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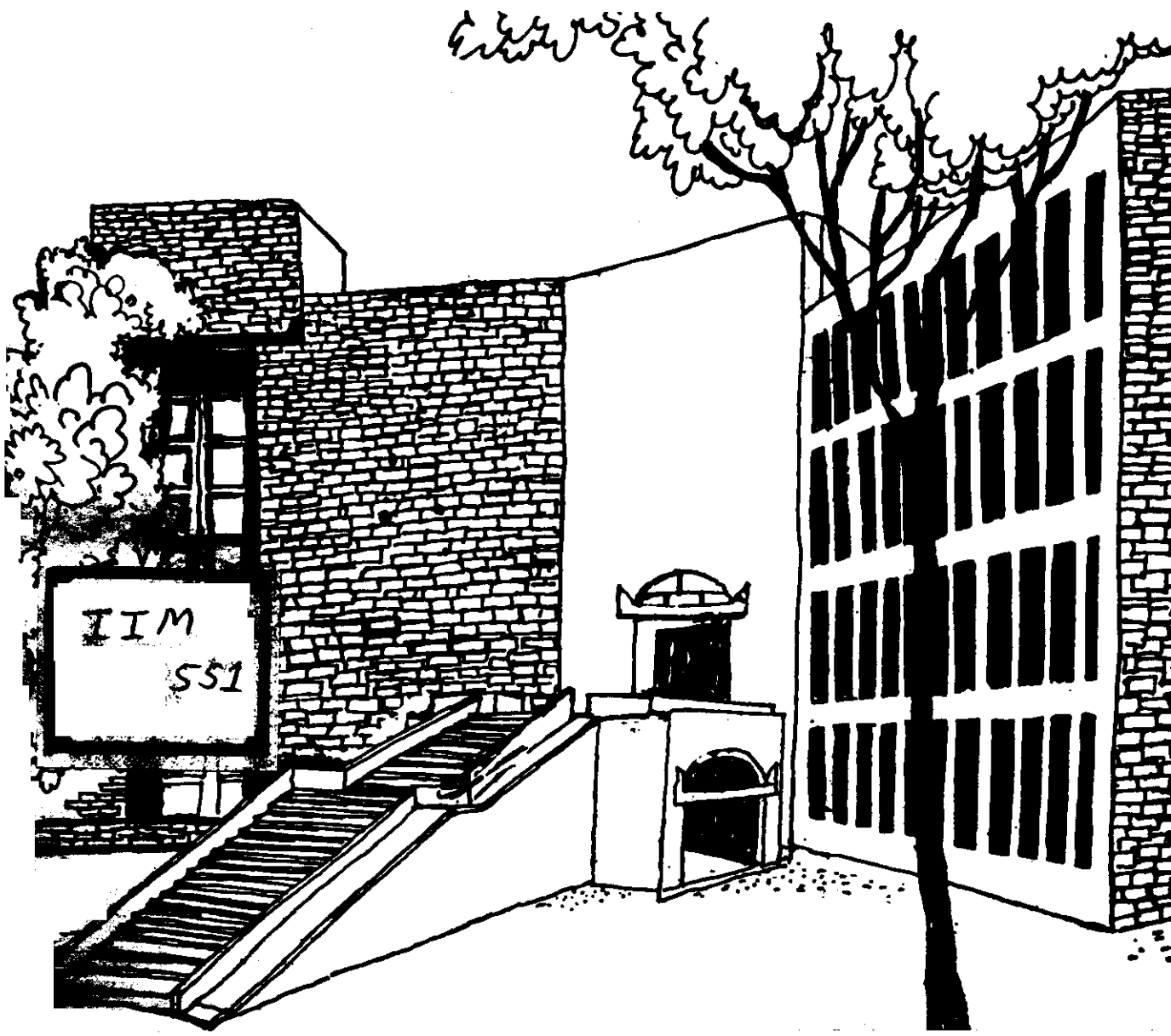

DISTRIBUTION AND DEVELOPMENT EFFECTS OF TARIFF SUBSIDY POLICIES IN SMALL, OPEN DUAL ECONOMY

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Abstract

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In this paper the effects of tariff cum subsidy policies in a small open dual economy with intersectoral migration are considered. The model used is an extended version of the mobile capital Harris-Todaro model of Gordon-Findlay and McCool. Within this framework the effects of policies on unemployment, absolute incomes, inequality and development patterns are studied. The major results are that policies which result in traditional sector development are likely to reduce both unemployment and inequality. Furthermore, subsidies to traditional sector capital may be the best available subsidy in the presence of revenue constraints.

Distribution and Development Effects of Tariff Subsidy Policies in a Small, Open Dual Economy*

By

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1. Introduction

The effects of economic policies enacted for a particular purpose are usually not limited to the targeted variable(s). In recognition of this, most policy analyses examine the effects of such policies on other variables that are of interest to policy makers in addition to the targeted variable(s).[1] Most common among the variables looked at are output levels, factor payment rates, employment levels, factor shares and relative prices. Very often policies are ranked according to the Pareto efficiency criterion. Policy studies which examine effects on other general variables (as opposed to targeted variables) are few in number. In fact, in many cases appropriate methodologies for such analyses are not readily available. This is an unfortunate state of affairs, particularly since distributional considerations are important to policy makers. In this study we concentrate explicitly on distributional effects of a subset of policies in order to fill a part of this gap.

To be specific, we look at the effects of tariff cum subsidy policies on absolute incomes and inequality. The vehicle we use for this purpose is the mobile capital Harris-Todaro dual economy model of Corden and Findlay (1975) and McCool (1982) as extended by Das-Gupta (1984) to permit the study of policy effects on the personal distribution of income.

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(1) Many studies however seek to identify welfare maximizing policies by considering particular welfare functions and a limited subset of policies. Discussion of this genre of studies is not within the scope of this paper.

McCool (1982) examines the effect of tax-subsidy and tariff-subsidy policies on employment and efficiency levels. Das-Gupta (1984) considers the effects of tax-subsidy policies on personal income distribution. This paper extends the analysis of Das-Gupta (1984) to tariff-subsidy policies. However, the analysis made here goes beyond that of Das-Gupta (1984). A somewhat refined methodology for the examination of policy effects on inequality due to endowment differentials is employed. Furthermore, the effects of policies on employment and output levels are reinterpreted in line with the illuminating typology developed in Fields (1980) as extended by Das-Gupta and Gang (1985). This permits us to carry out an interesting analysis of the relation between policy induced development and distribution patterns.

We show that commercial policies which promote traditional sector enrichment (and enlargement) are likely to have favourable effects on both unemployment and the personal distribution of income. In contrast, policies which promote the modern sector have negative implications for unemployment and distribution. An unusual finding which emerges from this study concerns capital subsidies to agriculture. Our study raises the possibility that, in the presence of revenue constraints, this form of subsidy has the greatest impact on unemployment and inequality of labour incomes.

The rest of the paper is structured as follows: In section 2, the model of McCool (1982), which forms the basis of this study, is reviewed and the efficiency and employment effects of tariffs obtained by him are presented.(2)

2 Some of the comparative static results in this section are not reported by McCool and have thus been computed and presented by us.

Section 3 reinterprets the results in line with the typology of Fields (1980) and Das-Gupta and Gang (1985). Section 4 presents the extension of McCool's model developed in Das-Gupta (1984) to permit an analysis of personal income distribution. In the next three sections policy effects on the personal distribution of income are discussed. Section 8 contains a concluding discussion.

2. The Mobile Capital Harris Todaro Model

In the notation of McCool (1982), the mobile capital Harris-Todaro model is given by equations 2.1 to 2.0 below.

$$y_i = f_i(k_i), \quad i = M, A. \quad f_i' > 0; \quad f_i'' < 0 \qquad 2.1$$

$$l_A + l_M + l_N = 1 \qquad 2.2$$

$$k_M l_M + k_A l_A = k \qquad 2.3$$

$$w_M (1-s_M) = p(f_M - k_M f_M') \qquad 2.4$$

$$r(1-v_M) = p\, f_M' \qquad 2.5$$

$$w_A(1-s_A) = f_A - k_A\, f_A' \qquad 2.6$$

$$r\,(1-V_A) = f_A' \qquad 2.7$$

$$w_A = \frac{l_M}{l_M + l_N} w_M \qquad 2.8$$

$$s_M w_M l_M + s_A w_A l_A = Tz_i \; ; \quad i = M, A. \qquad 2.9$$

$$p = p^*(1+T) \text{ if M is imported.} \qquad 2.10(a)$$

$$p = p^*/(1+T) \text{ if A is imported.} \qquad 2.10(b)$$

y_i, l_i, k_i, w_i, r_i, s_i, v_i, z_i are respectively the per capita output, labour units employed, capital to labour ratio, wage rate, rental rate, per unit wage subsidy, per unit rental subsidy and imports pertaining to sector i, i = M,A. p is the domestic price ratio with

the agricultural goods taken as numeraire. p^* is the given world price level. Total labour available is fixed at one unit and the capital stock is fixed at k. The per unit import tariff is T. w_A is assumed to be exogenously fixed. Here, sector A may be interpreted as the agricultural or traditional sector and sector M as the manufacturing or modern sector. l_M is the unemployment rate. Single primes denote first derivatives with respect to arguments and double primes denote second derivatives.

Of the equations, only (2.8) and (2.9) need comment. (2.8) is the well known Harris-Todaro migration equilibrium condition while (2.9) is the government budget balance relation. We may note for future reference that the model is consistent and has a stable capital market if and only if (Neary (1978), Khan (1980))

$$k_M > \frac{k_M l_M}{l_M + l_A} > k_A \qquad 2.11$$

Using this model, McCool analyses the impact of Tariff financed subsidies to wages in either sector or to both sectors at an equal rate ($s = s_A = s_M$). We add an analysis of the effects of rental subsidies to either sectors or to both at an equal rate as well ($v = v_M = v_A$). Values of impact multipliers (evaluated at $T = s_i = v_i = 0$) are given in Table 2.1 while signs of multipliers are given in Table 2.2. The reader is referred to McCool (1982) and Corden and Findlay (1975) for detailed discussion of the results. We simply recapitulate the major results below.

Proposition 2.1 (McCool)

(i) A subsidy to manufacturing sector wages only is always the lowest ranked wage subsidy for any method of finance in terms of output gains (where output is measured at world prices).

(ii) For a given subsidy to wages a tariff on agricultural imports always has a larger impact on output than a tariff on manufactured imports.

(iii) Tax financed subsidies but not tariff financial subsidies permit an attainment of the first best optimum.

(iv) A tariff on manufactured imports lowers capital labour ratios and increases unemployment and output measured in terms of the agricultural commodity (but lowers output valued at world prices). A manufacturing tariff has exactly the reverse effect.

We may add the following results for rental subsidies (see tables 2.1 and 2.2).

Proposition 2.2

(i) A subsidy to agricultural capital raises output (at world prices or in terms of the agricultural good) and lowers unemployment. Subsidizing manufacturing capital has the reverse effect and across the board rental subsidies have no effect on unemployment but rais the value of output in terms of the agricultural good.

(ii) Employment effects are negative if there are manufactured imports and manufacturing or across the board rental subsidies as are output effects in terms of world prices. However, in the case of manufacturing import tariffs, output in terms of the agricultural good increases.

	1	p	M	x	A
$s_A\ dT_M$	$\frac{w_A l_A}{z_M}$	$\frac{pw_A l_A}{z_M}$	$\frac{w_M w_A l_A}{z_M p k_M f_M''}$	$\frac{(w_M + rk_M) w_A l_A}{k_M z_M}$	$\frac{(w_M + rk_M) w_A l_A}{k_M z_M f_A''}$	$w_A - \frac{(w_M + rk_M)\, w_A l_A\, k_A}{k_M\, z_M}$
$s_M\ dT_M$	$\frac{w_M l_M}{z_M}$	$\frac{pw_A l_M}{z_M}$	$\frac{w_M(w_M l_M + z_M)}{z_M p k_M f_M''}$	$\frac{w_M}{k_M} + \frac{(w_M + rk_M)\, w_M l_M}{z_M k_M}$	$\frac{w_M(z_M + (w_M + rk_M) l_M)}{k_M z_M f_A''}$	$\frac{-(z_M + (w_M + rk_M) l_M) k_A w_M}{k_M z_M}$
$s\ dT_M$	$\frac{w_A}{z_M}$	$\frac{pw_A}{z_M}$	$\frac{w_M(w_A + z_M)}{z_M p k_M f_M''}$	$\frac{w_M}{k_M} + \frac{(w_M + rk_M)\, w_A}{z_M k_M}$	$\frac{w_M z_M + (w_M + rk_M) w_A}{k_M z_M f_A''}$	$\frac{(w_A k_M - w_M k_A) z_M - (w_M + rk_M) w_A k_A}{k_M z_M}$
$s_A\ dT_A$	$\frac{w_A l_A}{z_A}$	$\frac{-pw_A l_A}{z_A}$	$\frac{-w_M w_A l_A}{z_A p k_M f_M''}$	$\frac{-(w_M + rk_M)\, w_A l_A}{k_M z_A}$	$\frac{-(w_M + rk_M)\, w_A l_A}{k_M z_A f_A''}$	$w_A + \frac{(w_M + rk_M)\, w_A l_A k_A}{k_M z_A}$
$s_M\ dT_A$	$\frac{w_M l_M}{z_A}$	$\frac{-pw_M l_M}{z_A}$	$\frac{-w_M(w_M l_M - z_M)}{z_A p k_M f_M''}$	$\frac{w_M}{k_M} - \frac{(w_M + rk_M)\, w_M l_M}{z_A k_M}$	$\frac{w_M(z_A - (w_M + rk_M) l_M)}{k_M z_A f_A''}$	$-\frac{(z_A - (w_M + rk_M) l_M) k_A w_M}{k_M z_A}$
$s\ dT_A$	$\frac{w_A}{z_A}$	$\frac{-pw_A}{z_A}$	$\frac{-w_M(w_A - z_A)}{z_A p k_M f_M''}$	$\frac{w_M}{k_M} - \frac{(w_M + rk_M)\, w_A}{z_A k_M}$	$\frac{w_M z_A - (w_M + rk_M) w_A}{k_M z_A f_A''}$	$\frac{(w_A k_M - w_M k_A) z_A + (w_M + rk_M) w_A k_A}{k_M z_A}$
$r_A\ dT_M$	$\frac{rk_A l_A}{z_M}$	$\frac{prk_A l_A}{z_M}$	$\frac{w_M rk_A l_A}{z_M p k_M f_M''}$	$\frac{(w_M + rk_M) rk_A l_A}{k_M z_M}$	$\frac{-rk_M z_M + (w_M + rk_M) rk_A l_A}{k_M z_M f_A''}$	$rk_A - \frac{(w_M + rk_M) rk_A l_A}{k_M z_M}$
$r_M\ dT_M$	$\frac{rk_M l_M}{z_M}$	$\frac{prk_M l_M}{z_M}$	$\frac{w_M rk_M l_M}{z_M p k_M f_M''}$	$r + \frac{(w_M + rk_M) rk_M l_M}{k_M z_M}$	$\frac{rk_M z_M + (w_M + rk_M)\, rk_M l_M}{k_M z_M f_A''}$	$-rk_A - \frac{(w_M + rk_M)\, rk_M l_M k_A}{k_M z_M}$
$r\ dT_M$	$\frac{r_k}{z_M}$	$\frac{pr_k}{z_M}$	$\frac{w_M r_k}{z_M p k_M f_M''}$	$r + \frac{(w_M + rk_M)\, r_k}{k_M z_M}$	$\frac{(w_M + rk_M)\, rk}{k_M z_M f_A''}$	$\frac{-k_A(w_M + rk_M)\, rk}{k_M z_M}$
$r_A\ dT_A$	$\frac{rk_A l_A}{z_A}$	$\frac{-prk_A l_A}{z_A}$	$\frac{-w_M rk_A l_A}{z_A p k_M f_M''}$	$\frac{-(w_M + rk_M)\, rk_A l_A}{k_M z_A}$	$\frac{rk_M z_A + (w_M + rk_M) rk_A l_A}{k_M z_A f_A''}$	$rk_A + \frac{(w_M + rk_M)\, rk_A l_A}{k_M z_A}$
$r_M\ dT_A$	$\frac{rk_M l_M}{z_A}$	$\frac{-prk_M l_M}{z_A}$	$\frac{-w_M rk_M l_M}{z_A p k_M f_M''}$	$r - \frac{(w_M + rk_M)\, rk_M l_M}{k_M z_A}$	$\frac{rk_M z_A - (w_M + rk_M)\, rk_M l_M}{k_M z_A f_A''}$	$-rk_A + \frac{(w_M + rk_M)\, rk_M l_M k_A}{k_M z_A}$
$r\ dT_A$	$\frac{r_k}{z_A}$	$\frac{-pr_k}{z_A}$	$\frac{-w_M r_k}{z_A p k_M f_M''}$	$r - \frac{(w_M + rk_M)\, r_k}{k_M z_A}$	$\frac{-(w_M + rk_M)\, rk}{k_M z_A f_A''}$	$\frac{k_A(w_M + rk_M)\, rk}{k_M z_A}$

Notes: (1) $dl_M = -k_A Q_1 - w_A Q_2$; $dl_A = k_M Q_1 + w_M Q_2$; $dl_N = (k_A - k_M) Q_1 + (w_A - w_M) Q_2$; where $Q_1 = \frac{(1 - l_A) dw_A}{w_M(k_u - k_A)}$ and $Q_2 = \frac{l_M dk_M + l_A dk_A}{w_M(k_u - k_A)}$

$k_u = \frac{k_M l_M}{1 - l_A}$.

Thus, if dw_A, dk_A, $dk_M > 0$ then $dl_A > 0$; $dl_M < 0$; $dl_N < 0$ and if dw_A, dk_A, $dk_M < 0$ then $dl_A < 0$, $dl_M > 0$; $dl_N > 0$. otherwise signs are indeterminate.

(2) If dk_A and dk_M have the same sign, then output at world prices has that sign. Otherwise it is indeterminate.

(3) Output valued in terms of the agricultural goods is given by $rk + w_A$.

TABLE 2.2 SIGNS OF IMPACT MULTIPLIERS

CASE		dk_M	dr	dk_A	dw_A	dl_N	dl_M	dl_A	dy(World prices)	dy(A-units)	Remarks
1	T_M	−	+	−	−	+	+	−	−	+	
1	T_A	+	−	+	+	−	−	+	+	−	
s_A	1	0	0	0	+	−	−	+	0	+	
s_M	1	−	+	−	−	+	+	−	−	+	
s	1	−	+	−	+	?	?	?	−	+	
v_A	1	0	0	+	+	−	−	+	+	+	
v_M	1	0	+	−	−	+	+	−	−	+	
v	1	0	+	0	0	0	0	0	0	+	
s_A	T_M	−	+	−	?(+)	?(−)	?	?	−	+	Either $dl_M \geq 0$ or $dl_A \geq 0$ if $l_N \leq 0$
s_M	T_M	−	+	−	−	+	+	−	−	+	
s	T_M	−	+	−	?(+)	?(−)	?	?	−	+	Either $dl_M \geq 0$ or $dl_A \geq 0$ if $l_N \leq 0$
s_A	T_A	+	−	+	+	−	−	+	+	?	Assume $Z_A < w_M l_M$
s_M	T_A	?(+)*	?(−)*	?(+)*	?(+)*	?(−)	?(−)*	?(+)*	?(+)*	?(−)	Assume $Z_A < w_A$
s	T_A	?(+)*	?(−)*	?(+)*	+	?(−)	?(−)*	?(+)*	+	?	
v_A	T_M	−	+	?(+)	?(+)	?(−)	?	?	?	+	$(l_M dk_M + l_A dk_A) < 0$ and either $dl_M \geq 0$ or $dl_A \geq 0$ if $dl_N \leq 0$
v_M	T_M	−	+	−	−	+	+	−	−	+	
v	T_M	−	+	−	−	+	+	−	−	+	
v_A	T_A	+	−	+	+	−	−	+	+	?	
v_M	T_A	+	?(−)*	?(+)*	?(+)*	?(−)	?(−)*	?(+)*	?(+)*	?	Assume $Z_A < r$
v	T_A	+	?	+	+	−	−	+	+	?	

NOTES: (1) Signs in parentheses are under the assumption of decreasing unemployment.

(2) Signs in parentheses with an asterisk are under the assumptions of decreasing unemployment and the condition given in the remarks column.

(3) 'L' signifies lump sum finance or distribution of proceeds.

(iii) Employment and output at world prices increase with agricultural import tariffs and agricultural or across the board rental subsidies.

These results indicate that capital subsidies in a food-grain importing dual economy may be a welfare improving though not a first best policy. This issue is explored further below with respect to various distributional criteria. We now proceed to a classification of policy induced development patterns.

Policy Induced Development Patterns

Fields (1980) distinguishes between three types of economic development patterns in dual economies by focusing on labour incomes. In his terminology, these are modern sector enrichment, modern sector enlargement and traditional sector enrichment. To derive precise expressions for these development patterns, consider the total labour income identity as in(3.1).

$$y_l = w_M l_M + w_A l_A \qquad 3.1$$

differentiating this expression we get

$$dy_l = (w_M - w_A)\, dl_M + l_M dw_M + l_A dw_A + w_A(dl_M + dl_A) \qquad 3.2$$

The modern sector enlargement effect is captured by the term $(w_M - w_A)\, dl_M$, the modern sector enrichment effect by $l_M dw_M$, the traditional sector enrichment effect by $l_A dw_A$. The final term in (3.2) is absent in the Fields framework as he assumes the aggregate labour force to be fully employed in one or the other sector and fixed. We may term this the aggregate employment effect. Now, from (2.2) and (2.8) we can derive

$$(1-l_A)dw_A = w_M dl_M + w_A dl_A \qquad 3.3$$

(3.3) and the fact that w_M is given exogenously in the Harris-Todaro model allows us to conclude the following.

Lemma 3.1 In the Harris-Todaro model, if traditional sector enrichment occurs then either traditional sector or modern sector enlargement must occur.
Furthermore, since $dw_A > 0$ implies that $l_N dl_M > l_M dl_N$ from (2.8) we have

Lemma 3.2 : In the Harris-Todaro model, if traditional sector enrichment occurs and modern sector enlargement does not occur then aggregate unemployment must decrease. Thus, we can conclude the following

Proposition 3.1 If traditional sector enrichment occurs then one of the following must also occur

(i) Modern sector enlargement.
(ii) Modern sector and traditional sector enlargement and falling unemployment.
(iii) Traditional sector enlargement and decreasing unemployment.

It is instructive to analyse the effects of tariff-subsidy policies in the light of this classification. The results are presented in table 3.1. It may be seen from the table that modern sector enlargement induced by tariff-subsidy policies is always accompanied by falling output at world prices. Furthermore, protection to the agricultural sector is employment enhancing (whether a subsidy or a tariff is the form of protection). Thus, tariff or subsidy protection to the modern sector appears to have little to recommend it-in fact, the per worker production of manufactures falls with some form of protection (since $y_M = f(k_M)$ and $dk_M < 0$ in all these cases). Thus, we either have falling labour productivity or falling modern sector output or both with modern sector subsidies.

TABLE 3.1 DEVELOPMENT PATTERNS INDUCED BY TARIFF SUBSIDY POLICIES

CASE		DEVELOPMENT PATTERN INDUCED
L	T_M	MSE
L	T_A	TSE and AE
s_A	L	TSE and AE
s_M	L	MSE
s	L	TSE
v_A	L	TSE and AE
v_M	L	MSE
v	L	No effect
s_A	T_M*	TSE and AE
s_M	T_M	MSE
s	T_M*	TSE and AE
s_A	T_A	TSE and AE
s_M	T_A*	TSE and AE
s	T_A*	TSE and AE
v_A	T_M*	TSE and AE
v_M	T_M	MSE
v	T_M	MSE
v_A	T_A	TSE and AE
v_M	T_A*	TSE and AE
v	T_A	TSE and AE

tes: (1) MSE : Modern sector enlargement effect
TSE : Traditional Sector Enrichment Effect
AE : Aggregate Employment Effect
(2) *indicates that only the special case as in table 2.2 is presented.
(3) L indicates a lump sum subsidy or tax.

The Personal Distribution of Income in the Harris-Todaro Model

This section summarises the extension of the Harris-Todaro model developed in Das-Gupta (1984) and improves upon it. We seperate out income differences across individuals into two parts. Firstly we look at income differences due to the differential treatment of identically endowed individuals by imperfect institutions and then look at differences in ex ante expected incomes due to endowment differentials.

a) Labour income differences due to institutional rigidities. We assume that there are identical individuals, each endowed with equal amounts of labour time. Individuals have no other use for their time so that the entire time is spent labouring. We then have three labour income levels possible. An l_N fraction of the labour force gets zero labour income an l_A fraction of the labour force gets $w_A l_A$ units of income which is equally divided among them and an l_M fraction of workers gets $w_M l_M$ units of income which is, again, equally divided among them. Thus, the ratio of labour earnings of a modern and traditional sector worker is w_M/w_A. Total labour income is, using (2.8), $w_A l_A + w_M l_M = w_A l_A + w_A(1-l_A) = w_A$. We therefore see that the agricultural sector gets an l_A fraction of total labour income. The Lorenz curve for labour incomes connects the points $(0,0)$, $(l_N,0)$, (l_N+l_A, l_A), $(1,1)$. The three segments have slopes 0, 1 and w_M/w_A respectively. In examining the effects of policies on inequality we will work

with the Lorenz criterion and examine pre and post policy Lorenz curves in this context.

(b) Institutional rigidities and total income differences. Equally endowed workers each get an equal share of capital income rk. When this is added to labour incomes, the income of individuals in different sectors can be determined.

The lorenz curve for total incomes connects the points (o,o), $(l_N, l_N(1 - w_A/y))$, $(l_N+l_A, l_N(1-w_A/y + l_A))$, $(1,1)$. The slopes of the three segments are respectively $(1-w_A/y)$, 1 and $(1+(w_K-w_A)/y)$ where $y(=r_K+w_A)$ is aggregate income valued in terms of the agricultural good.

(c) Endowment differentials. Let b_i be the capital share of the ith individual and c_i be the share of the individual in total labour income. We have $\bar{b} = \bar{c}$ where a bar denotes the average value. Expected wage income can be found as follows. The conditional probabilities of the person having a modern sector job or being unemployed in the modern sector given that the person is not in the agricultural sector are respectively.

$$p(\text{employment/modern sector}) = l_M/(l_M+l_N)$$

and $$p(\text{unemployment/modern sector}) = l_U/(l_U+l_N).$$

The probability of being in the modern sector is, of course, l_U+l_N. Thus the probability of modern sector employment (unemployment) is just $l_M(l_N)$. The expected wage is therefore $E(w_i) = c_i(0.l_N + w_M l_M + (1 - l_M-l_N)w_A) = w_A c_i$ where c_i is the number of hours

worked. Thus, the ith individual's expected total income is

$$E(y_i) = rkb_i + w_A c_i \qquad 4.1$$

The income share may be found by dividing 4.1 through by aggregate output (in terms of the agricultural good) and is given by

$$\frac{E(y_i)}{y} = \frac{rk}{y} b_i + \frac{w_A c_i}{y} = (1-w_A/y)b_i + (w_A/y)c_i \qquad 4.2$$

In general, b_i and c_i need not be perfectly correlated. Furthermore, if labour's share of income (w_A/y) changes, a person's income rank may change. Even if income ranks do not change, little can be said about inequality without additional assumptions. To see this, assume that individuals are indexed in order of increasing incomes and consider a small change in w_A/y which does not affect income ranks. Let B(i) and C(i) be the cumulative capital and labour shares of the first i individuals[3]. Then the Lorenz curve is given by

$$LZ(i) = (1-w_A/y)B_i + (w_A/y)C_i \qquad 4.3$$

$$\text{Then } \frac{\partial (LZ(i))}{\partial (w_A/y)} = (C_i - B_i) \qquad 4.4$$

We therefore assume that poorer persons have <u>relatively</u> large shares of labour income - an eminently plausible assumption. For future reference we number this assumption below:

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3. That is $C_i = \int_0^i dF(C_i)$, where $F(C_i)$ is the distribution function for C_i. B_i is similarly defined.

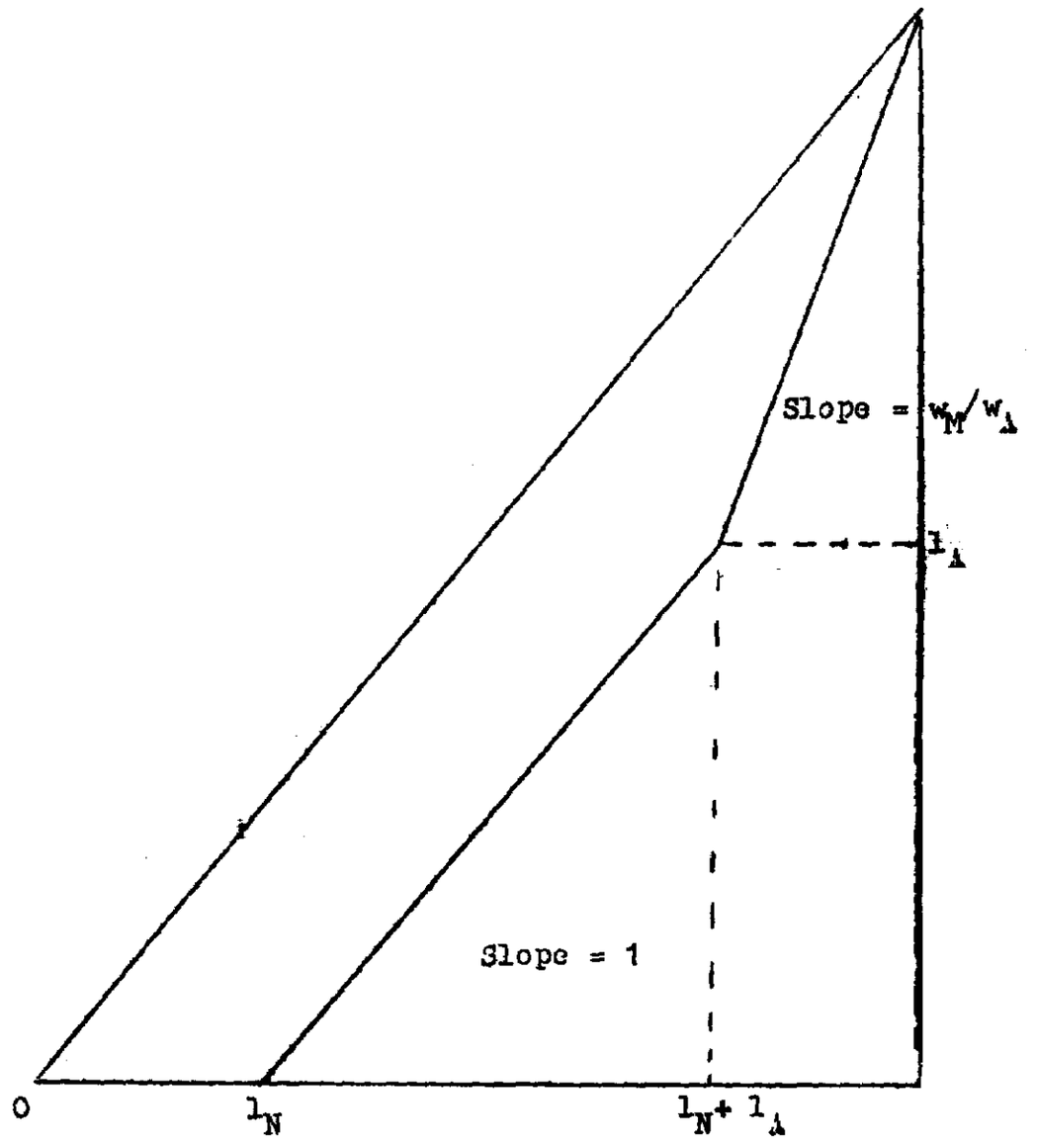

Figure 4.1. The Lorenz Curve for Labour Income.

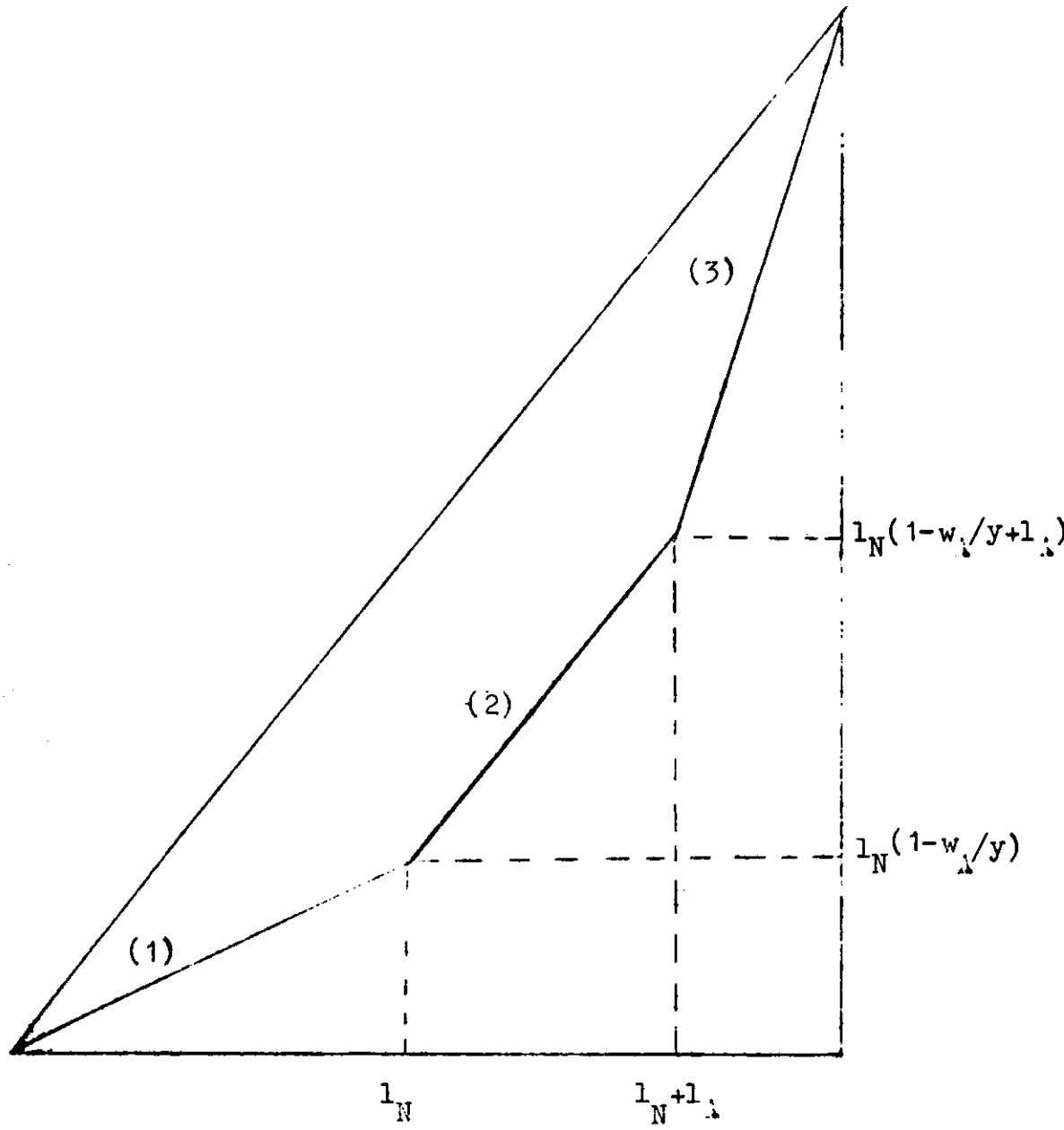

Figure 4.2 The Lorenz Curve for Total Incomes with Institutional Rigidities and Equally Endowed Individuals

(1) Slope = $1-w_1/y$

(2) Slope = 1

(3) Slope = $1+(w_2-w_1)/y$

Assumption 4.1

i The income ranks of persons do not change on account of policy changes.

ii The cumulative labour income share of individuals is less than the cumulative capital share when individuals are ranked in order of increasing incomes.

In the next two sections we look at the effects on policies on absolute labour incomes, and on inequality of labour incomes and total incomes due to institution related or endowment differentials.

Absolute Labour Incomes and Tariff Subsidy Policies

In studying absolute labour incomes we ask which policies (if any) do not decrease the labour incomes of any labourer. More precisely, if we rank pre and post policy labour incomes in ascending order we ask which policies lead to the latter vector of incomes being at least as large as the former and strictly greater for at least one entry. In the case of endowment differentials, clearly, rising w_i is necessary and sufficient for absolute (expected) labour income increases in this sense. Definition 5.1 formalizes the criterion for institutionally related differences.

Definition 5.1

In the case of identically endowed workers, absolute incomes will be said to have improved on account of a change in the policy variable x, if and only if

$$\frac{dl_N}{dx} \leq 0, \quad \frac{dl_M}{dx} \geq 0 \text{ and } \frac{dw_i}{dx} \geq 0$$ with at least one strict inequality.

We now state the following result.

Proposition 5.1 The conditions in Definition 4.1 are equivalent to $\frac{dw_A}{dx} > 0$ and either $\frac{dl_M}{dx} > 0$ or $\frac{dl_N}{dx} < 0$

The proof follows trivially by noting that

$$dw_A = \frac{(l_N dl_M - l_M dl_M)}{(l_M + l_N)^2} w_M .$$

An examination of Table 2.2. allows us to conclude the following

Proposition 5.2

If absolute incomes improve as in Definition 4.1 then they can only improve from the following policy packages:

(s_A, T_M), (s, T_M), (s_M, T_A), (s, T_A), (v_A, T_M) and (v_M, T_A).

We may now ask which of these packages (for each of modern sector imports and traditional sector imports) brings about the maximum decrease in unemployment if equal tariff revenues are collected. We have the following result.

Proposition 5.3

If tariff revenues are equal across policy packages, then subsidy to agricultural capital brings about the maximum decrease in unemployment.

Proof: In appendix 2.

The intuition behind this surprising result is as follows. Neglecting the actual source of finance (which will have the same effects across subsidies), a subsidy which decreases unemployment (when combined with lump sum finance) will lower unemployment by a greater amount than one which does not decrease unemployment. Unemployment will decrease only if the agricultural sector is

subsidized (an across the board wage subsidy may raise or lower employment, but in any case its effect, with equal revenues, will be less than a pure agricultural subsidy). However, only the rental subsidy leads to an increase in the capital intensity of the agricultural sector. The wage subsidy has no impact on capital intensity[4].

Thus, rental subsidies may, with revenue constraints prove superior to wage subsidies.

We now turn to an examination of the impact of tariff-subsidy policies on institutional inequality.

Tariff-subsidy policies and Institutional Inequality

(a) Labour incomes

Since many policies have no clearcut effects on capital intensities, factor returns or employment levels, we present results for both the general case and the special cases given in Table 2.1 where it is assumed that unemployment does decrease.[5]

Proposition 6.1 : Necessary and sufficient conditions for the post policy Lorenz curve for labour incomes to lie nowhere below the pre-policy Lorenz curve are given by $dw_N \geq 0$ and $dl_N \leq 0$. The proof of this proposition is straightforward. The result can easily be inferred by examining Figure 4.1. Turning to inequality effects,

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This result complements that of McCool (1982) who argues that a tax on manufacturing profits is the best available instrument with revenue constraints.

Clearly, a policy measure which raises unemployment is unlikely to be considered useful. Thus, it is worth examining the inequality effects of policies only when [illegible] reduce unemployment.

Table 6.1 gives the impact on inequality of the policies considered. Once again, the undesirability of subsidies to the manufacturing sector is revealed, especially in the presence of manufacturing imports. Once again for reasons similar to that given in Section 5, the greatest inequality decrease is brought about by subsidies to agricultural profits. We state this as a proposition.

Proposition 6.2 When there is a revenue constraint, institutionally inequality is decreased most by a subsidy to agricultural capital when revenues are raised through import tariffs.

Proof See Appendix 2.

(b) Total Income.

We first note that inequality of total income need not move in the same direction as inequality of labour incomes even though capital incomes are equally distributed.[6] In fact, Lorenz Curves cross in all six unambiguous cases of table 2.2. Furthermore, for the special cases of table 2.2 the possibility of crossing Lorenz curves is not ruled out for all the cases. Details are presented in Table 6.2. Unfortunately, no simple set of conditions for inequality decreases can be given here as was done for

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6. Proof Let k denote capital income per person, L(i,v) denote the cumulative share of total labour income of the poorest i individuals and Q denote capitals share of income in total output. v is a shift parameter. Then the Lorenz curve is given by

$$LZ(i,v) = iQk + (1-Q)L(i,v)$$

$$\frac{dLZ}{dv} = (ik-L)\frac{dQ}{dv} + (1-Q)\frac{dl}{dv}$$

$$\text{Thus } \frac{dLZ}{dv} \gtreqless 0 \text{ as } \begin{cases} \frac{dQ}{dv} \gtreqless \frac{(1-Q)dL/dv}{L-xk} & \text{for } ik > L \\ \frac{dQ}{dv} \lesseqgtr \frac{(1-Q)dL/dv}{L-kx} & \text{for } ik < L . \end{cases}$$

Thus, it is possible for the new Lorenz curve to cross the old one.

TABLE 6.1

Effects of Policies on Institutional Labour Income Inequality

CASE	POLICY CAUSES INEQUALITY TO	SPECIAL CASE*
Γ_M s_A	?	DECREASE
Γ_M s_M	INCREASE	——
T_M s	?	DECREASE
T_A s_A	DECREASE	?
T_A s_M	?	DECREASE
T_A s	?	DECREASE
T_M v_A	?	DECREASE
T_M v_M	INCREASE	-
T_M v	INCREASE	-
T_A v_A	DECREASE	-
T_A v_M	?	DECREASE
T_A v	DECREASE	-

* See TABLE 2.2. FOR DESCRIPTIONS OF SPECIAL CASES

TABLE 6.2

Effects of Policies on Institutional Income Inequality

CASE		POLICY CAUSES NEW LORENZ CURVE TO	SPECIAL CASES*
T_M	s_A	?	$l_M \leq 0$ DOMINATE
			$l_M > 0$ CROSS/DOMINATE
T_M	s_M	CROSS FROM ABOVE	-
T_N	s	?	AS FOR (T_M, s_A)
T_A	s_A	CROSS FROM BELOW	-
T_A	s_M	?	CROSS FROM BELOW
T_A	s	?	CROSS FROM BELOW
T_M	v_A	?	AS FOR (T_M, s_A)
T_M	v_M	CROSS FROM ABOVE	-
T_M	v	?	CROSS/DOMINATE
T_A	v_A	CROSS FROM BELOW	-
T_A	v_M	?	CROSS FROM BELOW
T_A	v	CROSS FROM BELOW	-

* SEE TABLE 2.1 FOR SPECIAL CASES.

labour income inequality. A detailed examination of the kink points of the Lorenz Curve of Figure 5.2 and an examination of slopes is called for. It may be noticed however that improvements are possible only with manufacturing imports and either agricultural wage subsidies or across the board subsidies to either factor when considering the special cases.

We now turn to an examination of policy effects on endowment linked inequality.

Impact of Tariff-Subsidy Policies on Income Inequality due to Endowment Differentials

In this section we restrict attention to cases when assumption 4.1 is valid. Examining Table 2.2 we conclude the following.

Proposition 7.1 Inequality (decreases) increases when an (agricultural) manufacturing import tariff is imposed. Inequality (decreases) increases when (agricultural wage subsidies or agricultural rental subsidies) subsidies to a manufacturing factor or across the board rental subsidies are given under Assumption 4.1. With across the board wage subsidies the inequality effects are ambiguous.

Therefore inequality is unambiguously decreased with (T_A, s_A) or (T_A, v_A) and unambiguously increased with (T_H, v_H) (T_M, s_M) or (T_M, v). In all other cases there are contradictory pulls on labour's share of income. In the special cases looked at with three other policies, (T_A, s_M), (T_A, s) and (T_A, v_M) inequality is decreased. In consequence of (T_A, v_M) and (T_A, v_A) leading to lower inequality in the special case, (T_A, v) also results in reduced inequality in the special case. The remaining

three packages continue to have ambiguous effects on inequality.

An alternate way of examining inequality due to endowment differentials is to examine the coefficient of variation of incomes as in Atkinson and Stiglitz (1980). If C denotes the coefficient of variation, then we have by a simple computation,

$$C^2(y) = c_k^2 (1-w_A/y)^2 + c_l^2 (w_A/y) + 2 \rho (w_A/y) (1-w_A/y) \quad 7.1$$

where ρ is the correlation coefficient between labour and capital income shares, c_k is the coefficient of variation for incomes and c_l is the coefficient of variation for labour incomes. Differentiation of 7.1 gives us

$$dc = \left[\frac{1}{c} (c_l^2 - c_k^2) + (1-2 w_A/y) \rho (w_A/y)\right] \quad 7.2$$

If, as is likely, $c_l < c_k$ $\rho > 0$ and $w_A/y > 1/2$ then the inequality effects of various policies are similar to these for the Lorenz Criterion presented above. Thus, it may be seen that the Atkinson-Stiglitz method requires equally strong if not stronger assumptions to examine inequality effects using the less acceptable coefficient of variation as the inequality measure.

Concluding Comments.

One aspect of the analysis above is extremely clearcut. Modern sector enlarging policies have extremely poor distributional performances. In fact, inequality of labour incomes due to institutions and of total income due to endowments increases in these cases. Only for identically endowed individuals do we see possibilities of inequality decreases if capital incomes are sufficiently enhanced. We note, in passing, that our findings contradict the proposition of Fields (1980), who claims that Lorenz Curves

for labour income must cross with modern sector enlargement. All it takes to find an exception to his theorem is the introduction of the possibility of unemployed labour, who receive a zero wage[7].

A second broad conclusion that can be drawn is with regard to traditional sector enrichment policies. traditional sector enrichment, in our framework is always accompanied by increased unemployment and lower inequality whenever results are clearcut. Furthermore, if imports are not too large (a joint sufficiency condition for the special cases of Table 2.2 is that imports in units of the agricultural good are less than min(wage bill in the manufacturing sector, rental bill in the manufacturing sector), these results are duplicated for all policies which now result in traditional sector enrichment. In addition this set of policies may be consistent with an improvement in absolute labour incomes across the board.
Finally, with revenue constraints, agricultural sector subsidies which result in traditional sector enrichment have attractive effects on distribution and the maximum effect on unemployment reduction regardless of the source of finance.

Our results thus lead us to believe that policies which promote the traditional sector's development, especially in relatively closed economies,(like India) are far superior to modern sector development strategies on grounds of efficiency, inequality or employment. Moreover, it appears that policies which promote the capital intensity of the traditional sector have much to commend them. While these propositions cannot be taken to be conclusively superior on the basis of just this study, the need for a serious examination of such a strategy is, we feel, clearly demonstrated.

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[7] Or a constant wage. See Corden and Findlay (1975)

Appendix I

Additional Impact Multipliers

CASE	dk_M	dr	dk_λ	dw_λ
dp	$\frac{w_M}{p^2 k_M f''_M}$	$\frac{w_M + rk_M}{pk_M}$	$\frac{w_M + rk_M}{pk_M F''_\lambda}$	$\frac{-k_\lambda (w_M + rk_M)}{pk_M}$
ds_λ	0	0	0	w_λ
ds_M	$\frac{w_M}{pk_M f''_M}$	$\frac{w_M}{k_M}$	$\frac{w_M}{k_M f''_\lambda}$	$\frac{-k_\lambda w_M}{k_M}$
ds	$\frac{w_M}{pk_M f''_M}$	$\frac{w_M}{k_M}$	$\frac{w_M}{k_M f''_\lambda}$	$\frac{w_\lambda k_M - k_\lambda w_M}{k_M}$
dv_λ	0	0	$\frac{-r}{f''_\lambda}$	rk_λ
dv_M	0	r	$\frac{r}{f''_\lambda}$	$-rk_\lambda$
dv	0	r	0	0

Appendix 2

PROOFS OF PROPOSITIONS

Proof of Proposition 5.3

When revenues are equalized from Tariffs, 2.9 allows us to get up the following equalities.

$$rk_M l_M dv_M = w_A l_A ds_A = w_A d_s = w_M l_M ds_M = rk_A l_A dv_A = rkd_v \quad A2.1$$

Now if the agricultural (manufacturing) good is import then the impact of tariffs across policy packages for economies with this import will be identical. Hence it suffices to compare the effects of subsidies.

Now (for example) if $\frac{dk_A}{dv_M} = x$ and $\frac{dk_A}{ds_A} = y$

then for equal revenues $xdv_M \gtreqless yds_A$ or $dk_A/v_M \gtreqless dk_A/s_A$

as $x \frac{w_A l_A}{rk_M l_M} ds_A \gtreqless yds_A$

or as $\frac{x}{rk_M l_M} \gtreqless \frac{y}{w_A l_A}$

that is as $\frac{dk_A/dv_M}{rk_M l_M} \gtreqless \frac{dk_A/ds_A}{w_A l_A}$.

Thus by dividing the multipliers given in Appendix 1 by the appropriate coefficient from A2.1, we can compare them.

Since $dl_N = \frac{(k_A - k_M)(1-l_A)}{w_M(k_u - k_A)} dw_A + \frac{(w_A - w_M)}{w_M(k_u - k_A)} (l_M dk_M + l_A dk_A)$,

(From Table 2.1) we look at dw_A, dk_M and dk_A only.

Doing this we conclude that, for equal revenues,

$$(1)\quad \frac{dw_{\Delta}}{ds_M} = \frac{dw_{\Delta}}{dv_M} < 0 = \frac{dw_{\Delta}}{dv} < \frac{dw_{\Delta}}{ds} < \frac{dw_{\Delta}}{ds_{\Delta}} = \frac{dw_{\Delta}}{dv_{\Delta}}$$

$$(2)\quad \frac{dk_M}{ds_M} = \frac{dk_M}{ds} < 0 = \frac{dk_M}{dv_M} = \frac{dk_M}{dv_{\Delta}} = \frac{dk_M}{dv} = \frac{dk_M}{ds_{\Delta}}$$

$$(3)\quad \frac{dk_{\Delta}}{ds_M} \quad \frac{dk_{\Delta}}{ds} = \frac{dk_{\Delta}}{dv_M} < 0 = \frac{dk_M}{dv} = \frac{dk_M}{ds_{\Delta}} < \frac{dk_M}{dv_{\Delta}}$$

The rankings will be clearer in the following chart.

	s_M	v_M	v	s	s_{Δ}	v_{Δ}
dw_{Δ}	4	4	3	2	1	1
dk_M	2	2	1	1	1	1
dk_{Δ}	3	3	2	3	2	1

Above the first rank is for the greatest increase. Now since w_{Δ}, k_{Δ} and k_M must <u>increase</u> to bring about an unemployment decrease unambiguously, it is clear that v_{Δ} will bring about the maximum decrease in unemployment. □

<u>Proof of Proposition 6.2</u>

For inequality to decrease, we require wages to increase and unemployment to decrease. From the chart above it is clear that v_{Δ} and s_{Δ} bring about the maximum wage increase while v_{Δ} brings about the maximum unemployment decrease. □

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