

# INTER-RACIAL BALANCE IN MALAYSIAN EMPLOYMENT AND WEALTH: AN EVALUATION OF DISTRIBUTIONAL TARGETS

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**I**N RECENT years, the government of Malaysia has become concerned with the observed differentials in wealth and employment between Malays and other races (i.e., Chinese and Indians) in the country and is pursuing various policies to reduce such differences. In particular, the government has set specific distributional targets for itself in the area of inter-racial ownership of wealth and employment composition. An evaluation of the feasibility and consistency of the distributional targets and finding out what the implications of such targets are is in order.

As the *Second Malaysia Plan (SMP)* states, the government will ensure that by 1990, "Malays and other indigenous people will manage and own at least 30 per cent of the total commercial and industrial activities in all categories and scale of operation" [2, pp. 41-42]. The government also wants to ensure that the "employment pattern at all levels and in all sectors particularly in the Modern Rural and Modern Urban Sectors will reflect the racial composition of the population" [2, p. 42].

The plan emphasizes a strategy to attain these objectives and targets through increasing the Malay share by their active participation in an expanding national economy rather than through redistribution of the existing cake. For instance, in wealth distribution, the plan specifically states that ownership targets will be effected through active participation of Malays in new additions made to the stock of wealth, not through "disruptive redistribution" of existing wealth. It is assumed that the target for employment composition will be secured through active participation of Malays in new employment opportunities generated in the economy, rather than through the displacement of existing workers, though there is no statement to the effect.<sup>1</sup>

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This paper has been extracted from my Ph.D. thesis [5]. It has been slightly rewritten for purposes of publication. I wish to record here my sincere thanks to my supervisor, Professor A. A. Walters, for his invaluable guidance and advice during the course of the preparation of this thesis.

<sup>1</sup> In perusing this paper, it is useful to bear in mind some important developments taking place in the mechanics of distribution in the country. It will not be far wrong if we say that in the past the respective shares of the different racial groups in income, employment, wealth, etc. were determined through the market mechanism. However, there are presently attempts to determine such shares through political processes. Where distribution is determined through the second mechanism, the actual shares accruing to different

A test should first be made of the feasibility and consistency of the employment composition target. In the subsequent section, the Stiglitz model of distribution is used to identify likely inter-temporal trends in inter-racial wealth ownership and to evaluate the feasibility of the government's wealth ownership target [4].

### I. EMPLOYMENT COMPOSITION

We shall test for feasibility and consistency of the employment composition target by a simple formula dealing with the problem of inter-temporal redistribution, where the redistribution to the Malay community is effected through an increase in its share in the increments of employment opportunities generated in the economy.

Before we undertake an actual test on the composition target, the formula used in the exercise is outlined below. And its derivation is given in Appendix A. In special cases where the initial Malay share (i.e., the initial participation rate) is zero, the underlying relationship between the rate of increment (or growth)  $g$ , and the Malay participation rate  $p$  in the increments, can be represented as follows:

$$p \left[ 1 - \frac{1}{(1+g)^n} \right] = t, \quad (1)$$

where  $t$  is the distribution/composition target. The equation shows that for each rate of increment  $g$ , there is a corresponding magnitude of  $p$ , that must be obtained to fulfill the composition target  $t$ . As the rate of increment accelerates, a decreasing  $p$  will be consistent with the attainment of the target  $t$ . For low values of  $g$ , a high rate of  $p$  is required to effect the given target. Note also that the longer the time horizon  $n$ , over which period the target is to be attained,

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racial groups will depend on their relative bargaining power. Ignoring foreign capital, the three groups can be identified for our purposes, the Malays, Chinese, and Indians. A competitive struggle can ensue among the three groups for shares in jobs, income, places in educational institutions, etc. In such a situation, the possibilities for collusion can in fact turn the struggle into the classic "two-person game" with which we have been made familiar in game theory. Whether we consider a collusion of (1) Malays and Chinese against Indians or of (2) Malays and Indians against Chinese or of (3) Chinese and Indians against Malays, the unmistakable conclusion that emerges in such a struggle is a basic instability. This destabilizing property is one that we can expect in many zero-sum games. The instability implicit in the "game situations" outlined above can be easily demonstrated. For instance, in the first and second cases, we have two groups which can combine to increase their shares at the expense of the third group. But where will this lead to when the latter group has been squeezed out of the game. In the third case, the matching of forces may be such that it is only likely to produce a state of endless strife.

Where there is growth in the system, it may be possible to minimize or even suspend the conflict inherent in such a bargaining model. With the additions to jobs, income, and wealth, it may be possible to meet the rising but competing demands of the various groups. But even here, there are obvious problems, as is shown in the main text of this paper. Where the alignment of forces is along the lines of income class rather than race, the results are likely to be different.

INTER-RACIAL BALANCE

TABLE I  
EMPLOYMENT BY RACE AND SECTOR, PENINSULAR MALAYSIA, 1970

Sector	Malays		Chinese		Indians		Others		Percentage of Total*		Percentage of Total Employment
	(1,000)	Percentage of Sector Total	(1,000)	Percentage of Sector Total	(1,000)	Percentage of Sector Total	(1,000)	Percentage of Sector Total	(1,000)	Percentage of Sector Total	
Agriculture, forestry, and fisheries	925.4	67.6	293.0	21.4	138.3	10.1	12.3	0.9	1,369	49.1	
Mining and quarrying	21.1	24.8	56.1	66.0	7.1	8.4	0.7	0.8	85	3.1	
Manufacturing	84.4	28.9	191.0	65.4	15.5	5.3	1.2	0.4	292	10.5	
Construction	16.9	21.7	56.2	72.1	4.7	6.0	0.2	0.2	78	2.8	
Electricity, water, and sanitary services	10.2	48.5	3.8	18.0	6.8	32.3	0.3	1.4	21	0.8	
Transport, storage, and communications	49.0	42.6	45.5	39.6	19.7	17.1	0.8	0.7	115	4.1	
Commerce	69.3	23.5	192.6	65.3	31.6	10.7	1.5	0.5	295	10.6	
Services	256.1	48.5	188.5	35.7	73.9	14.0	9.5	1.8	528	19.0	
Total	1,432.4	51.5	1,026.7	36.9	297.6	10.7	26.5	0.9	2,783	100.0	
Labor force	1,557.0		1,108.9		334.4		26.0		3,026		
%	51.5		36.6		11.1		0.8		100		
Unemployment	124.6		82.2		36.8		—		243		
%	8.0		7.4		11.0		—		8.0		
Population	4,841.3		3,285.6		981.5		73.0		9,181		
%	52.7		35.8		10.7		0.8		100		

Source: [1, p. 77, Table 4-4].

\* Totals do not add because of rounding.

the lower need  $p$  be for any given value of  $g$ .

In the general case where the initial Malay share is not zero, the relevant expression giving the underlying relationship is

$$\frac{p'}{(1+g)^n} + p \left[ 1 - \frac{1}{(1+g)^n} \right] = t, \quad (2)$$

where  $p'$  is the initial share. The higher the  $p'$  the easier it will be to attain any given target  $t$ . However, the effect of this will be lessened (1) the more rapid the rate of growth and/or (2) the longer the time horizon.

We will now use the above relationship to evaluate the government's employment composition target. The *SMP* states that an important aspect of new economic policies is to bring about a more balanced distribution of employment opportunities among the different communities. Presently Malays predominate in the agricultural sector whereas large numbers of non-Malays are employed in the commercial and industrial sector (see Table I). There is a disparity in the per capita income level between agricultural and industrial sectors. The government has deemed that more Malays should be engaged in industrial employment in order (1) to reduce the ethnic differential in income distribution and (2) to eliminate the identification of ethnic groups along occupational lines. In order to achieve this, the plan specifies that the pattern of employment in the different sectors should reflect the ethnic composition of the Malaysian population. According to the 1970 population census, the composition of the Malaysian population was: Malays 52.7 per cent, Chinese 35.8 per cent, Indians 10.7 per cent, and others 0.8 per cent.

Let us first investigate the feasibility of the employment composition target by sector and its implications for phasing the target if any. If the target is to be attained in the shortest possible time, i.e., five years, we must be capable of generating rapid employment expansion and a high participation rate for Malays in new jobs being created. For instance, in construction, even where all new jobs are taken by Malays, if the rate of growth of employment is less than 10.6 per cent per annum, then the target of "balanced" Malay employment in the sector cannot be attained. Where the target is to be achieved over a ten-year period, taking the rate of employment growth in the construction sector as 5.1 per cent per annum, as projected in the *SMP*, and assuming that this rate of growth prevails over the entire ten-year period, all new jobs will have to be taken by Malays if the composition target is to be attained by 1980. However, if the target is to be realized over a twenty-year period, again making the same assumption for employment growth over the period, about 71 per cent of the new jobs will have to be taken by Malays in order to attain the employment composition target by 1990. The implications for the phasing of the target is only too obvious from our preceding discussion. This can easily be demonstrated for other sectors as well, including manufacturing, commerce, and mining and quarrying.<sup>2</sup>

<sup>2</sup> The table below gives the required rate of employment growth ( $g$ ) and the Malay incremental share in new jobs ( $p$ ) for the two cases where the composition target is to be attained over a five-year and ten-year period:

There is yet another important implication which needs to be drawn, one which is inherent in any distribution strategy based on the above principle. This comes out quite clearly in relation to the employment composition target, especially where it has to be attained within a short span of time. If a vigorous attempt is made to correct the racial "imbalance" in employment opportunities in the different sectors, then it can only be done by setting aside for Malays a substantial proportion of the new jobs created in the nonagricultural sectors. This would have unhealthy implications for unemployment among the other communities, if there are no corresponding adjustments in the composition of agricultural employment.

On the other hand, if there had been no attempt to change the existing pattern of employment, unemployment among the Malays who predominate in the stagnant peasant sector may have risen as compared to that of non-Malays who predominate in the rapidly growing modern sector.<sup>3</sup> This would have produced the same unhealthy consequences. And as such, the need for changing the pattern of employment is very apparent, but if we are not to fall into any pitfalls, there is need for a smooth transition, through appropriate phasing of the target.

When the inter-racial employment composition target was first formulated in

REQUIRED RATE OF GROWTH OF EMPLOYMENT BY SECTOR  
TO ATTAIN EMPLOYMENT COMPOSITION TARGET

	Required Rate of Growth Where All New Jobs Accrue to Malays, i.e., $p=1$		Required Malay Incremental Share in New Jobs Given the Projected Employment Growth		Projected Employment Growth (%)
	5 Years	10 Years	5 Years	10 Years	
	Mining & quarrying	9.7	4.8	UA	
Manufacturing	8.5	4.2	UA	75.1	7.5
Construction	10.6	5.1	UA	100.0	5.1
Electricity, water & sanitary services	1.7	0.9	64.7	57.8	6.2
Transport, storage & communications	4.0	1.9	UA	83.2	2.9
Commerce	10.1	5.0	UA	UA	4.7
Services	1.7	0.9	78.2	64.5	3.1

Note: UA denotes that the composition target is unattainable, given the projected rate of growth in employment, even where all new jobs accrue to Malays. Note that the projected rates of growth in employment are rather optimistic for at least some sectors.

<sup>3</sup> This assumes that there are no equilibrating inter-sectoral labor movements in the face of labor surplus and shortages in different activities. This is indeed a strong assumption. We have persisted with this assumption only because we want to draw the implications relevant for policy even in such limiting cases.

TABLE II  
 INCREMENTAL SHARES OF VARIOUS RACES IN NEW JOBS IN 1971-90  
 GIVEN THE PROJECTED RATE OF EMPLOYMENT GROWTH

Sector	Projected Rate of Growth in Employment	Malays	Chinese	Indians
1. Agriculture	1.2	-3.8	90.4	13
2. Mining and quarrying	0.5	316.0	-249.4	32.9
3. Manufacturing	7.5	60.0	26.8	12.3
4. Construction	5.1	71.3	14.0	13.5
5. Electricity, water, and sanitary services	6.2	54.5	43.5	1.2
6. Transport, storage, and communications	2.9	65.7	30.9	2.4
7. Commerce	4.7	71.9	16.4	10.7
8. Services	3.1	57.7	35.9	6.7
Total		54.07	34.58	10.7

Note: The figures on incremental shares given above show the proportion of new jobs generated in different sectors that must accrue to the various races in order that the racial composition of the labor force correspond with that of the Malaysian population. According to the 1970 population census, the composition of the Malaysian population was as follows: Malays 52.7 per cent; Chinese 35.8 per cent; Indians 10.7 per cent; others 0.8 per cent. The rates of growth in employment used in the above computations are those which have been projected in the outline perspective plan of the *Mid-Term Review of the Second Malaysia Plan*.

It is clear from the above table that there must be an absolute reduction in the size of Malay employment in agriculture for the attainment of the composition target by 1990. Insofar as the mining and quarrying sector goes, the target of "balanced" employment composition can only be attained by displacing existing Chinese workers in the sector. This will then go against the basic strategy of the new economic policies, which states that such targets will be attained through growth rather than through redistribution.

1969 as part of the government's new economic policies (then explicitly incorporated into the *SMP*), no definite time horizon was set for phasing and implementation. This was only done in the *Mid-Term Review of the Second Malaysia Plan (MTR)*—possibly after the feasibility of attaining the target had come to be questioned.<sup>4</sup> The *MTR* states that the attainment of the target of employment composition (just as wealth ownership), is to be spread over a period of twenty years. Even with a twenty-year time horizon, a high proportion of new nonagricultural sector jobs must accrue to Malays to attain the composition target. On the other hand, in the agricultural sector, there is need to reduce (even in absolute terms) Malay employment to some extent, whereas that

<sup>4</sup> On the question of feasibility and consistency of these targets, see my paper, "The Second Malaysia Plan—Notes on the Objectives of Balanced Distribution of Wealth and Employment," *Kajian Ekonomi Malaysia*, December 1970.

of non-Malays (particularly Chinese) must increase substantially (see Table II). Where there is rigid enforcement of government policies on employment, it will lead to a rural-urban migration by Malays and an urban-rural migration by non-Malays. However, given the substantial difference in rural-urban income, and the current policy of discriminatory allocation of public expenditure benefits in the agricultural sector in favor of Malays, the migration of non-Malays from urban to rural areas is extremely unlikely. If there is a relaxation in public subsidization policies to ensure Chinese urban-rural migration, it will of course be difficult to justify such a shift in policy on equity grounds.

As stated earlier, the employment composition target aims not only to secure balanced employment opportunities within industries but also within occupational categories.<sup>5</sup> As listed in footnote 5, the first four occupational categories will be the most important from the point of view of injecting Malay participation in commerce and industry. The proportion of new jobs that must be taken up by Malays to fulfill the "balanced" target in these occupational categories for a five, ten, or twenty-year time horizon, has been worked out on the assumption that employment opportunities in such occupations are growing at 6 per cent per annum.

If a five-year time horizon is set, even with all the new jobs accruing to Malays, the target will not be realized for most occupational categories. Even with a ten-year time horizon, over 75 per cent of the new jobs in these occupational categories will have to be taken by Malays. This certainly has implications for unemployment, especially among educated youths in other communities, as indicated earlier. Where the time horizon is fixed at a period of twenty years, the task appears to be less stringent, again suggesting that a phased implementation of the target may be more desirable.

Where employment composition targets by occupational category are to be attained in a ten-year time period, about 72 per cent of the total new jobs generated in the four most relevant occupational categories will have to be taken up by Malays—constituting approximately 60 per cent of the total Malay entrants into the labor market over the period.

In our discussion on "balanced" employment by occupation, what we are looking at is a demand for trained and skilled Malay personnel that will arise if the composition target is to be attained in the stipulated time period. Unless the supply of such personnel is forthcoming, there will be unfilled slots in the occupational structure or otherwise such slots can at best be filled by under-qualified persons. Either way, this can constrain the growth of overall output and employment if minimum racial participation rate is rigidly enforced. Apart from that, in order to elicit the necessary supply of personnel, appropriate educational and training facilities will have to be provided. This consideration, along with the normally prolonged gestation period accompanying the training

<sup>5</sup> The occupational categories are as follows: (1) administrative, executive, and managerial, (2) professional and technical, (3) clerical and secretarial, (4) sales, (5) agriculture, (6) miners and quarrymen, (7) transport and communications, (8) craftsmen, production and process workers, and (9) services, sport, and recreation.

of high- and medium-level manpower, would imply that supply can only very slowly respond to policy-induced change in demand conditions. Thus such supply rigidities itself dictate the need for a phased implementation of this composition target. In any case, this amply demonstrates the need for careful manpower planning. The magnitude of the task is readily apparent. For instance, if the target is to be attained in a ten-year period, no less than 60 per cent of new Malay entrants in the labor force must go into the first four occupational categories—and they will have to be given the appropriate skills and expertise for this purpose.

From our discussion so far, it should be clear that the attainment of the employment composition target will be constrained by overall growth in employment opportunities. If employment growth is stepped up through increased output growth, then the supply of skilled Malay personnel may not be forthcoming and the target may not be attained. Evidently, there is a problem whichever method is used. In the limiting case as shown earlier where the time horizon is set at five years, even where all new jobs are taken by Malays, the target cannot be attained. Thus there will be a need for phasing the target for a fairly long period—possibly over twenty years.

## II. WEALTH OWNERSHIP

In this section, we will examine the inter-racial distribution of wealth in Malaysia, and how this distribution is likely to evolve in the future. There are differences in the distribution of wealth in the country among individuals and between races. The Malaysian government is committed to reducing the racial “imbalance” in wealth, not through any redistribution policy of existing wealth to Malays from non-Malays (including foreigners), but rather by giving Malays a larger share in incremental wealth generated in the Malaysian economy. As specific distributional targets have been fixed, to be attained in twenty years, this suggests that a certain relationship between the growth rate in the stock of wealth and the incremental share of Malays in additions to wealth must be obtained to attain the target.<sup>6</sup> Here the aim is to study the equalizing and disequalizing forces which are operating automatically in a market economy to change the state of distribution in the country. Some of these forces (e.g., accumulation out of earned income) tend to equalize the distribution of wealth, whereas others (e.g., the higher rate of profit on large wealth holdings) tend to less evenly distribute it. Differences in inheritance as well as variations in fertility will also influence the degree of wealth differential.

<sup>6</sup> For instance, if the rate of growth of the stock of wealth is 2 per cent per annum then Malays must own all additions to the stock if the 30 per cent wealth ownership target is to be attained. On the other hand, if the proportion of the new additions to the stock owned by Malays approaches 30 per cent, then the rate of growth of the stock of wealth must approach infinity if the ownership target is to be attained. What this relationship shows is that, if the growth rate of the capital stock is low, then the proportion to additions owned by Malays should be high, and where the proportion to additions owned is low, then the growth rate must be correspondingly high to attain the wealth distribution targets. See [5, pp. 60–62].

An outline of the theoretical framework used in our discussion of equalizing and disequalizing tendencies in wealth distribution, as well as in determining the equilibrium wealth holdings between different racial groups, is given in Appendix B at the end of this paper. This framework is derived essentially from the theoretical works of Meade and Stiglitz and was first applied by Furstenburg in studying the interrelations between labor and capital components of racial income differences in America [3] [4] [6]. We will use this framework to identify the likely inter-temporal trend in wealth ownership between the races (i.e., between Malays and non-Malays) in Malaysia and in evaluating the feasibility of the ownership target.

The ratio of wealth holdings for different groups  $i$  and  $j$  ( $i$  stands for Malays and  $j$  for non-Malays) and changes in these ratios depend on the relative values of their wage rate  $w$ , growth in labor productivity  $g$ , growth in population  $n$ , saving propensity  $m$ , rate of return  $r$ , and initial wealth holdings  $c_0$ . For different combinations of the above parameters, we can determine the equilibrium ratio of wealth holdings for the case of (1) instantaneous adjustment (as in the case of a forcible redistribution), where there is no growth in labor productivity and (2) inter-temporal adjustment, where there is growth.

In the case of instantaneous adjustment, the equilibrium ratio of asset holdings is as follows:

$$\left(\frac{c_i}{c_j}\right)^* = \frac{c_i}{m_j w_j} (r_i m_i - r_j m_j + n_j - n_i) + \frac{m_i w_i}{m_j w_j} \quad (3)$$

For the inter-temporal case with growth in labor productivity, the ratio of asset holdings can be determined for an infinite as well as a finite time horizon. For the infinite time horizon, the formula for the equilibrium ratio is

$$\left[\frac{c_i(t)}{c_j(t)}\right]^* = \frac{(g_j - m_j r_j + n_j) w_{i0}}{(g_i - m_i r_i + n_i) w_{j0}} \quad (4)$$

whereas for the finite time horizon  $h$ , the ratio is,

$$\frac{c_i(h)}{c_j(h)} = \frac{e^{(m_i r_i - n_i)t} \left\{ c_{i0} + \frac{m_i w_{i0}}{(g_i - m_i r_i + n_i)} [e^{(g_i - m_i r_i + n_i)t} - 1] \right\}}{e^{(m_j r_j - n_j)t} \left\{ c_{j0} + \frac{m_j w_{j0}}{(g_j - m_j r_j + n_j)} [e^{(g_j - m_j r_j + n_j)t} - 1] \right\}} \quad (5)$$

The main aim here is to examine how sensitive the state of wealth distribution is to changes in the relative values of the various parameters, such as the wage rate, propensity to save, rate of return, and growth in population. Given the current parametric values, the equilibrium ratio of asset holdings will be determined for the different groups, both for instantaneous adjustment as well as for inter-temporal adjustment with growth.

The data base for dealing with such an exercise is admittedly crude, and even where the necessary data is available, its reliability can be legitimately questioned (see Table III). However, the purpose here is not to generate the exact changes,

TABLE III  
ESTIMATES OF PARAMETERS

1	$w_i$	\$396
2	$w_j$	\$792
3	$n_i$	3.1%
4	$n_j$	2.3%
5	$m_i$	10.0%
6	$m_j$	10.0%
7	$r_i$	5.0%
8	$r_j$	7.5%
9	$g_i$	2.5%
10	$g_j$	2.5%
11	$c_{i0}$	\$80
12	$c_{j0}$	\$1,158/\$373

Note: 1 & 2: The wage per capita for Malays (the  $i$ -th group) and non-Malays (the  $j$ -th group) is based on the earnings data given in S. Anand, "The Size Distribution of Income in West Malaysia," mimeographed (IBRD, 1973). The per capita wage rate was derived by multiplying average earnings by the number of workers per household and dividing this by the average household size. Average earnings per worker per month in 1970 according to the study were \$116 for Malays, \$209 for Chinese, and \$180 for Indians. The overall average number of earners per household and the average household size, inferred from the above source, were as follows: 1.6 and 5.7 for Malays, 1.73 and 5.2 for Chinese, and 1.7 and 5.3 for Indians.

3 & 4: See [1, p. 25]. As is evident, the growth rate of population is much higher for Malays. An identical population growth rate of 2.5 per cent has also been assumed to test the sensitivity of wealth distribution to changes in the values of  $n$ .

5 & 6: A study by S. Hashim, and A. Halim Ismail, "Estimates of Personal Savings Functions for West Malaysia Based on 1957-58 Household Budget Survey Data," shows that the average savings out of personal income were 13 per cent for Malays, 8.3 per cent for Chinese, and 0.7 per cent for Indians. However, as the coverage and definitions of income and expenditures used in the survey was far from satisfactory, it is difficult to rely much on these estimates. Moreover, the explanatory power of the savings function fitted (which was of the simple Keynesian-type) was found to be particularly low for Indian households. As such, an average savings propensity of 10 per cent for Malays as well as for non-Malays has been used. Even this figure appears to be rather high for Malay households. Thus, for purposes of sensitivity analysis, different values for the  $m$  term are assumed.

7 & 8: There is no data available on rates of return to capital for different racial groups. However, since much of Malay capital is in the unorganized sector (especially peasant agriculture), where productivity is low,  $r_i$  is therefore taken to be lower than  $r_j$ .

9 & 10: See D. Snodgrass, "The Growth and Utilization of Malaysian Labour Supply," mimeographed. Snodgrass's estimate of the rate of increase in value added per man over 1957-67, in the economy as a whole, has been

(Note to Table III—continued)

used as the estimate of the growth in labor productivity. However, on the average, as Malays predominate in agriculture and not in industry and in jobs requiring less skills, the rate of increase in productivity of Malay labor may be lower than that for non-Malay labor. Accordingly, alternative estimates for  $g_i$  at 2 per cent per annum and  $g_j$  at 3 per cent per annum have been made.

11 & 12: In generating estimates on capital per man for the different group, the data on ownership of assets in modern agriculture and industry, as given in [1, p. 12], has been used. This is probably the only source for such data in Malaysia; however, as the data is based on specially conducted surveys, they are likely to be fairly reliable, at least with respect to activities covered. The modern agricultural sector covers the planted acreage under rubber, oil palm, coconut, and tea, and the industrial sector covers manufacturing, construction, and mining. Thus, of the activities for which data is lacking, and in which private enterprise predominates, there are paddy farming in agriculture, commerce, banking, and transport in industry. Also no data is available on capital investment in consumer durable goods, such as private dwellings, motor cars, etc. Since the interest here is in productive assets, the lack of data on consumer durable goods may not adversely affect our analysis. The nonconsideration of social overhead capital, such as roads, schools, hospital, etc., can also be justified on the ground that we are only interested in the distribution of private assets. If the percentage of private wealth excluded is the same for Malays and non-Malays, then of course their exclusion will not affect the results. At this stage, it will be difficult to say if the percentage of wealth excluded is the same.

The ownership breakdown is given in terms of acreage for agriculture and in money terms for industry. The acreages under the corporate and non-corporate sectors have been converted into money values at \$1,500 and \$1,000 per acre respectively. As a substantial proportion of the wealth in Malaysia is owned by foreigners, our estimates of capital per man will depend on how we define non-Malay wealth. When we included foreign capital under the non-Malay group, the capital per man for this group amounts to \$1,158, whereas if foreign capital is excluded, the figure is \$373. The capital per man was \$80 for Malays, \$456 for Chinese, \$95 for Indians, and \$553 for the aggregate economy.

but rather the likely changes (within a broad order of magnitude), that will take place in the state of distribution, for any given constellation of parameters. In fact, this is a sort of "sensitivity analysis," which will show the resulting changes in wealth distribution for any given variation in the parameters. From a policy point of view, such an exercise should provide some useful indicators as to the relative importance of the different variables which influence the distribution of wealth among individuals and between groups in a society. (On alternative parametric values for "sensitivity analysis," see Table IV.)

The current ratio of asset holdings per man between non-Malays and Malays is around 4.5 when foreign capital is not included as part of non-Malay capital, whereas it is close to 15 when the latter is included. The government has declared that by 1990, the respective shares of groups in total wealth holdings must be as follows: Malays 30 per cent, non-Malays 40 per cent, and foreigners 30 per cent. Given the population composition, this implies a ratio of per capita

TABLE IV  
ALTERNATIVE PARAMETRIC VALUES USED IN SENSITIVITY ANALYSIS

	Case A	Case A'	Case B	Case C	Case D	Case E	Case F	Case G	Case H	Case I
$w_{i0}$	\$ 396	396	396	396	396	396	396	396	396	396
$w_{j0}$	\$ 792	792	792	792	792	792	792	792	792	792
$n_i$	3.1%	3.1	2.5	3.1	2.5	2.5	2.5	3.1	2.5	2.5
$n_j$	2.3%	2.3	2.5	2.3	2.5	2.5	2.5	2.3	2.5	2.5
$m_i$	10%	10	10	10	10	5	10	5	10	10
$m_j$	10%	10	10	10	10	15	10	10	10	20
$r_i$	5%	5	7.5	7.5	5	7.5	5	10	7.5	5
$r_j$	7.5%	7.5	7.5	7.5	7.5	7.5	10	20	7.5	10
$g_i$	2.5%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2	2
$g_j$	2.5%	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3
$c_{i0}$	\$ 80	80	80	80	80	80	80	80	80	80
$c_{j0}$	\$1,158	373	1,158	1,158	1,158	1,158	1,158	1,158	1,158	1,158

asset holdings of 2.3 between non-Malays (including foreigners) and Malays and 1.3 between non-Malays and Malays. An examination should be made, for different parametric values, of the extent to which the differential in current asset holdings can be reduced to the desired ratio, both for instantaneous adjustment and for inter-temporal adjustment involving growth in labor productivity.

With instantaneous adjustment, where current values of different parameters are taken as in equation (3), the equilibrium ratio of capital per man of non-Malays to Malays is 2.31 for case A and 5.35 for case G. As is evident here, the equilibrium ratio is fairly sensitive to changes in the rates of return and saving propensity. For the case where all parameters are identical for the two groups, except wage rates, the equilibrium ratio is given by the ratio of their wage rates, which is around 2. It should be clear from these figures that as long as there are differences in the parameters, and especially in wage rates, equalization in wealth cannot be complete. There will continue to be some difference in asset holdings between the two groups.<sup>7</sup>

The process of adjustment entailed in the inter-temporal context of growth is considered next. For an infinite time horizon, the equilibrium ratio of capital per man for the two groups can be determined by reference to equation (4). Table V gives this ratio for alternative parametric values (which are enumerated in Table IV). For a finite time horizon, the estimated ratio of asset holdings per capita for the two groups, for different sets of parametric values, is given in Table VI. The unprimed cases in Table VI show the per capita asset holdings of non-Malays, inclusive of foreign capital, whereas the primed cases give the

<sup>7</sup> The case of instantaneous adjustment can be effected, possibly through a forced redistribution of wealth. Then, we can view the equilibrium associated with this instantaneous adjustment as a ratio of asset holdings that can be maintained "without further redistribution at given labour incomes (and growth rates) for the races" [6, p.160]. If the ratio of asset holdings associated with redistribution is less than the equilibrium ratio (as determined by relative wages, when the other parameters are identical), accumulation out of earned income will raise the actual asset holdings to the equilibrium ratio (see equation 4a in Appendix B).

TABLE V  
THE EQUILIBRIUM RATIO OF PER CAPITA ASSET HOLDINGS  
FOR AN INFINITE TIME HORIZON

Case	$c_{jt}/c_{it}$
A	2.52
B	2
C	2.4
D	2.12
E	2.39
F	2.25
G	3.64
H	1.58
I	2.29

TABLE VI  
PER CAPITA ASSET HOLDINGS IN 1990 (\$)

Case	Non-Malays $c_{jt}$	Malays $c_{it}$	Ratio $c_{jt}/c_{it}$
A	6,054	1,986	3.05
A'	4,733	1,986	2.38
B <sub>20</sub>	5,188	1,886	2.75
B' <sub>20</sub>	4,074	1,886	2.16
B <sub>10</sub>	2,554	683	3.74
B <sub>30</sub>	10,081	4,198	2.40
C	5,758	1,933	2.98
C'	4,502	1,933	2.33
D	5,455	1,933	2.82
D'	4,284	1,937	2.21
E	7,274	963	7.55
E'	6,076	963	6.31
F	5,350	1,843	2.90
F'	4,179	1,843	2.27
G	8,617	814	10.59
G'	7,297	814	8.96
H	5,395	1,788	3.02
H'	4,281	1,788	2.39
I	8,575	1,430	6.00
I'	7,403	1,430	5.18

Note: For case B we have worked out the per capita asset holdings for a period of twenty years, B<sub>20</sub>; for a period of ten years, B<sub>10</sub>; and for a period of thirty years, B<sub>30</sub>.

The initial value of the per capita asset holding of Malays  $c_{i0}$  is \$80. The corresponding estimate for non-Malays  $c_{j0}$  is \$1,158 when we include foreigners in this group and \$373 when we exclude them.

figures for non-Malays alone. When all parameters are identical, except wage rates, and have stipulated values (see case B in Table IV), it is clear that, over a twenty-year time horizon, there will be a substantial reduction of inequality in wealth ownership—though not to the levels targeted by the government in the *Second Malaysia Plan*. This demonstrates that accumulation out of earned income can serve as an important force towards equalization in asset holdings. The tendency towards equalization is weakened when provisions are made for the higher growth rate in Malay population (and labor force) as in case C.

However, as demonstrated in cases E and G, the distribution of wealth is also very sensitive to the respective saving propensities of the two groups. Where Malay saving propensities are low relative to non-Malay saving propensities, as in case E, the tendency towards equalization in wealth ownership is significantly reduced. In fact a close scrutiny of the table shows that relative savings of the two groups is an important determinant of wealth distribution, possibly as important as relative wages, and much more important than relative returns to capital (see case F). Given the importance of accumulation out of earned income as a force towards wealth equalization, the relative rates, at which labor productivity and hence wage income increases over time, will also be an important determinant of the equilibrium ratio of asset holdings. In our case, if the initial disparity ratio in non-Malay/Malay wage rates declines due to a differential growth rate in productivity, then the equilibrium ratio of capital per man for the two groups will also decrease and vice versa (see case H).

We can also work out the speed at which equalization in wealth ownership will proceed, for any given set of parametric values. For case B, for instance, it will probably take at least thirty years to reduce the ratio of asset holdings to the desired ratio. Within a twenty-year time horizon, the ratio of asset holdings between the two groups can be reduced from a ratio of 3.75 that will be obtained for a ten-year period to 2.75.

The simple theoretical framework outlined here provides a useful insight into some of the equalizing and disequalizing tendencies vis-à-vis wealth distribution, that are likely to be operating in a private enterprise economy. It also indicates the variables that are important for policy purposes in effecting any desired state of wealth distribution.<sup>8</sup> The numerical estimates of per capita asset holdings have been worked out in this paper, purely for illustrative purposes and for testing the sensitivity of distribution for any given change in parameters. It is not clear how reliable such a model is for predicting the magnitude as compared to the direction of change in asset distribution. In all likelihood, there is an underestimate of the time required for any given target of equalization, as will be readily evident if the model is used for backcasting purpose [6, pp. 158–59]. Therefore, there is a need for caution in interpreting numerical estimates reported here.

<sup>8</sup> From our analysis it is apparent that accumulation out of earned income, increases in labor productivity, and a lower rate of population growth are among the factors that can equalize wealth holdings. Thus, the need for policies for mobilizing small Malay savings, improving Malay productivity, and decreasing Malay population growth is apparent. But Malaysian policy makers have inadequate attention given to these policy issues.

## CONCLUSION

This paper has demonstrated one test for feasibility and consistency of specific distributional targets set by Malaysian planners in the *Second Malaysia Plan*. According to the plan, the share of Malays in employment and wealth in the modern sector of the economy is to be raised to the targeted level, not by re-distributing what is available but by giving them a larger share of increments arising from growth. Even if the target of employment composition by sector is attained over a twenty-year time horizon, it will require a substantial rural-urban migration of Malays and an equally significant reverse movement of non-Malays. On the other hand, if the target to be attained in a shorter period, unemployment of non-Malays can rise above tolerable limits. On the question of "balanced" employment by occupation, the analysis suggests that if an adequate supply of trained Malay personnel is not forthcoming, there will be unfilled slots in the occupational structure or such slots will at best be filled by under-qualified persons. Either way, this will constrain the growth of overall output and employment, if minimum racial participation ratios are rigidly enforced. The analysis indicates that the target for wealth ownership is far from attainable, if it is left to the Malay-owned private sector. Because of this, the public sector has ventured into commercial production, either on its own or jointly with the private sector. Its share in such undertakings is to be held in "trust" for Malays until such time as they are able to buy them from the state. At the same time, discriminatory employment practices in favor of Malays have been instituted to enable them to acquire managerial experience and skills. Here I need add no more than to reiterate the findings elsewhere, which point to the glaring inadequacies of the Malaysian public sector in its new found role as an entrepreneur.<sup>9</sup>

<sup>9</sup> See my study [5].

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## APPENDIX A

DERIVATION OF THE FORMULA FOR DEALING WITH THE  
PROBLEM OF INTER-TEMPORAL DISTRIBUTION  
OF EMPLOYMENT AMONG THE RACES

The problem I am dealing with is one where the *overall* share of the Malay community in total wealth, employment, or income as the case may be is being increased by raising its *incremental* share (participation rate) in the additions made to wealth, employment, or income. Let us consider the case of shares in employment. Insofar as employment composition goes, the distributional target  $t$  of the planners is to raise Malay employment by sectors and occupations to a level corresponding to their share in population, which is 52.7 per cent. Where the overall Malay share in employment is raised through an increase in its incremental share in the new jobs generated in the economy, there will be an underlying relationship between the level of employment, its rate of growth, and the Malay incremental share.

The level of employment  $E_n$  in year  $n$ , at various rates of employment growth  $g$ , is given as follows:

$$E_n = E_0(1 + g)^n, \quad (1)$$

where  $E_0$  is the initial level of employment. To simplify computations, the assumption is made that  $E_0 = 100$  and that employment will grow at a constant rate. In the first instance, there is a further assumption that the initial Malay share in employment  $E'_0$  is zero.

Then the relationship between the Malay incremental share  $p$  and the level of employment  $E_N$  in year  $n = N$ , for any given distributional target  $t$  is given by

$$p \left( \frac{E_N - E_0}{E_N} \right) = t. \quad (2)$$

Note  $p$  and  $t$  are expressed as proportions. This equation shows, given the initial employment level at 100, what  $p$  should be at different levels of  $E_N$ , so that the target is attained. Conversely, it shows, given the initial level of employment, what  $E_N$  should be at different levels of  $p$  so that the target level of  $t$  is attained. It is assumed that a fixed proportion  $p$  of the new employment accrues to Malays throughout the period  $n = 1$  to  $n = N$ .<sup>a</sup>

<sup>a</sup> Equation (2) is a particular case of the general problem discussed here. The general case is represented by the expression below:

$$\sum_{j=1}^N p_j \Delta E_j = t E_N, \text{ where } \Delta E_j = E_j - E_{j-1}.$$

In the particular case, the different values of  $p$  and  $g$  are determined that can satisfy the target on the assumption that the given values of  $p$  and  $g$  remain the same over the twenty-year period. The expression for the general case does not make any such restric-

A slight rearrangement of the above equation,

$$p\left(1 - \frac{E_0}{E_N}\right) = t, \tag{2a}$$

brings out the relationship in which we are interested. It shows that as employment in year  $N$  increases, a decreasing proportion of the additional employment should be owned by Malays in order to attain target  $t$ .

The third relationship,

$$p\left(1 - \frac{1}{(1+g)^n}\right) = t, \tag{3}$$

derived from the first two equations, shows that, for each rate of employment growth, there is a corresponding magnitude of  $p$  that must hold to secure target level. This equation too shows that as the rate of employment growth increases, a decreasing  $p$  will be consistent with the attainment of the target  $t$ . For low levels of  $g$ , a high  $p$  is required to attain target  $t$ .

The above formulation is correct only if the Malay share in initial employment  $E'_0$  is zero. In this regard, although the Malay share in initial employment in some of the sectors (such as commerce, manufacturing, and mining) and occupations (such as managerial, clerical, and sales jobs) is low, it is not zero. Where the initial Malay share is non-zero, this can be easily provided for in the formulation, as shown below:

$$\frac{E'_0 + p(E_N - E_0)}{E_N} = t. \tag{1'}$$

This can be rewritten as

$$\frac{E'_0}{E_N} + p\left(1 - \frac{E_0}{E_N}\right) = t. \tag{2'}$$

$$\frac{E'_0}{E_0(1+g)^n} + p\left(1 - \frac{E_0}{E_0(1+g)^n}\right) = t. \tag{3'}$$

Putting  $E'_0/E_0 = p'$ , equation (3') can be rearranged as follows:

$$\frac{p'}{(1+g)^n} + p\left(1 - \frac{1}{(1+g)^n}\right) = t, \tag{3a'}$$

or

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tions. From the expression for the general case, we can determine a set of  $p_j$  and  $g_j$  which can also satisfy the overall target  $t$ . Each  $p_j$  and  $g_j$  from the sets of  $p_j$  and  $g_j$  will then correspond to one subperiod, where the subperiods can be of varying lengths. Associated with a given set of  $p_1, \dots, p_k$  and a given set of  $g_1, \dots, g_k$ , there will be a subtarget (a target for each subperiod)  $t_k$ . The general case may be reduced to the particular case if  $p$  and  $g$  are taken respectively to be the generalized averages of  $p_j$  and  $g_j$ .

The particular case has been worked out here because working out the general case will involve great complications. In any event, the particular case gives an adequate insight for an understanding of the issues related to the problem discussed here.

$$p - \frac{p-p'}{(1+g)^n} = t.$$

The higher  $p'$  is, the easier it will be to attain any given target  $t$ . However, the effect of this will be lessened the more rapid the rate of employment growth.

## APPENDIX B

### MODEL OF WEALTH DISTRIBUTION BASED ON THE WORKS OF MEADE, STIGLITZ, AND FURSTENBURG

There have been theoretical attempts to examine the forces influencing the distribution of wealth and income among individuals in capitalist society. Some of these forces, e.g., accumulation out of earned income, tend to equalize the distribution of wealth, whereas others, e.g., the higher rate of profit on large wealth holdings, tend to make it less evenly distributed. Differences in inheritance practices as well as variations in fertility will also influence the degree of inequality.

In this appendix, there is an outline of the theoretical framework, which is used in the discussion of equalizing and disequalizing tendencies in wealth distribution. This framework is derived essentially from the theoretical works of Meade and Stiglitz and was first applied by Furstenburg in studying the interrelations between labor and capital components of racial income differences in America. We have used this framework to identify the likely inter-temporal trend in wealth ownership and income distribution between the races (i.e., between Malays and non-Malays) in Malaysia and for evaluating government policies and targets for a racially balanced distribution of wealth and income in the country in the main text.

#### *Theoretical Framework*

The per capita income of the  $i$ -th group,  $y_i$ , is given by the following relation,

$$y_i = w_i + r_i c_i, \quad (1)$$

where  $w_i$  is the wage per capita,  $c_i$  the capital per man, and  $r_i$  the rate of return on capital, of the  $i$ -th group. Assuming that savings per capita  $s_i$  is proportional to  $y_i$ , then,

$$s_i = m_i y_i, \quad (2)$$

where  $m_i$  is the marginal/average propensity to save of group  $i$ . The rate of capital accumulation per head in the  $i$ -th group can be defined as

$$\frac{\dot{c}_i}{c_i} = \frac{s_i - n_i c_i}{c_i} = \frac{s_i}{c_i} - n_i \quad (3a)$$

$$= \frac{m_i w_i + m_i r_i c_i - n_i c_i}{c_i} = \frac{m_i w_i}{c_i} - m_i r_i - n_i, \quad (3b)$$

where  $n_i$  is the rate of growth of population (and of employment) in this group.

Given expression (3) for the rate of capital accumulation, the distribution over time of wealth between any two groups  $i$  and  $j$  will depend on their relative rates of capital accumulation, i.e.,

$$\frac{\dot{c}_i}{c_i} - \frac{\dot{c}_j}{c_j} = \frac{s_i - n_i c_i}{c_i} - \frac{s_j - n_j c_j}{c_j} = \frac{s_i}{c_i} - \frac{s_j}{c_j} + n_j - n_i \quad (4a)$$

$$= \frac{m_i w_i - m_i r_i c_i - n_i c_i}{c_i} - \frac{m_j w_j - m_j r_j c_j - n_j c_j}{c_j} \quad (4b)$$

$$= \frac{m_i w_i}{c_i} - \frac{m_j w_j}{c_j} + m_i r_i - m_j r_j + n_j - n_i. \quad (4c)$$

If the initial capital per head of the  $i$ -th group is lower than that of the  $j$ -th group (i.e., if  $c_i < c_j$ ), but the rate of capital accumulation of the former exceeds the latter (i.e.,  $\dot{c}_i/c_i - \dot{c}_j/c_j$  is positive), then this would imply that with the passage of time, there will be a tendency towards equalization of wealth between the two groups. However, if the net difference in relative rates of accumulation is negative, then the distribution of wealth between the two groups will become increasingly unequal.

To examine equalizing and disequalizing tendencies at work, let us assume that  $m_i = m_j = m$ ,  $w_i = w_j = w$ ,  $r_i = r_j = r$ , and  $n_i = n_j = n$  but that  $c_i < c_j$ . Then equation (4c) will reduce to

$$\frac{\dot{c}_i}{c_i} - \frac{\dot{c}_j}{c_j} = mw \left( \frac{1}{c_i} - \frac{1}{c_j} \right). \quad (4d)$$

The bracketed term in equation (4d) is clearly positive, since  $c_i < c_j$ , and therefore the ownership of wealth between the two groups will be completely equalized over time, however unequal the initial distribution was. Accumulation out of earned income, thus serves as an important force towards equalizing wealth ownership. If saving propensities, rates of return, and population growth rates are identical for the two groups, wealth distribution will become more equalized even if  $w_i < w_j$ , so long as  $w_i/w_j > c_i/c_j$ . This can be seen from equations (4e) and (4f):

$$\frac{\dot{c}_i}{c_i} - \frac{\dot{c}_j}{c_j} = m \left( \frac{w_i}{c_i} - \frac{w_j}{c_j} \right) \quad (4e)$$

$$= m \frac{w_j}{c_i} \left( \frac{w_i}{w_j} - \frac{c_i}{c_j} \right). \quad (4f)$$

That is, so long as  $w_i/w_j > c_i/c_j$ , then accumulation from earned income will cause  $\dot{c}_i/c_i > \dot{c}_j/c_j$ . There will, therefore, be an equalizing tendency in wealth holdings. However, if  $w_i/w_j < c_i/c_j$ , the opposite tendency will be in force and the distribution of wealth will be further disequalized. Where  $w_i/w_j = c_i/c_j$ , the rate of accumulation from earned income will be the same for the two groups.

More generally, even where  $m_i < m_j$ ,  $w_i < w_j$ ,  $r_i < r_j$ , and  $n_i > n_j$ , so long as

$$\left( \frac{m_i y_i - n_i c_i}{m_j y_j - n_j c_j} - \frac{c_i}{c_j} \right) > 0,$$

then there will be a tendency towards wealth equalization. All that this condition implies is that, where  $c_i < c_j$ , as long as the net accumulation (after appropriate adjustments for population growth) of the  $i$ -th group relative to that of the  $j$ -th group exceeds the ratio of their current wealth holdings, there will be a reduction in existing wealth differentials. When we express our condition for the equalization of wealth in this manner, it will be readily apparent that although  $w_i/w_j > c_i/c_j$ , there is no reason why

$$\frac{m_i(w_i + r_i c_i) - n_i c_i}{m_j(w_j + r_j c_j) - n_j c_j} > \frac{c_i}{c_j}.$$

In fact the saving propensity and the rate of return on capital of the  $i$ -th group can be well below that of the  $j$ -th group (i.e.,  $m_i < m_j$  and  $r_i < r_j$ ). Where this is accompanied by a high rate of population growth for the former group than for the latter, it is not unlikely that

$$\frac{m_i y_i - n_i c_i}{m_j y_j - n_j c_j} < \frac{c_i}{c_j}.$$

In this case, the dispersion in wealth holdings will increase. If the rate of return on large wealth holdings is higher than on small wealth holdings (as is not unlikely, given the differential investment opportunities and capital gains), this may be a disequalizing force in wealth ownership [3, pp. 44–45]. Insofar as the saving propensity is concerned, this may be positively correlated with income and negatively associated with wealth holdings. In such a situation, although there is likely to be a divergence in savings as between the two groups, this divergence may not be large (when expressed in terms of income). Therefore, it may not serve as a powerful force in disequalizing wealth distribution. As regards the influence of demography, if the poor multiply faster than the rich (as is suggested by available empirical evidence), this will make for an increasing dispersion in wealth distribution. Hence, the direction of change in wealth distribution will depend on the magnitude of the ratio of net accumulation to existing wealth holdings.

In the preceding discussion, the focus has been on the forces that can equalize or disequalize wealth distribution. However, when the equalizing or disequalizing process has been set in motion, it will not continue indefinitely. There are some definite limits to the process. These limits depend on the values of the various parameters of the two groups—such as wage rates, saving propensities, returns to capital, and population growth. For any given set of parametric values, there will be an equilibrium ratio of wealth holdings. Where the actual ratio diverges from this equilibrium ratio, forces will be set in motion which will cause the actual ratio of wealth holdings to gravitate towards the equilibrium ratio. Let us illustrate this proposition for the simple case where only the wage rates differ for the two groups—while all other parameters are identical. In this case, the relative

rates of accumulation of the  $i$ -th and the  $j$ -th group is given by equations (4e) and (4f). From these equations, it is apparent that when  $w_i/w_j > c_i/c_j$ , then  $\dot{c}_i/c_i > \dot{c}_j/c_j$  such that the ratio of  $\dot{c}_i$  to  $c_j$  will rise until  $c_i/c_j$  equals  $w_i/w_j$ . Where  $w_i/w_j < c_i/c_j$ , then  $\dot{c}_i/c_i < \dot{c}_j/c_j$  and therefore the ratio of  $c_i$  to  $c_j$  will fall until  $c_i/c_j$  is equated to  $w_i/w_j$ . Thus where the existing ratio of wealth holdings diverges from the equilibrium ratio, forces will be set in motion which will change wealth distribution until the equilibrium distribution is attained. In this simple instance, the equilibrium ratio of wealth holdings actually equals the relative wage rates of the two groups. In equilibrium, the relative rates of capital accumulation of the two groups will equal each other. On the basis of this result, we can easily determine the equilibrium ratio of wealth holdings for any given situation. For the most general case, where all the parameters are different for the two groups, we can determine the equilibrium ratio by reference to equation (4c). Putting the net difference in the relative rates of accumulation as zero, we obtain

$$\frac{m_i w_i}{c_i} - \frac{m_j w_j}{c_j} + r_i m_i - r_j m_j + n_j - n_i = 0. \tag{5}$$

Therefore, the equilibrium ratio of capital per man is

$$\left(\frac{c_i}{c_j}\right)^* = \frac{c_i}{m_j w_j} (r_i m_i - r_j m_j + n_j - n_i) + \frac{m_i w_i}{m_j w_j}. \tag{6}$$

Note that where  $r_i = r_j = r$ ,  $m_i = m_j = m$ , and  $n_i = n_j = n$ , the equilibrium ratio of capital per man will equal the ratio of the wage rates, i.e.,

$$\left(\frac{c_i}{c_j}\right)^* = \frac{w_i}{w_j}. \tag{6a}$$

It should be apparent from the above discussion that this equilibrium ratio pertains to a situation of instantaneous adjustment (say through redistribution), where the parametric values used are the initial values. However, in an inter-temporal context, any discussion of the long-run equilibrium ratio of asset holdings will have to take into account growth in labor productivity.

To determine the equilibrium ratio of capital per man and the speed of equalization of asset holdings, in an inter-temporal context of economic growth, the differential equations (7) and (8) have to be solved, giving the increment in capital per capita for the two groups [6].

$$\dot{c}_i = m_i w_i + (m_i r_i - n_i) c_i. \tag{7}$$

$$\dot{c}_j = m_j w_j + (m_j r_j - n_j) c_j. \tag{8}$$

If the average productivity of labor grows at the rate of  $g_i$  and  $g_j$ , then the per capita wealth holdings of the two groups at any given time (or what is the same thing, the speed of equalization of the ratio of initial wealth holdings to any desired ratio) will be given by expression (9).

$$\frac{c_i(t)}{c_j(t)} = \frac{\left\{ e^{(m_i r_i - n_i)t} \left[ c_{i0} + m_i w_{i0} \int_0^t e^{(g_i - m_i r_i + n_i)t} dt \right] \right\}}{\left\{ e^{(m_j r_j - n_j)t} \left[ c_{j0} + m_j w_{j0} \int_0^t e^{(g_j - m_j r_j + n_j)t} dt \right] \right\}}. \quad (9)$$

The long-run equilibrium asset ratio, for an infinite time horizon, is

$$\frac{c_i(t)^*}{c_j(t)^*} = \frac{(g_j - m_j r_j + n_j) w_{i0}}{(g_i - m_i r_i + n_i) w_{j0}}. \quad (10)$$

For any finite time horizon,  $h$ , the asset ratio is given by

$$\frac{c_i(h)}{c_j(h)} = \frac{e^{(m_i r_i - n_i)t} \left\{ c_{i0} + \frac{m_i w_{i0}}{(g_i - m_i r_i + n_i)} [e^{(g_i - m_i r_i + n_i)t} - 1] \right\}}{e^{(m_j r_j - n_j)t} \left\{ c_{j0} + \frac{m_j w_{j0}}{(g_j - m_j r_j + n_j)} [e^{(g_j - m_j r_j + n_j)t} - 1] \right\}}. \quad (11)$$