text{for } y < \bar{y} \quad (21b)
\end{align*}
\]

Such a redistribution, however, is constrained by the possibility of the Rich renouncing their acquiescence in majority rule, e.g., by their attempting to establish a dictatorship of the plutocracy. Let us denote by \( \pi \) the probability which the Poor ascribe to such an attempt taking place, and by \( \delta \) the probability with which they expect it to be successful. In the latter case, the tax imposed on the Rich will be abolished and their incomes revert to the status quo ante level. If the attempt fails, on the other hand, the Rich will be penalized by the confiscation of all income in excess of \( \bar{y} \), which will be then transferred to the Poor. Thus (as perceived by the Poor), the expected income of the Rich, if they attempt to set up a dictatorship, is

\[
E_d(y_R) = \delta y + (1 - \delta)\bar{y} = \bar{y} + \delta(y - \bar{y}) \quad (22)
\]

The propensity of any member of the Rich group to support such an attempt may be expected to increase with the excess of \( E_d(y_R) \) over
\( y_{TR} \). We assume the Poor to perceive the probability of its taking place, \( \pi \), as a monotonic function of the aggregate of this excess for all the Rich

\[
[\delta - (1 - t)] \int \frac{\infty}{y} (y - \tilde{y}) f(y) dy
\]

(23)

The risk of an attempt at dictatorship will, thus, be perceived as being greater the larger the difference between the chances of it being successful, \( \delta \), and the rate of income retained under the tax, \( 1 - t \), and the greater the overall income inequality between the Rich and the Poor (the integral term in (23), which is equal to the denominator in (18) above.) In particular, it will be non-existent at \( t < 1 - \delta \), i.e., at tax rates falling short of the probability of an attempt at a dictatorship ending in a failure. It follows, of course, from the above that \( \frac{d\pi}{dt} > 0 \).

2. Consider now the position of the Poor. They face the following alternative prospects:

(a) Receiving \( y_{TP} \), with probability \( 1 - \pi \) (no attempt at dictatorship, transfer continued).

(b) Receiving \( y \), with probability \( \pi \delta \) (attempt successful).

(c) Receiving \( \tilde{y} \), with probability \( \pi (1 - \delta) \) (attempt unsuccessful, Rich penalized and incomes equalized).

Thus, for any one of them, expected income amounts to

\[
E_t(y_p) = y + (\tilde{y} - y)[(1 - \pi)t + (1 - \delta)\pi]
\]

(24)

The first- and second-order conditions maximizing this income are

\[
\frac{dE_t(y_p)}{dt} = (\tilde{y} - y)[(1 - \pi) + (1 - t - \delta)\frac{d\pi}{dt}] = 0
\]

(25)
and

\[ \frac{\mathrm{d}^2\pi}{\mathrm{d}t^2} = (\gamma - \pi)(1 - t - \delta) \frac{\mathrm{d}^2\pi}{\mathrm{d}t^2} - 2\frac{\mathrm{d}\pi}{\mathrm{d}t} \leq 0 \]  

(26)

respectively. Substituting in (26) from (25), the latter reduces to

\[ \pi < 1 + 2\frac{(\pi/dt)^2}{(\pi/\pi/\pi^2)} \]  

(27)

A sufficient condition for (27) is that \( \pi/\pi^2 > 0 \), i.e., that the probability of the Rich rebelling against majority rule increases at an increasing rate with \( t \), which seems reasonable. The value of \( t \) which satisfies (25)

\[ t^* = (1 - \delta) + \frac{1 - \pi}{\pi/\pi} \]  

(28)

is the rate at which it is optimal for the Poor to tax the Rich. At values of \( t > t^* \), the benefit of the increased transfer to the Poor will be offset by the increased risk of the Rich rebelling against majority rule and establishing a dictatorship, and vice versa for \( t < t^* \).^{12a}

Expression (28) is very similar to expression (10). But as \( \pi/\pi > 0 > \pi/\pi \), \( t^* \) and \( \lambda^* \) are not quite symmetric. In particular, while \( \lambda^* < \gamma \), here we obtain \( t^*(1 - \delta) \): the tax rate optimal for the Poor will exceed the probability they ascribe to the chance of an attempt to set up a dictatorship being unsuccessful.

Consequently, on our assumptions, \( \pi^* \), the value of \( \pi \) corresponding to \( t^* \), is always positive. We also observe that even if \( \delta = 1 \), \( t^* > 0 \), provided \( \pi < 1 \): The Poor will not refrain from taxing the Rich as long as there is no certainty that the latter will rebel against the tax.
As in the case of $\lambda^*$ and $p$, considered earlier, $t^*$ and $\pi$ in (28) have to be mutually consistent, $\pi$ itself being a function of $t$. This is illustrated in Figure 4, where the aa curve describes $\pi$ as a function of $t$, while bb traces $[(1 - \delta) + (1 - \pi) / (d\pi/dt)]$ as a function of $\pi$, both curves being drawn here on the assumption that $d^2\pi/dt^2 > 0$. Under our assumptions, as reflected in (23) above, $\pi$ is a function not only of $t$, but also of $\delta$, and of the inequality in the distribution of incomes between the Rich and the Poor as a whole. An increase in $\pi$ due to an increase in the probability of a rebellion by the Rich being successful, $\delta$, lowers the intersection of the aa curve with the vertical axis, thus shifting the whole curve downward by $d\delta$ without, presumably, affecting its slope at any given level of $\pi$. As such a change does not affect the positioning of the bb curve, it will result in a fall in $t^*$ and a rise in $\pi^*$. All other increases in the probability of a rebellion by the Rich will shift aa downward and rightward to a'a', without affecting its intersection with the vertical axis. Thus, at any given level of $\pi$, the slope of a'a' with respect to the vertical axis is increased, as compared to aa. This increase in $d\pi/dt$ has also the effect of shifting bb downward, thereby lowering $t^*$ even further, and checking, or even reversing, the increase in $\pi^*$. Thus, while an autonomous increase in either $\delta$ or $\pi$, by itself, always lowers $t^*$, a decrease in $d\pi/dt$ operates in the opposite direction, so that the ultimate result of the former may be an increase in $t^*$.

In symmetry to the case considered in II.2 above, the Poor may try to lower $\delta$, the probability of a 'Putch' being successful, by using part of the proceeds of the tax levied on the Rich to finance
the operation of law enforcing agencies. Because the results are very similar to those obtained there we do not present them here.
IV. REDISTRIBUTION UNDER MAJORITY RULE WITH PERSISTENT RISK OF REVOLUTION

1. In Parts I and III, the two constraints on income distribution -- the threats, respectively, of an egalitarian revolution and of a plutocratic dictatorship -- were treated independently of one another. There was nothing there to prevent the tax rate optimal from the point of view of the Poor, to fall short of that which they would have been granted voluntarily by the Rich. In this part, we shall try to combine these two models in a reconsideration of the limits to redistribution through majority rule.

Let the basic rules of the game be those of Part III above: Taxation decisions are determined by majority vote, so that the Poor can impose a redistributive tax on the Rich. The rules of this redistribution are those described by (2la) and (2lb) above. For the sake of simplicity, \( \delta \), the probability of an attempt at a plutocratic dictatorship being successful, is assumed to be exogeneously given. Unlike in Part III, however, we will no longer postulate that if the Rich acquiesce in majority rule, they will enjoy their (taxed) income with certainty. Instead, like in the case of the voluntary, self-imposed redistribution of Part I, the post-tax income will be subject to the probability of an egalitarian revolution occurring (and of it being successful or not). Consequently, the alternative to \( E_d(y_R) \), the income expected by the Rich if they attempt to upset majority rule, is no longer simply the after-tax income, \( y_{TR} \) of (2la), but that which takes into account the possibility that, despite the tax, an egalitarian revolution may still occur. Assuming the relationship between alternative political situations and the income of the Rich to be that postulated in Part I above, this expected income is given by (8), with the voluntary tax rate, \( \lambda \),
considered there substituted now by the rate of the tax imposed by the Poor, $t$

$$E_t(y_R) = y - (y - \bar{y})[p(y - t) + t]$$  \hspace{1cm} (29)

For simplicity, we assume $\bar{y}$, in similarity to $\delta$, to be given. As before, $p$ is assumed to be an increasing function of the revolutionary population, with $\frac{dp}{dt} < 0 < \frac{d^2p}{dt^2}$.

Under majority rule the Rich cannot (unlike in Part I) maximize the value of (29). But the level of this expected income affects their tendency to rebel against majority rule: $\pi$ may be expected to be (or, at least, to be perceived as such by the Poor) an increasing function of the excess of $E_d(y_R)$ over $E_t(y_R)$. As the former is invariant to $t$, $\pi$ will be a decreasing function of $E_t(y_R)$, minimized at that tax-rate which maximizes the latter, $t = \lambda^*$.

In Part III, $t$ affected $\pi$ only through its effect on the after-tax income of the Rich. Now, however, it affects $\pi$ through both its effect on after-tax income and its effect on $(1 - p)$, the probability that they will be allowed to enjoy it. Consequently, $\pi$ no longer increases monotonically with $t$. As illustrated in Figure 5, at values of $t > \lambda^*$, the decrease in $y_{TR}$ with $t$ is more than offset by the increase in the probability of it not being confiscated, so that $E_t(y_R)$ increases with $t$, and $\frac{d\pi}{dt} < 0$. It is only at values of $t > \lambda^*$ that this relationship reverses itself, and $\frac{d\pi}{dt} > 0$.

2. As in the case analyzed in Part III, the Poor will opt for that value of $t$ which maximizes their post-transfer expected income. In a sort of 'we know that you know' sequence, they are supposed now to have an idea of the way in which the Rich perceive $p$, so that, as
described in the preceding paragraph, the $\tau$ the Poor perceive is minimized at $t = \lambda^*$. The Poor themselves now attempt to maximize their expected income, $E_t(y_P)$. This, as defined by (24) can be rewritten as

$$E_t(y_P) = (1 - \tau)y_{TP} + \tau E_d(y_P)$$

(24a)

and the first-order maximum condition of (25) can be rewritten as

$$\frac{dE_t(y_p)}{dt} = (1 - \tau)\frac{dy_{TP}}{dt} - \frac{d\pi}{dt}y_{TP} - E_d(y_P) = 0$$

(25a)

where, in symmetry with (22),

$$E_d(y_P) = \bar{y} - \delta(\bar{y} - y)$$

(22a)

By substituting from (3) and (22a), it can easily be seen that for all values $t > (1 - \delta)$, $y_{TP} > E_d(y_P)$, and $dy_{TP}/dt > 0$. In all these cases, therefore, a tax rate cannot maximize the expected income of the Poor unless it corresponds to the rising segment of the curve relating $\tau$ to $t$ in Figure 5.

In the discussion earlier, we postulated that for $t \leq (1 - \delta)$, so that $E_d(y_R) < y_{TR}$, the risk of a rebellion vanishes completely, and $\pi = 0$. Under the assumptions of this part of the paper, this is no longer necessarily true: for the state of affairs which the Rich now consider as an alternative to rebellion is not the after-tax income, but the expected value $E_t(y_R)$, which takes into account the possibility of an egalitarian revolution, and which may fall short of the former. Consequently, there may exist values of $t$ such that

$$([(1 - \delta) - p\gamma](1 - p) < t < (1 - \delta)$$
for which $E_{t}(y_{R}) < E_{d}(y_{R})$, so that $\pi > 0$, but which requires $d\pi/dt < 0$, for (25a) to be fulfilled. This, however, will always be a local minimum, i.e., the highest value of $E_{t}(y_{p})$ for $t < \lambda^*$ only. Looking at (24a) we can readily see that any value of $\pi$ which satisfies (25a) for $t < \lambda^*$, can be attained also by a higher $t$, with a correspondingly higher $y_{tp}$ and, consequently, also a higher $E_{t}(y_{p})$. Therefore, only values of $t > \lambda^*$ may be optimal from the point of view of the Poor. (And in particular, as $d\pi/dt = 0$ contravenes (25a) irrespective of the value of $t$, $t = \lambda^*$ can never be optimal.)

3. To recapitulate, it has been shown here that, if [the Rich think that] majority rule by the Poor does not remove the risk of an egalitarian revolution, the Poor and the Rich will never agree on the rate at which the latter should be taxed. Despite the fear of confiscation by the Poor on one hand, and that of a rebellion by the Rich on the other hand, the tax-rate voluntarily ceded by the Rich will always fall short of that imposed by the Poor, $t^* > \lambda^*$. In the Introduction and in Part I of the paper, we raised the possibility of voluntary taxes -- i.e., taxes which are not imposed from the outside by law or decree, but which reflect an income maximization process under conditions of political uncertainty. We have now seen that under majority rule this cannot be the case. This result was derived without any further specification of the shape of the functions relating $p$ and $\pi$ to $t$, except that implied by a persisting risk of revolution.

The 'we know that you know that we know' sequence, assumed here can, for the sake of symmetry, be extended one step further. Without any loss of generality, we may assume the Rich to envisage $p$ to be an inverse function of the difference between $E_{t}(y_{p})$ and
$E_t(y_p)$, as measured at some given level of $y < \bar{y}$. In this case, $p$ would no longer decrease monotonically with $t$, but would be minimized at that tax rate which maximizes $E_t(y_p)$, i.e., at $t^*$. As shown in Figure 5 by the broken line segments, the curve relating $p$ to $t$ would then have a shape similar to that of the curve relating $\pi$ to $t$; which, in its own turn, would cause the latter to become steeper, from $t^*$ onward, than it would otherwise have been.  

The tax-rate imposed by the majority, $t^*$, can be decomposed as follows: We may regard $\lambda^*$ as an economic expression of the threat, to the Rich, of a successful revolution. The excess of $t^*$ over $\lambda^*$ may be similarly viewed as due to (the Poors' perception of) the risk to the Rich of a failed rebellion against majority rule. Finally, $1 - t^*$ may be regarded as measuring the risk to the Poor of a successful rebellion by the Rich. Throughout this paper we have ignored the possibility of taxation having any effect on incentives, and therefore on total income. Had an incentive effect been allowed for, it would have further reduced $t^*$, and $1 - t^*$ could have then been further decomposed, into an incentive and a risk-of-rebellion effect.

The optimal tax rate, $t^*$, does not minimize either the risk of a plutocratic rebellion or, as a rule, that of an egalitarian revolution. The relative magnitudes of these risks depend, of course, on the relationship between the $\pi$ and $p$ functions. We may distinguish between two basic relationships, corresponding to different positioning of the curves of Figure 5. If the curve describing the $p$ function nests throughout within that describing $\pi$, or intersects it at some $t > t^*$, the risk of revolution at $t^*$ exceeds that of rebellion. In all other cases, the optimal tax rate
will be associated with \( \pi > p \).

4. The scenarios employed in this paper were those of political action. But no attempt was made to exploit the present analysis more thoroughly for constructing models of political behaviour. For example, the persistence of revolution risk despite majority rule implies the existence of a revolutionary population. This has been defined in Part I as consisting of those individuals who prefer an egalitarian revolution to all available alternative. But as \( t^* < 1 \), the revolutionary population could not have been, therefore, part of the majority determining it. The latter is thus reduced to some subset of the Poor group, raising the possibility of coalitions, which has not been admitted here.

Similarly, it has been tacitly implied throughout that once the optimal tax rate, voluntary or not, has been chosen, the risk, whether of revolution or of rebellion, will not materialize. But there was nothing in our assumptions to ensure this. If we consider, for example, the model of Part I, a failed revolution would result in an increased social polarization, due to the income of the Poor being reduced to below its status quo ante level. This seems to suggest that a plutocracy which managed to put down an egalitarian revolution, could be setting out upon a development path which made further revolutionary attempts unavoidable. But the investigation of the long-run properties of the models outlined here falls outside the scope of the present paper.
FOOTNOTES

* I wish to thank Harold M. Hochman, Joram Mayshar, Shlomo Yitzhaki and participants at the I.I.E.S. seminar, for helpful comments on earlier versions of Part I and II of the paper; Henrik Horn for raising the questions which Parts III and IV attempt to answer; and Shmuel Nitzan for his detailed comments on a draft of the present version.

1 For models considering different forms of altruism, see, for example, Hochman and Rodgers (1969), Scott (1972), Kleiman (1978).

2 It will be the convention in this paper for the subscript on the expectations operator to denote the corresponding regime (in this case revolution), and that on \( y \) to denote the income group referred to (in this case the Poor).

3 We will refer later to the issues raised by \( p \) and \( \gamma \) here being the subjective probabilities, as perceived by the Rich. Equation (6) assumes that all the costs of a failed revolution are borne by the Poor. But the income associated there with \( p(1 - \gamma) \) could be differentiated from that associated with \( (1 - p) \), to account for the costs of preventing the revolution from succeeding. See Part II, below.

4 It may be convenient to restate (13) above as

\[
\frac{d^2\pi}{d\lambda^2} = \frac{\partial \pi}{\partial \lambda} \left[ \frac{\partial^2 p}{\partial N_T^2} \frac{\partial N_T}{\partial \lambda} + \frac{d^2 N_T}{d\lambda^2} \right]
\]
A case can easily be made for \( \frac{\partial^2 p}{\partial N_T^2} \) to be either negative throughout or becoming such at high values of \( N_T \). This, however, is not sufficient. Given a costless transfer, so that \( \frac{\partial \beta}{\partial \lambda} = 1 \)

\[
\frac{d^2 N_T}{d\lambda^2} = \frac{\partial^2 N_T}{\partial z_T^2} \left( \frac{\partial z_T}{\partial \beta} \right)^2 + \frac{\partial^2 z_T}{\partial \beta^2} \cdot \frac{\partial N_T}{\partial z_T}.
\]

Except in a rectangular income distribution, the sign of \( \frac{\partial^2 N_T}{\partial z_T^2} = f'(y) \) will vary with the value of \( z \). In particular, in a single-peaked rightward skewed distribution, \( f'(y) \) is positive for incomes falling below the mode, and negative for the rest. As \( \frac{\partial^2 z_T}{\partial \beta^2} < 0 < \frac{\partial N_T}{\partial z_T} \), it will be only in the latter case that the sign of \( \frac{d^2 N_T}{d\lambda^2} \) will be certain to be negative. So that even if, say, \( p \) were postulated to be a linear function of \( N_T \), the sign of \( \frac{d^2 p}{d\lambda^2} \) could be ascertained unambiguously only in the relatively narrow range \( y_{\text{mode}} < z_T < \bar{y} \).

5 Condition (12a) is satisfied by \( p < 1 + (\frac{dp}{d\lambda})^2/(\frac{d^2 p}{d\lambda^2}) \).

For all values of \( \frac{d^2 p}{d\lambda^2} > 0 \), this is satisfied by virtue of \( p < 1 \).

For \( \frac{d^2 p}{d\lambda^2} < 0 \), the R.H.S. of (12) is always smaller than the R.H.S. of the expression above.

6 With \( T_R = \lambda(y - \bar{y}) \), the average tax-rate on a Rich individual's income is \( T/y = \lambda[1 - (\bar{y}/y)] \), yielding \( \frac{dT/y}{dy} = \frac{\lambda\bar{y}}{y^2} > 0 \)

and \( \frac{d^2 (T/y)}{dy^2} = -2\lambda\bar{y}/y^3 < 0 \).

Thus, the proportionate taxing of \( y - \bar{y} \) is equivalent to a (degressively) progressive tax on \( y \). We ignore here the possibility of the
perception of \( p \) and \( \gamma \) varying systematically with income.

7 Comparing (6) and (7) we observe that \( \lambda^* < \gamma \) means that the Rich will never opt for a tax rate at which \( y_{TR} < E_R(y_R) \).

8 Generally speaking, transfer surpluses may be said to occur whenever, because of the rules employed, the sum transferred exceeds the minimum one required to attain the aim of the transfer, either by transferring too much to the target population or by covering other populations as well.

9 Restricting the transfer under this rule only to individuals with, say \( y < z_T \), would result in a serious 'notching' problem at the cut-off point.

10 We ignore here the possibility of \( p \) being, for example, a function not only of the number of people preferring revolution, but also of their income, say, as a proxv for their human capital, so that \( p \) may increase even as \( N_T \) decreases, given a change in its composition.

11 In terms of equation (8), we observe that police expenditures increase the value of \( E_R(y_R) \), while redistribution increases the probability of receiving \( y_{TR} \) (and decreases that of receiving \( E_R(y_R) \)).

12 Thus, the present model is not quite symmetrical to that considered in Part I. There, the probability of revolution, \( p \), was a function of the number of individuals preferring it to all other regimes; here, the probability of a coup d'etat, \( \pi \), is a function of the extra income with which its success would provide the Rich. This asymmetry is, perhaps, not much at variance with popular views of the motives of political behaviour. In any case, the model of Part I could easily be brought in line with the present one in this
respect, without any substantial changes in the results. (As \( N_r \) decreases, so does also the gap between \( E_r(y_P) \) and \( y_{TP} \).) Another difference is the assumption that, in the case of failure, the Rich will be penalized by losing all income in excess of \( \bar{y} \), while the Poor, in similar circumstances, were assumed to be penalized by forfeiting some proportion of their income.

12a Thus, the risk of rebellion by the Rich plays a role in the determination of the optimal tax rate similar to those of work-incentives (Sadka, 1976) or of emigration (see the symposium in Jour. Pub. Ec. August 1982.)

13 The persistence of the risk of revolution is due here to the optimal tax rate imposed by the Poor, \( t^* \), not being necessarily sufficient to reduce to zero the size of the revolutionary population, i.e., the number of those individuals for whom \( y_{TP} \) -- or, in a version considered later, \( E_t(y_P) \) -- falls short of \( E_r(y_P) \).

14 We ignore here the possibility that \( E_d(y_R) < E_t(y_R) \), in which case, presumably, \( \pi = 0 \).

15 We note, passim, that the sub-group of the Poor which determines \( t \), determines through it both \( p \) and \( \pi \).

16 Compare the expressions of equations (9) and (25), keeping in mind that \( dp/dt > 0 \) requires \( dE_t(y_P)/dt < 0 \), while \( d\pi/dt < 0 \) requires that \( dE_t(y_R)/dt > 0 \).
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FIGURE 5

\[ P, \pi \]

\[ \lambda^* \quad t^* \]

\[ p = p(t) \]

\[ \pi' = \pi(t) \]
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