

Modern Sector Enlargement or Traditional Sector Enrichment?

GNP Effects with Induced Migration

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*Journal of Population Economics* (1992), 5, 101-112

## Abstract

This paper considers how GNP would change if development resources are allocated in alternative ways, taking account of induced migration. The preferred allocation of development resources between sectors is shown to depend on the amounts of modern sector enlargement and traditional sector enrichment that could be achieved under alternative resource allocations and the labor market effects of each.

The practical significance of these results is the following. Using additional development resources to expand modern sector exports and employment is most efficacious when the marginal product of capital in the modern sector is high and the amounts of induced migration and employment low. In other circumstances - namely, when the marginal product of capital is higher in the traditional sector than in the modern sector and search unemployment widespread - allocating the development fund for purposes of traditional sector enrichment might be better.

## Introduction

This paper analyzes how GNP is affected in a dualistic economy when aid to one sector induces migration from the other. The economy is comprised of a modern export sector and a traditional agricultural sector. Suppose a development fund, originating from the national treasury or from foreign aid, is made available for use in either of two ways: (1) to expand production and employment in the economy's modern sector (a process termed "modern sector enlargement") or (2) to enhance productivity in the domestic agriculture sector (a process termed "traditional sector enrichment").<sup>1</sup>

Different theoretical perspectives on dualistic development suggest different ways of allocating such a development fund. Those coming from the tradition of Lewis, Fei and Ranis, Jorgenson, and others might tend to regard the modern sector as the leading sector and trade as the engine of growth. The presumption among these observers might be that the best use of additional development resources is to stimulate the modern sector, thereby achieving export-led growth. Others would tend to argue just the opposite. Some, such as Schultz and Adelman, are inclined to believe that traditional agriculture has been starved for resources and that an influx of development funds to that sector would have a higher marginal product than in the modern sector. Furthermore, in light of the migration models of Harris and Todaro, Harberger, and followers, there is good reason to be wary of an expansion of jobs in the relatively high-wage urban economy, because in these models, such an expansion would be followed by an influx of

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<sup>1</sup> In earlier work of mine (Fields 1979), I used the term "traditional sector enrichment" to refer to higher incomes of persons in the traditional sector, holding the number of such persons constant. In the present paper, an increase in traditional sector incomes is allowed to induce in-migration of workers into that sector.

additional job-seekers, in all likelihood aggravating unemployment in urban areas and lowering output in rural areas.

These different perspectives about how best to allocate development resources reflect different maintained assumptions (usually implicit) about conditions in product and labor markets. I would characterize them thus.

Those who favor allocating development resources to the modern sector tend to presume that economic growth is best achieved by shifting the locus of economic activity toward modern sector activities. The case for development of the modern export sector hinges on a number of assumptions: that the marginal product of additional resources allocated to the modern sector is high; the labor required for expanding production is forthcoming; the additional products can be sold profitably in the world market; and relatively little output is foregone by rechanneling resources from the traditional to the modern sector.

The case favoring the allocation of additional resources to the traditional sector reflects different assumptions. Among them: that the marginal product of additional resources is higher in traditional agriculture than in the modern sector; that an expansion of employment in the modern urban sector may pull so much labor out of the traditional sector that considerable output is foregone; and that an excess of jobseekers over job opportunities will create additional unemployment.

This paper considers how GNP would change if the development resources were allocated in alternative ways, taking account of induced migration. The preferred allocation of development resources between sectors is shown to depend on the amounts of modern sector enlargement and traditional sector enrichment that could be achieved under alternative resource allocations and the labor market effects of each.

The practical significance of these results is the following. Using additional development resources to expand modern sector exports and employment is most efficacious when the marginal product of capital in the modern sector is high and the amounts of induced migration and unemployment low. In other circumstances - namely, when the marginal product of capital is higher in the traditional sector than in the modern sector and search unemployment widespread - allocating the development fund for purposes of traditional sector enrichment might be better.

## II. The basic model

The economy consists of two sectors: a modern sector  $M$  and a traditional sector  $A$ . The products of both sectors are exportable in principle; consequently, they are valued at world prices. For simplicity, a small country assumption is made for both commodities, i.e., the amount exported by the country in question does not alter the world prices for the products.

To ease notation, the price of the product in each sector ( $p_M$  or  $p_A$ ) and the physical output in each sector ( $q_M$  or  $q_A$ ) are multiplied together to form a single value measure ( $Q_M$  or  $Q_A$ ). These terms  $Q_M$  and  $Q_A$  then represent the value of output from the two sectors. Because  $p_M$  and  $p_A$  are unrestricted, terms of trade effects might be allowed for. The respective derivatives with respect to the inputs capital ( $K_M$  or  $K_A$ ) and labor ( $L_M$  and  $L_A$ ) are the values of marginal product. Extensive use will be made of these expressions below.

The basic equations of the model are as follows. Output in the two sectors in value terms is represented by the production functions

$$Q_M = f(K_M, E_M), \quad f_1 > 0, f_2 > 0$$

and

$$Q_A = g(K_A, E_A), \quad g_1 > 0, g_2 \geq 0$$

Output in each sector is assumed to be non-negative in both capital and labor.

The wage in the modern sector is set above the market-clearing level. This wage is denoted by  $W_M$  and is treated as a parameter. Hiring in the modern sector is undertaken such that the marginal product of labor equals the wage:

$$W_M = \partial Q_M / \partial E_M = f_2 = j(K_M, E_M)$$

It is assumed that the marginal product of labor in the modern sector is a positive function of the capital employed in that sector and a negative function of the labor employed. That is, capital augments the productivity of labor, but the productivity of labor is subject to diminishing returns. Hence,  $j_1 > 0$  and  $j_2 < 0$ .

The wage in the agricultural sector ( $W_A$ ) is a market-clearing wage. Its level is assumed to be a positive function of the amount of capital ( $K_A$ ) in the agricultural sector and a non-positive function of the amount of labor employed in that sector ( $E_A$ ):

$$W_A = h(K_A, E_A), \quad h_1 > 0, h_2 \leq 0$$

The function  $h(\cdot)$  may, alternatively, be either the marginal productivity function in the standard neoclassical case or an average product rule in the case of surplus labor hours. But whichever it is, because  $W_A$  is assumed to clear the market, all labor in agriculture is employed, and hence

$$L_A = E_A$$

The total labor force in the economy is  $L$ . It is divided between labor in the modern sector ( $L_M$ ) and labor in agriculture ( $L_A$ ). Of those in the modern sector,  $E_M$  are employed. Should open unemployment arise, the number so situated is denoted by  $U_M$ . Thus

$$L = L_M + L_A$$

and

$$L_M = E_M + U_M$$

The system given by Eqs. (1)—(7) constitutes the basic model with which we shall work. Observe that the model is not yet complete. To achieve closure, we must specify the rules determining the allocation of the labor force between employment in the modern sector, employment in the agricultural sector, and unemployment. Two alternate closure rules—corresponding respectively to the Lewis-Fei-Ranis model of a dualistic economy and a Harris-Todaro type of model—are presented below.

### III. The model with Lewis-Fei-Ranis closure

#### *Statement of the Model (Model 1)*

In the Lewis-Fei-Ranis model of dualistic development, all labor not employed in the modern sector is employed in the agricultural sector. Another feature of their model is the assumption of surplus agricultural labor, an assumption not needed here.<sup>2</sup> Under the assumption that everyone is employed on one sector or the other, the model is completed by specifying that

$$U_M = 0$$

and hence

$$L_M = E_M$$

The model given by Eqs. (1)—(9) shall be referred to as Model 1 in what follows.

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<sup>2</sup> The zero marginal product of labor assumption restricts the agricultural production function (2) such that  $g_2 = 0$ . The model presented in this section is more general in that  $g_2$  may or may not equal zero.

The response of Model 1 to some exogenous change is represented by taking the total differential of the system. After some substitution, this yields:

$$dQ_M = f_1 dK_M + f_2 dL_M \quad (10.a)$$

$$dQ_A = g_1 dK_A + g_2 dL_A \quad (10.b)$$

$$dL_M = -dL_A \quad (10.c)$$

$$df_2 = 0 = j_1 dK_M + j_2 dL_M \quad (10.d)$$

$$dW_A = h_1 dK + h_2 dL_A \quad (10.e)$$

To find the effects of alternative allocations of a development fund for purposes of modern sector enlargement or for traditional sector enrichment, reformulate (10.a)-(10.e) as partial derivatives with respect to the particular allocation under consideration. To find the effects of modern sector enlargement, the differentiation is with respect to  $K_M$ , while for traditional sector enrichment, it is with respect to  $K_A$ .

*The effect of modern sector enlargement on GNP*

Consider modern sector enlargement first. We obtain:

$$\partial Q_M / \partial K_M = f_1 + f_2 \partial L_M / \partial K_M \quad (11.a)$$

$$\partial Q_A / \partial K_M = g_2 \partial L_A / \partial K_M \quad (11.b)$$

$$\partial L_M / \partial K_M = -\partial L_A / \partial K_M \quad (11.c)$$

$$j_1 + j_2 \partial L_M / \partial K_M = 0 \quad (11.d)$$

$$\partial W_A / \partial K_M = h_2 \partial L_A / \partial K_M \quad (11.e)$$

One result emerging from Eqs. (11.a-e) is that

$$\partial L_M / \partial K_M = -\partial L_A / \partial K_M = -j_1 / j_2 \quad (12.a)$$

where

$$j_1 = \partial Q_M^2 / \partial L_M \partial K_M > 0 \quad (12.b)$$

and

$$j_2 = \partial Q_M^2 / \partial L_M^2 < 0 . \quad (12.c)$$

Thus:

$$j_1 / j_2 < 0 , \quad (13)$$

a fact we will use repeatedly. One use is immediate. It follows from (13) that  $\partial L_M / \partial K_M > 0$ , i.e., labor moves into the modern sector when more modern sector jobs are created. In the Lewis-Fei-Ranis model, one worker moves in for each new job; a different result arises in the Harris-Todaro model below.

Let us now derive the GNP effects. The effect of modern sector enlargement on output in the modern sector,  $Q_M$ , is

$$\partial Q_M / \partial K_M = f_1 - f_2 j_1 / j_2 > 0 . \quad (14.a)$$

Because labor moves out of the agricultural sector, modern sector enlargement reduces agricultural output,  $Q_A$ :

$$\partial Q_A / \partial K_M = g_2 j_1 / j_2 < 0 . \quad (14.b)$$

The total effect of modern sector enlargement on GNP in this model is the sum of (14.a) and (14.b):

$$\partial \text{GNP} / \partial K_M = f_1 + (g_2 - f_2) j_1 / j_2 > 0. \quad (14.c)$$

It must be shown that (14.c) is indeed positive as claimed. Note that the first term,  $f_1$ , is positive. In the second term,  $g_2$  and  $f_2$  are respectively the marginal product of labor in agriculture and the marginal product of labor in the modern sector. We know from the marginal product hiring rule that  $g_2 < f_2$ , hence  $(g_2 - f_2) < 0$ . So too is  $j_1/j_2$ . Thus, the second term in (14.c) is positive. The right hand side is the sum of two positive terms. Therefore, when the development fund is allocated to the modern sector, output indeed increases as a result, as claimed.

*The effect of traditional sector enrichment on GNP*

Consider now the effects of traditional sector enrichment on GNP. To find these effects, take the system given by Eq. (10.a~e) and partially differentiate with respect to the size of the agricultural capital stock  $K_A$ . This yields:

$$\partial Q_M / \partial K_A = f_2 \partial L_M / \partial K_A \quad (15.a)$$

$$\partial Q_A / \partial K_A = g_1 + g_2 \partial L_A / \partial K_A \quad (15.b)$$

$$\partial L_M / \partial K_A = - \partial L_A / \partial K_A \quad (15.c)$$

$$0 = j_2 \partial L_M / \partial K_A \quad (15.d)$$

$$\partial W_A / \partial K_A = h_1 + h_2 \partial L_A / \partial K_A \quad (15.e)$$

From these equations, we derive the following output effects of traditional sector enrichment:

$$\partial Q_M / \partial K_A = 0 \quad (16.a)$$

$$\partial Q_A / \partial K_A = g_1 > 0 \quad (16.b)$$

$$\partial \text{GNP} / \partial K_A = g_1 > 0 \quad (16.c)$$

Thus, allocating the development fund to the traditional sector is found to increase GNP.

*Comparing the GNP effects*

Bringing together the preceding results, we find that GNP increases when the development fund is allocated either for modern sector enlargement or for traditional sector enrichment in this model:

$$\partial \text{GNP} / \partial K_M = f_1 + (g_2 - f_2)j_1/j_2 > 0 \quad (14.c)$$

$$\partial \text{GNP} / \partial K_A = g_1 > 0 . \quad (16.c)$$

Which allocation raises GNP by more: the allocation of the development fund to the modern sector or to the traditional sector? No obvious answer appears by comparing (14.c) and (16.c). This is for very good reason:

*Unless the model is further specified, it cannot be determined -which policy—modern sector enlargement or traditional sector enrichment—raises GNP by more*

Why is there this ambiguity? The answer is that in order to be able to determine the consequences for GNP of alternative policies, one must know the relative productivity of development resources in the two sectors. Because this has not yet been specified, we cannot determine which policy would raise GNP by more.

The indeterminacy can be resolved in a special case. *If* the initial allocation of capital were such that capital's marginal product in the two sectors were equal, then  $f_1 = g_1$ . In that event, the GNP for the modern sector allocation differs from that for the traditional sector allocation by  $(g_2 - f_2)(j_1/j_2)$  which derives from the reallocation of labor induced by the additional capital. Both terms in parentheses are negative, so this expression is positive. We may therefore conclude:

*In the special case where the marginal products of capital are equal in the two sectors, modern sector enlargement will increase GNP by more than does traditional sector enrichment.*

The result that modern sector enlargement raises GNP by more than does traditional sector enrichment does not require equality between the marginal products of capital in the two sectors. It holds also whenever the marginal product of capital is greater in the modern sector than in the traditional sector. But if, as is implicitly assumed by agricultural development enthusiasts, the marginal product of capital is higher in agriculture than in the modern sector,  $g_1 > f_1$ , so it is not clear how the GNPs compare under the two alternative policies. A policy of traditional sector enrichment might raise GNP by more than would a policy of modern sector enlargement; this would take place provided the marginal product of\* capital in agriculture is enough higher than that in the modern sector. Without further specifying the conditions under which resources are being allocated, one cannot determine a priori which development policy results in the better resource allocation.

#### **IV. The model with Harris-Todaro closure**

##### *Statement of the model*

The Harris-Todaro model is like the Lewis-Fei-Ranis model in a number of respects. In fact, Eqs. (1)—(7) of the LFR model carry over directly into the HT model.

The defining feature of the Harris-Todaro model is that unemployment arises due to the need for workers to migrate out of agriculture if they are to pursue high wage jobs in the modern

sector. Labor moves purposefully between sectors in order to equalize the expected wages associated with each. Expected wage equalization means that the modern sector wage, when weighted by the probability of employment (which equals modern sector employment divided by modern sector labor force), is equal to the wage in agriculture:

$$W_M(E_M/L_M) = W_A$$

Unemployment is the difference between labor force in the modern sector ( $L_M$ ) and employment in the modern sector ( $E_M$ ). The dualistic model with HT closure consists of Eqs. (1)—(7) and (8') (but deleting (8) and (9)).

The response of a dualistic economy of the HT type to some exogenous change is obtained by taking the total differential of the system given by (1)—(7), and (8'):

$$dQ_M = f_1 dK_M + f_2 dE_M \quad (17.a)$$

$$dQ_A = g_1 dK_A + g_2 dE_A \quad (17.b)$$

$$dE_A = dL_A \quad (17.c)$$

$$dL_M + dL_A = 0 \quad (17.d)$$

$$dW_M = 0 = df_2 = j_1 dK_M + j_2 dE_M \quad (17.e)$$

$$dW_A = h_1 dK_A + h_2 dE_A \quad (17.f)$$

$$W_M[L_M dE_M - E_M dL_M]/L_M^2 = dW_A \quad (17.g)$$

*The effect of modern sector enlargement on GNP*

As in the LFR model, the effects of modern sector enlargement are given by the partial derivative of the system with respect to  $K_M$ . This yields:

$$\partial Q_M / \partial K_M = f_1 + f_2 \partial E_M / \partial K_M \quad (18.a)$$

$$\partial Q_A / \partial K_M = g_2 \partial E_A / \partial K_M \quad (18.b)$$

$$\partial E_A / \partial K_M = \partial L_A / \partial K_M = -\partial L_M / \partial K_M \quad (18.c)$$

$$j_1 + j_2 \partial E_M / \partial K_M = 0 \quad (18.d)$$

$$\partial W_A / \partial K_M = h_2 \partial E_A / \partial K_M = W_M \{ [L_M \partial E_M / \partial K_M - E_M \partial L_M / \partial K_M] / L_M^2 \} \quad (18.e)$$

One result that emerges from this system is that the change in the agricultural sector labor force is

$$\partial E_A / \partial K_M = W_M [-j_1 / j_2] / [h_2 L_M - W_A] . \quad (19)$$

Because  $(j_1 / j_2)$  is negative, the numerator of (19) is positive. And because  $h_2 \leq 0$ ,  $L_M > 0$ , and  $W_A > 0$ , the denominator of (19),  $h_2 L_M - W_A$ , is negative. This fact will also be used below. Because the numerator of (19) is positive and the denominator negative, the fraction is thus negative, meaning that labor is drawn out of the agricultural sector when capital is injected into the modern sector.

The GNP effects are as follows. In the agricultural sector, we find that

$$\partial Q_A / \partial K_M = g_2 W_M (-j_1 / j_2) / [h_2 L_M - W_A] . \quad (20.a)$$

Provided that  $g_2 > 0$ , this expression is negative by the same reasoning as in the preceding paragraph. Agricultural GNP falls because labor is drawn out of the agricultural sector. As the following equation shows, modern sector GNP rises, both because more capital is available for production there and because additional labor is drawn into that sector to complement the new capital:

$$\partial Q_M / \partial K_M = f_1 + f_2 (-j_1 / j_2) , \quad (20.b)$$

which is positive since  $f_1$  and  $f_2$  are positive and  $(j_1 / j_2)$  is negative. Summing the two sectors' changes in GNP together, and using the fact that  $W_M = f_2$ , we obtain:

$$\begin{aligned} \partial \text{GNP} / \partial K_M &= \partial Q_M / \partial K_M + \partial Q_A / \partial K_M \\ &= f_1 + W_M \{ [h_2 L_M - W_A + g_2] / [h_2 L_M - W_A] \} [-j_1 / j_2] . \end{aligned} \quad (20.c)$$

Note that  $W_A$  is the wage of labor in agriculture and  $g_2$  is the value of marginal product of labor in agriculture. Given the structure of the model,  $g_2$  certainly cannot exceed  $W_A$  and it may well be less.

Therefore,  $g_2 \leq W_A$  which, combined with the fact that  $h_2 L_M < 0$ , implies  $h_2 L_M - W_A + g_2 < 0$ . Recall our earlier results that  $h_2 L_M - W_A < 0$  and  $j_1/j_2 < 0$ . The term in curly braces is the ratio of two negatives, hence is positive. All other terms are positive. It then follows from (20.c) that  $\partial GNP/\partial K_M > 0$ , i.e., modern sector enlargement raises GNP.

### *The effect of traditional sector enrichment on GNP*

The derivation of the effects of traditional sector enrichment on GNP follows a by-now familiar procedure. Express the system given by (17.a)—(17.g) as partial differentials with respect to  $K_A$  to obtain

$$\partial Q_M/\partial K_A = f_2 \partial E_M/\partial K_A \quad (21.a)$$

$$\partial Q_A/\partial K_A = g_1 + g_2 \partial E_A/\partial K_A \quad (21.b)$$

$$\partial E_A/\partial K_A = \partial L_A/\partial K_A = -\partial L_M/\partial K_A \quad (21.c)$$

$$0 = j_2 \partial E_M/\partial K_A \quad (21.d)$$

$$\begin{aligned} \partial W_A/\partial K_A &= h_1 + h_2 \partial E_A/\partial K_A \\ &= W_M [L_M \partial E_M/\partial K_A - E_M \partial L_M/\partial K_A] / L_M^2 . \end{aligned} \quad (21.e)$$

From this, obtain

$$\partial Q_M/\partial K_A = 0 \quad (22.a)$$

$$\partial Q_A/\partial K_A = g_1 - g_2 h_1 L_M / [h_2 L_M - W_A] = \partial GNP/\partial K_A . \quad (22.b)$$

In (22.b),  $g_1 > 0$ ,  $g_2 h_1 L_M > 0$ , and  $(h_2 L_M - W_A) < 0$ . Thus, traditional sector enrichment raises GNP in the HT model as it did in the LFR model.

*Comparing the GNP effects of modern sector enlargement and traditional sector enrichment in the Harris-Todaro model*

We have seen that GNP is increased by either modern sector enlargement or by traditional sector enrichment in the model with Harris-Todaro closure. The sizes of the two gains are given by

$$\begin{aligned} \partial \text{GNP} / \partial K_M &= \partial Q_M / \partial K_M + \partial Q_A / \partial K_M \\ &= f_1 + W_M \{ [h_2 L_M - W_A + g_2] / [h_2 L_M - W_A] \} [-j_1 / j_2] \end{aligned} \quad (20.c)$$

and

$$\partial Q_A / \partial K_A = g_1 - g_2 h_1 L_M / [h_2 L_M - W_A] = \partial \text{GNP} / \partial K_A . \quad (22.b)$$

It cannot be determined in general which policy raises GNP more until specific values are assigned to the various effects. It is most interesting to do this for special cases of the Harris-Todaro type of model.

*GNP effects of alternative policies in two special cases*

More specific results can be derived in two special cases. One special case is that of a constant wage in the agricultural sector regardless of the number of workers in that sector, i.e.,  $h_2 = 0$ ; this shall be referred to as *Model 2.a* or the *constant-marginal-product-of-labor-in-*

*agriculture model*.<sup>3</sup> In this model, agricultural labor is paid its marginal product, so  $W_A = g_2$ .

The other special case is when the total product in agriculture is invariant with respect to the size of the agricultural labor force, and the available income is shared equally among agricultural workers, i.e.,  $g_2 = 0$ ; this shall be referred to as *Model 2.b* or the *zero-marginal-product-of-labor-in-agriculture model*.

The GNP effects of modern sector enlargement and traditional sector enrichment policies in the two special cases are summarized in Table 1. They are as follows:

*Model 2.a: Constant-marginal-product-of-labor-in-agriculture* ( $h_2 = 0$ ). The effects of modern sector enlargement are given by Eq. (20.a-c). In Model 2.a, which has  $h_2 = 0$ , these simplify to

$$\partial Q_A / \partial K_M = W_M j_1 / j_2 < 0 , \tag{20.a'}$$

$$\partial Q_M / \partial K_M = f_1 + f_2 (-j_1 / j_2) > 0 , \tag{22.b'}$$

and

$$\partial \text{GNP} / \partial K_M = f_1 . \tag{20.c'}$$

Equation (20.c') means that although GNP increases due to modern sector enlargement, it does so only by the amount of the marginal product of capital. All of the gain accrues to capital; the total wage bill paid to labor is unchanged, because so much labor shifts out of agriculture that the wages lost on account of that shift exactly offset the wage gain due to increased modern sector employment.

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Insert Table 1

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<sup>3</sup> Model 1 was the Lewis-Fei-Ranis model with zero unemployment.

What is the effect of traditional sector enrichment on GNP in this special case? Take (22.b), substitute  $h_2 = 0$  and  $W_A = g_2$ , to obtain

$$\partial Q_A / \partial K_A = g_1 + h_1 L_M = \partial \text{GNP} / \partial K_A . \quad (22.b')$$

The two terms,  $g_1$  and  $h_1 L_M$ , are respectively the GNP gains accruing to capital and to labor.

Which has the larger GNP effect in Model 2.a, expanding the modern sector or enriching the traditional sector? In general, even in this restrictive case, the comparison is indeterminate. However, if a further restriction is imposed—namely, that the returns to capital are initially equalized across sectors—then a comparison is possible. Under this assumption,  $f_1 = g_1$ , so traditional sector enrichment adds  $h_1 L_M$  more to GNP than does modern sector enlargement. We may also consider the possible circumstance raised by agricultural sector optimists: that the marginal product of capital is higher in the agricultural sector than in the modern sector. In that circumstance, traditional sector enrichment is to be preferred to modern sector enlargement even more.

*Model 2.b: Zero-marginal-product-of-labor-in-agriculture* ( $g_2 = 0$ ). Model 2.b has  $g_2 = 0$ . In that case, the equations for modern sector enlargement, (20.a-c), simplify to

$$\partial Q_A / \partial K_M = 0 , \quad (20.a'')$$

$$\partial Q_M / \partial K_M = f_1 + f_2(-j_1/j_2) > 0 , \quad (20.b'')$$

and

$$\partial \text{GNP} / \partial K_M = f_1 + f_2(-j_1/j_2) > 0 . \quad (20.c'')$$

What this means is the GNP increases as a result of modern sector enlargement both because modern sector output increases and because agricultural output holds steady even when labor is withdrawn from agriculture to work in the modern sector.

The effect of traditional sector enrichment on GNP is found by substituting  $g_2 = 0$  into Eq. (22.b). This produces

$$\partial Q_A / \partial K_A = g_1 = \partial \text{GNP} / \partial K_A . \quad (22.b'')$$

GNP increases as a result of traditional sector enrichment, but only by the direct marginal product effect alone.

Once again, it is impossible to determine in general which allocation of the development fund would raise GNP by more. But for the special case of equal marginal product of capital in the two sectors, the comparison *is* determinate. In that case,  $f_1 = g_1$  and the modern sector enlargement allocation contributes more to GNP than does the traditional sector enrichment allocation.

*On the indeterminacy of policy based on GNP comparisons*

The Harris-Todaro model yielded an indeterminate GNP comparison. The two special cases, Models 2.a and 2.b, also were indeterminate. However, under the particular assumption of equal marginal products of capital, determinate results could be obtained. Under that assumption, the two models actually yielded *opposite* answers: higher GNP for traditional sector enrichment in Model 2.a, higher GNP for modern sector enlargement in Model 2.b. The inability to

determine in the general model which policy is better in terms of GNP is therefore not surprising—we could not get a general answer because no general answer can be gotten.

We have arrived at the following conclusion:

*In the Harris-Todaro model, the GNP-maximizing policy choice depends on the particular circumstances in an economy, GNP might be increased more by modern sector enlargement or by traditional sector enrichment. It is an error to advocate either policy unconditionally.*

It bears mention that if policy is based on considerations other than GNP, further ambiguities arise.

## **V. Conclusion**

This paper has evaluated the effects of modern sector enlargement and traditional sector enrichment policies in dualistic development models with Lewis-Fei-Ranis and Harris-Todaro types of closure rules. The effects of these alternative policies on GNP are in general indeterminate. The magnitudes of specific parameters must be known before it is possible to predict whether GNP would be increased more by one policy or the other.

These findings have the important, if unsatisfying, implication that the choice between modern sector enlargement or traditional sector enrichment kinds of policies cannot be made in any easy way once due account is taken of induced migration. No one policy is automatically better than the other. Ultimately, the policy choice depends on four critical variables - how much modern sector enlargement can result from a given allocation of funds, what the consequences of modern sector enlargement will be if the funds are used for that purpose, how much traditional sector enrichment can result from a given allocation of funds, and what the consequences of

traditional sector enrichment would be if the funds are used for that purpose - as well as one's social welfare judgement regarding the different outcomes. The tasks for policymakers and those who advise them are to make policy choices based on the most precise theoretical, empirical, and social welfare foundations possible.

Table 1

**Table 1.** GNP effects of modern sector enlargement and traditional sector enrichment in alternate Harris-Todaro models

	Model 2.a		Model 2.b	
	Effect of modern sector enlargement	Effect of traditional sector enrichment	Effect of modern sector enlargement	Effect of traditional sector enrichment
(1) Effect on modern sector output ( $\partial Q_M/\partial K$ )	$f_1 + f_2(-j_1/j_2)$	0	$f_1 + f_2(-j_1/j_2)$	0
(2) Effect on agricultural sector output ( $\partial Q_A/\partial K$ )	$W_M j_1/j_2$	$g_1 + h_1 L_M$	0	$g_1$
(3) Effect on total GNP = (1) + (2) ( $\partial \text{GNP}/\partial K$ )	$f_1$	$g_1 + h_1 L_M$	$f_1 + f_2(-j_1/j_2)$	$g_1$

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