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Looking for Boy-Girl Discrimination in Household Expenditure Data

Angus Deaton

The ability to test for discrimination in the allocation of goods between boys and girls is hampered by a lack of data on intrahousehold distribution. The analysis presented here allows inferences about intrahousehold allocation to be made from household-level expenditure data. For a given level of income, families with children will spend less on adult goods in order to purchase children's goods. If household purchasing favors boys over girls, smaller expenditures on adult goods would be made by families with boys as compared with those with girls. A method for determining "adult" goods is described, and the procedure for detecting gender bias is applied to data from Côte d'Ivoire and Thailand. The data show no evidence of discrimination between boys and girls in Côte d'Ivoire, and a small and statistically insignificant bias in favor of boys in Thailand.

How commodities are allocated among the members of a household has recently occasioned a good deal of interest. Assessments of poverty and income distribution based on *household* incomes or expenditures will be misleading if allocation within the household is unequal. The position of women and girls has been of particular concern, and there is a considerable amount of empirical evidence, much of it from the Indian subcontinent, that documents discrimination against females (see in particular Bhagwati 1973; Sen 1984; Sen and Sengupta 1983; Miller 1981; Bardhan 1982; and Kynch and Sen 1983; as well as survey papers by Behrman 1987 and Harriss 1987). Much of the evidence is concerned with measurements of nutritional outcomes, mortality, and health status rather than with the direct allocation of goods by gender.

The difficulty in trying to determine the intrahousehold allocation of goods is that household budget surveys, the obvious source of data, record consumption not of individuals but of households. And while attempts can be made to

The author is a professor of public affairs and of economics and international affairs at Princeton University and is a consultant to the Population and Human Resources Department of the World Bank. The author thanks Dwayne Benjamin who provided for excellent research assistance. He is grateful to him and to members of the Economic Growth Center at Yale University for helpful comments. This is a revised and shortened version of Living Standards Measurement Study Working Paper 39, "The Allocation of Goods within the Household: Adults, Children, and Gender," June 1987. The results from Thailand were not included in the working paper.

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observe who gets what, this presents both practical and conceptual difficulties. The direct observation of allocations, for example at meals, is intrusive and likely to affect the behavior of the people being observed. There are also important goods and services that are consumed jointly, such as housing, sanitation, and water supply, and it is difficult or impossible to decide whether all household members enjoy equal access to these "public" goods.

Nevertheless, household expenditure data can be used to make at least some inferences about the allocations to different types of individuals. In this article, I propose one possible procedure that appears to yield sensible results in practice. I focus on allocations to children and on whether there is discrimination in favor of boys. The starting point, somewhat paradoxically, is expenditures on goods that are *not* consumed by children, such as alcohol, tobacco, and adult clothing, items that appear in most household surveys. Imagine three households, the first consisting of a married couple with no children, the second of a married couple with a female child, and the third of a married couple with a male child. The two children are the same age, and the households are otherwise identical, with the same income, occupation, place of residence, and so on. If we compare expenditures on nonchild goods by the three households, we should expect the first to spend more on adult goods than the other two. The children require food, clothing, and other items, and the money to supply them has to come from the same total for all three households. The reduction in expenditure on adult goods reflects the additional needs of the children, and the fact that there has been a reduction in the amount of income available for nonchild expenditures. The question that is important for determining gender bias is whether the reduction in adult-goods expenditure is larger for the household with the female child or larger for the household with the male child. If the latter is true on a systematic basis, it would seem that households are diverting more resources to male children than to female children.

In practice, even the largest household surveys are not large enough to allow us to find groups of households that are identical in all respects but the gender of their children. In consequence, factors other than gender have to be controlled for statistically, in this case by using regression analysis. In this article I use household survey data from the Côte d'Ivoire and Thailand to relate expenditure on various adult goods to household characteristics and then test whether there is gender bias in favor of male children. As might be expected, the results for both countries show that the presence of additional children does indeed reduce household expenditure on adult goods. In the Côte d'Ivoire, the reduction is estimated to be the same for boys and girls. For rural Thailand, there is some evidence of a preference in favor of boys, but the effect is neither very large nor very strongly significant in a statistical sense.

The following section explains the procedure in more detail, and the subsequent two sections present results for the Côte d'Ivoire and Thailand. The only major addition to the procedure outlined above is the need to check that the selection of adult goods is a reasonable one. This requires that a number of

statistical tests be carried out before calculating the boy-girl comparisons. The final section considers an alternative statistical procedure for determining a set of adult goods.

I. METHODOLOGY

I start from a general expression that relates household expenditure on good i to the household's budget and other relevant characteristics:

$$(1) \quad (p_i q_i) = f_i(x, n, z, u),$$

where $p_i q_i$ is expenditure on good i , x is household total expenditure, or "outlay," n is a vector that characterizes the demographic composition of the household, z is a vector of other household characteristics, and u is a term that represents unobservable taste variation. I shall be working with survey data collected within a single year, so I make the standard assumptions and ignore price variation across households. For the purposes of this study, the vector n will be taken to be a list of the number of people in each of several categories defined by gender and age, so that n_r denotes the number of people in the household in the r th category.

Holding everything else constant, the effect of an additional person of type r is given by the partial derivative $\partial(p_i q_i) / \partial n_r$. Since I will be concerned mostly with the case in which r refers to a child and i refers to an adult good, and in which the effect on purchases is essentially an income effect, it is convenient to relate the effect of an additional person to the effect of an increase in the budget. Income effects are given by the marginal propensities to spend, $\partial(p_i q_i) / \partial x$, and the ratio of $\partial(p_i q_i) / \partial n_r$ to $\partial(p_i q_i) / \partial x$ tells us by how much the total budget would have to be increased to generate the same additional expenditure on good i as would the addition to the household of one more person of type r . If i is an adult good and r is a child, the ratio would be negative; additional children act like decreases in income for adult goods. As is often the case, it is simpler to work not with sums of money but with dimensionless ratios, and to this end I define the "outlay equivalent ratios," π_{ir} , by

$$(2) \quad \pi_{ir} = \frac{\partial(p_i q_i) / \partial n_r}{\partial(p_i q_i) / \partial x} \cdot \frac{n}{x}.$$

These π -ratios are simply the outlay changes that are equivalent to the additional person expressed as a ratio of total household expenditure per person. For example, if good i is tobacco and n_r is the number of female children in the household, a value of π_{ir} of -0.3 means that the addition of a girl to the household has the same effect on tobacco expenditures as a 30 percent reduction in total household expenditures per person.

The π -ratios can be used to give simple answers to questions about adult goods and gender bias. Consider first the question of whether a particular group of goods can be legitimately treated as adult goods. When an additional

child enters the household, it brings additional needs, so that expenditure on all adult goods can be expected to fall. This effect acts exactly like a reduction in income, so that the reductions in expenditures on individual adult goods ought to be in proportion to the marginal propensities to spend on each. If 10 percent of additional income is spent on adult clothes and 5 percent on alcohol, then an additional child should reduce expenditures on adult clothes and alcohol in the ratio of 2 to 1. Put another way, the reduction in expenditure on adult clothes divided by the marginal propensity to consume adult clothes should be the same as the reduction in expenditure on alcohol divided by the marginal propensity to consume alcohol. But this simply means that the two goods have identical π -ratios. In general, all adult goods should have the same π -ratios for an additional child of any gender or age.

The procedure followed here is to take a list of possible adult goods, calculate the π -ratios for each child and adult age and gender group, and test whether the ratios for the children are the same for all the goods. When a suitable group of goods has been found, the π -ratios for boys are compared with those for girls; if the boy ratios are more negative than the girl ratios, there is a supposition that boys get more than girls.

In order to calculate the π -ratios, estimates are required of marginal propensities to consume and of the effects of household demographic structure on expenditures. The simplest way to obtain these is to specify an empirical Engel curve that can be estimated on household survey data. Here, I use the following specification:

$$(3) \quad w_i = p_i q_i / x = \alpha_i + \beta_i \ln(x/n) + \eta_i \ln n + \sum_{j=1}^{J-1} \gamma_{ij} (n_j/n) + \delta_i \cdot z + u_i \quad .$$

This type of Engel curve is an extension of that first advanced by Working (1943) and proposes a linear relation between the share of expenditure of each good and the logarithm of total outlay. The demographic structure of the household is incorporated through the ratios (n_j/n) , where n is the total number of household members. Note that if there are J categories of people, the demographic structure of households can be summarized by only $J-1$ ratios. Total household size appears both as the deflator of total outlay x and in its own right in the term $\ln n$. Previous work with this sort of Engel curve has shown that household expenditure patterns can often be well explained by the logarithm of household per capita expenditure. The additional term in the logarithm of household size allows for the possibility that the pattern of expenditures is not invariant to changes in the size of the household, even when household structure and household per capita outlay are held constant. The vector z contains a number of dummy variables that allow for possible effects of other household characteristics, such as location, region, nationality, or education.

Equation 3 can be used to calculate expressions for the effects of additional outlay and additional people on the expenditure on each good. If the results

are substituted into equation 2, we obtain the following expression for the outlay equivalence or π -ratios:

$$(4) \quad \pi_{ir} = \frac{(\eta_i - \beta_i) + \gamma_{ir} - \sum_{j=1}^{J-1} \gamma_{ij}(n_j/n)}{\beta_i + w_i} .$$

Equation 4 holds only for $r = 1, \dots, J-1$, that is, for the first $J-1$ demographic categories, while for the J th, the formula for π_{ij} is the same but without the γ_{ir} term. Estimates of the ratios are obtained by replacing the parameters with their estimates and replacing w_i and the (n_j/n) ratios with their values at the sample mean of the data. Having calculated the π -ratios, I test the hypothesis that they are equal,

$$(5) \quad H_0: \pi_{ir} = \pi_{jr} ,$$

for all i and j that refer to adult goods and for all r that refer to children.

The econometric procedures used here are conceptually quite straightforward. Given a household survey, and a provisional list of adult goods, equations like equation 3 are estimated for each good. The technique is ordinary least squares, and all households are included, whether or not they purchase the good. In general, changes in household composition will influence not only the amount that people purchase but whether they purchase at all. By including nonpurchasing households, both types of effects are captured. If we are interested in whether girls get less than boys, it is of secondary importance whether girls get none and boys get some or whether both get some but girls get less. According to equation 4, the coefficients are functions of the parameters estimated from the ordinary least squares regressions, so that their standard errors can be calculated, at least approximately, from the estimated variances and covariances of the regression estimates. The formulas for doing this are not given here but can be found in Deaton (1987) or in Deaton, Ruiz Castillo, and Thomas (forthcoming).

The procedure for testing the hypothesis in equation 5 is again a very simple one: I calculate the difference of the estimated π -coefficients from their mean and test whether the resulting deviations are jointly significantly different from zero. Again, the basic requirements for calculating the test are the variances and covariances of the estimated π -ratios; these are used to form a test statistic which, under the null hypothesis, has a large sample X^2 -distribution with degrees of freedom equal to one less than the number of adult goods. The formulas are given in the references cited above.

II. RESULTS FROM CÔTE D'IVOIRE

The first set of data is taken from the 1985 Living Standards Survey of Côte d'Ivoire. A description of the survey and the sampling methodology is given in Ainsworth and Muñoz 1986. Although this survey is an unusually rich one,

the calculations in this article could be replicated with any household budget survey containing data on consumers' expenditures. The 1,563 households in the sample are a simple random sample of the population of households in the country. Seven commodities in the Ivorian survey are plausible candidates for adult goods: adult clothing, adult shoes, fabric for adult clothing, alcohol, tobacco, meals taken away from home, and entertainment. The fabric is the material used to make the *pagnes* that are worn by many adult Ivorians. Meals taken away from home and entertainment may also be consumed by children, at least on occasion, but if so, the empirical tests should detect the fact.

Engel curves like those specified in equation 3 were estimated for expenditures on each of the seven categories as well as for expenditures on the group as a whole. Eight demographic types were distinguished: the number of males and females in each of the four age groups, 0–4 years, 5–14 years, 15–55 years, and over 55. Dummy variables for location were also included, with the country divided into Abidjan, other urban, East Forest and West Forest, and the Savannah. A dummy variable was also added for farm or nonfarm households. The results show that the shares of clothing, shoes, and tobacco fall as total expenditure increases, while those of fabric, alcohol, entertainment, and meals away from home all increase. All of the goods are estimated to be “normal” goods, that is, expenditure on each increases with the total budget.

Somewhat surprisingly, the urban dummy variables have negative effects, so that there is less expenditure on adult goods in Abidjan and the other towns than in the countryside, even when the total budget and other factors are controlled for. Changes in total household size, with expenditure per person held constant, act so as to decrease total expenditure on these adult goods. The good that makes the largest contribution to this effect is tobacco, although it is hard to see why smoking should be subject to these sorts of economies of scale!

The main interest here is in the effects of the demographics, and these can be conveniently assessed by looking at the estimated π -coefficients displayed in table 1. Note first the estimated standard errors at the foot of the table. These are often quite large relative to the π -ratios themselves, and their size must be borne in mind when interpreting patterns in the ratios.

The first four rows of table 1 give the π -ratios for children; if the adult goods are correctly defined, that is, if children do not consume them directly, these coefficients ought to be negative. All but three of the 32 estimates are so, the exceptions being adult fabric for small children of both sexes and eating out for small boys. It may be supposed that “adult” fabric is sometimes bought for children, while the eating-out effect, if indeed it is real, may reflect more complex substitution patterns in behavior. (The same sort of issue arises in the Thai results considered in the next section.) For all of the other pairings of children and adult goods, expenditure falls when an additional child is added to the household, and the π -coefficients lie between 0 and -1.0 . The test statistics for the equality of the π -ratios are given in the left side of table 2; all are well within the conventional range of significance. There is therefore no

Table 1. *Outlay Equivalence Ratios for Adult Goods, Côte d'Ivoire, 1985*

Gender and age ^a	Adult clothing	Adult fabric	Adult shoes	Alcohol	Tobacco	Meals out	Entertainment	All adult goods
π -ratios								
<i>Children</i>								
M 0-4	-0.01	0.37	-0.23	-0.58	-0.89	0.27	-0.42	-0.12
M 5-14	-0.67	-0.35	-0.21	-0.69	-0.71	-0.37	-0.41	-0.49
F 0-4	-0.20	0.41	-0.24	-0.33	-0.45	-0.21	-0.30	-0.22
F 5-14	-0.39	-0.12	-0.45	-0.39	-0.45	-0.62	-0.37	-0.48
<i>Adults</i>								
M 15-55	1.30	0.79	1.63	-0.19	1.88	0.91	0.74	0.81
M > 55	-0.74	0.33	-0.28	1.45	1.06	-0.47	-0.98	0.16
F 15-55	0.32	-0.14	0.17	-0.39	-0.41	-1.33	-1.07	-0.71
F > 55	-1.14	-0.97	-0.69	-1.24	-1.29	-1.33	-0.99	-1.21
Standard errors								
M 0-4	0.46	0.35	0.33	0.38	0.74	0.32	0.40	0.20
M 5-14	0.32	0.25	0.23	0.27	0.52	0.22	0.28	0.14
F 0-4	0.43	0.33	0.30	0.36	0.69	0.30	0.37	0.19
F 5-14	0.33	0.25	0.23	0.27	0.53	0.23	0.29	0.14
M 15-55	0.31	0.22	0.23	0.22	0.54	0.20	0.25	0.13
M > 55	0.45	0.35	0.32	0.39	0.75	0.31	0.39	0.20
F 15-55	0.27	0.20	0.19	0.22	0.43	0.19	0.23	0.11
F > 55	0.53	0.40	0.37	0.44	0.85	0.37	0.46	0.23

a. M = male; F = female.

Source: Deaton (1987).

evidence in the top half of table 1 to suggest that the choice of adult goods is incorrect.

Nor do these results suggest any real difference in the overall treatment of boys and girls. The relevant figures for the test are the top four figures in the last column of table 1; these relate to total adult expenditures and show the reductions corresponding to boys and girls in the two age groups. If boys were favored over girls, we should expect the π -ratios for adult goods as a whole to be bigger negative numbers for boys than for girls; adults must (or are willing

Table 2. *Wald Tests for Equality of π -ratios across Adult Goods, Côte d'Ivoire*

Gender and age	Children			Adults	
	Test	p-value		Test	p-value
Males 0-4	7.12	0.31	Males 15-55	39.21	0.00
Males 5-14	3.87	0.69	Males > 55	27.98	0.00
Females 0-4	3.69	0.28	Females 15-55	45.98	0.00
Females 5-14	2.41	0.88	Females > 55	2.08	0.91

Note: Test statistics are asymptotically distributed as χ^2 with six degrees of freedom under the null hypothesis that the π -ratios are the same over all seven goods.

Source: Deaton (1987).

to) give up more of their own consumption to accommodate the favored male children. As it is, the two coefficients for the older male and female children are nearly identical, while those for the younger groups show, if anything, a bias toward girls, a result that confirms the earlier evidence in van der Gaag (1986). As we shall see below, none of these differences is statistically significant.

The third and fourth sets of rows of table 1 present the outlay equivalent ratios for adults. For these coefficients, the theory does not predict any specific sign pattern except that, if some adults have access to adult goods, *some* of the π -ratios should be positive. The table shows a mixture of outcomes. For adult males 15–55 years old, all but one of the ratios are positive, and all but the negative one—for alcohol—are significantly different from zero. It is clear that prime-age adult males have access to adult goods. In total, adding an additional such male to a household increases expenditures on adult goods as much as does an 81 percent increase in total outlay per member. None of the other groups of adults is similarly favored. Adult females show positive π -coefficients for only two adult goods, clothes and shoes, while for the other commodities, an additional female has the effect of reducing household expenditure. Old men appear to do rather better than adult females; they have large positive π -coefficients for alcohol and tobacco and have a small positive net effect on adult goods expenditures as a whole. Given these results, it is perhaps not surprising that old women do worst of all in terms of access to these goods; all the coefficients are negative and most are quite large.

Note that these differences do not *necessarily* reflect bias against females in the allocation of goods as a whole; it is conceivable that preferences vary by gender and age, so that old women in the Côte d'Ivoire, while receiving little in the way of these goods, may be well taken care of in other respects. Data on household expenditures as a whole are not well-suited to separating these two hypotheses. Indeed, that preferences are likely to be different for boys and girls is the reason we cannot look for discrimination by examining the consumption levels of goods consumed by boys and girls but instead follow the more indirect route of looking at the effects of additional children on expenditure on adult goods.

For completeness, the Wald statistics for the four adult groups are shown on the right side of table 2. All groups register rejections of equality except for old women. The strong rejection for adult women may at first sight seem surprising, but it reflects, not the presence of *positive* coefficients in table 1, but the marked inequality in the *negative* coefficients. Equality in the adult π -coefficients is a less interesting hypothesis than is equality for children, but the rejections confirm that these procedures are capable of detecting adult and child effects, thus strengthening the acceptances on the left side of table 2.

The significance of gender differences for both adults and children can be tested by comparing the π -coefficients by gender as well as by commodity. The easiest way to do this is to test the equality by gender of the original regression

Table 3. *F-tests for Equality of π -ratios by Gender, Côte d'Ivoire*

<i>Adult good</i>	<i>Children</i>	<i>Prime adults</i>	<i>Old adults</i>	<i>All groups</i>
Degrees of freedom	3	1	1	7
Adult clothing	0.19	7.43/(s)	0.31	2.55
Adult fabric	0.17	11.33/(s)	16.54/(s)	3.84/(s)
Adult shoes	0.23	32.57/(s)	0.64	11.18/(s)
Alcohol	0.36	0.44	21.14/(s)	0.38
Tobacco	0.87	15.55/(s)	4.18/(s)	5.28/(s)
Eating out	0.42	79.44/(s)	2.99	27.22/(s)
Entertainment	0.97	32.90/(s)	0.00	11.03/(s)
All	0.93	93.74/(s)	19.63/(s)	31.33/(s)

Note: (s) indicates that the null hypothesis of equality is rejected at the 5 percent level.

Source: Deaton (1987).

coefficients for the Engel curve (equation 3). The results are given in table 3. The first column shows that none of the coefficients is significantly different between boys and girls, thus confirming the assertion that there is no evidence of favoritism toward boys in the reaction of expenditure on any adult good to the presence of an additional child. By contrast, the coefficients on prime-age males in the Engel curves are all larger than those on prime-age females, and the differences are significant for all the goods except alcohol. For old people, the coefficient for old men is always positive, and therefore larger than the implicit zero coefficient for the omitted category of women over 55 years of age, and the difference is significant for fabric, alcohol, and tobacco. The last column in the table shows the test for equality of gender effects overall; these essentially reflect the results for adults. These formal test statistics therefore confirm the impressions that come from the examination of the π -ratios in table 1.

In summary, the response of expenditures on adult goods to additional children shows no evidence of a bias in favor of male children. Among the adults, however, there is far from equal access to the adult goods examined here; adult males get more than adult females, who register positive effects only for clothes and shoes. Old men get less than do young men but appear to consume alcohol and tobacco, while old women seem to get none of these goods.

III. RESULTS FROM THAILAND

The data for Thailand come from the 1980–81 Socioeconomic Survey. The sample is divided into municipal areas, sanitary districts, and villages, which correspond to urban, small town, and rural areas, respectively. In this study, I confine myself to the 5,835 village households covered in the survey, which are a random sample of all Thai village households.

It is more difficult for the Thai survey than for the Ivorian to find obvious candidates for adult goods. As before, the survey records expenditure on tobacco, alcoholic drinks, and food taken away from home, but there are no

other immediately obvious candidates. Expenditures on clothing and footwear are distinguished by the gender of the user, but not by age, so that for example we have "men's and boys' clothing," rather than adult clothing and children's clothing, which was the division in the Ivorian data. Nevertheless, I use the four categories men's and boys' clothing, women's and girls' clothing, men's and boys' footwear, and women's and girls' footwear, together with the other three categories, although it is clear in advance that all of these goods cannot be expected to pass the tests for a legitimate group of purely *adult* goods.

When estimating the Engel curves for Thailand, I distinguish ten age and gender categories: age groups of 0–2, 3–4, 5–14, 15–60, and over 60 years for each gender. The regressions also contain the age and educational level of the household head, together with a range of regional and seasonal dummy variables. The estimated π -ratios are shown in table 4. Ratios are calculated for each of the seven goods and for two aggregates, the first containing all seven goods and the second containing only the last three, that is, excluding the clothing and footwear categories which are known to contain some children's goods. Despite the problems with these categories, nearly all the π -ratios for the children are negative. Most of the exceptions are the obvious ones—boys from 5–14 have positive coefficients for men's and boys' clothing and footwear, as do girls from 5–14 for women's and girls' clothing and footwear. Note that boys under 4 have a negative π -ratio even for men's and boys' clothing and footwear, as do very young girls for women's and girls' clothing and footwear. Presumably the negative income effect of the child outweighs the small positive requirement for the commodity. The only other positive numbers are those for girls from 3–4 for male and female clothing and for both groups of young boys for tobacco. None of these estimates is significantly different from zero.

The tests for the hypothesis that all these are adult goods are given in the

Table 4. *Outlay Equivalence Ratios for Adult Goods, Thailand, 1980–81*

Gender and age	Clothing		Footwear		Tobacco	Alcohol	Meals out	All adult goods	Last three goods
	Male	Female	Male	Female					
Children									
M 0-2	-1.13	-3.12	-2.22	-1.88	-0.32	-0.50	-0.52	-0.89	-0.47
M 3-4	-0.05	-0.73	-1.00	-2.98	0.14	-0.01	-0.89	-0.54	-0.52
M 5-14	1.38	-0.89	0.45	-1.98	0.01	-0.25	-0.50	-0.21	-0.34
F 0-2	-1.21	-2.05	-1.47	-1.39	-0.22	-0.07	-0.38	-0.63	-0.30
F 3-4	0.60	0.16	-0.95	-1.42	-0.11	-0.51	-0.42	-0.23	-0.36
F 5-14	-1.78	0.72	-0.95	2.58	-0.05	-0.29	-0.26	-0.27	-0.22
Adults									
M 15-60	5.83	-0.49	3.57	-1.71	0.15	-0.28	-0.64	0.37	-0.40
M > 60	2.72	-1.46	0.83	-1.13	0.15	-0.38	-0.34	-0.02	-0.24
F 15-60	-0.01	3.29	-0.26	3.25	-0.14	-0.20	-0.66	0.04	-0.47
F > 60	0.12	-0.48	-0.18	-0.51	0.00	-0.22	-0.54	-0.32	-0.37

Note: M = male; F = female.

Source: Deaton (1987).

Table 5. *Wald Tests for Equality of π -ratios across Adult Goods, Thailand*

Children					Adults				
Gender and age	Broad aggregate		Narrow aggregate		Gender and age	Broad aggregate		Narrow aggregate	
	Test	p-value	Test	p-value		Test	p-value	Test	p-value
M 0-2	17.8	0.012	1.1	0.786	M 15-60	63.8	0.000	61.2	0.000
M 3-4	42.0	0.000	27.4	0.000	M > 60	117.9	0.000	7.1	0.068
M 5-14	63.8	0.000	28.0	0.000					
F 0-2	10.2	0.176	1.5	0.677	F 15-60	67.2	0.000	29.6	0.000
F 3-4	13.1	0.070	4.1	0.250	F > 60	127.3	0.000	116.0	0.000
F 5-14	47.4	0.000	6.5	0.092					

Note: M = male; F = female. Test statistics are asymptotically distributed as χ^2 with six (broad aggregate) or two (narrow aggregate) degrees of freedom under the null hypothesis that the π -ratios are the same over all seven goods.

Source: Deaton (1987).

left side of table 5. The hypothesis is generally rejected, although not for the two youngest groups of girls and the youngest group of boys. For the narrow aggregate, the hypothesis that these goods are not consumed by girls can be accepted for all three age groups, but the rejection for boys is repeated for the two oldest groups, even though the test statistics are a good deal smaller. These rejections are not unexpected given the dearth of adult goods in the survey, and given the results in table 4. However, the results mean that the question of gender bias has to be approached rather more carefully than was the case for the Côte d'Ivoire. Note finally from the right side of table 5 that, once again, it is easy to reject the hypothesis that the π -ratios are the same for all goods for adults. Adding an adult to the household has effects on the expenditure on these goods that cannot be reproduced by giving the household more money.

The summary outlay equivalent ratios for all seven of the goods and for a group composed of the last three (tobacco, alcohol, and food taken away from home) are contained in the last two columns of table 4. Although the π -ratios for all seven goods include not only the negative income effect of children on adult goods expenditure, but also the positive effect of children's needs for clothing and footwear, the effect should be the same for boys as for girls, so that the π -ratios should still be the same if there is no gender discrimination. As it is, both columns tell the same story. All the π -ratios are negative, and with one exception (the age group 5-14 for the broad aggregate), the figures are more negative for boys than for girls. According to these figures, households devote about 20 percent less to their under-five-year-old children if the children are girls than if they are boys. Of course, these are only point estimates, and the standard errors are large enough that the differences are not statistically significant.

The tests for gender effects corresponding to those presented for Côte d'Ivoire in table 3 are not shown explicitly, but the results can be summarized as follows. For the youngest age group (those under 3), there are no significant gender differences for any of the goods or for the aggregates. For the next

group, there are differences in the tobacco and meals-out equations, but the aggregate differences are not statistically significant. Finally, for children aged 5–14, and apart from the obvious clothing effects, there are significant gender differences in the meals-out equation, which carry through to the narrow aggregate. The gender differences that are apparent in the last column of table 4 come mostly from differences in the equation for food eaten away from home. The addition of a girl to the household causes expenditure in this category to fall by less than does the addition of a boy. By itself, this effect is generally statistically significant, although it is not sufficient to generate a significant effect when all the adult goods are taken together.

Although the π -ratios for adults are not my main concern, it is worth looking briefly at the results presented in the bottom panel of table 4. The signs of the clothing and footwear figures are very much as expected, with men using men's goods and women using women's. But once again, the effects are hardly equal. The π -ratios for men on men's goods are larger than the π -ratios for women on women's goods, while the negative effects of additional men on women's purchases is larger (negative) than the negative effects of additional women on men's purchases. As was the case for the Ivorian figures, these differences may simply reflect taste differences, but they are interesting nevertheless. The other notable feature of the adult π -ratios in table 4 is the large number of negative signs for tobacco, alcohol, and meals out. Apart from men buying tobacco, additional adults seem to *decrease* expenditures on these supposedly adult goods. These estimates suggest that the technology of consumption may be more complicated than can be represented by matching individuals to goods. For example, in Thailand, particularly in Bangkok, people purchase a great deal of cooked food in restaurants or from street vendors. It would not be surprising if many of these purchases are made by people who live alone or in small households where there are no economies of scale to food preparation. These hypotheses could explain the negative effect of additional adults on food eaten outside the household. The negative π -ratios for alcohol are less easily explained.

While these results are rather mixed, the methodology of this article still seems to be useful even for the more difficult case presented by the Thai survey. The outlay equivalence ratios are generally sensible and reproduce the expected patterns of association between goods and people. A really convincing test of gender bias among children requires the construction of a group of adult goods that survives the various statistical tests. This is difficult to do for Thailand, where even the obvious adult goods, like alcohol and tobacco, do not generate clear-cut patterns. For one good, meals taken away from home, the results show a reduction in expenditures associated with additional boys that is larger than the reduction associated with additional girls. It is possible that this result reflects a general preference toward boys, although at this stage the inference is little more than conjecture. A few of the Engel curves show significant differences between boys and girls, but the significance levels are never very impressive, particularly given a sample containing 5,835 households.

IV. AN ALTERNATIVE PROCEDURE FOR FINDING ADULT GOODS

The main practical difficulty in using the methods of this article lies in finding a group of adult goods. Once a list has been established, the calculations for gender bias are very simple, requiring essentially one ordinary least squares regression and some F -tests. Some surveys will have a longer list of plausible adult goods than others, but the test procedures still have to be carried out. Although conceptually straightforward, the tests used in this study are quite complex to calculate in practice, so that an alternative and simpler procedure would have its attractions. There is also a question of robustness, of how much the results depend on the choice of functional form and on the particular techniques used for testing. In this section, I suggest a simple alternative procedure that can be used to test whether a group of goods can reasonably be accepted as adult goods. The procedure does not yield estimates of gender bias, so it is a complement to the preceding analysis, not a replacement for it.

The basic idea is the same, that expenditure on adult goods depends on number of children only through income effects. Given this, children affect only the total expenditure allocated to adult goods, not the allocation within the adult-goods group once total group expenditure is given. That they do not do so can be shown to be formally equivalent to the equality of the π -ratios that was the basis for the tests presented in the methodology section of this article (see Deaton, Ruiz-Castillo, and Thomas, *forthcoming*). This alternative way of looking at the problem also suggests an empirical procedure. The expenditure on each adult good is regressed on total expenditure for all adult goods. If all members of the group are genuine adult goods, the age and gender of children should play no part in the regression, a hypothesis that can be easily tested by an F -test.

In practice, there is a complication that must be taken into account. When there are only a few adult goods, there is a danger that regressing one on the total will be very like regressing something on itself. More formally, there is a spurious correlation between the variables being explained and the main explanatory variable, in this case total adult expenditure. For example, if a household spends an abnormally large amount on meals taken away from home, the chances are that the household will also have an abnormally large total of adult expenditure. The resulting correlation will cause bias in ordinary least squares regression. The solution is to use two-stage least squares estimation. At the first stage, total adult expenditure is regressed on total household expenditure and on the other variables in the regression. The predicted values from this first stage are then used in place of total adult expenditure in the original regression.

The procedure is applied to the same Ivorian data used in section II above. To keep things as simple as possible, and to provide a cross-check on the previous results, I use linear functional forms. The expenditure on each good is regressed on a constant, total expenditure on adult goods, the same regional and farm dummies as before, and the number (not ratio) of people in each of

Table 6. *F-tests for Exclusion of Demographics, Côte d'Ivoire*

<i>Adult good</i>	<i>Children excluded</i>		<i>Adults excluded</i>	
	<i>Test</i>	<i>p-value</i>	<i>Test</i>	<i>p-value</i>
Adult clothing	0.44	0.78	8.19	0.00
Adult fabric	0.96	0.43	2.67	0.03
Adult shoes	2.58	0.04	4.35	0.00
Alcohol	0.51	0.73	2.40	0.05
Tobacco	2.52	0.04	7.96	0.00
Meals out	0.45	0.77	1.39	0.24
Entertainment	1.03	0.39	0.81	0.51

Source: Deaton (1987).

the eight age and gender classes. The *F*-tests for the exclusion of the child and adult variables are shown in table 6. (Technically, these are not strictly *F*-tests since, with two-stage least squares, only asymptotic distributions are valid; even so, the use of *F*-statistics is asymptotically correct and is unlikely to be misleading in finite samples.) Like the test results shown in table 2, these figures do not suggest any problems with the hypothesis that these seven goods can be regarded as adult goods. Although the *p*-values for two of the categories are a little below the 5 percent level, the other five are easily within the acceptable range, so that the overall picture is as positive as before. As was the case for the original tests, the results for adults are quite different, and there are several sharp rejections. Note that the null hypothesis being tested here is not that adults do not consume adult goods but that they do so in ways that cannot be reproduced by an increase in total expenditure.

The similarity between these results and those presented in section II suggests that the findings are quite robust and that the choice of adult goods is indeed legitimate. The simplicity of the methods of this section also makes it attractive to consider these tests as a way of conducting preliminary tests on a list of possible adult goods. The methods of section I can then be used to test for possible gender bias.

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Inflation and the Financing of Government Expenditure: an Introductory Analysis with an Application to Turkey

Ritu Anand and Sweder van Wijnbergen

This article presents a simple framework to assess the consistency of appropriately defined fiscal deficits with other macroeconomic targets, such as inflation. It also considers the relation of fiscal deficits to output growth, real exchange rate developments, and management of internal and external debt. Finally, it considers the implications of relying on interest-bearing government debt to postpone the adjustment necessary to restore consistency with inflation targets. It demonstrates how the intertemporal budget constraint of the government creates a tradeoff between current and future adjustment. Real interest rates and output growth rates are shown to determine the terms at which this tradeoff takes place. The usefulness of this framework is demonstrated through an analysis of fiscal policy options in Turkey in 1985.

This article presents an integrated framework to assess the consistency between fiscal deficits and output growth, the rate of inflation, and other macroeconomic targets. The model centers on the government budget constraint and can be used either to derive the "financeable" deficit given inflation targets or to derive an equilibrium inflation rate for which no fiscal adjustment would be necessary. The financeable deficit is defined as the deficit that does not require more financing than is compatible with sustainable external and internal borrowing and with existing targets for inflation and output growth. The work presented here draws on theoretical contributions by Phelps (1973), Dornbusch (1977), Sargent and Wallace (1982), and Buiter (1983). (For similar work in the context of open economies, see also Drazen and Helpman 1987 and van Wijnbergen 1988.)

Consistency between fiscal deficits and other macroeconomic targets can be judged starting from the government budget identity. This identity says that

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the sum of the deficit, including the interest due on foreign and domestic debt, is equal to the sum of financing from all sources. Fiscal deficits can be financed in three ways: by issuing external debt, by issuing interest-bearing internal debt, and through monetary financing.

Macroeconomic targets, such as a target inflation rate, imply restrictions on these sources of financing which then determine the financeable deficit. If the actual deficit exceeds the financeable deficit, one or more of the macroeconomic targets will not be met without fiscal policy adjustment.

We should indicate, at the outset, the limitations of the approach developed in this article, which is not a general equilibrium analysis of inflation and output growth. It cannot provide the government with a tool to set policy variables such that a particular welfare function is maximized. Our aim, the design of consistent fiscal policy, is more modest. We answer the question, what is a *sustainable* fiscal deficit given targets for inflation, output growth, real exchange rate developments, and others. The guidelines developed in this article do not guarantee that the stated macroeconomic goals will be achieved, only that fiscal policy in itself is not inconsistent with them.

Section I presents the framework for an analysis of the link between inflation and the financing of government expenditure. As an example, section II then applies the methodology to Turkey, which has faced inflation and deficit problems since 1980. This section also analyzes how the future adjustment burden increases if current adjustment is postponed through the issue of interest-bearing debt. Finally, we analyze how much future inflation will increase compared with what it would be today if tight monetization policies are pursued in conjunction with the issue of unsustainable debt. Section III gives our conclusions.

I. ANALYTICAL FRAMEWORK

Shifts in wages or prices of intermediate goods, devaluation, and changes in the money stock all affect the price level. But they do not explain the root cause of prolonged inflation. Any real wage can be sustained at any rate of inflation, especially in the presence of indexation agreements. An increase in the price of imported intermediate goods would not explain sustained domestic inflation rates in excess of world levels, since relative world prices of intermediate goods cannot rise forever. Although continued nominal devaluation of the exchange rate can sustain a matching excess of home inflation over world inflation, that does not explain what is behind this continued process of nominal devaluation. Similarly, while any sustained rate of inflation must be matched by a corresponding rate of money growth, that explanation begs the question of what drives the sustained increase in money growth in excess of what would be compatible with announced inflation targets.

Theory suggests that the answer to that question is the maintenance of fiscal deficits in excess of what can be financed through debt issue on a sustainable

basis. While short-term links between inflation and deficits are likely to be tenuous, any deficit, coupled with sustained debt-output ratios, implies a particular inflation rate. This is the inflation rate at which inflation tax revenue covers the difference between the government's financing needs and its issue of interest-bearing debt.

The inflation tax equals the amount of nominal money the private sector needs to accumulate so as to maintain the real value of its stock of money. Within a given financial structure, the real money stock is usually a stable function of interest rates and income. For given interest rates, level of income, and structure of the financial system, if consumers wish to maintain money balances fixed in real terms, they will have to accumulate nominal balances at the rate of inflation and in proportion to their desired level of real balances, L . Thus the revenue from the inflation tax is:

$$(1) \quad IT = \hat{P}L(i, \dots, y)$$

where P is the price level and " $\hat{\cdot}$ " indicates percentage change, so that $\hat{P}$ equals inflation, i is the nominal rate of interest, and y is real income. Other variables, such as inflation and regulatory restrictions on reserves, typically also will enter demand for base money.

Base money is an interest-free liability of the public sector, which can thus cover real expenditure through the issue of nominal liabilities. The private sector will have to run a matching surplus of income over expenditure to accumulate these money balances when inflation is positive; it thus pays what is called "the inflation tax." By analogy with more conventional taxes, inflation can be considered the tax rate and L , the level of real money demand, the tax base.

The fiscal authorities only make a net gain to the extent that the inflationary erosion of the money stock is not offset by inflationary gains by domestic borrowers. Hence the proper tax base is not the broad money stock (currency held by the public plus demand and time deposits, $M2$), but the more narrow concept of "outside" or base money, none of which is offset by private-sector debt owed to the banking system.

In addition, the government derives what we call seignorage revenue, SR , when real balances rise:

$$(2) \quad SM = \dot{m}$$

where m is real money balances and we use " $\dot{\cdot}$ " to indicate a change in value. In equilibrium, changes in real balances will equal changes in demand for real balances, arising from movement in interest rates, inflation, real income, and even from changes in financial regulation (see van Wijnbergen, Anand, and Rocha 1988 for a detailed discussion of the latter effect). But by definition, in the steady state, inflation, nominal interest rates, and financial structure are constant. Our medium-term focus on sustainability allows us to ignore the once-off increases or decreases in demand for base money caused by changes in

those variables. In the steady state, however, real income will not be constant. Hence if money demand is unit-elastic with respect to real income, Y , we get as steady state seignorage revenue:

$$SR_{steady\ state}/Y = nL(i, \dots, Y)/Y$$

To link revenue from the inflation tax, IT , and seignorage, SR , to debt management and budget deficits, one needs to look at the government budget identity linking expenditure categories to sources of financing. We discuss below the appropriate concept of deficits and the link between deficits and changes in debt and monetary aggregates. We then show how to go beyond accounting to derive deficit levels that are consistent with internal and external debt strategies, inflation targets, and exchange rate policy.

On the Definition of the Public Sector

Problems with the measurement of public deficits involve both accounting conventions and issues of economic analysis. Most countries have several layers of government: national, provincial, and local. In Turkey, this is complicated further by the recent proliferation of extrabudgetary funds and by the existence of an extensive state economic enterprise (SEE) sector.

Focusing on central government budget data alone gives a misleading impression of recent public developments in Turkey. The size of central government has fallen between 1981 and 1986. A different picture emerges, however, once other components of the public sector are taken into account. Central government budget expenditure declined by 3 percentage points (as a share of gross national product, GNP) between 1981 and 1986; however, the share of the public sector in GNP, inclusive of local governments, extrabudgetary funds, and SEEs, increased from 34 percent in 1981 to 37 percent in 1986 (table 1). Similarly, in computing the deficit it is important to include the entire public sector because SEEs are the major factor behind the high public deficits.

Table 1. *The Size of the Public Sector in Turkey*
(percentage of GNP)

<i>Component</i>	<i>1981</i>	<i>1982</i>	<i>1983</i>	<i>1984</i>	<i>1985</i>	<i>1986^a</i>
Central government budget	23.1	22.0	22.6	20.6	18.3 ^b	20.1 ^b
Extrabudgetary funds	1.1	1.1	1.2	1.3	3.1	4.3
Local governments	1.5	1.4	1.7	1.8	2.3	3.6
Total public administration	25.7	24.5	25.5	23.7	23.7	28.0
State economic enterprises ^c	8.4	8.2	8.6	10.4	10.6	9.4
Total	34.1	32.7	34.1	34.1	34.3	37.4

Note: Sum of all current and capital expenditure as a share of GNP. This exceeds the claim on actual resources by the public sector because it includes transfer payments.

a. Estimate.

b. Excluding value-added tax rebates paid to exporters and purchasers of capital goods.

c. Value added produced by state economic enterprises.

Source: World Bank data.

Including all these additional public components would still leave a potentially important loophole: the profit and loss account of the central bank. In many countries the restraints imposed on fiscal authorities have been circumvented by shifting expenditure items to the central bank. Therefore, inclusion of the profit and loss account of the central bank in the public accounts is necessary to establish the link between fiscal deficit and base money creation, as we will see below.

Another problem concerns the measurement problems caused by capital gains and losses due to inflation and exchange rate changes. In the next section we discuss the necessary adjustments to properly account for them. This will complete the link between public deficits and the net change in real value of public liabilities.

Accurate and internally consistent data on expenditure and revenue flows for all public entities are usually not available. Moreover, what is available is not consistent with national accounts data, complicating comparisons with, for instance, private savings and investment flows. We have therefore chosen another approach to the measurement of the fiscal deficits, an approach that starts from the stock of indebtedness. A properly measured deficit should equal the change in net indebtedness of the public sector. Since much better information is available on stocks of outstanding debt than on flow-based profit and loss accounts of the public sector, such an approach is an improvement over flow-based measures.

Fiscal Deficits, Money Creation, and Debt

To derive the relation between fiscal deficits, money creation, and debt, start from the following relation:

$$(3) \quad D + iB + i^*B^*E = \dot{B} + \dot{B}^*E + \dot{DC}_g$$

The left-hand side of equation 3 lists the expenses of the public sector (net of taxes): its noninterest deficit, D , plus nominal interest payments on domestic and foreign debt. The variable i (i^*) is the nominal domestic (foreign) interest rate on domestic (foreign) debt B (B^*). E is the nominal exchange rate (Turkish lira, TU, per U.S. dollar). These expenses are covered (on the right-hand side) by the issue of domestic or foreign debt, plus central bank advances to the public sector, the stock of which equals DC_g (with “ $\dot{\cdot}$ ” again indicating change in the value of the variable). The noninterest deficit, D , and the interest payments should include the obligations of all government entities: the central government, state enterprises, municipalities, local governments, and extra-budgetary funds.

Equation 3, while correct in an accounting sense, is not enough to assess consistency of fiscal policy with other macroeconomic targets. First, it does not cover the central bank. The government could easily shift a substantial part of its deficit into the central bank’s accounts by mere changes in bookkeeping practices. For example, a substantial part of the interest payments on the

foreign debt of the central government is often handled by the central bank, without being recorded in the central government's budget. To close this loop-hole, the profit-and-loss account of the central bank needs to be brought into the budget balance equation, and the central bank needs to be incorporated into the definition of the public sector accordingly. The importance of this correction cannot be stressed enough.

The second issue is related. Central bank credit to the government, DC_g , is a claim of one public entity on another. Debt consolidation would make it disappear. Moreover, it does not correspond to any asset in private portfolios and bears no obvious link to inflation, output growth, and so on. For that, the link with money needs to be established.

To remedy these shortcomings, consider a simplified central bank balance sheet. The balance sheet shows that the central bank's liabilities consist of currency held by the public, Cu , and commercial bank reserves, RR . The funds so obtained are used to hold net foreign assets, NFA^*E , and to extend credit to the government, DC_g . The balancing item is the central bank's net worth, NW .

<i>Assets</i>	<i>Liabilities</i>
DC_g	NW
NFA^*E	Cu
	RR

Currency in the hands of the public and required reserves held by commercial banks at the central bank equal the supply of base money: $M = Cu + RR$. From the balance sheet it is clear that M can be interpreted as the net liability of the central bank to the private sector. The balance sheet also shows the uses made of the funds raised through the issue of zero interest debt (base money): $M = DC_g + NFA^*E - NW$. Thus, base money is issued to cover credit to the government and the central bank's accumulation of net foreign assets, insofar as this is not already covered by the central bank's accumulated profits or net worth, NW .

In the simple balance sheet above, the central bank's profits consist of interest earnings on foreign reserves, i^*NFA^*E . The counterpart of these profits are increases in the central bank's net worth, NW . Its profit-and-loss account thus reads:

$$(4) \quad i^*NFA^*E = \dot{NW}$$

To incorporate the central bank into the public sector deficit identity, central bank profits need to be subtracted from the deficit, and its increase in net worth from the public sector's increase in liabilities (sources of financing). Thus from equation 3 one gets:

$$(5) \quad D + iB + i^*(B^* - NFA^*)E = \dot{B} + \dot{B}^*E + \dot{DC}_g - \dot{NW}$$

Equation 5 includes the central bank and thus the entire public sector, so

one important loophole is now closed. However, it is difficult to interpret. On the left-hand side, it lists interest payments on the net foreign debt of the public sector, $B^* - NFA^*$. The right-hand side, however, lists increases in gross foreign debt, $\dot{B}^*$, excluding the central bank, as a source of financing. It furthermore includes claims of one government entity on another: DC_g is really an inter-government agencies debt, which should be netted out.

Debt consolidation can be done in two steps. To switch to net public foreign debt throughout, the change in the central bank's net foreign assets, NFA^* , is subtracted from the change in the government's foreign debt, $\dot{B}^*$, on the right-hand side of the equation. To maintain equality, it is also added back. The net result is

$$(6) \quad D + iB + i^*(B^* - NFA^*)E = \dot{B} + (\dot{B}^* - \dot{NFA}^*)E + \dot{DC}_g + \dot{NFA}^*E - \dot{NW}$$

The resulting equation consolidates foreign debt and assets of various government agencies, but includes an interagency debt, central bank credit to the government, DC_g . This can be remedied by recognizing that the last three terms on the right-hand side of equation 6 equal the change in the supply of base money, M , as can be seen from the central bank balance sheet above. Substituting the money supply identity into equation 6 yields:

$$(7) \quad D + iB + i^*(B^* - NFA^*)E = \dot{B} + (\dot{B}^* - \dot{NFA}^*)E + \dot{M}$$

This analysis also suggests the proper definition of money for an analysis of inflation tax revenue and deficit finance. Revenue derived from inflationary erosion of the private sector's deposits in the banking system that is offset by inflationary erosion of loans outstanding to the private sector does not increase net revenue. This is clarified in the stylized set of balance sheets of the central bank, commercial banks, and the banking system below. The commercial banks hold reserves, RR , and make loans, L_{pvt} , to the private sector. On their liability side, they accept from the public demand deposits, DD , and time deposits, TD . Combining the commercial banks' and central bank's balance sheets yields the balance sheet of the integrated banking system:

Central bank		Commercial banks		Integrated banking system	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
NFA^*E	NW	RR	DD	NFA^*E	NW
DC_g	Cu	L_{pvt}	TD	DC_g	Cu
	RR			L_{pvt}	DD
					TD

This balance sheet shows the shortcoming of M2 for our purpose. While nominal deposits are eroded by inflation, these capital losses are partially offset by similar gains made by the private holders of the loans, L_{pvt} . This is what is meant by the claim that M2 has an "inside money" component.

One can rewrite the balance sheet of the integrated banking system using standard definitions of the various concepts of money supply.

<i>Integrated banking system</i>	
<i>Assets</i>	<i>Liabilities</i>
M	M2
L_{pvt}	

The proper money concept should exclude this "inside" component. It thus equals total currency held by the public plus total bank deposits (M2) minus bank loans to the private sector, L_{pvt} . But the tables above show that M2 minus bank loans equals base money or "outside money":

$$(8) \quad M2 - L_{pvt} = Cu + DD + TD - L_{pvt} = Cu + RR = M$$

In practice, there will be further complications, and these require adjustments to the reserve money concept underlying, for example, the International Monetary Fund's *International Financial Statistics* data base. The central bank not only holds reserves from commercial banks; in many countries it also lends to them, and to other actors in the private sector too. This requires adjustment in the definition of base money, so that the definition coincides with the central bank's net liabilities to the private sector.

<i>Extended central bank</i>		<i>Adjusted central bank</i>	
<i>Assets</i>	<i>Liabilities</i>	<i>Assets</i>	<i>Liabilities</i>
NFA*E	NW	NFA*E	NW
DC_g	Cu	DC_g	$Cu - DC_{pvt}$
DC_{cml}	RR		$RR - DC_{cml}$
DC_{pvt}			
	Monetary		Adjusted
	base		monetary
			base

The adjusted monetary base equals the monetary base minus central bank credit to commercial banks, DC_{cml} , and to other private agents, DC_{pvt} . This concept equals the central bank net non-interest-bearing liabilities to the private sector and is the appropriate concept to use for calculations of consistency of fiscal deficits with levels of inflation tax revenue.

Using this concept has an important consequence for the measurement of public foreign debt. If all of the central bank's liabilities (base money) are counted as public liabilities, then the central bank's claims on nongovernment agents, correspondingly, must be subtracted from the public sector's debt. Thus, public foreign debt needs to be measured net of the central bank's foreign assets (that is, $B^* - NFA^*$).

The deficit as defined in equation 7, however, still does not adequately capture the public sector's claim on resources, at least not in periods of nonzero inflation. While the right-hand side lists all the increases in the public sector's net liabilities, these are increases in the nominal value, not the real value. The counterpart of this is the inclusion of nominal instead of real interest payments in the definition of expenditure. This is misleading: as is by now widely recognized, the domestic and foreign inflation components in nominal interest rates,

$\hat{P}B$ and $\hat{P}^*(B^* - NFA^*)$, respectively, represent repayment of (real) principal and thus are capital account rather than current account transactions.

Taking this capital account transaction out of the identity on both sides and dividing all variables by the price level, P , yields:

$$(9) \quad d + rb + r^*(b^* - nfa^*)e = \dot{b} + (\dot{b}^* - \dot{nfa}^*)e + \dot{M}/P$$

Lower-case letters denote real variables, so $d = D/P$, the real value of the noninterest deficit; P and P^* are the domestic and foreign price levels. The variables b and b^* are the real values of domestic and foreign debt in terms of domestic and foreign goods, respectively, and m is the real money stock, M/P . The variable nfa^* is the real value of the central bank's net foreign assets in terms of foreign goods. The variable e is the real exchange rate, $e = EP^*/P$. The real rates of interest in terms of home and foreign goods, respectively, are:

$$r = i - \hat{P}, \text{ and } r^* = i^* - \hat{P}^*$$

where a “ $\hat{}$ ” above a variable indicates the percentage change in that variable. As an aside, the exact formula is slightly different in discrete time:

$$(10) \quad 1 + r = (1 + i)/(1 + \hat{P}), \text{ and } 1 + r^* = (1 + i^*)/(1 + \hat{P}^*)$$

The difference between the two ways of calculating r and r^* is of second order, but in discrete time and with substantial inflation rates, may still be substantial. We always use the exact formula given as equation 10 in the actual calculations.

Equation 9 still does not include the capital losses due to real exchange rate changes which are part of the cost of servicing foreign debt. We use the identity:

$$\overbrace{(b^* - nfa^*)e}^{\dot{}} = (\dot{b}^* - \dot{nfa}^*)e + \hat{e}(b^* - nfa^*)e$$

and add real exchange rate changes to both sides of equation 9 to obtain:

$$(11) \quad d + rb + (r^* + \hat{e})(b^* - nfa^*)e = \dot{b} + \overbrace{[(b^* - nfa^*)e]}^{\dot{}} + \dot{M}/P$$

One further rearrangement is illuminating. Simple differentiation allows us to rewrite the real value of the increase in nominal base money as the sum of two components:

$$(12) \quad \dot{M}/P = \dot{m} + \hat{P}m$$

The first component represents the increase in the real value of base money, or seignorage. The second term on the right-hand side represents the amount of nominal balances that need to be accumulated just to keep the real value of the money stock constant (the inflation tax). Insertion of equation 12 into 11 yields:

$$(13) \quad d + rb + (r^* + \hat{e})(b^* - nfa^*)e = \dot{b} + \overbrace{[(b^* - nfa^*)e]}^{\dot{}} + \dot{m} + \hat{P}m$$

Equation 13 states that the fiscal deficit, inclusive of the central bank's profit-and-loss account, but counting real interest payments only, equals changes in

the real value of domestic and foreign debt, plus revenue from the seignorage and from the inflation tax. In the steady state, the revenue from the seignorage equals nm , with n the real growth rate of the economy. The sum of revenue from the inflation tax and seignorage equals revenue from monetization. Outside the steady state there could also be other sources of revenue from monetization: one-time changes in the real money stock because of changes in inflation, interest rates, or financial innovations that shift money demand.

Equation 13 as it stands is merely an accounting identity, but it is at the base of most of the analysis to come. Macroeconomic variables such as output growth and inflation have implications for the amount of money the private sector is willing to absorb for given interest rates. Similarly, changes in financial structure and regulation will also have an impact on the amount of revenue from monetization that can be expected. Finally, the government's creditworthiness and the perceived sustainability of the deficit-financing policy imply constraints on the issue of interest-bearing debt. All such restrictions can be incorporated into equation 13.

Money Demand and Inflation

An example of an application of the apparatus developed above requires quantification of the effect of inflation on money demand. An applied analysis to derive the policy implications for a particular country, however, would require a detailed study of base money demand. Aggregate money demand depends not only on inflation and rates of return on alternative assets but also on monetary policy instruments such as reserve requirements (see van Wijnbergen, Anand, and Rocha 1988 for such a study in a similar framework).

A simple unit income elasticity demand function is sufficient for the examples presented below. The government derives revenue from the inflation tax, but as inflation (the "tax rate") rises, money demand and hence the tax base falls. At the point where the inflation elasticity of money demand equals one, the revenue increase from the rise in the rate equals the revenue decrease from the decline in money demand, and inflation tax revenues reach their maximum value (Cagan 1956).

The demand function used in the text yields the following results:

$$\begin{aligned}
 \log m/y &= -0.1 - 0.5 \log (1 + \hat{P}) \\
 &\quad (0.2) \quad (2.5) \\
 (14) \quad &+ 3.1 \log (1 + i_{TD}) + 0.03 \text{ time} \\
 &\quad (2.2) \quad (5.6) \\
 R^2 &= 0.84 \quad DW = 1.96
 \end{aligned}$$

The equation shows a strong negative dependence on inflation, as expected, and a high positive time trend—3 percent (quarter to quarter, from the fourth quarter of 1981 to the third quarter of 1985). The time trend reflects increased

monetization of the Turkish economy. In addition, base money demand is shown to depend strongly on time deposit rates. Equation 14 is used in the inflation tax calculations presented in section II.

Fiscal Policy and Macroeconomic Consistency

Consistency between fiscal deficits and other macroeconomic targets can be judged from the government budget constraint, linking deficits to sources of financing. Fiscal deficits can be financed in three ways: through the issue of external or internal interest-bearing debt, or through monetary financing. Macroeconomic targets, such as the inflation rate, external debt, and GNP growth, however, imply restrictions on each of these financing methods. These restrictions add up to a total financeable deficit; if the actual deficit exceeds that financeable deficit, one of the nonfiscal targets will have to be abandoned or fiscal policy will need to be adjusted.

Equation 13 can be used to derive a value for the fiscal deficit consistent with a given debt strategy and whatever inflation target policymakers wish to achieve. We give an example for a particularly simple debt strategy, fixed debt-output ratios for both internal and external debt. Target values for the ratio of domestic and foreign debt to output imply that real domestic debt cannot grow faster than real output and real net foreign debt cannot grow faster than the ratio of output to the real exchange rate:

$$(15a) \quad \dot{b} = nb, \text{ and } \overbrace{(\dot{b}^* - nfa^*)}^{\cdot} e = (n - \hat{e})(b^* - nfa^*)$$

or, using tildes to indicate variables expressed as a percentage of GNP,

$$(15b) \quad \dot{b}/y = n\tilde{b}, \text{ and } \overbrace{(\dot{b}^* - nfa^*)}^{\cdot} e/y = (n - \hat{e})\tilde{\overbrace{(b^* - nfa^*)}^{\cdot}}$$

Again, n is the growth rate of real output, y .

Using these target values in equation 13 yields the consistency condition we are after:

$$(16) \quad \tilde{d} + r\tilde{b} + \overbrace{r^*(\dot{b}^* - nfa^*)}^{\cdot} e = n\tilde{b} + \overbrace{(n - e)(\dot{b}^* - nfa^*)}^{\cdot} + (\hat{P} + n)m$$

or the noninterest deficit, d , plus real interest payments on domestic and foreign debt, cannot exceed what can be financed through debt issue at target debt-output ratios, plus the revenue from the steady-state seignorage and the inflation tax. Consistency requires that equation 16 hold with m/y evaluated at the equilibrium value $L(\dots)/y$, where it equals demand for real balances (as a share of GNP) evaluated at the *target* inflation rate.

Several important factors will shift the relation between public deficits and inflation embedded in equation 16. For example, lower reserve requirements or the introduction of attractive liquid alternatives to domestic money, such as the foreign deposits accounts permitted in Turkey since 1984, both lower the base over which the inflation tax is levied. These changes require higher inflation rates to finance the same noninterest deficit at given income levels. A

quantitative assessment requires more detailed and empirical work on the structure of the financial sector than can be provided in this paper (this issue is discussed in more detail in van Wijnbergen, Anand, and Rocha 1988).

A second factor influencing the relation between public deficits and inflation is the government's policy on issuance of bonds. In the short run, bond issues at a rate higher than is necessary to maintain b leads to a lower required inflation tax and to potentially lower inflation. This effect will be reversed as time goes by, however, if the economy grows at a rate less than the rate of interest (that is, if $n < r$). As is indicated in equation 16, as long as $r > n$, long-run revenue requirements will increase rather than decrease, requiring some other adjustment in fiscal policy or financing. This issue is taken up in the next section.

Finally, exchange rate policy plays an important role in all this. The closed economy analysis by Sargent and Wallace (1982) on which this article draws has been extended to the open economy so as to allow discussion of exchange rate policy (see Drazen and Helpman 1987 and van Wijnbergen 1988). It is arguable that the exchange rate policy followed in many moderate- and high-inflation countries has increased the relevance of the public finance approach to inflation. Moderate and high rates of inflation have forced many countries to offset inflation differentials with trading partners by nominal devaluation to avoid disruption of real trade flows. However, such a policy eliminates the role of the exchange rate as a nominal anchor for prices, since any blip in the price level will be offset automatically by a matching exchange rate adjustment. Thus, under such an exchange rate policy, the nominal exchange rate does not provide a restraining influence on the levels of domestic prices. If the central bank also monetizes fiscal deficits, no monetary anchors are left to tie down the price level. In such circumstances the public finance approach to inflation also becomes relevant for the explanation of short-run inflation, not just for medium-run trends.

Even if a government adheres to a fixed exchange rate regime, the approach suggested here is relevant. A fixed exchange rate regime or, more generally, a predetermined exchange rate regime implies a medium-term inflation rate: foreign inflation plus the rate of nominal devaluation embedded in the exchange rate regime (which equals zero if it is a truly fixed regime). Consistency between fiscal policy and the inflation rate implied by the exchange rate policy is important. Empirical evidence shows conclusively that the absence of such consistency undermines the credibility of a fixed exchange rate regime and leads to its eventual collapse (Cumby and van Wijnbergen, forthcoming). Hence the approach suggested here can also be used to assess sustainability of a fixed exchange rate regime.

II. CONSISTENCY OF FISCAL POLICY AND INFLATION TARGETS

In this section we apply the framework developed in the previous section to an assessment of compatibility of fiscal deficits and other macroeconomic tar-

gets in Turkey. We first derive the actual deficit in 1985 based on the change in the real value of net public liabilities, including those of the central bank. The actual deficit is then compared with the financeable deficit as implied by consistency with other macroeconomic targets. Finally we explore the consequences of delaying necessary fiscal correction measures.

Table 2 gives a breakdown of the actual deficit in 1985 by sources of financing. When corrected for inflation, the real value of net domestic liabilities as a share in GNP went down. The inflation tax, however, yielded revenues equivalent to 4.5 percent of GNP, so domestic sources of financing yielded a total of 3.9 percent of GNP.

Foreign financing was also significant: there was a large increase (\$3.1 billion) in foreign debt, including net foreign liabilities of the central bank. As may be seen in table 2, most of this increase was due to an increase in real foreign debt; capital losses on the debt due to exchange rate changes were small since there was little depreciation of the real exchange rate. The total financing from all sources amounted to 6.6 percent of GNP. This number needs to be compared with the financeable deficit that we will derive from macroeconomic targets and debt strategies.

Consider first external debt targets and the restrictions on financing they imply. There is nothing magic about any given debt-output ratio. In Turkey, the ratio of external debt to GNP at the beginning of 1985 was more than twice as high as it was in the crisis year 1978. Nevertheless Turkey's creditworthiness has improved dramatically, presumably because of its much improved export performance. Due to the recent slowdown in Turkey's exports, however, further increases in the debt-output ratio may seem imprudent.

A real depreciation will, all other things being equal, increase the ratio of foreign debt to GNP and thus further restrict the room for external financing if the debt-output ratio is to be maintained at a particular level. This link, incidentally, points to a potential conflict between fiscal retrenchment and

Table 2. *Public Sector Deficit in 1985*
(percentage of GNP)

<i>Domestic financing</i>	
Increase in real value of all domestic liabilities	-0.6
Inflation tax	4.5
Total	3.9
<i>Foreign financing</i>	
Capital loss because of real exchange rate depreciation	0.2
Increase in real foreign debt at real exchange rate	2.5
Total foreign financing	2.7
<i>Total deficit</i>	6.6

Source: World Bank data.

increasing external competitiveness through exchange rate depreciation in the presence of a substantial foreign debt.

At the end of 1985 the external debt of central and local government and state economic enterprises (SEEs) plus foreign liabilities of the central bank minus the central bank's foreign assets was 48 percent of GNP.¹ At the 1985 real output growth rate of 5 percent, maintaining the end-of-period debt-output ratio of 48 percent allows for foreign financing of the deficit up to 2.4 percent of GNP. A 5 percent real depreciation would reduce the margin for external financing to zero, as the reduction in the debt-output ratio by a 5 percent real output growth will be offset exactly by the capital losses on external debt associated with a 5 percent real depreciation.

A more contentious question involves domestic debt issue. The real interest rate on auctioned one-year government paper was approximately 18 percent in early 1986. Issuing domestic debt at such a high real interest rate will allow lower money growth but at the cost of future increases in debt service obligations and thus future budget deterioration. The latter occurs because debt service will grow explosively at real interest rates so far above the real growth rate of the economy. A debt strategy that so clearly sacrifices future budget balance for current monetary restraint is likely to fuel inflationary expectations even if favorable external shocks allow a temporary decline in the rate of increase in prices. This in turn will keep nominal (and hence "ex-post" real) interest rates high, fueling a vicious circle of high interest rates, high public debt service, increasing budget deficits, high inflationary expectations, and back to high interest rates. (We demonstrate the negative impact of such a debt strategy on fiscal balance in tables 5 and 6 below.) Relying on further domestic debt issue should therefore be avoided, as cheaper forms of debt are still available. In what follows we will assume that the government does not allow any further *real* increase in domestic public debt.

The third source of financing is the issue of money. The government can raise revenue through monetary financing in two ways. First, for any given inflation rate, people will want to hold a certain amount of real money balances in relation to GNP. Thus a positive growth rate of output implies that the government can increase the real money stock in line with real output growth without undue pressure on inflation targets. This source of monetary financing is called seignorage. Its extent depends on the rate at which the output growth takes place; in Turkey a 5 percent real growth rate at a 25 percent inflation rate implies seignorage revenue of only 0.54 percent of GNP. Lower inflation increases desired money holdings in relation to output and will thus raise seignorage revenue. Growing monetization of the economy will likewise augment seignorage revenue.

1. A correction has been made for the fact that dividing debt by nominal GNP implies deflation of debt by an average rather than end-of-period price index. Turkey's central bank net foreign assets are taken from its *Quarterly Bulletin*. Other debt data were provided by the treasury.

The second source of monetary financing provides the link between fiscal deficits and inflation targets. We already saw that a particular inflation rate implies that people will want to maintain a certain ratio between real money balances and output. Since inflation reduces the ratio of real money to output, consumers increase nominal balances to offset this "inflationary erosion." This is referred to as the "inflation tax," since it forces moneyholders to reduce expenditure below income without providing any increase in real assets. At moderate inflation rates, the revenue it yields increases with the inflation rate. From the money demand estimate for Turkey, equation 14, it follows that the government can expect 2.7 percent of GNP from the inflation tax if inflation remains at 25 percent a year.

In the preceding paragraphs we outlined how much Turkish authorities can expect from the various sources of financing if prudent internal and external debt strategies are pursued and a real growth target of 5 percent and an inflation target of 25 percent are adopted. Adding up the financing these sources offer, under the constraints implied by the macroeconomic targets, yields an estimate of the financeable deficit of 5.64 percent of GNP. This is a full percentage point less than the actual deficit just derived (see table 3).

The deficit in 1985 was lower than that in 1984, largely because of expenditure cuts and higher than expected value-added tax revenues. Table 4 shows that it was just compatible with an inflation rate of 35 percent. A more moderate inflation rate of 25 percent, and certainly a further reduction to 15 percent, requires further reduction in the fiscal deficit (see table 4). A 15 percent inflation rate will slightly increase anticipated seignorage, as desired money holdings will rise; however, it will also substantially reduce the revenue from the inflation tax, down to 1.7 percent of GNP from its 1985 value of 4.5 percent. The required deficit reduction therefore increases to almost 2 percent of GNP (1.93 percent), as table 4 shows. The conclusion is clear: to maintain consistency between fiscal policy and even a moderate inflation target of 25 percent, a substantial further reduction in fiscal deficits, of 1 percentage point of GNP, is required. Current fiscal policy and inflation targets cannot simultaneously be maintained for a prolonged period of time.

Table 3. *Turkey's Actual and Financeable Deficit*
(percentage of GNP)

<i>Financing source</i>	<i>Deficit</i>	
	<i>Financeable</i>	<i>Actual</i>
Inflation tax, $\bar{P}m$	2.7	4.5
Change in domestic liabilities, $(\dot{m} + \dot{b})$	0.5	-0.6
Total foreign financing, $(\dot{b}^*e)$	2.4	2.7
Total financing	5.6	6.6

Note: The "financeable deficit" is calculated assuming growth of real output of 5 percent, an inflation rate of 25 percent, and no change in the real exchange rate or the ratio of domestic and foreign debt to output.

Table 4. *Required Fiscal Deficit Reduction for Consistency with Various Macroeconomic Targets*

(percent)

	<i>No real depreciation; real GNP growth 5 percent</i>			
Inflation target	15	25	35	45
Required deficit reduction	2	1	0	-0.8 ^a
	<i>No real depreciation; inflation 25 percent</i>			
Real GNP growth target	2	5	7	
Required deficit reduction	2.7	1	0	
	<i>Real GNP growth 5 percent; inflation 25 percent</i>			
Real depreciation target	0	5	10	
Required deficit reduction	1	3.4	5.8	

Note: Required deficit reduction (1985) is given as a percentage of GNP.

a. A minus sign indicates that the deficit can be increased without any conflict with the other macroeconomic targets.

A higher GNP growth rate relaxes the financing constraint by increasing revenue from seignorage and by allowing more foreign debt accumulation. Hence the smaller required adjustment effort as the growth rate of GNP rises. Growth will influence not only the financeable deficit, as indicated in table 4, but also the deficit itself, through increases in production, exports, or income on which government taxes may be based. Thus some of the required adjustment might take place automatically as growth picks up, while the opposite effect takes place when growth slows down; the figures in table 4 do not account for these possible changes in the actual deficit itself.

The final row in table 4 shows the fiscal implications of an export strategy that relies on real exchange rate depreciation to maintain export growth. Real depreciation raises the cost of servicing foreign debt and so reduces room for fiscal policy. The required cuts are substantial, because external public debt stood at 48 percent (1985). A 5 percent real depreciation would thus have *increased* the required adjustment by 2.4 percent to bring it to 3.4 percent of GNP, assuming 5 percent real output growth and 25 percent inflation. Similarly, a 10 percent real depreciation would require a fiscal adjustment of 5.8 percent to restore fiscal policy consistency.

Next, consider the consequences of an alternative financing method—domestic issue of government securities. With domestic real interest rates so far above the real growth rate, financing deficits through domestic bond sales will lead to explosive debt growth and increasing future fiscal deficits because of higher real interest payments. This is demonstrated in table 5 where we assume a restrictive monetary policy aiming at 15 percent inflation, and the same basic noninterest deficit as in 1985. However, we assume that the fiscal cuts required to sustain a monetary policy geared for 15 percent inflation are not undertaken. Instead, deficits are covered by issuing domestic debt at a real interest rate of 18 percent, which is approximately the real interest rate on auctioned government securities at the beginning of 1986. Each year, the interest on debt so issued is added to the deficit to be financed. The numbers in table 5 show the

Table 5. *Required Fiscal Deficit Reduction Due to Domestic Debt Financing of the Fiscal Deficit*
(percentage of GNP)

Macroeconomic assumptions	Years following debt issue						Change in domestic debt/output
	1	2	3	4	5	6	
Real GNP growth = 0 RER depreciation = 0 ^a External debt / GNP = constant	2.0	2.4	2.8	3.3	3.9	4.6	18.9
Real GNP growth = 5 percent RER depreciation = 0 External debt / GNP = constant	2.0	2.2	2.5	2.8	3.2	3.6	16.4
Real GNP growth = 5 percent RER depreciation = 5 percent External debt / GNP = constant	4.4	4.9	5.6	6.2	7.0	7.9	36.1
Real GNP growth = 5 percent RER depreciation = 5 percent Nominal value of external debt = constant	6.8	7.6	8.6	9.7	10.8	12.2	55.7

Note: The required reductions are calculated assuming 15 percent inflation and an 18 percent real interest rate.

a. RER is the real exchange rate.

required adjustment in six successive years if fiscal consistency were to be attained in that year.

The table demonstrates that while bond sales make it possible to sustain restrictive monetary policy, they do so at the cost of ever larger fiscal cuts if consistency is to be restored. The reason for this is that the real interest rate on internal debt substantially exceeds the growth rate of the economy. That becomes clear when comparing the first two rows in table 5. Row two shows the effects of such a debt management policy at a 5 percent growth rate of real output. In this scenario, the required fiscal deficit reduction rises from 2 percent to 3.6 percent of GNP in six years. At lower growth, this increase is much bigger; row one shows that at zero real growth, the required cut increases to 4.6 percent in six years.

The situation is actually worse than is shown: a lower growth rate for a given real interest rate not only influences the dynamics of the process but would also increase required deficit reduction in the base year (see table 4). This is ignored in row one of table 5 to bring out the dynamic complications more clearly.

Table 5 also shows the effects of various changes in the assumptions on exchange rate policy and external debt management. The 5 percent real depreciation per year adds to the cost of external finance, and has implications for external debt accumulation. The exercise has been set up under the assumption

of a constant external debt-output ratio. At a 5 percent real rate of depreciation and 5 percent real growth rate of GNP, that implies no real increase (in terms of foreign goods) in external debt. In other words, to meet the external debt target, nominal debt can only go up at the foreign rate of inflation under this scenario. This clearly adds to the pressure on domestic finance, as table 5 shows; the total of internal debt to GNP increases by 36 percentage points over the six years shown. Compound interest on internal debt also makes for a rapid deterioration of the fiscal situation: the required adjustment rises from 4.4 percent to 7.9 percent in six years under the pressure of the increasing cost of servicing the growing internal debt.

The final row assumes a stricter target on external account: no increase in the dollar value of external debt. This means that a 5 percent rate of world inflation would imply an approximate 5 percent real decline in the value of the debt. This adds a further 2.4 percent of GNP to domestic financing requirements if no matching expenditure cuts or tax increase takes place. Table 5 shows that under this scenario the fiscal situation will deteriorate very rapidly because of the large interest differential between internal and external debt.

There is an alternative way of presenting these intertemporal tradeoffs which may be more realistic. In table 5, we assumed that fiscal adjustment would be postponed but would take place eventually. The table suggests at which intertemporal terms adjustment today can be traded for adjustment tomorrow. Since real interest rates exceed the growth rate of real GNP, those terms are unfavorable, as the table shows. But what if, in the future, fiscal adjustment does not take place, and monetization becomes the residual source of finance? What happens if monetization is reduced through increased bond finance, in an attempt to restrain inflation, only to see renewed monetization later when debt service escalates too much?

Table 6 shows the tradeoffs involved when fiscal adjustment does not take place. Column one shows which inflation rate is required to yield sufficient

Table 6. *Intertemporal Inflation Tradeoffs through Temporary Bond Financing*
(percent)

Macroeconomic assumptions	Years following debt issue					
	1	2	3	4	...	6
Real GNP growth = 5 percent RER depreciation = 0 ^a External debt / GNP = constant	35	38	41	45		55
Real GNP growth = 5 percent RER depreciation = 5 percent External debt / GNP = constant	67	75	88	102		**

** Indicates there is no inflation rate at which the financing gap can be covered.

Note: Inflation rates shown after year 1 are those required to finance the fiscal deficit when bond financing is used in the intervening years.

a. RER is the real exchange rate.

inflation tax revenue to cover the entire gap under zero and 5 percent rates of real exchange rate depreciation. Column two shows what is needed in year two if in the intervening year bond finance is used. Once again, since real interest rates exceed the growth rate of real GNP, the debt service burden will have increased and more inflation is needed to restore balance. Column three shows the corresponding entry for year three if bond finance has been relied upon for the intervening two years, and so on.

For a 5 percent growth rate of real output and a constant real exchange rate target, the financing gap equals 2.2 percent of GNP, as we saw before. To finance this through the inflation tax requires 35 percent inflation. Postponing adjustment through bond issue at the 18 percent real interest rate prevailing at the end of 1985 clearly compounds the problem: after three years, the inflation rate necessary to fill the gap has increased to 45 percent and two years later, to 55 percent. In addition, the cost of the policy increases as the inflation rate rises; the second 10 percent increase took only half as much time as the first 10 percent increase. This is due to the fact that the marginal revenue from inflation tax falls as higher inflation pushes money demand in a more price-elastic range.

The second row in the table goes through the same exercise, but assuming a 5 percent real depreciation each year. This erodes the fiscal deficit through increased capital losses on foreign debt and hence requires higher inflation tax revenues and thus higher inflation rates. In the first year, 67 percent inflation is required to fill the financing gap. This rapidly escalates to just over 100 percent in the fourth year, after which the financing gap becomes too large to be covered through the inflation tax.

III. CONCLUSION

In this article we present a framework to assess the consistency of fiscal deficits with macroeconomic targets such as inflation, output growth, and real exchange rate developments. The framework's usefulness is demonstrated in an analysis of the consistency between macroeconomic targets and current fiscal deficits in Turkey. The analysis suggests that, if 1985 is taken as a benchmark, a substantial reduction in the fiscal deficit is necessary: an inflation target of 15 percent is shown to require, for consistency, a cut of 2 percentage points of GNP in the total public deficit. It should be emphasized that this measure includes the entire public sector—the central government (inclusive of extra-budgetary funds), local governments, state economic enterprises (SEEs), and the central bank.

The example demonstrates how taking a more restricted definition of the public sector may yield misleading results. While including SEEs, local government, and off-budget agencies is by now accepted practice, our inclusion of the central bank in the public sector accounts is not. We show how such an integrated view is necessary for a consistent link between deficits, money creation, and debt. This link is crucial for any assessment of sustainability, and, as

a corollary, so is the inclusion of the central bank accounts into those of the public sector.

We also highlight a number of interactions between different macroeconomic instruments and targets that often receive insufficient attention. First, pursuing current restrictive money growth targets by relying on debt finance rather than cuts in the noninterest deficit sacrifices future budget balance if real interest rates exceed the real growth rate of the economy. In this sense there is an intertemporal tradeoff between current and future inflation when bond issues rather than fiscal correction are used to support tight money. We demonstrate quantitatively that in Turkey this tradeoff takes place at highly unfavorable terms in the year considered in this example.

Second, there is a conflict between fiscal retrenchment and increasing external competitiveness through exchange rate depreciation in the presence of a substantial foreign debt. This is because of the impact of a real depreciation on the real cost of foreign debt service. Thus, an export strategy that relies on real depreciation to maintain export growth requires more stringent fiscal policy to an extent quantified in the preceding section.

Finally, there is a link between stabilization policy and growth: a higher GNP growth rate relaxes the financing constraint by increasing revenue from seignorage and by allowing more foreign debt accumulation within the constraint of a given debt-output ratio. Hence the smaller required fiscal adjustment effort as the growth rate of GNP rises.

APPENDIX. REVENUE FROM MONETIZATION AND THE STRUCTURE OF THE FINANCIAL SECTOR

In the article we argued that the appropriate money concept to use is net central bank liabilities to the private sector or base money. It is clearly important to understand how demand for base money responds to changes in financial sector regulation, interest rates, and so on. The money demand function used in the example of section II is too simple to incorporate the impact of changes in reserve requirements, for example. Incorporating such shift factors in the money demand function creates a practical problem in that central bank has liabilities of different agents in the economy. It is unlikely therefore that an aggregate money demand function would adequately capture the sensitivity of reserve money demand with respect to changes in the inflation rate, financial structure, and interest rates.

In what follows we outline an approach that explicitly incorporates the structure of the financial sector, and we enter separate behavioral equations for different actors (for an application, see van Wijnbergen, Anand, and Rocha 1988). Underlying the approach is a model describing private portfolio choice as a function of inflation, output growth, and interest rates, which gives the amount of currency, demand deposits, and time deposits the private sector is willing to hold. This is coupled with a simple financial sector model incorpo-

rating reserve requirements and other bank regulatory policies to derive the demand for reserves by commercial banks. The demand for reserves is then added to the demand for currency already derived to get an estimate of the total demand for base money. This is used to calculate revenue from monetization for different inflation rates, output growth rates, and interest rates, and for different regulatory policies.

This indirect, structural approach has a number of advantages. It allows explicit calculation of the effects of changes in financial sector regulation on the financeable deficit through the impact of such regulation on the aggregate demand for base money. For the same reason, this approach is more likely to be stable across changes in financial sector regulation. Below we give an example for a simple fractional reserve banking system (that is, a system where banks are required to hold a fraction of their deposits as reserves). More complicated regulatory systems can easily be incorporated (see Rocha and van Wijnbergen 1988 for more extensive discussion).

To analyze the determinants of the demand for the primary components of reserve money entering into such a financial sector model, consider first a simple portfolio approach to private asset demand:

$$(A-1) \quad (Cu/GNP) = f_C(\hat{P}, i_{DD}, i_{TD})$$

$$(A-2) \quad (DD/GNP) = f_{DD}(\hat{P}, i_{DD}, i_{TD})$$

$$(A-3) \quad (TD/GNP) = f_{TD}(\hat{P}, i_{DD}, i_{TD})$$

Demand for currency Cu , demand deposits, DD , and time deposits, TD , each as a share of nominal GNP, depend on inflation and the interest rates paid on demand and time deposits, i_{DD} and i_{TD} .

More sophisticated financial structures would introduce additional factors. For example, with foreign exchange deposits available one would expect exchange rate depreciation and foreign interest rates to influence demand for domestic assets. The time period since the introduction of foreign exchange deposits in Turkey, however, has been too short to allow econometric analysis of the influence of such factors.

Under a fractional reserve system, with reserve requirement ratios, RR_{DD} and RR_{TD} against demand and time deposits respectively, demand for base money M is:

$$(A-4) \quad \begin{aligned} M/(GNP) &= Cu/(GNP) + RR_{DD}(DD/GNP) + RR_{TD}(TD/GNP) \\ &= f_C(\hat{P}, i_{DD}, i_{TD}) + RR_{DD}f_{DD}(\hat{P}, i_{DD}, i_{TD}) \\ &\quad + RR_{TD}f_{TD}(\hat{P}, i_{DD}, i_{TD}) \end{aligned}$$

Equation A-4 can be used to derive the impact of changes in inflation, interest rates, and financial sector regulation on base money demand (as a share of GNP; the inverse, GNP/M , is often referred to as velocity) and their likely impact on the revenue the public sector can expect from monetization. Com-

binning this information with equation 13 of section I allows assessment of the fiscal consequences of financial sector reforms affecting, for example, reserve requirements or the interest rates paid on various types of deposits in commercial banks.

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Food Aid: A Cause of Development Failure or an Instrument for Success?

T. N. Srinivasan

The role of food aid in furthering the economic development of poor countries and in alleviating the adverse effects on the poor of structural and sectoral adjustment programs is discussed. A simple analytical framework for evaluating the incentive and welfare impact of food aid is suggested. Domestic and international markets for food historically have been subject to severe distortions, leading to ever-growing food stocks in some, mainly rich, countries while in others, largely poor, many cannot afford to consume enough food. The possible impact of distortion-free global food markets is sketched. The use of surplus food for payment of wages in rural works programs has often been proposed as a means to create productive assets while alleviating poverty. Using an applied general equilibrium model of the Indian economy, it is shown that a well-designed and efficiently implemented food-for-work program can virtually eliminate abject poverty in India at a modest cost. Experience with food aid in several other countries is also briefly discussed.

This article is concerned with food aid, its role in furthering the economic development of poor countries and in alleviating the adverse effects on the poor of structural and sectoral adjustment programs that many developing countries are undertaking. Some of this ground is well covered in the voluminous literature on food aid (Hopkins 1984, 1987, Mellor and Ezekiel 1987, World Food Programme 1983, 1985, and Wallerstein 1980, to mention only a select few). For an iconoclastic analysis of hunger, see Lappe and Collins (1977).

Before discussing food aid, a few remarks on aid in general may be appropriate. While any form of aid from one agent (individual, household, nation) to another is an unrequited transfer, the donor may often expect or receive some favors from the recipient in other forms (for example, political concessions or support). Furthermore, in a world with three or more agents, terms-of-trade effects can make a transfer from one agent to another beneficial to the transferor and not to the transferee. Some have suggested that developing

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countries, in accepting economic aid, have obtained short-term benefits at the cost of long-term dependency. Others argue that aid from governments and multilateral agencies (including loans at concessionary terms) is in large part a correction of the imperfect international markets for capital and risk sharing and shifting. Two very interesting recent studies, Cassen (1986) and Krueger and Ruttan (1983), explore in depth the larger concerns about aid.

Food aid, other than as emergency relief when famines or other abnormal circumstances arise, is of two forms: project aid, where aid is tied to the implementation of projects mutually agreed upon by the donor and recipient, and untied program aid. If a project is defined broadly enough to include policy reforms or changes, then the so-called policy-conditional food aid would be covered under project aid. I will discuss emergency food aid for relief of famines and natural disasters only briefly. My concern is mainly with longer-term food aid.

Hopkins (1984) points out that food aid has evolved from its inception in the 1950s as a means for disposal of food surpluses in donor countries to a policy tool for promoting economic development in the recipient countries in the 1980s. The volume of food aid has fluctuated, ironically reaching a low during the food crisis of 1973–74. The recovery since then has not restored the volume to the levels of the mid-1960s (table 1). In the mid-1960s the United States was essentially the only food aid donor. By the mid-1980s the European Economic Community (EEC) emerged as a significant donor, in large part reflecting the growth of its food surpluses as a consequence of its common agricultural policy of price support and protection of agriculture as well as the reduction in U.S. food stocks. Thus, surplus disposal as an objective has not completely disappeared from the food aid scene. Even though liberalization of agricultural trade is one of the items on the agenda of the ongoing Uruguay Round of multilateral trade negotiations and the costs of domestic agricultural subsidy programs are spiraling in the United States and the EEC, it is unlikely that either the programs or the surpluses will disappear soon.

Food aid can further economic development through several channels. First, as does any form of aid, it adds resources that can be used for current consumption or accumulation. Second, since most food is internationally traded, food aid provides balance of payments support (just as any other form of

Table 1. *Cereal Aid by Principal Donors*
(millions of tons)

<i>Donor</i>	1965–66	1967–68	1972–73	1974–75	1984–85
Australia	—	0.19	0.26	0.33	0.48
Canada	—	0.80	0.81	0.61	0.94
EEC	—	—	0.99	1.41	2.47
United States	17.32	13.50	6.95	4.72	7.54
Total (including others)	17.73	16.22	9.96	8.40	12.52

— Negligible.

Source: FAO (1985).

foreign aid) by reducing the foreign exchange spent on food imports. Third, it augments the domestic availability of food (though not necessarily on a one-to-one basis). Fourth, to the extent it is targeted at the poor, it can alleviate poverty, a major goal of economic development. By improving the health and nutritional status of the poor it augments their human capital and future income earning capability. Fifth, food aid tied to development-oriented projects that would not have been undertaken otherwise promotes development. Sixth, to the extent it can be credibly tied to the initiation of growth-promoting policies and reform of policies detrimental to growth, it can promote development. This last role can be important in the structural adjustment process. Adjustment to unanticipated shocks as well as reform of entrenched policies involve political and economic costs. External aid, including food aid, can in some situations increase the credibility of reforms by alleviating these costs. The operative word in all the above is "can" and not "will."

As against the benefits of food aid, several possible costs have been discussed in the literature, for example, that it blunts incentives for domestic food production and hence increases the probability of long-term dependency on donors; or that by alleviating food shortages, it enables the regime in power to postpone, if not abandon, politically costly economic reforms.

Whether the potential of food aid for furthering development will be realized in full measure depends on the flexibility with which it is used, whether other objectives of donors conflict with the objective of economic development, and whether the domestic, economic, political, and institutional environment in recipient countries is conducive to efficient utilization of food aid as a development tool.

Section I is devoted to the analytics of food aid. Section II takes up the impact of global agricultural trade liberalization. Since surplus disposal has been an objective of food aid and the emergence of agricultural surpluses in the developed (and even in some developing) countries is a consequence of protection, it is worth analyzing the costs and benefits to developing countries of a liberal trade regime in agriculture. It is also worthwhile to see to what extent additional food availability in the global market will improve nutritional status in developing countries through reduced world prices of food. This section draws on the simulations from the Basic Linked System of Models (BLS) of the Food and Agriculture Project of the International Institute for Applied Systems Analysis (IIASA). In section III, the Indian model of the BLS is used to analyze the impact on the poor of an expansion of the subsidized system of public distribution of foodgrains and of the so-called food-for-work program, in which labor from poor rural households is employed in slack agricultural seasons in public works projects (roads, irrigation works, schools, and so on) and is paid in kind (at least in part) with foodgrains. These simulations are of some interest, since one of the more important objectives of food aid is poverty amelioration and improvement of nutritional status, and food-for-work programs are prime examples of projects to which food aid is tied. Section IV

briefly reviews some salient features of the experience with food aid. Section V concludes the paper with a few remarks on past experience with food aid and policy implications for the future.

I. SOME SIMPLE ANALYTICS OF FOOD AID

The standard workhorse of international trade theory, the two-commodity general equilibrium model, can be used to illustrate some of the analytical issues involved in food aid. Indeed, Bhagwati (1986) did so to great effect. We reproduce and extend his analysis below. A more general framework involving many commodities, while analytically tractable, will not add much to the insights derived from the use of a simpler framework in the present case.

Consider a country producing and consuming two aggregate commodities, food and nonfood. The production possibility frontier (PPF) of this country is AB in figure 1. The preferences of its citizens are represented by a set of Samuelson social indifference curves (SICs). Such a representation is based on a social welfare function that aggregates individual welfare and takes into account the feasibility of lump-sum income transfers (or some other nondistortionary tax subsidy mechanism) between individuals to implement social welfare maximization through decentralized markets. The latter is a critical

Figure 1. *Food Aid without International Trade*

assumption. As is well known, if lump-sum transfers are ruled out, resource-allocational efficiency cannot be separated in general from distributional equity issues. In other words, achieving distributional equity may involve the use of policy instruments that result in efficiency losses, and a tradeoff inevitably arises.

Assume, to begin with, that the country is in autarkic equilibrium with its production and consumption at P^0 , where the sic represented by CC touches the PPF . The equilibrium domestic relative price of food in terms of nonfood is the common slope of the PPF and sic at P^0 . The common tangent is shown as PP (hereafter price PP). Suppose the country (its government) is offered food aid, gratis, in the amount AA^1 . What will be its effect on domestic prices, production, and welfare? Of course, the answer will depend on how the recipient government responds to aid or conditions, if any, that the donor imposes on the recipient. We begin with the case of a closed economy.

Incentive Effects (Closed Economy)

With food aid of AA^1 , the domestic availability curve becomes AA^1B^1 , which is to the right of the PPF by the distance AA^1 . Suppose the government sells the food aid in the open market and returns the sale proceeds to consumers as lump sum income transfers. If the domestic price remained unchanged at PP , output and domestic availability will be at P^0 and $\hat{A}$ respectively. By construction, the slope of curve AA^1B^1 at $\hat{A}$ equals price PP . For simplicity assume homothetic social preferences in which, given the same relative prices, the relative proportions of goods demanded remains the same at all levels of income or consumption. Then demand at price PP and disposable income $O\hat{P}$ in terms of food (including the value of food aid received as lump sum transfers) will be $\hat{C}^1$. The resulting excess supply (demand) of food (nonfood) forces relative food prices down. Equilibrium obtains at $\hat{A}^1$ to the left of $\hat{A}$ at which an sic (not shown) touches AA^1B^1 . Production is at P^1 on the PPF . At P^1 the equilibrium domestic relative price of food (that is, the slope of PPF at P^1) is below price PP and food output is lower than at P^0 . This illustrates the often-cited production disincentive effect of food aid. Although the domestic price of food and its output have fallen, consumer welfare at A^1 is clearly *higher* than at P^0 . This is to be expected since aid is a transfer that augments the commodity availability set of the economy and the use of lump sum transfers counters any social welfare reducing income distributional effects among citizens. Gainers from aid can fully compensate the losers (that is, food producers) and still gain.

However, the government can maintain producer incentives by not allowing the domestic relative price to fall from PP and by ensuring consumers are in equilibrium at $\hat{A}$. For this to be a consumption equilibrium, the relative price of food facing consumers must be the slope of the sic passing through $\hat{A}$. Clearly this price will be lower than PP , at which price, as we saw earlier, there is an excess supply of food. A food subsidy for consumers (or equivalently a tax on nonfood) will therefore be needed. With this distortionary subsidy (or

tax), consumer welfare at $\hat{A}$ (where an SIC intersects AA^1B^1) is lower than at $\hat{A}^1$ (where an SIC touches AA^1B^1), but of course higher than at P^0 . With a consumption tax on nonfood, the problem of financing does not arise—the tax revenue as well as the proceeds from food aid can be returned to consumers as lump sum transfers. If nonfood consumption is not taxable and production is to remain at P^0 , then part of the value of food aid (at domestic prices) has to be used in financing the food consumption subsidy. Producer incentives could be maintained also through a production subsidy on food relative to the consumer price at $\hat{A}$ or equivalently a production tax on nonfood.

These illustrations demonstrate that food aid being an unrequited transfer adds to domestic resources and at the same time adds to domestic food availability. Under laissez-faire, with prices unchanged, since not all of the additional resources will be spent on food, the relative price of food has to fall to absorb the additional food. However, consumer welfare will unambiguously rise. An intervention is needed if the price fall is to be prevented or mitigated. If this intervention takes the form of a food consumption subsidy or an equivalent production subsidy, part of the additional resources will be used up in financing the subsidy. This distortion-creating intervention will reduce the welfare gain from food aid compared to laissez-faire, but the gain is still positive. Thus the fall in food prices with aid is neither undesirable, if it occurs as in the laissez-faire situation, nor is it inevitable, since it can be prevented through government intervention (albeit at some welfare cost).

Usual Marketing Requirements or Additionality (Open Economy)

Let us now turn to the more realistic world in which the economy receiving food aid is open to international trade. To keep matters simple, let us assume the economy is a price taker in world markets and in the absence of noneconomic objectives is rationally following a free trade policy. In the pre-aid equilibrium (figure 2) production is at P^0 , consumption is at C^0 (with the slope of P^0C^0 representing the relative price of food in world markets). Food imports equal C^0D^0 . Suppose now food aid in the amount T^0T^1 becomes available. With prices unchanged (because of free trade), production remains at P^0 , availability moves to A^1 , and consumption moves to C^1 (under homotheticity). Food imports rise to C^1D^1 . However C^1D^1 is less than the sum of the pre-aid commercial imports C^0D^0 and food aid T^0T^1 . Thus part of food aid has been used to replace commercial imports.¹

Food aid donors do not wish to see their commercial sales reduced as a consequence of food aid. For this reason they often impose what are called

1. In this setup, the impact of food aid on demand is the same as that of aid not tied to food of equivalent value; that is, food aid is equivalent to the lump sum income transfer. In a different context, public finance economists in the United States compared different forms of grants to state and local government from the federal government on their impact on local public expenditures. Empirical analysis of the effects of revenue-sharing arrangements (which are analogous to food aid) appear to show that, contrary to theory, they are not equivalent to lump sum grants (see Gramlich 1977).

Figure 2. Food Aid with International Trade

“usual marketing requirements” (UMR) as a condition for providing food aid. These can take various forms. But for simplicity assume that the donors require that the recipient country continue to import at least as much as it did from commercial channels before food aid. This means, given the aid, *total* imports (aid plus commercial) has to be at least $C^0D^0 + T^0T^1$. As is well known from the theory of noneconomic objectives (Bhagwati and Srinivasan 1969), the optimum policy to absorb food imports exceeding the level that would obtain under *laissez-faire* is to have an import subsidy. This means that the domestic price of food will fall below world prices, thereby discouraging domestic food production and consumption sufficiently to increase imports of food to the required extent. In figure 2 an import subsidy on food moves the production point to P^2 from P^0 , thus lowering the output of food. The availability frontier now passes through A^2 , and consumption is at C^2 . Food imports C^2D^2 now equal pre-aid imports C^0D^0 plus food aid. Such a policy minimizes the welfare loss (relative to *laissez-faire*) associated with meeting UMR.

This brings to the fore a possible conflict between the two objectives of the donors, namely between the desire to see incentives for food production in the

recipient country not being adversely affected and the desire to see that export markets for food for donors are not adversely affected by aid. UMR serve the latter objective at the expense of the former if the optimal response of the recipient country through an import subsidy reduces the domestic price of food there. Of course, if the donors insist on both objectives being met, they will force the recipient country to use the policy of a food consumption subsidy rather than the first-best import subsidy, thereby imposing on it a further welfare loss relative to aid without conditions.

Food Aid and Improvement of the Nutritional Status of the Poor

An objective of food aid is to improve the income and nutritional status of the poor in recipient countries through some form of targeting. To explore this set of issues a partial equilibrium model of the global food market is used. More specifically, all donors of food aid are aggregated into one and all recipients into another, with the former exporting food to the latter. Two distinct groups of consumers within the recipient region are distinguished: the poor, who have fairly elastic demand with respect to price, and the rich, who have fairly inelastic demand. Again for simplicity, assume that there is no domestic production of food in the recipient region. For the sake of variety let us illustrate with numerically specified export supply and demand functions rather than with diagrams.

The export supply function of the donor region is $0.9 + p$, where p is the price per unit. The demand functions of the rich and poor respectively are $10 - 0.01p$, $0 \leq p \leq 100$ and $2 - 0.1p$, $0 \leq p \leq 20$. In free trade with no aid, the market clears at a price of 10, with the donor region exporting 10.9 units, of which 9.9 are consumed by the rich and 1 by the poor in the recipient region.

Suppose now the farm lobby in the donor region succeeds in raising the domestic price of food (by a "modest" 5.5 percent) to 10.55. The export surplus rises to 11.45. Were this to be "dumped" in the recipient country market, the price would fall by 50 percent to 5, with the consumption of the rich increasing to 9.95 and the poor to 1.50. Thus export revenue would fall from 109 to 57.25. The cost to the donor country treasury of acquiring and dumping the surplus arising out of the domestic price increase would be $(10.55 - 5) \times 11.45 = 63.5475$. Policymakers in donor countries may think that there must be better ways of disposing of the surplus created by their domestic price policy than to dump it in world markets! One such idea is food aid tied to its being used for the poor in the recipient country.

The donor offers, say, 1.55 units of the export surplus free of cost to the recipient country to be sold to the poor, the resulting revenues being kept by the recipient country government. The rest of the surplus, 9.9 units, is sold to the rich. Assuming that the transactions cost for the poor of reselling to the rich is prohibitive, the sale in the rich market will yield a price of 10. Thus the price paid by the rich and their consumption are the same as in the free trade

equilibrium situation. The consumption of the poor rises by 55 percent to 1.55 and the price they pay falls by 55 percent to 4.5 as compared with free trade equilibrium. The donors realize a revenue of $10 \times 9.9 = 99$ on the sales to the rich, thereby reducing the cost of their domestic price support program to 21.7975 from 63.5475, a reduction of more than 65 percent. The recipient country government realizes a revenue of 6.975 from the sale of food aid to the poor. Thus in the recipient country, with aid, the rich are just as well off as in the free trade situation, the poor much better off, and the government acquires revenues. As compared with the hypothetical equilibrium with dumping, in the aid equilibrium the poor in the recipient region are better off, the rich worse off (their food consumption under dumping at half the price would have been 5 percent higher), and the government is better off (it gets no revenue under dumping). The donor government, given that it has to raise domestic prices, is better off in the aid equilibrium compared with dumping, since it saves more than 65 percent on the cost of price supports!

The essence of the above example is that by inducing the recipient country to isolate the market with more elastic demand, that is, the poor market, with the carrot of food aid and the right to keep the revenue from sales to the poor, the donor government achieves price discrimination. If the poor are easily identified and targeted and the costs of organizing a resale market are sufficiently high, such market segmentation is possible. With such segmentation the donor government can do even better by giving the poor 2 units of food free of charge and selling the remaining 9.45 units to the rich at a price of 55 (a jump of 550 percent over the price in free trade), thus realizing a revenue of 519.75 and making a profit of 398.9525! Clearly, the rich in the recipient country will strenuously resist such gouging, let alone the fact the recipient government may balk because it receives no revenue from such a gift of food! Achieving price discrimination through food aid with the consent and cooperation of the recipient country government is the next best thing to gouging. Be that as it may, there is no reason to believe that monopolistic exploitation was ever the motivation of those who thought of food aid tied to the poor in recipient countries as a less costly way of dealing with surpluses than dumping. However, they may have viewed as more realistic the cost saving in surplus disposal achievable through what is essentially price discrimination.

In practice complete segmentation of markets is unlikely, and to the extent some part of the aid sold to the poor is resold to the rich the equilibria in the rich market will be lower and the cost of surplus disposal correspondingly higher. However, if the poor can be targeted but market segmentation is impossible, providing the poor with an income subsidy from aid receipts to shift their demand curve for food outward is another approach. If, for example, the demand curve of the poor shifts to $2.33 - 0.1p$, when the sale proceeds of, say, 1.55 units of food, is transferred to them instead of accruing to the recipient government, the equilibrium market price will be 8. The donor government realizes 79.2 from sales of 11.45 units less the revenue given to the

poor, and the cost of surplus disposal becomes 41.5975, a reduction of about 35 percent compared with the dumping case. Governments in those countries interested in the welfare of the poor may welcome such targeted aid-cum-income subsidy for the poor even though they receive no revenues.

*Project Tying, Commodity Composition of Aid,
and Use of Counterpart Funds*

Food aid by definition is tied aid: it is tied to a commodity or set of food commodities given as aid. However, as we saw earlier, if there are no usual marketing requirements and as long as the recipient country imports these commodities commercially and the volume of aid is not too large relative to commercial imports, commodity tying is likely to be of relatively little consequence, as long as rational behavior can be assumed (see footnote 1). Sometimes food aid is tied to particular projects, such as food-for-work projects (more on this below) in which a part or all of the wages of workers employed in such projects are paid in kind with food. There is no evidence to suggest that the availability of food aid has led to the choice and implementation of projects that should not have been chosen. If projects proposed for implementation are evaluated using techniques of social cost-benefit analysis in which food aid is valued at its social opportunity cost, the availability of food aid per se will not necessarily make a project (that would not have been socially worthwhile if food were to be commercially imported) pass the social cost-benefit test. The social cost of food obtained through aid has to be sufficiently below its commercial import cost to bring this about.

Food aid, originating as it did with the accumulated surpluses in donor countries, is more often than not offered in commodities which happen to be in surplus, mainly wheat, rice, yellow maize, and dairy products. As most of these commodities are internationally traded, the fact that aid comes in a particular commodity composition will not create any problem to the recipient if usual marketing requirements are not imposed as part of aid. By substituting for commercial imports or exports appropriately, aid can be absorbed without any domestic production effect. Even if the recipient country does not trade, as long as there are substitution possibilities in domestic production or consumption, aid can be absorbed by suitably altering the domestic production and consumption baskets through appropriate price changes. Of course, a problem can arise if conditions imposed on the recipient preclude trading part or all of the aid given in one commodity for others, and if there are no substitution possibilities in production and consumption. An example of such aid is yellow maize offered to Kenyans who preferred white maize. Since the same donor often provides aid to many countries with differing preferences and production possibilities, by permitting the recipients to exchange commodities received in aid for others which they can supply, the utility of aid to each recipient can be enhanced without affecting the donor's interests. Indeed, if such a swap can be planned ahead, some saving in transportation and other transaction costs can be attained as well.

A potentially more serious problem arising from food aid is the change in consumption preferences in the long run in the recipient country toward the commodities supplied as aid. Although a shift toward imported "superior" cereals (wheat and rice) supplied by aid and away from domestically produced "inferior" coarse grains has been observed in West Africa (Delgado and Miller 1985), as Mellor and Ezekiel (1987) point out, this shift may be simply a reflection of higher Engel elasticity for wheat and rice, in addition to the effect of lowered price of wheat and rice brought about in part by absorbing aid. In other words, the shift in commodity composition of consumption reflects the same preferences (that is, set of indifference maps), and changing budget constraints (prices and incomes) rather than a change in the preferences.

The possible real problem is the fact that the continuance of food aid in the indefinite future is uncertain, and even if it continues, its volume will certainly fluctuate. If the resources allocated away from the production of commodities supplied under aid cannot be flexibly reallocated without excessive cost, then foreign exchange will have to be spent to import commodities when they are no longer supplied or supplied in smaller volumes under aid. Unanticipated withdrawal of food aid constitutes an adverse shock to which the economy will have to adjust. There is substantial evidence (Balassa 1985) that economies which have maintained a neutral incentive structure between earning foreign exchange through export promotion and saving foreign exchange through import substitution, thereby adhering to dynamic comparative advantage considerations, have not only achieved efficient and rapid economic growth but have weathered better the adverse oil and interest rate shocks since 1973. Apart from the foreign trade regime, domestic distortions of various kinds, including those adversely affecting producer incentives in agriculture and the capability to respond to a changing economic environment (in particular to the availability of new technologies) can impose high and avoidable social costs of adjustment.

Most of the above analysis is based on the assumption that food aid is an unrequited transfer. In reality this is not quite so. Until 1972 or so, the revenues generated in a recipient country's currency (the so-called counterpart funds) by the sale of food aid received under U.S. Public Law 480 Title I (PL480) were put in special accounts, the disbursement from which was governed by agreements between the United States and recipient country governments. In effect the value of food aid was a U.S. asset in local currency, although the recipient had some say over the use of it. Part of it was used for some U.S. embassy expenses and part as a grant for investment on agreed projects. To the extent such expenses would have been incurred and such projects would have been aided even if counterpart funds were not available, the use of local currency assets for such purposes meant that foreign exchange that would otherwise have accrued to the recipient did not. Thus, the foreign exchange saved by the recipient to the extent food aid replaced commercial food imports becomes in effect a loan that is repaid later in the sense of potential foreign exchange inflow forgone.

In cases where the project would not have been aided but for the availability of U.S. assets in local currency, nor undertaken by the recipient in the absence of aid, the undertaking of the project adds to domestic demand which otherwise would have been absent, thereby adding to inflationary pressures usually present in many developing countries. In other cases some have argued that it is inflationary because the use of accumulated counterpart funds is not associated with any fresh inflow of food or other commodities from abroad. In India there was an extensive debate on PL480 aid (Rath and Patvardhan 1967; Shenoy 1974) and in particular on the inflationary potential of the use of PL480 funds and whether the deposits of such funds in special accounts added to the money supply growth, thereby adding another source of potential inflation (Sundaram 1970 and the references cited by him). The debate was inconclusive, mostly because whether or not any inflationary potential was realized depended on the assumptions one made about the actions (accommodating or sterilizing) of the Indian government and monetary authorities.

*Food Aid Dependency, the Neglect of Agriculture,
and Long-Term Development*

The permanent shift in consumption preferences toward commodities supplied as aid is only one example of long-term consequences of food aid. Another is the complacency on the part of the recipient with a poorly performing agricultural sector, if not outright discrimination in favor of other sectors, induced by the expectation that food aid will be forthcoming to solve any emerging food problems. Such an attitude, it is claimed, can be changed only by withdrawing food aid or by making it costly politically, if not economically. For example, it has been suggested that the availability of cheap food under PL480 enabled Indian policymakers to neglect agriculture and pursue an import-substituting industrialization strategy emphasizing heavy industry while at the same time keeping the vocal urban population, including industrial workers and the bureaucracy, happy with public distribution of subsidized food and other essential commodities. U.S. President Lyndon Johnson's approved PL480 shipments to India on a month-to-month basis while India was threatened with famine after two successive years of unprecedented drought in 1965-66 and 1966-67 (which many saw as an attempt to change India's stance toward the Vietnam War). It is claimed that this convinced Indian policymakers of the dangers of food aid dependency and that the political cost of the neglect of agriculture was too high. In this version of history, Indian policymakers dramatically shifted the incentives in favor of agriculture, the Green Revolution was facilitated, and consequently India was able to export food in the late 1980s.

The facts appear to be more prosaic. As I showed elsewhere (Srinivasan 1986), the available data do not support the contention that the agricultural sector was much more favored in terms of allocation of investment by Indian

economic planners in the period since the mid-1960s than before.² Nor is there any evidence for any significant change in the trend rate of growth of output of foodgrains or real agricultural output between the two periods. What did happen is a change in the sources of growth, a relatively larger proportion in the later period being accounted for by improvements in yield per hectare of cropped area and a smaller proportion by expansion of area. Of course the performances of different crops were not the same, with the growth in output of wheat (and to a lesser extent, rice) being substantially faster in the later period because of the adoption of the Green Revolution technology. This also suggests that if the planners shifted resources toward agriculture in the later periods, it may have been a rational response to the rightward shift in the marginal productivity of investment schedule for agriculture because of the Green Revolution, a technology that became available only in the mid-1960s.

The aid dependency argument is a multifaceted one. At the aggregate level, in an extreme form, it suggests that all foreign aid is used to substitute on a one-to-one basis for domestic savings, so that aggregate investment and hence the growth rate of aggregate output is unchanged. Thus, aid is simply consumed. Even in this form the implied behavior of the recipient is neither irrational nor suggestive of dependency. If aid (by which I mean the unrequited transfer element in external resource inflow) is confidently expected to be permanent, it is like an added permanent income flow. And theory would suggest that it be largely consumed. At the sectoral level, the argument has been stated earlier: the availability of food aid will either reduce producer prices and hence incentives to produce food and to invest in the capacity to produce food, or simply end up increasing consumption of food (not necessarily on a one-to-one basis) with no impact on prices or incentives. As we saw in the subsection on incentive effects, both of these results are essentially rational responses to a permanent availability of food aid.

There is one form of dependency argument that may make some sense: the recipient country embarks on a development strategy that is rational were aid to be permanent but aid is not, so that at some stage in the development process the country is faced with a cessation or reduction of aid that it did not anticipate. As argued above, this is equivalent to an adverse shock on an economy that has geared its resource allocation intertemporally to aid availability (that is, had become dependent on aid) and as such, suffers a cost of adjustment the size of which will vary with the flexibility and efficiency of

2. Public investment in irrigation, research, and extension has been extremely important in Indian agriculture, particularly in the period before the mid-1960s. Whether shifts in relative prices or in nonprice factors such as investment in irrigation and technology are the major determinants of long-term growth in agricultural output has been extensively debated in the Indian literature. The available evidence does not indicate any significant trend in relative prices but only substantial fluctuations. The government has effectively insulated domestic agriculture price movements from their world market counterparts.

resource allocation. But unless the recipient's expectations about permanence of aid were irrational and not based on all available information about aid flows, it is inaccurate to blame aid dependency for the adverse consequence of unanticipated aid curtailment. Conversely, if despite all the available information to the contrary, a recipient chose to act as if aid were permanent, it is this irrationality, rather than aid dependency, that is responsible for the inevitable cost of adjustment when aid ceases.

Famines and Food Aid

Famine, according to the 1955 edition of the *Oxford Universal Dictionary*, means an instance of extreme and general scarcity of food, and in its transferred figurative use, hunger and hence starvation. Yet not having enough food to feed everybody (that is, general scarcity) does not mean everyone will starve. Equally, having enough food or more (that is, absence of scarcity) to feed everybody does not mean that none will starve. Unless an individual has access to available food, he is likely to starve regardless of food availability in the aggregate. This rather elementary and obvious point has been elaborately and elegantly developed by Sen (1981). As documented by him, the Bengal famine of 1943, the Bangladesh famine of 1974, and the Ethiopian famine of 1974 were not associated with any rapid decline in food availability. The Chinese famine of 1959–61, in which more than 20 million people are estimated to have died, had much less to do with a shortfall in aggregate food availability than with incentives and distribution.

Merely augmenting food availability through emergency food aid whenever an episode of famine threatens may not be adequate to prevent starvation, let alone reduce the chances of future occurrence of famines. However, an overwhelming proportion of the world's poor depend on agriculture for their employment and income. As such, a serious crop failure erodes their incomes, and given the imperfection in credit and asset markets, they cannot borrow or sell their meager assets to finance consumption except at high cost. In such circumstances, food (whether from foreign aid or from other crop-failure-free regions of the country) can be used for relief and food-for-work programs to employ those who can work, and mass starvation can be avoided. Equally, if food-for-work programs financed by food aid are used even in normal years to employ rural labor in slack seasons in building irrigation works and infrastructure including roads, the probability and intensity of crop failure can be reduced in the long run. Mellor and Gavian (1987) provide an incisive analysis of these issues.

The Role of Food Aid in the Adjustment Process

An important role for an expanded, more purposeful and sharply focused program of food in support of the adjustment process in developing countries has attracted attention, particularly in international bureaucracies involved in food aid (World Food Programme 1987). Since by adjustment one means

painful adjustment, anything that eases the pain will be welcomed by the people in the country where adjustment is occurring. Analytically, there is nothing in food aid to suggest that it will ease the pain more than any other aid. If the policy framework, incentive structures, and resource allocation mechanisms can be reformed so as to enable the economy to perform efficiently and equitably in a changed external economic environment without sacrificing growth, it is of course desirable. However, if the need for adjustment arises in large part from past policies that would not have been sustainable for long even if there had been no change in the external environment, adjustment will necessarily involve sacrifices and even a pause in growth. In such circumstances, policy reform will not be credible (that is, it will not remain in place for long if initiated) because the short-run resource reallocation and hardship will be too severe to permit the political survival of the reforming regime.

The availability of additional resources to the required extent to ease the pain of adjustment could bring credibility to reforms. It must be emphasized that this is a political and not necessarily economic argument. The threat to political survival usually arises either because those who have to bear the burden of adjustment are politically powerful or because the burden is inequitably distributed. Making additional resources available raises another troublesome issue: if the country's development strategies, and not changes in the external environment, led to the crisis, giving additional aid for adjustment in such a situation may encourage others to follow politically rewarding but economically unsustainable development strategies.

Similar considerations apply to food aid tied to policy reform or to the choice of particular projects even if these were not part of an adjustment program. If an economy is following an appropriate development strategy and the social cost of a project exceeds social benefits were food to be imported commercially, a donor may induce the choice of the project by providing food aid at a sufficiently low social cost to the recipient. There is, however, no strong empirical evidence of this having happened. But if aid is given to reduce the political cost to the regime in the recipient country to induce it to implement a project the donor regime prefers, the argument shifts to the political arena.

II. TRADE VERSUS AID IN COMBATING HUNGER: AGRICULTURAL TRADE LIBERALIZATION OR LARGER AID FLOWS?

There is perhaps no country in the world in which the government does not intervene in the determination of agricultural output, foreign trade, and prices. Obviously, interventions that affect a country's imports or exports, such as quotas, tariffs, voluntary export restrictions, and voluntary import expansions, not only affect that country but the international market, the quantitative significance of the effect depending on how large a trader the country happens to be in world markets. Less obviously, domestic interventions, such as acreage restrictions, set-aside programs, credit subsidies, and price supports, affect the

international markets as well. The interventions are so many and their nature so complex that disentangling their individual effects is an almost impossible task. However, their combined effect in terms of the difference between domestic and border prices (that is, c.i.f. import prices or f.o.b. export prices) can be viewed as a measure of protection. By this measure, average agricultural protection varied from -19 percent in Indonesia to 175 percent in Japan during 1975-76. Only Australia, New Zealand, and Thailand had negative protection besides Indonesia (details of the computation including the treatment of exchange-rate changes are available in an appendix to Parikh and others 1986).³ Of course, changes in the protection regime by one or more countries in the global market will affect all and call for adjustments by each. One needs a fairly sophisticated set of general equilibrium models, one for each country or region, linked together by global market clearing for a satisfactory analysis of changes in protection levels.

Researchers at the International Institute for Applied Systems Analysis (IIASA) have put together a system of empirically estimated models, distinguishing 18 countries, 2 regions (the EEC and the Eastern Bloc), and 15 simpler models for groups of the remaining countries of the world (Parikh and others 1986; Parikh and Tims 1986). The models distinguished 10 commodities: wheat, rice, coarse grains, bovine and ovine meat, other animal products, dairy products, protein feeds, other food agriculture, nonfood agriculture, and nonagriculture. The model solved for equilibrium domestic and international prices sequentially. The simulation period was 1980-2000.

A reference simulation of basically unchanged policies was compared with simulations of policy scenarios in which the number of hungry is affected mainly by changes in market prices (table 2). The policy scenarios shown include trade liberalization by (i) the countries belonging to the Organisation for Economic Co-operation and Development (OECD); (ii) the developing countries; and (iii) all market economies. In addition to trade liberalization scenarios, several other scenarios were simulated. In one, grain supplies in the world market are increased through (i) an extra 50 million tons of wheat being put on the world market each year, this addition being "manna from heaven," so to speak, and not emerging from any of the countries in the model and hence not contributing to any country's income, and (ii) a 50 percent reduction in the consumption of meat in OECD countries. In another, higher prices for producers in developing countries was assured by reducing OECD output by 25 percent. In contrast with these scenarios of policies which work mainly through changes in market prices, aid scenarios were also simulated (table 3). In scenario A, developed countries provide additional aid of 0.5 percent of gross domestic

3. Defining a measure of protection that reflects the real incentive structure faced by agricultural producers is not simple. Tariffs and border and domestic nontariff measures (price supports, input subsidies, deficiency payments) must be measured, effective exchange rates computed and quality variations in agricultural commodities taken into account. Comparison of protection estimates from different studies, without taking into account the judgments required, can be simplistic and misleading.

Table 2. *Effect on Hunger of Alternative Global Food Market Scenarios, Years 1990 and 2000*

Scenario	(Percentage change in number hungry compared with reference scenario)	
	1990	2000
Agricultural trade liberalization		
By OECD countries	+3	+4
By developing countries	-5	-5
By all market economies	+1	+1
50 percent million tons more wheat in the market	-3	-2
50 percent less meat consumption in OECD countries	-7	-1
25 percent less output in OECD countries	+11	+9

Note: Hunger is defined as not having nutritionally adequate food energy intakes. The reference scenario is based on no change in current markets or policies and predicts 470 million and 400 million will be hungry in the years 1990 and 2000, respectively.

Source: Parikh and Tims (1986, box 3).

product (GDP) (over and above the present level of about 0.35 percent) in the form of program aid, that is, as balance of payments support. This additional aid is distributed to developing countries in inverse proportion to their per capita incomes. In scenario B, the same amount of additional aid is given as project-tied aid to be saved and invested. The results are compared with the third, reference, scenario.

These results show that market-price-mediated effects on hunger in developing countries appear modest, except perhaps in the case of increased producer prices in developing countries through reduced OECD output, in which case the effect is detrimental. For example, even though the volume of additional food needed to raise the food intake of the entire population of developing countries to nutritional adequacy is about 50 million tons of wheat in 2000, simply

Table 3. *Effect on Hunger of Aid*

Countries	Reference scenario: millions of hungry persons, year 2000	Percent change compared with reference scenario ^a	
		A	B
All developing	400	-32	-32
Middle-income	30	0	+4
Low-middle-income	60	-13	-8
Low-income	310	-40	-40
of which India	155	-54	-56

Note: Hunger is defined as not having nutritionally adequate food energy intakes.

a. In A, developed countries provide additional aid of 0.5 percent of GDP over present levels, distributed to developing countries in inverse proportion to per capita income. In scenario B, the same quantum of additional aid is given as project-tied aid to be saved and invested.

Source: Parikh and Tims (1986, box 4).

adding 50 million tons of wheat to the market supplies will reduce the number of hungry persons by only 2 percent. The reason is that the global market systems adjust to the extra wheat put on the market through price reductions, shifts of resources away from wheat, and so on. The net result is that, because of a reduction in food output induced by these changes, the net addition to food consumption is far less than the 50 million tons added to the market and the consumption of the poor increases even less. Interestingly, given the protection levels in developing countries, consumers, particularly the poor, are better off when trade is liberalized and worse off and significantly so when their domestic producer prices are increased. The reason is that in most developing countries the majority of the poor are net purchasers of food, many being landless agricultural workers. An increase in producer prices that is passed on to consumers increases the purchase price of food for the poor, while the income effect of the producer price increase, if any, through additional employment and output, is not enough to offset the adverse purchase price effect. In contrast, agricultural protection in OECD countries and the consequent surplus disposal actually helps the poor in developing countries by reducing world market prices below what they would be if there were no surpluses.

In contrast to the above, the results in table 3 show substantial reductions in hunger, particularly in low-income countries when the volume of aid is increased. It does not make any difference, to developing countries as a whole or to low-income countries, whether aid is program aid or project aid. With project aid tied to investment, however, the time pattern of the reduction in hunger (not shown in table 3) is different, with only a small reduction initially, but catching up with program aid by 2000. More significantly, the reduction in hunger with project-tied aid persists even if aid is discontinued after fifteen years.

III. SUBSIDIZED FOOD DISTRIBUTION, FOOD-FOR-WORK PROGRAMS, AND HUNGER IN INDIA

The India model (Narayana and others 1988, forthcoming) of the Basic Linked System (BLS) of the IIASA models distinguishes five different socioeconomic groups within the rural and urban areas of India, each group defined by its monthly household real consumption expenditure per head. A household in each group has a claim on the output of the economy depending on its factor endowments, any income transfers from the government, and the direct taxes it pays. It saves part of its income and spends the rest on consumption of the ten commodities distinguished in the model, given their prices, according to a linear expenditure system separately estimated for each group. The model is thus better equipped to analyze income distribution issues than representative consumer models.

In the simulations with the model reported here, India is viewed as a small open economy facing parametrically given international prices, the time path

of which was taken from the reference scenario of the BLS system as a whole. Four scenarios are compared, the first, C, being equivalent to no public procurement or distribution of foodgrains. In the second, D, a basket of rice, wheat, and coarse grains (in fixed proportions) weighing approximately 135 kg. is distributed to all urban residents in each year at a subsidized price (approximately 20 percent subsidy). The foodgrains needed are purchased from the farmers at a price below the equilibrium open-market price. In E, 100 kg. of wheat are distributed free of charge to all residents of India (rural and urban), with the cost of procuring the needed grains being financed by additional income taxes. In F, the cost of free distribution of food is accommodated by a reduction in aggregate investment while keeping the tax rate fixed at its level in the reference scenario. The results are presented in table 4 in terms of their effect on the size of the population in each expenditure group and its average equivalent expenditure (that is, the expenditure needed at 1970 prices to achieve the same welfare as is being attained in the relevant scenario in the year 2000). Thus, equivalent expenditures are comparable across scenarios.

It is seen from table 4 that scenario D, the distribution of subsidized food in urban areas (and the associated implicit procurement tax on food producers in rural areas) as compared to scenario C, as is to be expected, worsens rural income distribution and slightly improves the urban distribution. The macro indicators do not differ much. Interestingly, extension of the public distribution of foodgrains to rural areas, making it completely free and financing it through an increase in income taxes (levied mainly on the urban rich) in E, improves rural income distribution significantly: the number of persons in the poorest class falls by 58.5 and 57 million compared with C and D respectively, while the number of persons in all other income groups rises. The income distribution in urban areas also improves though not as dramatically. With investment kept unchanged, aggregate growth (that is, GDP) is essentially unchanged, while the average energy intake rises and the Gini coefficient of equivalent expenditure falls. When the free distribution of food is financed by a reduction in investment rather than through an increase in taxes, as in F, aggregate growth of course is affected—GDP is about 10 percent less and the improvements in income distribution in rural areas are slightly attenuated compared to E. An implication of the comparison between E and F is that if the free distribution of food could be financed through aid, rather than tax increases, the improvements in E as compared to C or D would be even more dramatic.

Rural works programs (RWP) in India are meant to provide gainful employment to rural workers, particularly during slack seasons, in creating productive assets. Because participation in these programs has been voluntary and because it is largely the poor who participate, these schemes enable better targeting of the poor for other poverty alleviation programs. However, the execution of these programs has been criticized on the grounds that the works are often poorly designed and hence unproductive and that the benefits largely accrue to nontarget groups because of corruption and other problems. In specifying rural

Table 4. *Impact of Alternative Public Distribution Policies in the Year 2000*

Expenditure group ^a	C		D		E		F	
	Population ^b	Expenditure ^c	Population ^b	Expenditure ^c	Population ^b	Expenditure ^c	Population ^b	Expenditure ^c
<i>Rural</i>								
1	149.1	136.3	147.6	132.8	90.6	153.4	97.0	153.5
2	113.8	270.6	114.0	261.4	135.5	261.4	138.9	261.7
3	135.2	413.5	136.0	399.1	154.4	401.5	153.7	401.9
4	154.8	634.3	154.9	616.2	165.8	613.4	169.7	615.5
5	165.7	1,233.8	166.0	1,227.3	172.4	1,169.2	159.2	1,168.1
<i>Urban</i>								
1	2.4	169.2	1.5	171.8	0.6	171.3	0.9	170.3
2	12.2	271.6	10.6	272.9	8.3	271.2	11.7	269.6
3	42.5	390.6	41.2	394.8	39.4	392.7	47.7	393.1
4	108.0	596.7	109.0	604.9	110.4	596.0	116.4	600.3
5	164.6	1,199.1	167.3	1,223.6	171.1	1,158.0	152.9	1,164.0
<i>Macro indicator</i>								
Real GDP (1980 = 100)		270		270		272		244
Average energy intake per capita (kcal. per day)		2,581		2,569		2,610		2,539
GINI coefficient of expenditure		0.3418		0.34450		0.3100		0.3149

Note: Scenario C = no subsidized distribution or purchases at below market prices. Scenario D = subsidized annual basket of 135 kg. of rice, wheat, and coarse grains distributed to all urban residents, purchased at below market prices from farmers. Scenario E = 100 kg. of wheat a year distributed to all Indians, financed by taxes. Scenario F = same distribution as E, cost met by reduced investment.

a. Expenditure groups are from lowest to highest quintiles of monthly household real consumption expenditure per head.

b. Population in millions. Total rural population is 718 million and urban population is 330 million in all scenarios.

c. Expenditure per capita required at 1970 prices to achieve the welfare level in the relevant scenario in the year 2000. Thus higher expenditure indicates a higher welfare level.

Source: An unpublished longer version of Narayana and others (1988), available upon written request from the author of this article.

works scenarios in the model, the efficiency of design and targeting can be varied.

More specifically, it is now assumed that the two lowest expenditure classes constitute the target groups. Each person in the poorest class is assumed to receive 125 kg. of wheat per year as wages for participation in the RWP. The payment to each person in the other class is adjusted (depending on the scenario-specific populations in the two classes) to maintain an average payment of 100 kg. for the two classes together. Other inputs besides labor are needed for constructing rural works, and the cost of these inputs are assumed to be 50 percent of the wage bill. Half of the works created are assumed to be used for agricultural production and the other half for nonagricultural production.

If the RWP is well-designed and well-executed, the value of the entire expenditure is translated into assets of equal value. At the other extreme, a poorly designed and poorly executed program spends the resources but creates no productive assets. Thus, efficiency is defined as the ratio of the value of assets created to the value of resources spent, and this ratio, e , is assumed to take two values, 1 and 0. Targeting success is captured by a parameter t : a proportion t of the wage bill is assumed to reach the two poorest rural expenditure groups (the target groups) and the remaining $(1 - t)$ accrues to all the other rural classes in proportion to their population. Values of t used are 1 and 0.5. Scenarios are designated by $R-t-e$. Thus, $R-1-1$ means a well-targeted and well-executed RWP. The two alternative values for each of t and e together yield four scenarios. In these it is assumed that the rural works are financed by reducing other investment. In scenario $R-1-1-T$ the cost of rural works is financed by additional taxation while investment is kept unchanged. The results are presented in table 5 in terms of the value of the relevant variable in the policy scenario as a percentage of its value in the reference scenario, which is the base situation without rural works programs.

It is clear from table 5 that rural works programs have a substantial impact on the poor. A well-targeted and well-executed program raises the equivalent expenditure and energy intake of the poorest class by about two-thirds and the two poorest classes by about two-fifths relative to the reference scenario. With their cost coming out of investment, aggregate growth is somewhat lower. As is to be expected, a poorly executed and well-targeted program still yields the same benefits for the poor—because they are the beneficiaries of the expenditure on the program rather than its product. But spending resources in creating unproductive assets naturally affects aggregate growth adversely (compare $R-1-1$ with $R-1-0$ or $R-0.5-1$ with $R-0.5-0$). Targeting failure reduces the benefits to the poor by nearly a half (compare $R-1-1$ with $R-0.5-1$ or $R-1-0$ with $R-0.5-0$). If a well-executed and well-targeted program can be financed through additional taxes rather than by reduction in investment, the poor will benefit as much and the economy will gain growth. If instead of additional taxes, aid becomes available, benefits as well as growth could be even further augmented.

IV. FOOD AID: SOME RELEVANT EXPERIENCE

Food aid in the form of cereals has declined substantially from its peak in the mid-1960s: that of the United States in 1984–85 was nearly 10 million tons less than the 17.7 million tons it reached in 1965–66 (see table 1). The emergence of other donors, mainly the EEC, only partially compensated for the decline from the United States. The U.S. domestic price-support program, as it operated until the mid-1960s, contributed to the accumulation of stocks which reached a peak of over 1.5 billion (billion = 1,000 million) bushels of wheat or over 118 percent of all uses in 1960–61. In part as a means of stock disposal, food aid shipments almost quadrupled from the early 1950s to their peak of 572 million bushels in 1965. The basic support price, together with other support, fell progressively from \$2.00 per bushel in 1962 to \$1.69 in 1965. Stocks began declining and with the extraordinary food aid shipment to India in the two drought years of 1965–66 and 1966–67, they fell to 36 percent of all uses. After increasing and then falling again to an even lower level in 1974, the year of large sales of wheat to the Soviet Union, they recovered and in 1982–83 surpassed their 1960–61 peak in absolute terms (USDA 1984, 1986). However, political support in the United States for a return to using food aid as a means of disposing of emerging stocks was not present, and instead farmers were induced through changes in policy to divert cropland from food-grain production. In 1984 stocks had risen above the 1973 trough but only to their 1950s levels, and the terms of U.S. food aid also became harder. For example, payment in terms of local currency was phased out: while in 1965,

Table 5. *Impact of Alternative Rural Works Programs*

Variable (average)	Scenario ^a				
	R-1-1	R-1-0	R-0.5-1	R-0.5-0	R-1-1-T
Real GDP growth rate (1980–2000)	95.1	85.6	96.1	87.0	104.3
Equivalent expenditure per capita in 2000:					
India	99.8	94.6	100.0	95.3	102.2
Poorest rural class	167.0	167.0	133.0	133.0	167.0
Two poorest rural classes	139.0	139.0	119.0	119.0	139.0
Energy intake per capita (kcal. per day) in 2000:					
India	104.7	102.6	103.0	101.0	105.7
Poorest rural class	170.0	170.0	140.0	133.0	170.0
Two poorest rural classes	140.0	140.0	120.0	119.0	140.0

Note: Each variable is expressed as a percentage of its value in the reference scenario, in which no RWPs are adopted.

a. Scenario R-1-1 = efficient targeting and execution. Scenario R-1-0 = efficient targeting and poor execution. Scenario R-0.5-1 = semiefficient targeting and efficient execution. Scenario R-0.5-0 = semiefficient targeting and poor execution. Scenario R-1-1-T = efficient targeting and execution; tax financed; in the other scenarios, the RWPs are financed by reduced investment.

Source: Narayana and others (forthcoming).

nearly 70 percent of wheat exports under aid programs was sold for foreign soft currency, by 1972 none of it was. Further, recipient countries had to bear an increasing share of transport and other costs.

As mentioned earlier, until the mid-1960s a large fraction of food aid went to India and Pakistan. In both countries import-substituting industrialization was facilitated by food aid, which was used to supply a substantial part of the subsidized distribution of grains through ration shops in urban areas, reducing food costs and wages. Famine was barely averted in India in the drought years of 1965–66 and 1966–67 by the importation of more than 10 million tons of cereals, largely under PL480 food aid. Earlier U.S. technical assistance (governmental as well as private) in setting up agricultural universities and strengthening research capability in plant breeding (including the Indian Agricultural Research Institute) helped India to reap substantial gains from the Green Revolution technology that became available in the mid-1960s (Lele and Agarwal 1987). But external aid to these institutions was technical assistance and not food aid.

Another major recipient of food aid in the 1950s and 1960s was the Arab Republic of Egypt. Handoussa (1987) claims that during the 1959–66 period the availability of food aid under PL480 enabled Egypt to save foreign exchange that otherwise would have been spent on commercial food imports. The saved foreign exchange was spent on importing capital goods needed for industrial investment and growth. But food imports, mainly wheat, vegetable oils, and sugar, were more than a third of merchandise imports in 1975 and a quarter in 1984 and rice exports and output of wheat declined during this period. Cereal imports increased from about 50 percent of domestic production in 1975 to 100 percent in 1984–85 and cereal consumption grew at a phenomenal 15 percent a year average. This course of events was largely due to the heavily subsidized food distribution policy backed by imported food (see Alderman and others 1987 for a description of the system, and von Braun and de Haen 1983 for its effects on agriculture). The political difficulties of such a policy were shown by the riots that ensued when a reduction in the subsidy was attempted. As Scobie (1983, p. 48) points out, this political commitment to the system of food subsidies meant that “any decline in the supply of foreign exchange is met first by postponing the import of capital goods, then by reductions in raw materials, and finally, and only in a minor way, by a reduction in the quantity of imported food.”

In the 1970s and 1980s Sub-Saharan African (SSA) countries have been the major recipients of food aid: the share of SSA in cereal aid has risen steadily from less than 5 percent in 1970–71 to nearly 50 percent in 1984–85. To cite just a few cases from a study on managing agricultural development in Africa (MADIA) by the World Bank, during 1970–85 the volume of food aid grew at an average annual rate of 4.1 percent in Cameroon, 43.1 percent in Kenya, 28.6 percent in Malawi, and 23.5 percent in Tanzania (see also Lele 1989, this issue). Ezekiel (1986) states that between 1985 and 1990 food aid requirements

will grow by about 25 percent in Kenya, 20 percent in Tanzania, 15 percent in Senegal, and 14 percent in Cameroon. There is also an increasing tendency to use food aid as a lever to promote structural adjustment and policy reform (World Food Programme 1987). For example, in the late 1970s the United States provided food aid to Bangladesh more or less as a grant under Title III of PL480 to sustain Bangladesh's attempt to reduce food subsidies and move toward an open-market food pricing system. Eleven food aid donors have agreed to provide food aid to Mali in return for its restructuring the cereal marketing system, reducing the deficits of the parastatal marketing boards, stabilizing cereal prices, and improving farm incomes. A more broad-ranging reform of the agricultural sector conditioned on food aid is being attempted in Madagascar and Senegal. In Ghana, where there have been substantial falls in real wages and productivity over several years, food aid under the World Food Programme (WFP) and the World Bank is being used to augment the real wages of workers engaged in key export sectors and in the improvement of infrastructure. In Grenada, local resources generated from sales of food aid have been earmarked for support of a structural adjustment and reform plan. In Morocco, food aid is to be used in a compensatory program for people placed at nutritional risk during a structural adjustment plan aimed at the elimination of food subsidies by 1990. The adjustment program was expected to reduce the real income of the very poor by a fifth, placing them at nutritional risk. By expanding ongoing supplementary feeding and school feeding projects using additional project food aid provided by the United States and WFP, this risk is expected to be avoided. Since the results from most of these programs are not yet available for evaluation, it is too soon to judge the effectiveness of food aid in easing structural adjustment costs.

V. POLICY IMPLICATIONS AND CONCLUSIONS

Food aid can play a useful role in furthering development and poverty amelioration in situations in which the recipient country is generally following an appropriate development strategy and the aid is used either in support of distributive policies that are effectively targeted at the poor or in financing efficiently executed and effectively targeted investment projects. But the use of any aid, in the form of food or foreign exchange, in support of policy reform and adjustment has to be carefully thought through so that it does not end up encouraging the very thing it wants to eliminate, namely, inappropriate policies. Of course, the effectiveness of the use of food aid can be enhanced substantially through proper design, the choice of commodities, and the flexibility with which recipients can exchange with each other commodities supplied by aid and their own output (Mellor and Ezekiel 1987; Hopkins 1987).

During the 1950s and 1960s the United States and Canada were the major food aid donors, and most of the aid was received by the South Asian states of India, Pakistan, and Sri Lanka, and to a lesser extent other Asian states (the Republic of Korea and the Philippines). With the dramatic increase in food

output in all of them and the accumulation of large food stocks in some in the 1980s (more than 25 million tons in India in June 1987 that would decline to less than 10 million tons by April 1, 1988, after the failure of the 1987 monsoon rains), it is tempting to conclude that purposively used food aid is a major factor in this turnabout. Such a conclusion is too facile, however. Certainly, food aid at concessional terms, particularly in years of unprecedented droughts, helped India avert what could have been major disasters. But regardless of the persuasion that aid donors may have applied, it is the availability since the mid-1960s of dwarf varieties of wheat and rice with high-yield responses to heavy doses of chemical fertilizers that largely explains the change. Some of the domestic policy distortions, such as zonal restrictions in the movement of food, had been removed even earlier. The new technology brought in its wake new distortions: fertilizer subsidies, irrigation subsidies, and price supports at levels that led to the accumulation of stocks. The extent of their distortionary effects is hard to judge since the distortions in favor of agriculture were in part corrections for distortions in other sectors that penalized agriculture. It may be time now to remove or reduce these distortions. Still, the availability of technology and the desire to exploit it induced these, albeit distortionary, producer incentives.

With Sub-Saharan Africa replacing South Asia as the major recipient of food aid, it may be thought that in SSA also, food aid leverage can be used to turn the situation around. Extreme caution is warranted before any such conclusion is drawn. First of all, the domestic policy distortions with respect to agriculture in SSA appear, according to some of the MADIA studies, to be far more serious and pervasive than they were in South Asia. South Asia has never experienced a decline in the trend of growth of food or agricultural output, let alone a negative trend. Although severe droughts in the Sahel and other regions are partly responsible, the declining trend in SSA output is a reflection largely of policy failures. Most important, in South Asia a research infrastructure existed that could rapidly breed rice and wheat varieties to suit local conditions, once the dwarf genes became available, and an extension service for spreading the knowledge about new varieties could be assembled. None of these conditions exist in SSA to the same extent, not to mention the differences in soil, climate, and factor endowments between SSA and South Asia. One should not be unduly optimistic about the quick success of food aid conditional on policy reform. It remains to be seen whether policy-reform conditioned food aid will prove to be a cure.

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Wage Differentials and Moonlighting by Civil Servants: Evidence from Côte d'Ivoire and Peru

Jacques van der Gaag, Morton Stelcner, and Wim Vijverberg

As part of their efforts to reduce fiscal deficits, many governments have allowed public sector salaries to erode, often on the assumption that government workers are overpaid vis-à-vis those in the private sector. We test that assumption by analyzing public-private pay differentials in Côte d'Ivoire and Peru. Switching regressions models are estimated using full information maximum likelihood (FIML), and the results are compared to those obtained using ordinary least squares (OLS) techniques. The OLS yields seriously biased estimates of the pay structure, suggesting that public wages are higher than private wages; the FIML estimates show the opposite. Our probit analysis also shows that the wage disadvantage of civil servants is a determinant of the greater prevalence of moonlighting among public than private employees. The evidence suggests that reductions in employment rather than pay, while being less palatable in the short term, will be more effective in the long run.

The severe economic crises of recent years in developing countries have increased the pressure by policymakers and lending agencies to make economies more productive and to reduce fiscal deficits. The public sector has not escaped this pressure. Governments account for 54 percent of nonagricultural employment in Africa, 36 percent in Asia, 27 percent in Latin America, and 24 percent in countries belonging to the Organisation for Economic Co-operation and Development (OECD) (Heller and Tait 1984, Internal Monetary Fund survey). Given the size of the government, a reduction of the wage bill is all but unavoidable. To do so, policymakers have two options: reduce wages or reduce employment.

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A recent review of public sector pay and employment shows that countries with an excessive public wage bill have a surplus of civil servants (Nunberg 1987). Nonetheless, reduction of the public labor force is not frequently undertaken. Though freezing recruitment or preventing guaranteed hiring of, say, university graduates may be possible, in many countries the dismissal of civil servants is considered politically infeasible.

Explicit wage reductions or freezes are equally unpalatable. Hence, it is not surprising to find that wage cuts have been disguised, and perhaps most commonly undertaken through inflationary erosion. In a recent sample of African countries, for example, growth in real starting salaries was almost uniformly negative for the period 1975–83 (Lindauer and others 1988). Annual reductions of more than 10 percent were the rule, and in some cases they exceeded 30 percent.

In sum, the general policy has been to maintain public employment while reducing real wages. Whether or not this is the best policy depends heavily on the answer to a deceptively straightforward question: are government wages too high? In most cases, the most relevant yardstick for answering this question is the wage level in the private sector.

The answer to this question has implications not only for the size of the budget. Government wage policies have a significant impact on the entire economy. If public wages are too high, they exert upward pressures on wages in the private sector, with obvious employment and efficiency implications. If they are too low, they will lead to a discouraged public work force and moonlighting (double jobbing) activities (see Mazumdar 1987).

For developing countries, there are few empirical studies that deal with the issue of public sector–private sector wage comparisons in a systematic manner. Making a comparison on the basis of *average* wages is misleading since no adjustment is made for differences in education levels and work experience of workers in the two sectors. Many studies use standard ordinary least squares (OLS) regression techniques to control for wage-determining attributes (for example, education and experience) in assessing the public-private wage differential. There are numerous such studies for the industrial world, especially for Canada and the United States (for studies on Canada, see Abbot and Stanos 1986, Gunderson 1979a, 1979b, 1979c, Robinson and Tomes 1984, and Shapiro and Stelcner 1980, 1986; for surveys of American studies, see Ehrenberg and Schwarz 1986 and Wise 1987). A search of the literature revealed but a handful of studies which address this issue empirically in the developing world. More serious than the lack of research is a methodological flaw in these studies that casts doubts on some of the findings.

In this article we compare public and private sector wages for two developing countries, Côte d'Ivoire and Peru, using data from the 1985 Côte d'Ivoire Living Standards Survey (CILSS), and the 1985–86 Peru Living Standards Survey (PLSS). In section I, we briefly review the literature on public-private pay differentials in developing countries and indicate why the available studies may have

produced misleading results. We formalize this argument in section II, develop the model used in this study, and present our estimation results, showing that at the time of the data surveys, public wages were well below those in the private sector.

What are the effects of this pay gap on the quality and motivation of government workers and on the private sector? One hypothesis is that the wage gap provokes moonlighting activities (double jobbing), a phenomenon that is known to be widespread among civil servants in developing countries. Our results, discussed in section III, link lower public wages to a greater incidence of moonlighting and therefore provide additional support for the conclusion that public wages are below those in the private sector. In section IV we summarize and discuss our results and draw conclusions for public employment and wage policies, as well as for future research.

I. REVIEW OF THE LITERATURE

A perusal of the literature on wage comparisons between the public and private sectors in developing countries reveals that there are two general types of studies, one which compares some group averages, the other, based on human capital models, which assesses variation based on individual characteristics.

The former approach compares averages between the two groups of workers, either on an aggregate basis or stratified by qualification levels (such as education) or by job characteristics (occupation). Examples are the studies by Bennell (1983), Heller and Tait (1984), and Lindauer, Meesook, and Suebsaeng (1988), and the numerous country economic memorandums of the World Bank (listed in Nunberg 1987). Although these descriptive analyses do shed light on the policy issues at stake, comparisons of average wages do not systematically analyze the role of worker background characteristics in determining relative levels of remuneration.

The conceptual framework of the second group of studies is the human capital model of earnings determination developed by Becker (1964) and Mincer (1958, 1974). This model postulates that observed wage differences among individuals arise from a mix of school and postschool investments (education, training, work experience) as well as other socioeconomic factors, such as marital status, geographical location, and nationality, thought to be correlated with earnings.

These studies typically estimate sector-specific wage equations which allow one to test statistically for the equality of overall pay structures in the two sectors and also to gauge the sectoral differences in the "rates of return" of a specific background attribute, for example, a year of schooling or a diploma. The estimated wage functions can further be used to decompose the observed wage gap into two components: one that comes from differences in endowments of wage-determining attributes (the explanatory variables), and a second

that arises from differences between the sectors in the estimated "rewards" or "returns" to these attributes (the regression coefficients). The second component cannot be ascribed to productivity-enhancing background attributes and is to be regarded as a priori evidence that one or the other group of workers enjoys a pay premium.

There are four other common strands among the studies. First, all studies use cross-section data. Second, they find that the observed *average* wage of government workers exceeds that of private workers. Third, each study uses some variant of the Mincerian earnings function. Fourth, they employ the ordinary least squares (OLS) regression technique. In general, the studies find that the wage determination process differs (statistically) in the two sectors, but there is a lack of consensus about the existence of economic rents and which group of workers receives them. In the studies we reviewed (table 1) there is much variation in both the direction and magnitudes of the estimated wage advantage.

Several authors find that government employees enjoy a significant wage advantage. In their study on Tanzania, Lindauer and Sabot (1983) report that both civil servants and parastatal (state enterprise) employees enjoy a premium vis-à-vis private sector workers. The former receive a modest 14 percent surplus, while the latter earned about 30 percent more than private sector workers. House (1984) decomposed the public-private wage gap for different levels of work experience and education, for both male and female workers in Cyprus. He reports a pure earnings advantage for both men and women in the public sector, but that for women is much larger than for men. For women, the estimated surplus ranges from 5 to 109 percent. The rents are less, but still substantial, for male government employees, ranging from 5 to 46 percent. House finds a negative pay differential (of 5 percent) in the public sector only for male workers with vocational training and two to five years of work experience.

Conversely, for Chile, Corbo and Stelcner (1983) find that private workers receive a modest wage premium of 5 percent, which rises to 20 percent if Minimum Employment Program workers are included. For the majority of studies, however, the results are mixed or inconclusive. For Colombia, Mohan (1986) finds that there is no statistical difference in the wage structures between the public and private sector. Mazumdar (1981), in his study on Malaysia, concludes that the returns to primary schooling are lower and those to post-primary schooling are higher for workers in the public sector. The study by Komenan (1987) on Côte d'Ivoire for 1984, on the one hand, finds that, with the exception of university education, the returns to schooling are higher for civil servants than for private workers, while returns to work experience are higher in the private sector. On the other hand, the results for Colombia reported by Psacharopoulos, Arriagada, and Velez (1987) show higher returns to education and lower returns to experience in the private sector. The survey by Psacharopoulos (1983) on Brazil, Colombia, Greece, Malaysia, and Portu-

gal reports that, in all except Greece, returns to both education and experience are higher in the private sector than in the public sector. While highly educated workers in the government sector do not have a wage advantage, however, less educated public workers may receive a wage premium.

Steier (1987) reports that, in Venezuela in 1975, average public wages were higher than private wages at all educational levels except postsecondary (about the same), but that by 1984, public wages were lower at all schooling levels. Moreover, while in 1975 the returns to schooling and experience were higher for private workers, by 1984 these were about the same in the two sectors. Also, in 1975 government workers had a 17.5 percent wage advantage which disappeared by 1984. This, Steier suggests, was possibly due to a selective wage freeze imposed on government workers.

All these studies tested for the equality of the wage structure in the two sectors after estimating the wage equation using OLS. The validity of this approach depends crucially on the implicit assumption that employees are randomly distributed (with respect to their unobservable wage-determining characteristics) between the two sectors. But they may not be, especially when wage differentials exist. In that case, potential employees will queue for the "preferred" sector, and a selection process will determine who will obtain employment in that sector. Sometimes this selection process is very explicit, for instance, when high school or university graduates are guaranteed employment in the public sector. Usually, however, the selection process will be the result of the interplay between the preferences of the employees and the employers. In any case, the process will lead to two samples of workers (public and private) which, by design, are selected, not randomized. Thus the selection process may lead to biases in the estimates of the parameters of interest, depending on whether the characteristics that have an impact on both the wage level and the selection process are in any way correlated. If so, the OLS results will be biased, and, consequently, derived sectoral wage comparisons will be misleading.

II. THE MODEL AND ESTIMATION RESULTS

To formalize the argument concerning sectoral wage comparisons obtained using OLS, we develop a model that tests for the existence of selectivity bias. We estimate this model for Côte d'Ivoire and Peru using Full Information Maximum Likelihood (FIML) methods, compare the results with OLS estimates, and answer the main question of interest: are wages in the public sector higher or lower than those in the private sector?

A Switching Regression Model for Public-Private Wage Comparisons

The switching regression model consists of two wage equations, one selection equation and an assumption about the statistical distribution of the three disturbance terms in the model (for the derivation of the structure of the model, see also Maddala 1983, p. 261).

Table 1. *A Review of Findings on Wage Differentials between the Public and Private Sectors*

<i>Authors</i>	<i>Year</i>	<i>Country</i>	<i>Sample</i>	<i>Findings</i>			
				<i>Regarding Public "Net" Wage Advantage</i>			
Corbo and Stelcner (1983)	1978	Chile	Employment survey Santiago: males	-21 percent (in favor of private sector) -5 percent (in favor of private sector excluding PEM workers)			
House (1984)	1979	Cyprus	Survey of wages, salaries, and hours of work, males and females	<i>Education</i>	<i>Work experience (years)</i>		
					2-5	6-10	7-10
				<i>Graduate</i>			
				Males	9 percent	24 percent	46 percent
				Females	70 percent	62 percent	109 percent
				<i>Secondary general</i>			
				Males	13 percent	7 percent	5 percent
				Females	63 percent	60 percent	18 percent
				<i>Vocational</i>			
				Males	-5 percent	22 percent	14 percent
				Females	20 percent	45 percent	5 percent
Lindauer and Sabot (1983)	1971	Tanzania	National urban mobility, employment and income survey, males	Government versus private:	14 percent		
				Parastatal versus private:	29 percent		
				Government versus parastatal:	5 percent		
Mohan (1986)	1978	Colombia	City study (Departemento Administrativo Nacional de Estadistica survey, DANE), males	No difference			
Mazumdar (1981)	1975	Malaysia	Migration and employment survey, males	Predicted private wage > predicted public wage Returns to primary schooling lower in public sector Returns to Postprimary schooling higher in public sector			

Table 1. (Continued)

Authors	Year	Country	Sample	Findings		
				Regarding returns to education and experience		
					Public sector	Private sector
Komenan (1987)	1984	Côte d'Ivoire	Labor force survey, males	Schooling	12 percent	11 percent
				Levels ^a		
				Primary	0.85	0.74
				Secondary	2.34	1.58
				University	5.54	6.59
				Experience	8 percent	9 percent
Psacharopoulos, Arriagada, and Velez (1987)	1984	Colombia	National household survey, males	Schooling	10 percent	11 percent
				Experience	6 percent	4 percent
73 Psacharopoulos (1983)	1977	Portugal	Ministry of Labor personnel records, males	Schooling	5 percent	8 percent
				Experience	3 percent	6 percent
	1970	Brazil	1970 census, males	Schooling	15 percent	19 percent
				Experience	3 percent	5 percent
	1975	Colombia	DANE urban market survey, males	Schooling	13 percent	15 percent
				Experience	4 percent	7 percent
	1978	Malaysia	Special survey, males	Schooling	18 percent	23 percent
				Experience	3 percent	10 percent
	1977	Greece	Special survey, males	Schooling	6 percent	7 percent
				Experience	6 percent	6 percent
Steier (1987)	1975	Venezuela	National household survey, males	Schooling	9 percent	11 percent
				Experience	3 percent	6 percent
	1984	Venezuela	National household survey, males	Schooling	10 percent	10 percent
				Experience	4 percent	4 percent

a. Coefficients on dummy variables.

Let us denote the public and private sectors as sector 1 and 2 respectively, and express the corresponding wage functions as:

$$(1) \quad \ln w_1 = X\beta_1 + u_1$$

$$(2) \quad \ln w_2 = X\beta_2 + u_2$$

where $\ln w_i$ is the natural log of wages in section i , β_i is the vector of coefficients associated with wage-determining attributes X , and u_i is a disturbance term.

The process that leads to the selection of an individual into one of the sectors has two steps. First, an individual will determine whether or not to try to obtain a public job. For the sake of exposition, we assume that public jobs are the preferred ones; the argument is symmetrical. Second, he or she may or may not be chosen for the job. Because there are costs (deferred wages) to applying for a job, the prospective employee compares the expected benefits with the likelihood of not being chosen. We assume, for the time being, that the benefits are equal (or proportional) to the difference in the (log) wage rates between the two sectors. The cost, that is, the likelihood of not being selected, is assumed to be determined by a set of employee characteristics (a vector Z_1).

Thus an employee will be in the public sector if the benefits exceed the cost, that is, if

$$(3) \quad (\ln w_1 - \ln w_2) > Z_1\gamma_1 + \epsilon_1$$

where ϵ_1 is a random disturbance term to be discussed below. If we combine the wage determinants X (from equations 1 and 2) with the variables in Z_1 to obtain the vector Z , we can summarize the selection process as follows:

$$(4) \quad \begin{aligned} I &= 1 \text{ (public sector), if } I^* \geq 0 \\ I &= 0 \text{ (private sector), if } I^* < 0 \end{aligned}$$

$$(5) \quad I^* = Z\gamma + \epsilon$$

where I^* represents the (unobserved) probability of being in the public sector and ϵ is a random disturbance term that combines the effect of u_1 , u_2 , and ϵ_1 .

Note that this single equation summarizes a two-step process. First, the expected wage differential must be large enough to make it worthwhile for the individual to try to obtain a public job. The decision to apply is determined by the expected wage differential, the cost of applying, and variables related to preferences for a public job. Second, the employer determines whether the person is chosen for the job depending upon the person's attributes in the eyes of the employer. The outcome of the two levels of choices is one group of public workers ($I^* \geq 0$), who apply *and* receive an offer of a public job, and another group of private workers ($I^* < 0$), who either do not apply or apply but do not receive a public wage offer.

In principle, one could model the applicant and employer choices with two selection equations (Poirier 1980; Abowd and Farber 1982; Hendricks and

Kahn 1984). But since the expected wage differential is unknown, and must be estimated in a study such as this, the distinction between the first- and second-choice equations lies mainly in the variable measuring the cost to the worker of applying. The data sets used for this study do not contain any information on such costs, so that it is not possible to adequately identify the two stages of the selection process separately. (Hendricks and Kahn 1984, using a binary probit model, find a correlation between the error terms of the two selection equations of 0.9998, implying that the data were essentially unable to separate the two equations.) Hence the factors affecting the choice of both the individual and the employer are combined in Z and ϵ and the linear specification in equation 5 approximates the nonlinear relation implied by a model with two selection equations.¹ To the extent that by this the model is misspecified, the parameter estimates are biased.

There are three more issues that, if properly taken into account, may lead to further complications of the model. First, sectoral differences in nonpecuniary benefits of employment may exist. When nonpecuniary benefits are a fraction, p , of total compensation, E_1 , the selection equation remains the same. We then have $\ln w_1 - \ln w_2 = \ln [(1 - p)E_1] - \ln [(1 - p)E_2] = \ln E_1 - \ln E_2$, and equation 3 can be expressed in either E_i or w_i . When nonpecuniary benefits are not proportional to the wage, the differential in proportions enters the selection equation directly, and $\ln w_1 - \ln w_2 = \ln E_1 - \ln E_2 + \ln (1 - p_1) - \ln (1 - p_2) \approx \ln E_1 - \ln E_2 + (p_2 - p_1)$. The differential appears in the intercept in $Z_1\gamma_1$ if the proportions are constant. If they are not constant, the differential is among the explanatory variables in Z_1 to the extent that these capture wage-seekers' responses to the divergence in nonpecuniary benefits between the sectors.

Second, public sector workers are more frequently observed to hold a second job. In this article we take the simple view that the relatively high incidence of moonlighting may, at least in part, be induced by the public-private wage differential: public workers may be forced to engage in other work after hours to increase total income. We test this hypothesis in section IV. In a more structural approach to the sector choice problem one may want to include the probability of finding a second job as a determinant of the preference for, say, public employment, the assumption being that required hours of work and regulations on absenteeism in the public sector facilitate moonlighting. Since the focus of this study is on public-private wage differentials, we postpone extension of the model in this direction for future work.

Third, the sectoral decision may well be a lifetime choice based on expected average long-run returns. Thus people may choose to work in a sector despite

1. While it is beyond the scope of this article, applicants have also made the decision to participate in the "formal" labor force, as a private or public employee, as opposed to not working or being self-employed. Thus the applicant pool is already self-selected, and parameter estimates may be affected by this.

short-run wage shortfalls. A short-run business cycle may hurt these workers, but expected future gains may offset current losses. This is a source of error, captured by the disturbance term ϵ_1 in the selector equation 3, and thus also by ϵ in equation 5.

In summary, the selection process will reflect supply and demand factors. The difference in wage offers will matter, at least to the worker, and consequently all variables included in the vector X which determine wage levels are potentially relevant. Furthermore, the applicant's personal characteristics will matter, at least to the employer, and many of these are also included in the vector X . Hence, the vector X will enter the selection equation, but the associated vector of coefficients will not necessarily be proportional to $(\beta_1 - \beta_2)$. Characteristics other than those contained in X may also be relevant. The vector Z combines factors that are relevant to the prospective employee in determining whether to apply for the job (including nonpecuniary benefits and prospects of moonlighting) and to the employer in deciding which worker to choose.

Turning to the estimation issues, the switching regression model of equations 1, 2, 4, and 5 contains three random disturbances, namely u_1 , u_2 , and ϵ . We shall assume that (u_1, u_2, ϵ) follows a trivariate normal distribution with non-zero covariances.

It has been shown (for example, Olsen 1980) that the estimates of models of the type used here are sensitive to the distributional assumption. Such sensitivity is reduced if the vector Z includes variables that theory indicates would affect the selection process but which are not determinants of wage rates. In the absence of such variables, the functional form of the distribution of the random disturbances can provide identification of the model (that is, allow one to estimate all parameters), but functional form is generally regarded as a weak and therefore unsatisfactory basis for identification. In the empirical analysis below, the wage determinants, X , overlap with the selection variables, Z , almost entirely, so caution in interpretation applies. Experimentation with inclusion of different variables in the vector Z , however, left the parameter estimates largely unchanged, supporting the validity of the estimates as derived.

To see why OLS estimation is a flawed technique in models where selection occurs, one must recognize that equations 1 and 2 represent the unconditional wages in the two sectors (that is, the wage offers). In response to these, workers end up in one or the other sector, as given by the selection equation, so that the sample of workers in any one sector represents conditional or accepted wages, that is, wage rates conditional upon being selected into that sector. In using OLS, the selection decision reflected in equation 5 does not enter the wage estimates. In fact, the OLS technique implicitly assumes that equation 5 is uncorrelated with equations 1 and 2. It is quite possible, though, that some correlation does exist, since preference or taste variables and unmeasured productivity-enhancing traits may influence both the selection process and the wage. For example, a preference for risk taking and entrepreneurship may make it more likely that an individual chooses a career in the private sector. Such an individual may also be more successful (have a higher wage) than the

average private employee. Similarly, for public employees, nepotism or "connections" may increase both the chances of obtaining a public job and the wage received. We can readily test for the correlation between the disturbance terms of the wage equations on the one hand and the disturbance term of the switching equation on the other by estimating the model with maximum likelihood techniques. (See the appendix for specification of the FIML and OLS estimations).

Data and Estimation Results

We estimate the model developed above for Côte d'Ivoire and Peru. Both countries face severe budgetary constraints, have targeted the government wage bill for budget reduction, and show the typical pattern of wage erosion for public employees, although the change in real wages is much more dramatic for Peru. The important observation, as shown in table 2, is that public wages have decreased significantly relative to real wages in the private sector for both countries (see Instituto Nacional de Estadística 1986; Côte d'Ivoire 1982; and Komenan 1987).

The Côte d'Ivoire Living Standards Survey (CILSS) and the Peru Living Standards Survey (PLSS) contain virtually identical information, which is the basis for this study (see Ainsworth and Muñoz 1986; Grootaert and Arriagada 1986; and Stelcner, Arriagada, and Moock 1987). The remuneration measure used for both countries, which we term "the wage," comprises cash and the value of in-kind benefits, such as food, housing, and transportation allowances.

The CILSS collects information on 1,600 households per year, nationwide. The wage sector is relatively small in Côte d'Ivoire, as compared with agriculture and self-employment (see, for instance, Newman 1987). Therefore, the CILSS contains information on only 513 individuals who report a wage earning activity (with positive earnings) as their main job during the seven days before the interview. Our analysis is based on this sample of wage earners.

The PLSS, conducted between June 1985 and July 1986, contains detailed socioeconomic information on 5,000 households nationwide. The analysis for Peru is confined to a sample of 1,013 urban male wage earners in Lima, who were over fourteen years of age and who reported positive earnings during the week before the interview.

Table 3 presents the definitions and summary statistics of all variables used

Table 2. *Indexes of Real Wages, 1979 and 1984*

<i>Year</i>	<i>Côte d'Ivoire</i>		<i>Year</i>	<i>Peru</i>	
	<i>Public sector</i>	<i>Private sector</i>		<i>Public sector</i>	<i>Private sector</i>
1979	100.0	100.0	1980	100.0	100.0
1984	95.6	113.4	1985	42.8	78.4

Sources: Calculations based on data from La Direction des Etudes et de la Recherche de l'Office National de Formation Professionnelle (ONFP), an agency of the government of Côte d'Ivoire; and on data from the Instituto Nacional de Estadística of Peru.

Table 3. *Definitions and Summary Statistics of the Variables Used for the Côte d'Ivoire Analysis*

Variable	Private sector (N = 301)		Public sector (N = 212)	
	Mean	Standard deviation	Mean	Standard deviation
Log of hourly wage (CFAF) ^a	5.557	1.29	6.557	0.99
General background and characteristics (years)				
Age	32.554	10.16	35.566	8.70
General work experience	13.135	9.36	9.705	8.85
Occupation-specific experience	7.399	7.58	11.116	8.23
Apprenticeship	1.166	2.20	0.241	1.08
Technical training	0.734	1.58	1.462	1.61
Reading, writing, and arithmetic skills ^b	1.973	1.37	2.637	0.94
Nationality: non-Ivorian (percent)	0.275	0.44	0.000	0.00
Female (percent)	0.149	0.35	0.259	0.44
Schooling (years)				
Total	5.269	4.94	9.179	5.26
Elementary	3.561	2.84	5.132	2.08
Junior high	1.215	1.69	2.472	1.80
Senior high	0.322	0.89	0.859	1.29
University	0.169	0.83	0.717	1.87
Diplomas obtained (percent)				
Elementary	0.478	0.50	0.830	0.38
Junior high	0.182	0.38	0.491	0.50
Higher	0.089	0.28	0.236	0.43
Technical	0.202	0.40	0.472	0.50

a. CFAF is Communauté Financière Africaine Franc; CFAF 50 = 1 franc (F); F 10 = \$1 in 1985. The averages reflect CFAF 595 for the private and CFAF 1,173 for the public sector. The standard deviations correspond to these calculations.

b. This index is zero for the completely illiterate and increases by 1 for every skill acquired.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

in the analysis for Côte d'Ivoire.² They foreshadow to some extent the estimation results of the sector-choice equation. Public employees are on average better educated, showing 9.2 years of education versus 5.3 in the private sector. Furthermore, the concentration of schooling diplomas is much higher in the public sector. There are no non-Ivorians in the public sector, and 26 percent of the government labor force is female versus only 15 percent in the private sector. Total experience, measured as age minus formal schooling minus technical training minus 5, averages about 20 years in both sectors. But occupation-specific experience is much lower in the private than in the public sector, showing the importance of job tenure in the latter and of job mobility in the former. Note that, with an average age of 32 years, 20 years of experience

2. Note that in the Lima sample, all potential experience accumulated since leaving school, including job-specific experience, is aggregated in one variable, overlapping with the "job-specific" measure. The Côte d'Ivoire sample, however, measures experience prior to entering the current occupation as one variable, with no overlap with the occupation-specific measure.

Table 4. *Definitions and Summary Statistics of the Variables Used for the Peru Analysis*

Variable	Private sector (N = 759)		Public sector (N = 254)	
	Mean	Standard deviation	Mean	Standard deviation
Log of hourly wage rate (intis at June 1985 price) ^a	1.598	0.85	1.910	0.66
<i>General background</i>				
Age (years)	33.7	12.3	37.6	12.4
Potential work experience (years)	18.1	13.4	20.4	13.1
Job-specific experience (years)	7.5	9.3	10.6	9.2
Vocational training (percent)	0.37	0.48	0.48	0.50
Married or cohabiting (percent)	0.55	0.50	0.69	0.46
Father's schooling (years)	5.8	4.0	6.5	4.1
Mother's schooling (years)	4.0	3.6	4.8	3.5
<i>Schooling (years)</i>				
Total	9.2	3.4	11.0	3.7
Primary	4.8	0.6	4.9	0.4
Secondary	3.5	2.0	4.2	1.6
Postsecondary	0.9	1.7	1.9	2.6
Public (percent) ^b	0.82	0.38	0.87	0.33
<i>Diplomas obtained (percent)</i>				
Secondary technical	0.02	0.15	0.05	0.21
Postsecondary nonuniversity	0.02	0.15	0.05	0.22
University	0.08	0.28	0.22	0.41

a. In June 1985, 20 intis = \$1. The averages reflect 7.09 intis for the private and 8.39 for the public sectors.

b. School last attended.

Source: Calculations based on data from the Instituto Nacional de Estadística, Peru.

makes very young entry into the private sector possible. Most striking is the difference in the average wage rates: public employees earn *on average* almost twice as much as private wage earners.

Table 4 presents definitions and summary statistics for the study on Lima. As in Côte d'Ivoire, public workers show on average a higher level of education, though the difference is less than two years. However, while 22 percent of public workers have a university diploma, only 8 percent of private employees have one. Public workers are slightly older and more likely to be married. Again, on average, public wages exceed those in the private sector.

The two samples were used to estimate the complete model, equations 1, 2, and 4, using Full Information Maximum Likelihood (FIML) (see van der Gaag and Vijverberg 1988). We also estimated equations 1 and 2 separately with OLS. The FIML and OLS estimates of the log wage equations are shown in tables 5 and 6, using the best specification of the model. While the model was first estimated allowing all elements of the β_1 and β_2 vectors to vary, χ^2 tests showed that the coefficients of the experience, diploma, and parental education varia-

Table 5. *FIML and OLS Estimates of Log-Wage Equations for the Public and Private Sectors, Côte d'Ivoire*

Variable	FIML estimates				OLS estimates			
	Public sector		Private sector		Public sector		Private sector	
<i>Intercept</i>	2.993	(10.20)	3.586	(19.02)	4.819	(14.59)	3.320	(14.14)
<i>General background and characteristics</i>								
Non-Ivorian	—	—	0.125	(1.06)	—	—	−0.124	(1.05)
Female	−0.0735	(−0.61)	0.122	(0.82)	−0.319	(3.06)	0.312	(2.17)
<i>Diplomas obtained (percent)</i>								
Elementary		0.401	(2.69)		0.195	(0.54)	0.552	(2.75)
Junior high		0.443	(3.18)		0.179	(0.95)	0.806	(3.00)
Higher		0.390	(1.56)		0.551	(1.83)	0.175	(0.32)
Technical		0.042	(0.50)		−0.036	(0.32)	0.071	(0.35)
Reading, writing, and arithmetic	0.154	(1.50)	0.126	(1.73)	0.195	(1.44)	0.091	(1.15)
<i>Schooling and experience (years)</i>								
Elementary	0.050	(1.13)	0.010	(0.27)	0.002	(0.02)	0.048	(1.00)
Junior high	0.191	(4.24)	0.039	(0.82)	0.152	(2.85)	0.047	(0.76)
Senior high	0.007	(0.08)	−0.102	(−0.88)	−0.010	(0.10)	−0.007	(0.35)
University	0.221	(6.42)	0.259	(3.74)	0.160	(4.74)	0.307	(3.91)
Technical training	0.049	(1.72)	0.108	(3.10)	0.020	(0.60)	0.112	(2.47)
Apprenticeship		−0.003	(−0.14)		0.014	(0.27)	0.010	(0.38)
Occupation-specific experience		0.097	(7.82)		0.53	(2.70)	0.127	(7.47)
Occupation-specific experience squared ÷ 100		−0.150	(−3.54)		−0.513	(0.79)	−2.321	(3.82)
General work experience		0.021	(2.06)		−0.023	(1.28)	0.053	(3.15)
General work experience squared ÷ 100		0.011	(0.44)		1.007	(1.95)	−0.489	(1.31)
σ_{ii}	0.690	(6.71)	0.909	(9.45)	0.389		0.692	
ρ_{ie}	0.913	(22.39)	−0.779	(−12.39)				
Log-likelihood		−820.66						
Adjusted R ²					0.631		0.609	

— Not applicable.

Note: *t*-statistics are in parenthesis; ρ_{ie} is the correlation between u_i and ϵ_i .

Source: van der Gaag and Vijverberg (1988).

Table 6. *FIML and OLS Estimates of Log-Wage Equation for the Public and Private Sectors: Peru*

Variable	FIML estimates				OLS estimates			
	Public sector		Private sector		Public sector		Private sector	
<i>Intercept</i>	-1.154	(-2.17)	0.245	(1.15)	0.795	(1.37)	0.164	(0.81)
<i>Experience</i>								
Potential work experience (years)		0.030 (3.98)			0.020 (1.33)		0.032 (3.70)	
Potential work experience squared ÷ 100		-0.032 (-2.28)			-0.019 (-0.69)		-0.037 (-2.37)	
Job-specific experience (years)		0.020 (2.39)			0.001 (0.08)		0.027 (2.73)	
Job-specific experience squared ÷ 100		-0.045 (-1.69)			-0.005 (-0.10)		-0.058 (-1.87)	
<i>Schooling (years)</i>								
Primary	0.089	(0.89)	0.069	(1.61)	0.068	(0.56)	0.061	(1.49)
Secondary	0.102	(3.36)	0.049	(2.82)	0.051	(1.56)	0.048	(3.01)
Postsecondary nonuniversity	0.073	(3.20)	0.104	(4.41)	0.018	0.68	0.105	(4.66)
Vocational training (percent)	0.142	(1.53)	0.222	(4.01)	0.050	(0.61)	0.216	(4.13)
Public	0.229	(1.66)	-0.159	(-2.01)	0.021	(0.18)	-0.120	(-1.74)
Secondary technical		0.007 (0.05)			-0.147	(-0.79)	-0.044	(-0.27)
Postsecondary		0.297 (2.20)			0.352	(1.78)	0.216	(1.26)
University		0.414 (3.98)			0.448	(2.65)	0.360	(2.75)
Father's schooling		0.030 (4.97)			0.008	(0.59)	0.030	(3.75)
Mother's schooling		-0.002 (-1.39)			0.010	(0.67)	0.013	(1.50)
Married or cohabiting (percent)		0.180 (2.94)			-0.005	(-0.05)	0.199	(3.09)
σ_{ii}	0.712	(6.27)	0.416	(17.69)	0.360		0.421	
ρ_{ie}	0.844	(18.10)	-0.080	(-0.24)				
Log-likelihood		-1,485.26						
Adjusted R ²					0.18		0.42	

Note: *t*-statistics are in parentheses; ρ_{ie} is the correlation between u_i and ϵ .

Source: Stelcner, van der Gaag, and Vijverberg (1987).

Table 7. *Estimates of the Switching Equations*

Variable	Côte d'Ivoire		Peru	
Intercept	-4.810	(-7.35)	-2.615	(-6.03)
Female	0.455	(3.06)	—	—
Elementary school	0.568	(2.70)	0.287	(1.34)
Junior high	0.363	(2.15)	0.239	(1.03)
Higher schooling	-0.402	(-1.69)	0.026	(0.26)
Technical training	0.121	(1.02)	0.180	(1.96)
Reading, writing, and arithmetic	-0.045	(-0.50)	—	—
Years schooling	0.054	(1.71)	0.091	(5.83)
Public schooling	—	—	0.434	(3.36)
Age	0.176	(5.02)	0.009	(0.41)
Age squared/100	-0.182	(-3.96)	0.003	(0.12)
Married	—	—	0.303	(2.84)

— Not applicable.

Note: *t*-statistics are in parentheses.

Sources: For Côte d'Ivoire, van der Gaag and Vijverberg (1988); for Peru, Stelcner, van der Gaag, and Vijverberg (1987).

bles were not significantly different between the sectors. Subsequently, the model was reestimated restricting the effects of these variables to be the same in both sectors. The corresponding sector choice equations are presented in table 7. Detailed discussions of the results can be found in van der Gaag and Vijverberg (1988) for Côte d'Ivoire and in Stelcner, van der Gaag, and Vijverberg (1987) for Peru. For our purpose here, these results are best summarized in experience-wage profiles, which show the expected wage for an average worker (where characteristics are averaged over both sectors) over the worklife.

Experience-wage profiles for an average employee are shown in figures 1 and 2 for Côte d'Ivoire and Peru, respectively, to compare the results of OLS and FIML estimates. Starting from age 18, we let occupational experience and, in the case of Lima, general experience grow yearly until age 55. Perhaps the most striking result is the large deviation between the two types of estimates. Selectivity bias in the OLS estimates appears to be very serious. The OLS results show that starting salaries in the private sector are well below those in the public sector, but the experience profiles are steeper for private employees. For Peru, private wages eventually will exceed those in the public sector, but in Côte d'Ivoire public wages are always higher than private wages through fifty-five years of age. The conclusion based on the FIML estimates is quite different: for workers with *average* characteristics, public wage offers are lower than private wage offers throughout the working lifetime. This conclusion holds for both countries.

Table 8 shows the differences in sectoral reward to worker characteristics as reflected in the wages offered and paid for an average worker with values for the characteristics again averaged across sectors. Wage offers from the private sector exceed those of the public sector by 36 percent in Côte d'Ivoire (1985)

Figure 1. *Experience-Wage Profiles for Average Wage Earners in Côte d'Ivoire*

Figure 2. *Experience-Wage Profiles for Average Male Wage Earners in Peru*

Table 8. *Wages Offered and Accepted in Côte d'Ivoire and Peru*

Wages; wage determinants and differences	Côte d'Ivoire (CFAF)		Peru (I/)	
	Private Sector	Public Sector	Private Sector	Public Sector
Wage offer	414.9	304.8	6.34	3.22
Selectivity effect	283.9	295.9	0.09	5.03
Accepted wage	698.8	599.7	6.43	8.25
Rejected wage	179.3	214.9	2.46	6.34
Difference	519.5	384.8	3.97	1.91
(<i>t</i> -statistic) ^a	(8.99)	(7.15)	(7.00)	(0.43)
Percentage of sectoral workers				
With insignificant negative difference ^b	0.0	0.0	0.0	34.6
With insignificant positive difference ^c	5.5	13.2	0.0	65.4
With significant positive difference ^d	94.5	86.8	100.0	0.0

a. *t*-statistic of the difference between accepted and rejected log wage.

b. *t*-statistic of the difference in log wages is between 0 and -2.

c. *t*-statistic of the difference in log wages is between 0 and 2.

d. *t*-statistic of the difference in log wages exceeds 2.

Sources: Calculations based on data from ONFP, Côte d'Ivoire, and the Instituto Nacional de Estadística, Peru.

and by 97 percent in Peru (1985-86). That does not mean that every average worker would reject a public job offer: variation in unobserved productive characteristics will still make public employment a preferred choice for some, otherwise average, workers.

In Côte d'Ivoire, when the average worker applies to the private sector, the wage offer is CFAF 415. For the average worker who *accepts* the offer, however, the wage is CFAF 699; the unobserved productive characteristics which determine selection in that sector are worth CFAF 284. The wage in the public sector rejected by such workers is CFAF 180, a difference of CFAF 520. The difference between the accepted wage in the public sector and that offered in the private sector is much smaller: the wage gap equals CFAF 385 on a wage of CFAF 600.

In Peru, those who accept a public job received an average wage offer of 8.25 intis (I/). Their unobserved productive characteristics are worth I/5.03, that is, the selectivity effect. Such workers rejected job offers with an average wage of I/6.34 from the private sector, a difference of I/1.91. Statistically, this difference is insignificant. In comparison, the difference accruing to an average private worker equals I/3.97 on an average wage of I/6.43.

The bottom part of table 8 shows the statistical significance of the wage difference of every worker in each sector.³ In Côte d'Ivoire, every worker is better off in the sector where he or she is found to be. In Peru, all private workers enjoy a significant positive difference, but none of the public workers does so. In fact, one-third of the public workers appear to reject an (insignificantly) higher private sector wage.

3. Since non-Ivorian workers in Côte d'Ivoire do not hold public jobs, they are omitted from the calculations.

The conclusion is the following. In Côte d'Ivoire in 1985, public wage offers were below private wage offers. Through selection among the two sectors, workers sorted themselves into the sector where they were able to enjoy the highest wage. This is consistent with the assumption that workers are heterogeneous and will function better in some environments than in others.

There is also evidence that Peruvian workers sorted themselves according to their comparative advantage. However, public wage offers to workers who accept them were so low that there was no monetary benefit for the worker to this selection at that time. Subsequent labor unrest among civil servants, and the 50 percent increase in public wages in 1987 provide additional evidence of this negative wage gap (Bonner 1988).

If they suffer from wage discrimination, why do workers continue to seek employment in and remain in the public sector? One reason may be that nonmonetary remuneration is greater for civil servants. While our comparisons include the monetary value of such benefits as housing and travel allowances and of food received at work, the value of other fringe benefits, such as paid holidays or pensions, is not included. As is well known and shown in table 9, the percentage of workers who receive these benefits is greater for the public than the private sector.

Intangibles, such as pressure on the job, type of work, or job security also are not measured. However, in Côte d'Ivoire 55 percent of public workers have a signed contract, as compared with 33 percent of employees in the private sector. Having a contract may be a proxy for job security. If this is important to the employee he or she may be willing to forgo some salary to obtain security or tenure. Other benefits, such as retirement payments or social security, may have a large monetary value that needs to be taken into account in a more comprehensive study of public and private remuneration systems (for a discussion of the economics of nonwage labor costs, see Hart 1984).

Another explanation may be that public employees are able to retain the nonmonetary benefits of government employment while offsetting the lower wage with outside income. While this might be optimal individually, the implications for time and effort spent on the primary job are negative and would become increasingly so as the wage gap (and thus moonlighting) increased.

Table 9. *Percentage of Workers Receiving Fringe Benefits*

<i>Benefit</i>	<i>Côte d'Ivoire</i>		<i>Peru</i>	
	<i>Public</i>	<i>Private</i>	<i>Public</i>	<i>Private</i>
Contract	54.7	33.2	42.1	22.5
Paid holiday	92.5	53.2	91.7	59.3
Paid sick leave	90.1	48.5	91.6	57.3
Retirement pension	91.5	40.9	90.0	53.6
Social security	62.7	27.0	62.2	59.2

Source: Calculations based on data from ONFP, Côte d'Ivoire, and the Instituto Nacional de Estadística, Peru.

Table 10. *Workers Holding Second Jobs, by Sector*
(percent)

<i>Sector</i>	<i>Côte d'Ivoire</i>	<i>Peru</i>
Public	9.9	26.7
Private	4.6	14.3
All employees	6.8	17.4

Sources: Calculations based on data from ONFP, Côte d'Ivoire, and the Instituto Nacional de Estadística, Peru.

IV. MOONLIGHTING

If the FIML results are correct and public wages are too low, we might expect that civil servants would be more likely than private workers to take second jobs ("moonlight") to compensate for the wage gap. Our evidence supports this hypothesis: as shown in table 10, moonlighting is much more prevalent among civil servants than among private wage earners. For Lima, 26.7 percent of public employees have secondary jobs, versus 14.3 percent of private employees. In Côte d'Ivoire, the phenomenon seems less prevalent, and the proportions are 9.9 and 4.6 percent, respectively. The results in table 10 should be interpreted as lower-bound estimates, however. While work on a second job can take place after regular work hours or during the weekend, casual observations on absenteeism among civil servants in developing countries suggest that some of it takes place during the day. Thus respondents to the survey may have been reluctant to reveal moonlighting activities.

Table 11 compares characteristics of civil servants with and without a second job. In terms of age and education the differences between the two groups of employees are fairly small. For Peru we find that those with a second job are more likely to have taken vocational training. Women are less likely to have a second job in Côte d'Ivoire. Hourly wages (of the primary, public job) are somewhat higher for moonlighters in Côte d'Ivoire but show little difference between the two groups in Lima. Moonlighters report slightly fewer hours of work in the primary job than those without a second job. Average hours on the second job are 9.7 in Côte d'Ivoire and 13.3 in Lima. Not surprisingly, most of those with second jobs are self-employed.

An important assumption in the literature on the economics of moonlighting is that individuals make their labor supply decisions sequentially (see Brown 1983; Joll and others 1983; and Shishko and Rostker 1976). First, they try to obtain a public job; then, given the income earned in this job and the opportunities offered in the private sector, they decide whether or not to take a second job. This is a very reasonable assumption, although there are numerous sequences depending upon relative wages in the main and second jobs, unobserved tastes for the two jobs, and, perhaps most important, constraints on the choice of hours in the two jobs. Under an alternative scenario, workers choose the public sector knowing that they have better opportunities in that sector for

Table 11. *Characteristics of Single and Double Job Holders in the Public Sector*

Characteristic	Côte d'Ivoire		Peru	
	Moonlighters	Nonmoonlighters	Moonlighters	Nonmoonlighters
Age	39.0 (7.6)	36.3 (8.8)	41.0 (11.8)	36.3 (12.4)
Years of schooling	7.1 (6.2)	9.4 (5.1)	11.4 (3.6)	10.9 (3.9)
Vocational training (percent)	—	—	0.53	0.32
Female (percent)	0.14	0.27	—	—
Cohabiting or married (percent)	—	—	0.85	0.32
Main job				
Hourly wage ^a	1,381 (2,348)	1,195 (1,597)	8.85 (6.6)	8.66 (11.3)
Hours per week	39.9 (14.3)	42.9 (14.6)	39.1 (12.2)	46.7 (16.2)
Second job				
Hours per week	9.7 (7.3)	n.a.	13.3 (10.3)	n.a.
Self-employed (percent)	0.91	n.a.	0.75	n.a.

— Not available; n.a. Not applicable.

Note: Standard deviations are in parentheses.

a. Monetary values are CFAFs for Côte d'Ivoire and I/ for Peru at 1985 prices.

Sources: Calculations based on data from ONFP, Côte d'Ivoire, and the Instituto Nacional de Estadística, Peru.

second jobbing. As argued, the switching regression model may not be affected by that, but it would make some of the explanatory variables used here endogenous, and thus it would bias the estimation results reported below.

The simplest model to test for the effect of wages in the public and private sectors is given in columns 1 and 4 of table 12 for Côte d'Ivoire and Peru, respectively. The table shows the estimation results of the probit equations in which the dependent variable equals one if the person has a second job, and zero otherwise. We expect, a priori, that a higher public wage will reduce the probability of moonlighting by civil servants, while a higher private wage offer will make moonlighting activities more attractive. Note that the public wage is the predicted *accepted* wage received by the civil servant, as compared with the private wage *offer* to public employees as predicted by our FIML estimates.⁴ The private wage offer is used as a proxy for earnings potential in the private sector, since, as shown in table 11, moonlighters are usually self-employed (in the informal sector) rather than wage earners (in the formal sector). The implicit

4. In terms of the model described in the appendix, the government wage is $\ln(w_{\text{Gov}}) = X\hat{\beta}_1 + \hat{\sigma}_1\hat{\lambda}_1$ (see equation 6) and the private wage is $\ln(w_{\text{Priv}}) = X\hat{\beta}_2 + \hat{\sigma}_2\hat{\lambda}_1$ (see equation 7) where “ $\hat{\cdot}$ ” indicates estimated values.

Table 12. *Determinants of Moonlighting by Public Employees*

Variable	Means	Côte d'Ivoire			Means	Peru		
		(1)	(2)	(3)		(4)	(5)	(6)
Intercept		-0.966 (4.60)	-5.458 (2.02)	-5.531 (2.04)		-0.484 (1.26)	-2.847 (2.48)	-2.910 (2.50)
Per capita household consumption ^a	7.41 [7.1]	-0.051 (1.53) {0.82}	—		8.34 [9.0]	-0.010 (1.08) {0.34}		
Earnings from main job ^a	3.95 [3.9]		-0.157 (1.65) {-3.02}	-0.162 (1.67) {-3.12}	3.24 [1.8]		-0.292 (3.41) {9.67}	-3.02 (3.40) {10.02}
Other income ^a	3.34 [5.5]			-0.011 (0.37) {-0.22}	4.46 [8.2]			0.026 (1.81) {0.87}
Public wage ^b	10.23 [11.7]	-0.022 (0.67) {0.35}			7.27 [2.9]	-0.141 (1.37) {-4.63}		
Private wage offer ^b	3.70 [4.7]	0.058 (0.76) {0.93}	0.066 (1.62) {1.27}	0.065 (1.62) {1.26}	7.75 [5.6]	0.103 (1.96) {3.37}	0.061 (1.68) {2.01}	0.059 (1.62) {1.97}
Household size	8.4 [4.5]		-0.010 (0.32) {-0.19}	-0.006 (0.20) {-0.12}	5.8 [2.4]		0.067 (1.71) {2.20}	0.048 (1.20) {1.61}
Years of schooling	9.2 [5.3]		-0.018 (0.42) {-0.35}	-0.012 (0.29) {-0.28}	11.0 [3.7]		0.023 (0.50) {0.76}	0.016 (0.34) {0.53}

Table 12. *Continued*

Variable	Means	Côte d'Ivoire			Means	Peru		
		(1)	(2)	(3)		(4)	(5)	(6)
Age (in years)	36.5 [8.7]		0.256 (1.80) {4.94}	0.258 (1.81) {4.97}	37.5 [12.3]		0.068 (1.27) {2.27}	0.076 (1.37) {2.51}
Age squared/100	1,406.7 [661.0]		-0.322 (1.75) {-6.22}	-0.323 (1.75) {-6.23}	1,556.4 [1,014.7]		-0.061 (0.97) {-2.03}	-0.070 (1.09) {-2.32}
Vocational training	—	—	—	—	0.48 [0.50]		0.280 (1.50) {9.27}	0.279 (1.48) {9.27}
Married or cohabiting	—	—	—	—	0.72 [0.45]		0.332 (1.23) {10.99}	0.362 (1.33) {12.03}
Female	0.26 [0.44]		-0.682 (1.96) {-13.15}	-0.653 (1.82) {-12.57}	—	—	—	—
Log-likelihood		-65.96	-61.63	-61.56		-142.25	-130.50	-128.32

— Not available.

Note: *t*-values in (), standard deviation in [], and marginal effect on percentage probability in { }.

a. in CFAF 10,000s and I/100.

b. in CFAF 100s and I/s.

Sources: Calculations based on data from ONFP, Côte d'Ivoire, and the Instituto Nacional de Estadística, Peru.

assumption is that the returns to labor in the informal sector are adequately reflected by wages in the formal sector.

We include per capita household consumption as a proxy for the need to earn extra income from a second job. The estimation results generally confirm our expectations. All coefficients on household consumption and on the wage variables have the expected signs, and the wage effects are significant in Peru. The results for Côte d'Ivoire lack statistical significance, which is probably due to the fact that only 10 percent of government workers reported having a second job.

A potential problem with the specification of this simple model is the obvious correlation between consumption and income earned from both the main and second jobs. In an attempt to deal with this, we replaced the per capita consumption variable with total income from the primary job. The latter is calculated as the public wage times hours worked in the main job.

In terms of the standard labor-supply literature, the coefficient on primary job income reflects the unearned income effect, while that on the private sector wage yields the wage effect, as shown in columns 2 and 5 of table 12. In columns 3 and 6, we push this approach one step further by including a proxy variable for household income earned by other members of the family, "other income" calculated as total household consumption minus the wage income of the public employee. Finally, we add several variables such as household size, age, experience, and education to see whether these characteristics have an additional direct effect on the probability of moonlighting (other than through their effect on wages).

Again, the estimation results generally confirm our expectations. Most important, if public earnings rise, the probability of moonlighting decreases. If the private wage offer increases so does the likelihood of having a secondary job. The effect of the variable representing "other" income is negligible in Côte d'Ivoire and in Lima it is small, but statistically significant (at the 7 percent level), and has the wrong sign. This is probably due to reversed causation: to satisfy the income needs of the household, other household members also pitch in and generate a higher "other" income. Thus, the work effort of others may be positively correlated with the moonlighting effort of the public worker. Most of the socioeconomic background variables seem to affect the moonlighting decision only through their impact on the wage rates. Female employees in Côte d'Ivoire, however, are less likely to hold a second job, all other things being equal. While the moonlighting behavior of female workers may well be different from that of males, the sample is too small to warrant a separate analysis.

This analysis thus confirms the hypothesis that the public-private wage gap is partly responsible for the moonlighting activities of government workers. Since government workers are much more likely to have a secondary job than wage earners in the private sector, this result is consistent with our main finding

of section II: wages in the private sector *exceed* those in the public sector for the average worker.

IV. DISCUSSION AND CONCLUSION

Before summarizing the results of the previous sections a few remarks are in order. First, though we argue that it is necessary to make the sector choice endogenous when comparing public and private wages, it has been shown that the estimates of the resulting switching regression model are sensitive to the distributional assumptions. Our estimates are based on the assumption of joint normality of the disturbance terms. Tests for normality have been proposed for simpler models (for example, Newey 1987) but we are not aware of any available tests for the more elaborate model employed here.

Second, a closer examination of the actual selection process is desirable. Our estimates show strong selectivity that is not being captured by such observable variables as education and experience. The switching equation is basically a reduced form that allows for the correction of selectivity bias but does not cast sufficient light on the actual two stages of choice by prospective employees and employers. Further analysis of these choices may bring to light various measures necessary to bring public wage and employment policies in line with those in the private sector. Such analysis will also facilitate the identification of the model which now depends on the distributional assumptions and the inclusion of a limited number of additional variables in the switching equation. To the extent that the single selection equation misspecifies the actual interplay between prospective employers and employees, the parameter estimates will still be biased, despite the fact that this model (unlike studies based on OLS regression analysis) recognizes the endogenous nature of sectoral choice.

In spite of these caveats, our estimation results yield two strong conclusions. The first is of methodological importance: conventional OLS estimates on selective samples of public and private employees may yield seriously biased estimates of the expected wage offers in both sectors. In the examples shown above, the OLS estimates actually lead to the wrong conclusion. Given the widespread use of OLS techniques in the literature on the public-private wage issue, especially in developing countries, our results issue a strong warning against the interpretation of these previous findings.

Our second result is the answer to the main question of interest: in both Côte d'Ivoire and Peru wage offers in the public sector are well below those in the private sector. Our results include all monetary remuneration, including housing and travel allowances, food at work, and other fringe benefits. They do not account for paid holidays, pensions, or intangibles such as job security, for which a worker may be willing to forgo some wages.

If such benefits are taken into account there is evidence to suggest that our basic result, that public wage offers are well below those in the private sector,

will not be significantly altered. This evidence includes the time series data on public wage erosion vis-à-vis the private sector and the higher prevalence of moonlighting among public employees. Though we did not present a structural analysis of the moonlighting phenomena, the results clearly show that the public-private wage differential is an important determinant of moonlighting. A further erosion of public wages can be expected to result in more double jobbing by civil servants.

If public wages are indeed too low, why do civil servants not quit their government jobs? There are several reasons. One is that full-time wage jobs in the private sector are not available. This explanation, however, implies severe wage stickiness in the private sector, an assumption that runs counter to recent evidence on this issue for Côte d'Ivoire (see Levy and Newman 1989). A second explanation is that some people are willing to forgo direct monetary rewards for job security, other intangible job characteristics, and fringe benefits such as paid holidays, sick leave, and social security (Hart 1984). This view is consistent with our data on nonwage benefits in public and private jobs, though we do note that for Peru the prevalence of social security (an important fringe benefit) is about the same in both sectors.

Perhaps the most plausible explanation is that government workers can have their cake and eat it too. That is, they can enjoy the security and other benefits of having a government job and at the same time supplement their income by having a second job. As we have shown, the probability of finding a civil servant who has a second job in the private sector depends significantly on the public-private wage differential for this employee.

Fiscal constraints will continue to exert pressure on the government wage bill. In all likelihood, these pressures will intensify, and, given past experience, will result in further erosion of the public wage levels rather than in a reduction of public employment. At least for the two countries we studied, this has led to a situation in which public wage offers are well below those in the private sector.

The consequences of having underpaid government workers for internal efficiency in the government and the concomitant effects on the economy as a whole are particularly serious. The ongoing economic crisis in which many countries find themselves calls for better educated and highly motivated civil servants to promote productivity and to provide advice in the design and implementation of policies that would ameliorate an economic situation that showed significant deterioration in the recent past. One cannot reasonably expect to find these characteristics in a work force that is badly underpaid. The diagnosis is clear: fiscal constraints call for a reduction of the public wage bill. Two prescriptions are available, wage reduction or public employment reduction. All evidence suggests that the time has come to prescribe the latter, acknowledging that of the two, it is likely to be the more bitter medicine.

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APPENDIX: FIML AND OLS ESTIMATION

Equations 1 and 2 represent the *unconditional* wages in the public and private sectors. The expected accepted wages can be written as follows (Heckman 1979):

$$(6) \quad E[\ln w_1 | I^* \geq 0] = X\beta_1 + \sigma_{1\epsilon}\lambda_1$$

$$(7) \quad E[\ln w_2 | I^* < 0] = X\beta_2 + \sigma_{2\epsilon}\lambda_2$$

where

$$\lambda_1 = \frac{f(Z\gamma)}{F(Z\gamma)},$$

and

$$\lambda_2 = \frac{-f(Z\gamma)}{1 - F(Z\gamma)},$$

f and F being the normal density and cumulative distribution functions, and where $\sigma_{i\epsilon}$ is the covariance between u_i and ϵ . When one estimates the sector-specific wage equations by OLS, accepted wages are treated as wage offers, and the last term of equation 6 and 7 is erroneously omitted. Thus OLS will yield unbiased estimates of the wage equations if and only if $\sigma_{1\epsilon} = \sigma_{2\epsilon} = 0$. We can readily test for this by estimating the model by maximum likelihood techniques. It is likely, however, that unmeasured traits affecting productivity would influence both an individual's sectoral selection and wage, so that the covariance terms would be nonzero.

Wage Rigidity: Micro and Macro Evidence on Labor Market Adjustment in the Modern Sector

Victor Levy and John L. Newman

Aggregate data on wages and employment may provide misleading indicators of labor market conditions. They may suggest inappropriate wage policies in the face of the rising unemployment experienced in many developing countries during the 1980s. Such increases in unemployment are often attributed to wage rigidities. A cursory review of aggregate data for the modern sector in Côte d'Ivoire would support this view, suggesting that employment declined during the 1979-84 recession due to an increase in real wages. Examination of disaggregated data from two labor force censuses of the modern sector, however, shows that real wages declined for specified classes of labor. The work force was characterized by greater education, training, and experience; workers with a given level of attributes received a lower real wage by the end of the recession than before it. Despite this drop in real wages, employment in the modern sector declined.

Recessions and persistent unemployment in many developed and developing countries over the last decade have increased interest in the operation of labor markets. Much of the debate on the causes of unemployment has focused on the role of real wages. Although the restoration of equilibrium in the labor market during the recent recessions would appear to have required a fall in real wages, one widely held view is that this either has not taken place or has taken place very slowly, resulting in prolonged unemployment. Three reasons have been advanced as to why real wages may not be sufficiently flexible to clear the labor market. First, there may be legal impediments to lowering wages. Second, if workers are unable to detect whether a firm is accurately representing the demand for its products, they may resist wage cuts and prefer layoffs or firings. Because an employer would prefer to pay lower wages regardless of demand conditions and would want to decrease its employment only if times were bad, a layoff may be a more credible indication of true demand conditions. Third, a firm's management might also resist wage cuts if it feared that they would reduce the efficiency of its work force.

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A different view on why unemployment has persisted and even increased is that aggregate demand has been low. Governments, reacting to balance of payments problems and revenue reductions caused by the fall in export prices, adopted contractionary fiscal and monetary policies, an approach that led to a fall in the demand for labor and to Keynesian unemployment (for studies that analyze the cyclical behavior of real wages in developed countries, see Sachs 1980, O'Brien 1985, Mitchell 1985, Rosen 1985, Bean, Layard, and Nickell 1987, Solow 1987, Layard and Nickell 1987, and Ashenfelter and Card 1987).

There is considerable empirical evidence regarding the behavior of real wages and employment in developing countries, and this generally supports the first view (see Edwards 1986, Collier 1986, Sanchez 1987, Demekes and Klinov 1987, Fallon 1985, 1987). The studies have been based mainly on analyses of aggregate wage changes, however, which implicitly assume that the composition of the work force remains the same over the business cycle and that the relation between real wages and the business cycle is the same for all individuals or groups of individuals.

This article uses a case study of Côte d'Ivoire to demonstrate that reliance on aggregate data can lead to erroneous conclusions concerning the role of real wages in labor market adjustment during a recession. Using data from the 1979 and 1984 censuses of private and semipublic firms and employees in the modern sector, we consider changes in real wages at an aggregate level and then at the firm and individual level in order to contrast the macro and micro evidence.

Although employment in the modern sector makes up only 10 percent of total employment in Côte d'Ivoire, this sector is most likely to have rigidities and to have government policies directed toward it. Moreover, employment practices in the modern sector do not affect only current employees, but also those unemployed and in the informal sector. For example, relatively high unemployment rates of educated individuals in developing countries may be due to their preference for secure jobs in the public sector, in which wages are unresponsive to business cycle fluctuations (Squire 1981).

Besides presenting a more accurate picture of the movement in real wages, the micro data provide important information about the turnover of firms that is not apparent from the aggregate data. Although the entry of new firms and the growth of surviving firms are the two vehicles for new job creation and recovery from a recession, little evidence is available on their relative importance in developing countries. From a policy viewpoint, it is important to understand not only where an expansion comes from, but also the factors that influence it. For example, the effects of an export subsidy on existing firms may be different than on new entrants. If firms that survived the recession have underutilized capital, increasing the price of their product may be sufficient to increase employment and output without any new investment. For new firms to increase employment and output, new investment may be required. Without credit, the new smaller firms would be unlikely to respond to an export subsidy by increasing production and employment. This type of compositional variation is examined comprehensively below.

Section I describes the survey data and provides a brief account of the recent recession in Côte d'Ivoire. The real wage changes evident from the aggregate data are presented in section II and then contrasted with the changes evident from an analysis of the micro data. Section III discusses the dynamics of employment changes, distinguishes among exit, entry, and survival of firms, and relates these three phenomena to characteristics of the firm such as size, age, sector, and private or public ownership. Our conclusions are presented in section IV.

I. THE RECESSION IN CÔTE D'IVOIRE: THE DATA AND THE EXPERIENCE

Our analysis of the effect of the 1979–84 recession on employment and wages in Côte d'Ivoire is based on data from two labor force surveys of the modern sector, the 1979 and 1984 Enquêtes de Main d'Oeuvre, coordinated by La Direction des Etudes et de la Recherche de l'Office National de Formation Professionnelle (ONFP), an agency of the government of Côte d'Ivoire. In the surveys, the modern sector was defined as those establishments in industry, commerce, and services that realized a minimum value of production, or followed an accounting system called "Le Plan Comptable Ivoirien," or, in the case of the agricultural sector, met certain production levels. These surveys furnish longitudinal information on each firm and its employees in 1979, the beginning of the recession, and 1984, after the trough of the recession.

Some expansion of the coverage and types of information collected occurred between the 1979 and 1984 censuses. We have excluded from our analysis here information on 1,106 firms from the 1984 survey that were established before 1979 but were not included in the 1979 survey. These firms employed 36,199 workers in 1984. The firms that were included in the 1984 survey as a result of the expanded coverage paid average wages that were 25 percent lower than either the new or surviving firms in the 1984 survey. In addition, new hires in the latter firms were paid mean wages 40 percent higher than those of new hires in the firms added due to wider coverage. If these new hires had been included in the analysis for 1984, the decline in real wages would have been overestimated. These patterns indicate that those added may have been smaller service-oriented firms often classified as part of the informal sector. More significantly, they suggest the importance of using data obtained at the micro level to control for compositional differences, a point which becomes more apparent as the analysis proceeds.

The 1979 survey also did not provide individual data on apprentices and on the two classes of manoeuvres (the lowest skill category), although aggregate data were reported. Therefore in our analysis of the individual characteristics, information on only the five highest skill groups and the higher class of manoeuvre was used.

Firms are classified as "surviving" if they are present in both the 1979 and 1984 censuses, whereas "entries" are those established after 1979. As a check that the entries were not just old firms with a new name, we confirmed that

they had no employees hired before 1979. We do not have information on firms formed after 1979 which went out of business before the 1984 survey. Thus all references to new firms over a specified period are conditional on the firm having survived to the survey date.

Although there was some economic growth in 1980 and some sectoral recovery by 1984, the surveys generally bracket Côte d'Ivoire's 1979–84 recession and allow us to investigate the effects of recession on employment and wages. The history of Côte d'Ivoire parallels the experience of other developing countries that experienced a boom in primary commodity prices in the 1970s. Because the government paid a fixed producer price and sold at international prices, rising prices for its two main export crops, coffee and cocoa, resulted in a large increase in government revenues. The government used these revenues to stimulate investment: between 1976 and 1978, public investment as a proportion of gross domestic product (GDP) increased from 15 percent to 25 percent, while the rate of growth of GDP averaged 9.0 percent a year.

Between 1977 and 1978, coffee and cocoa prices declined by 31 percent and 10 percent, respectively, remaining at those levels until the first half of 1980. At the same time, import prices rose, with oil prices doubling in 1979. These changes resulted in a cumulative decline of 31.7 percent in Côte d'Ivoire's terms of trade in the 1977–79 period. Rather than reducing investment, the government increasingly relied on external borrowing to finance the continued expansion. Together with rising interest payments on external public debt, this borrowing transformed a balance of payments surplus into a deficit amounting to 12 percent of GDP in 1980.

In 1981, the government initiated a drastic financial recovery and structural adjustment program, supported by an International Monetary Fund loan and two structural adjustment loans from the World Bank (1981 and 1983). The program called for a reduction in the public sector and current account deficits and the restoration of overall balance of payments equilibrium by the end of 1983. Additional objectives were to remove the price distortions and to establish incentives to improve resource allocation. The government instituted a 24 percent cut in real public investment in 1981, followed in 1983 by a further 20 percent decline in public current and capital expenditures. Together with the continued fall in coffee and cocoa prices and a drop in export crop production attributable to a severe drought, the contractionary measures adopted by the government contributed to a deepening recession between 1981 and 1984.

The extent of the recession is reflected in the decrease in modern sector employment between 1979 and 1984 (table 1). Employment in the modern sector, which had 248,350 workers in 1979, had declined by 31 percent by 1984. Roughly two out of every three firms in the 1979 survey (2,164 firms) had gone out of business by 1984. Although the number of exiting firms exceeded the number of new entering firms by just 127, firm closures eliminated 67,511 jobs, which substantially exceeded the 25,853 jobs contributed by entering firms. There was a further reduction of 35,098 jobs among the

Table 1. *Changes in Aggregate Employment, 1979-84*

	1979 employment	Firm closures	Layoffs	Survivors	Firm entries	1984 employment	Change
Employment	248,350	-67,511	-35,098	145,741	+25,853	171,594	-76,756
Firms	3,243	-2,164		1,079	+2,037	3,125 ^a	-127

a. A total of 17 of the 1979 firms had merged into 4 while 10 had split into 32 by 1984, which accounts for the discrepancy in the entries for firms.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

1,079 surviving firms. Sixty-six percent of all job losses arose as a result of the closure of firms and 34 percent as a result of the net contraction of surviving firms.

The firms that survived also experienced considerable turnover of personnel. Of the 145,741 employed in 1984, 80,317 had been with the same firm in 1979, while 65,424 had been hired since then. We do not know whether those newly hired had been employed at the same firm in a previous period. The implication of these figures is that 100,522 workers (or 55 percent of the work force) in surviving firms lost their jobs or were laid off between 1979 and 1984.

II. MOVEMENTS IN REAL WAGES

Examination of the behavior of real wages between 1979 and 1984 shows that the conclusions about the extent of real wage flexibility are significantly altered by adjusting for compositional changes in employment. Table 2 presents average real wages in 1979 and 1984 for workers in each professional category. The average monthly wage rate was 60,000 Communauté Financière Africaine Francs (CFAF) in 1979 and CFAF 104,300 (nominal) in 1984 (excluding firms

Table 2. *Average Real Wages by Professional Category*
(monthly salary in CFAF 1,000)

Job category	1979		1984	
	Share of employment	Average wage	Share of employment	Average wage ^a
Director	1.8	345	2.4	384
Upper management	3.7	341	5.4	305
Middle management	2.8	181	3.6	161
Technical employees	6.4	110	11.8	97
Skilled workers	16.6	56	24.6	52
Unskilled workers (including higher and lower classes)	68.9	31	56.0	28
Apprentices	0.2	20	0.2	17
Total	100.0	60	100.0	71
Total (weighted by 1979 shares)				55

a. Deflated by consumer price index.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

entering as part of the expanded coverage). Given the 48 percent rise in the consumer price index (CPI) during this period, this implies a real wage of CFAF 70,500 in 1984 and a real increase of 17.5 percent.¹ There were no differences in the average real wage for new and surviving firms in 1984. But in 1979 the firms which were to survive paid a higher wage than those which exited.

The strong countercyclical movement of wages indicated by the aggregate data suggests that slow adjustment or rigidity of real wages was a potentially important factor in explaining the employment loss in the modern sector. The aggregate picture is misleading, however, for it does not take into account the large compositional changes that accompanied the contraction in employment. For example, the share of unskilled workers in total employment declined from 69 to 56 percent, whereas the share of management-level employees increased from 1.8 to 2.4 percent. Given the large differences in the wage rates across educational or occupational groups, controlling for the compositional changes makes a difference. If the composition across occupational categories had remained the same in 1984 as in 1979, the average real wage rate in 1984 would have been CFAF 55, representing a decline of 8 percent from 1979.

The view that real wages were rigid may also be challenged by looking at the variation across firms, not simply at the mean. Table 3 presents the distribution of the change in mean real wages for surviving firms. Fifty-one percent of the firms witnessed a real decrease in their mean wage. The reductions were greatest among small and agricultural firms and lowest among large firms and firms in the manufacturing sector.

Data on real wages of workers by professional categories or by firms still embody a high degree of aggregation. This level of aggregation does not allow one to address the key question related to wage flexibility: are firms able to hire workers of a given quality at lower wages during a recession? This question is best addressed by an analysis of real wages received by individual workers within each firm.

The data on individual workers allow us to consider separately the wages of workers that remained in the surviving firms and the wages of newly hired workers. The wage of new hires is a measure of the marginal cost of labor to the firm—what the firm must pay to hire a worker of a given set of characteristics. Given the substantial turnover of firms and workers within firms, declines in real wages of new hires can be an important mechanism for achieving wage cuts.

Because a newly hired worker has not built up specific human capital in the firm, this wage also may be a measure of an alternative wage—what a worker would receive if he or she left the current job and obtained employment elsewhere. For retained workers, there may well be specific human capital gener-

1. Deflating by the CPI rather than the firm's product price, which was not available, makes our results comparable to those of other wage equations in subsequent regressions. However, the real cost of labor to the producer will differ to the extent that the increase in their product price is greater or less than the CPI.

Table 3. *Distribution of Real Wage Changes among Surviving Firms*
(percentage of firms)

Real wage change (dw; percent)	Types of firms									
	All	Small ^a	Large	Public ^b	Private	Nontraded	Manufacturing	Agricultural	Expanding ^c	Contracting ^d
$dw \leq -60$	12	18	8	14	12	12	10	23	8	15
$-60 < dw \leq -50$	2	4	3	1	2	2	1	0	1	3
$-50 < dw \leq -40$	5	9	3	3	6	5	4	8	3	7
$-40 < dw \leq -30$	6	7	6	6	6	7	2	3	4	7
$-30 < dw \leq -20$	7	6	6	5	7	6	8	0	5	8
$-20 < dw \leq -10$	8	8	3	8	8	8	7	5	6	9
$-10 < dw \leq 0$	11	9	6	7	11	11	13	10	13	9
$0 < dw \leq 10$	8	6	14	3	9	8	12	3	8	9
$10 < dw \leq 20$	8	7	0	5	8	8	7	5	10	7
$20 < dw \leq 30$	8	4	6	8	8	8	8	8	10	6
$30 < dw \leq 40$	4	2	8	2	4	3	8	5	4	4
$40 < dw \leq 50$	3	1	3	2	3	3	5	0	5	2
$50 < dw \leq 60$	3	3	3	2	3	2	5	3	4	2
$dw > 60$	16	16	33	32	14	15	11	30	19	13
Average = 16										

a. Small firms are those with 10 or fewer employees.

b. Public firms are 50 percent or more publicly owned.

c. Expanding firms are those that increased employment between 1979 and 1984.

d. Contracting firms decreased their employment between 1979 and 1984.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

ated by the job association. If their wages are set as an outcome of a bargaining process between firms and workers over the resulting rents, the behavior of wages of retained workers need not follow that of new hires.

Wage Changes of Workers Who Retained Their Jobs

It is not possible to determine the extent to which wage rigidity contributed to unemployment by examining the wage changes of those who remained employed without accounting for workers who become unemployed (see the discussion in Beckerman and Jenkinson 1986). Only where a worker retains the job is it possible to observe a wage change, and by definition, these workers' wages were sufficiently flexible to ensure employment. The question then becomes, could real wages fall in response to reductions in demand? If they can fall (and we find evidence that they can), to argue that the rigidity of wages was responsible for the loss in employment requires explaining then why wages were not able to fall for those who became unemployed. An alternative explanation for the loss in employment in the modern sector is that wages were flexible, but when they fell below what could be obtained in the informal sector, workers went into the informal sector.

Over the five-year period, those who retained their jobs experienced no change in real wages, despite the severe recession. However, as the distribution of real wage changes for both sexes shows (table 4), that trend did not apply to all workers. Forty-four percent of the males and 42 percent of the females suffered real wage decreases over this period. The proportion of workers in each sector facing real wage declines ranged from 43 to 48 percent, with the agricultural sector having not only the largest proportion of its workers experiencing a decline, but also having the greatest share facing the most severe cuts (a cut of 20 percent or more). The public sector had the second largest share of retained workers facing declining wages, whereas the private and nontraded

Table 4. *Distribution of Real Wage Changes by Sex and Sector*
(percentage of individuals in category)

Category	Real wage change (percent)					
	-20 and lower	-19 to -10	-9 to -1	0 to 9	10 to 19	20 and higher
<i>Sex</i>						
Male	17	11	16	14	10	32
Female	9	10	23	20	9	29
<i>Sector</i>						
Traded	21	10	14	12	9	35
Nontraded	13	11	19	16	11	29
Public ^a	14	13	20	15	10	27
Private	17	10	16	15	10	33
Manufacturing	21	10	14	12	9	34
Agriculture	26	9	13	15	8	29

a. Public firms are those 50 percent or more publicly owned.

Source: Calculated from 1979 and 1984 Enquêtes de Main d'Oeuvre, ONFP, Côte d'Ivoire.

sectors had the smallest share. The highest proportion of workers experiencing real wage declines was found among the lowest education levels: more than 55 percent of uneducated workers suffered a real wage decline (not shown).

Although observed differences in wages are appropriate for comparing the welfare of individuals over a set period, they are not necessarily the best indicator of the extent of flexibility in the wage structure. This is because they do not account for the different patterns of earning over a person's work life: unskilled workers typically face flat wage profiles, whereas skilled workers generally face an upward sloping profile. Thus the wage in 1984 corresponds to a different point on an individual's wage profile than was true in 1979. Wage profiles may also shift as a result of macroeconomic changes in the economy. A recession may induce a downward shift in the profile of unskilled workers that could result in a lower wage, as may have happened in the period between 1979 and 1984. Conversely, skilled workers' wages may not decline despite a downward shift in their wage profile.

To examine the extent of real wage flexibility, we believe it is more informative to look at changes in real wage profiles, which we estimated for 1979 and 1984. The mean values and definitions of the explanatory variables used in the regressions are given in table 5. The business-cycle variable employed is the ratio of the number of workers who left the industry to the total number hired in the year previous to the survey. Contracting industries will tend to fire more workers than they hire, making the value of the index higher. The average value of the index rose, reflecting the recession in the economy between the two surveys.

Table 5. *Wage and Wage Determinants*
(mean values)

<i>Determinant</i>	<i>Retained Workers</i>		<i>New Hires</i>	
	1979	1984	1979	1984
Sex (dummy = 1 if female)	0.12	0.12	0.09	0.13
Years of education	5.40	5.97	5.70	6.64
Technical training (dummy = 1 if trained)	0.04	0.09	0.04	0.10
Specific experience in firm	8.08	12.93	2.41	2.93
Specific experience squared	104.99	206.98	7.52	10.64
General experience	14.41	13.76	15.46	15.14
General experience squared	287.85	273.56	335.32	322.23
Size of firm	922.63	751.29	1,762.36	757.12
Age of firm	22.75	26.49	15.72	15.28
Public (dummy = 1 if firm is more than 50 percent state owned)	0.30	0.28	0.40	0.36
Business cycle (ratio of number of workers who left the industry to those hired in past year)	0.52	0.65	0.50	0.89
Monthly wage (ln)	4.20	4.20	3.95	3.89
Number of observations ^a	10,622	10,835	75,995	54,477

a. Differences in the number of observations for retained workers are due to missing values for some of the explanatory variables.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

Table 6 presents estimated coefficients from the regressions for retained workers using the log of the monthly wage as the dependent variable. The results indicate a good overall fit. The human capital variables exhibit the same general pattern as is found in other human capital wage equations. The rate of return on education is 16 percent in 1979, which is high but comparable to the 20 percent rate of return in Côte d'Ivoire found by van der Gaag and Vijverberg (1987). The estimated return on vocational training is very high, especially in 1979, but note that the mean of this variable is low. The overall flat 5 percent return on experience also corresponds to the overall return to experience in van der Gaag and Vijverberg. The effects of the firm-level variables did not change greatly. The coefficient of the business-cycle variable was negative in 1979—the greater the ratio of workers leaving than entering, the lower the wage. In 1984, the coefficient was essentially zero. Because before the 1979 survey the economy was growing whereas before the 1984 survey it was declining, this may suggest a differential response to demand conditions depending on the position in the business cycle.

Because it is difficult to infer what happened to the level of wages from the table of coefficients, figure 1 presents graphically the wage profiles predicted by years of firm-specific experience calculated at the mean values of the explanatory variables. There is a downward shift in the wage profile between 1979

Table 6. *Retained Workers: Effect of Worker, Firm, and Industry Characteristics on Wages*
(percent)

Determinants	1979		1984	
[Constant]	2.63	(85.0)	2.36	(60.4)
Sex (dummy = 1 if female)	0.03	(1.6)	-0.03	(-1.5)
Years of education	0.16	(98.9)	0.17	(100.5)
Technical training (dummy = 1 if trained)	0.45	(16.7)	0.23	(10.5)
Specific experience in firm	0.05	(20.7)	0.03	(9.1)
Specific experience squared	-0.0005	(-4.6)	-0.00004	(-0.3)
General experience	0.05	(22.7)	0.04	(19.7)
General experience squared	-0.0006	(-10.8)	-0.0005	(-8.2)
Size of firm	0.000007	(1.8)	0.00003	(5.1)
Age of firm	-0.002	(-5.1)	-0.001	(-2.8)
Public (dummy = 1 if firm is more than 50 percent state owned)	-0.13	(-10.7)	-0.19	(-14.5)
Business cycle (ratio of number of workers who left the industry to those hired in past year)	-0.23	(-9.1)	0.004	(0.8)
R ²	0.61		0.58	
Number of observations	10,622		10,835	

Note: *t*-statistics are in parentheses.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

Figure 1. *Real Wage Profiles for Retained Workers*

Key: ---1979 — 1984 — 1984 (1979 weights).

Note: Calculated at mean values of explanatory variables.

Source: Calculated from 1979 and 1984 Enquêtes de Main d'Oeuvre, ONFP, Côte d'Ivoire.

and 1984, a trend that is not inconsistent with the constant level of average real wages for retained workers which is apparent from the raw data, because that was calculated by comparing a point on the 1979 profile (at roughly eight years of specific experience) with a different point on the 1984 profile (thirteen years of specific experience). At eight years of experience in 1984 there is a decline in real wages of 17 percent relative to the 1979 level. However, if wages at eight years of experience in 1979 are compared with those at thirteen years of experience in 1984, there was a 1 percent decrease in the latter period.

There are two sets of factors determining the shape and level of the wage profile: first, the values of the personal, firm, and industry characteristics; and second, the strength of their influence on the wage. If we wish to separate out the effect of a change in a variable's level from a change in its effect on the wage, we can predict wages using the 1979 values of the characteristics. The result predicts what the wage would have been if there had been no changes in the values of the characteristics.

We know that the personal characteristics of the labor force changed over the period: education, training, and firm-specific experience all increased. If we retain the 1984 values of the firm and industry variables, but give the personal characteristics their 1979 values, we estimate a 1984 wage profile which would have been 24 percent lower than it was. This indicates that declines in the returns to personal characteristics were mainly responsible for the decline in the real wage profiles. Alternatively, if we hold education and training constant, but predict on the basis of eight years of experience in 1979 and thirteen in 1984 (the actual mean values of firm-specific experience), the real wage drops by 8 percent, which is very close to the figure obtained above when controlling only for occupational category in the aggregate data.

As mentioned above, the 1979 survey omits information on individual characteristics of apprentices and manoeuvres (the second class in the lowest skill category). A comparison of the aggregate wage change from table 2 (which includes those categories) with information on the higher groups suggests that real wages for the two excluded groups fell by around 10 to 15 percent.

Wage Flexibility among New Hires

In both years the wage level of new hires was lower than that of retained workers (table 5). But individual characteristics for new hires differ from those of retained workers so that we would not expect their wages to be the same. To analyze the effect of the different characteristics, we used the same empirical specification for their wage as was used for the wages of retained workers. To ensure comparability between the results for 1979 and 1984, we have excluded new hires in firms that were included in the 1984 survey as part of the expanded coverage. The mean wages of new hires in new firms and in surviving firms were almost identical. The results of the analysis are presented in table 7.

The regression results again indicate a good fit, and the human capital variables are important. The returns on education and specific experience went

Table 7. *New Hires: Effect of Worker, Firm, and Industry Characteristics on Wages*
(percent)

<i>Determinants</i>	<i>1979</i>		<i>1984</i>	
[Constant]	2.65	(201.2)	1.97	(114.5)
Sex (dummy = 1 if female)	0.09	(13.4)	0.05	(5.9)
Years of education	0.12	(217.7)	0.15	(212.3)
Technical training (dummy = 1 if trained)	0.78	(81.2)	0.28	(3.1)
Specific experience in firm	0.03	(5.1)	0.07	(7.2)
Specific experience squared	-0.0002	(-0.2)	-0.002	(-1.5)
General experience	0.06	(84.6)	0.06	(69.0)
General experience squared	-0.0008	(-51.9)	-0.0007	(-35.4)
Size of firm	-0.00003	(-34.6)	0.00002	(7.9)
Age of firm	0.003	(22.1)	0.0013	(7.1)
Public (dummy = 1 if firm is more than 50 percent state owned)	-0.04	(-7.9)	-0.16	(-25.8)
Business cycle (ratio of number of workers who left the industry to those hired in past year)	-0.31	(-28.5)	-0.02	(-9.8)
R ²	0.56		0.53	
Number of observations	75,995		54,477	

Note: New hires are workers hired in the previous five years. The *t*-statistics are in parentheses.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

up for new hires by 1984. Although the change in the return on specific experience could reflect changes in the wage growth in the firms, it could also indicate a tempering of the growth in entry-level wages over the period. Relative to the 1979 survey, more of the new hires in the 1984 survey were hired in the early part of the five-year period.

Wages for the newly hired in public firms went from being 4 percent less than in private firms in 1979 to 16 percent less in 1984. Thus, in the effort to reduce the size of the public sector, parastatals reduced the nominal wages of new hires by considerably more than they reduced the wages of those who remained employed. Wages for retained workers in public firms, which had been 13 percent lower than in private firms in 1979, were 19 percent lower in 1984 (table 6). As was the case for retained workers, in industries with relatively more workers leaving than entering, real wages for new hires are lower. The pattern is much more pronounced in 1979 than in 1984.

Figure 2 presents predicted wage profiles for the new hires based on years of general experience. Comparing the wage profiles at the mean years of general experience (fifteen years for both 1979 and 1984) reveals a decline of approximately 6 percent. However, if new hires in 1984 had the same characteristics as they had in 1979, the decline in the wage profile would have been 25 percent. As was the case with retained workers, the observed decline in the wage profile was due to a decline in the returns to the characteristics.

Figure 2. *Real Wage Profiles for New Hires*

Key: ----- 1979 ——— 1984 -.-.- 1984 (1979 weights).

Note: Calculated at mean values of explanatory variables.

Source: Calculated from 1979 and 1984 Enquêtes de Main d'Oeuvre, ONFP, Côte d'Ivoire.

Summary of Real Wage Changes

Table 8 summarizes the real wage changes as revealed by aggregate and individual data. Although the universe of all workers consists only of retained workers and new hires in 1984, this is not the case for 1979. Workers who were hired before 1974 and who lost their job between 1979 and 1984 are not included in the estimation. Moreover, some of the retained workers include workers newly hired in 1979. This means that taking a weighted average of the real wage changes of the retained and newly hired workers will not exactly replicate the aggregate picture.

Controlling for the composition of the work force in the aggregate data makes a difference, reversing the picture from one of a real wage increase to that of a decrease. Once this point is evident, little additional information is gained by reconstructing the aggregate picture from the micro components (although it is possible to do this). It is more important to ask what happened to the wages that firms must pay for the characteristics they value. This is best measured by the change in real wages obtained holding characteristics constant. Over the course of the recession, firms were able to pay their existing workers and their newly hired workers approximately 25 percent less in real terms for the same level of characteristics.

III. CHANGES IN EMPLOYMENT

The evidence presented above suggests that real wage rigidity may not have been as important a factor as previously thought for the slow growth in employment during the recession. In this section we examine changes in the

Table 8. *Real Wage Changes Shown by Aggregate and Individual Data*
(percent)

<i>Aggregate data</i>	
No control for composition of work force	+17
Controlling for distribution of occupational categories	-8
<i>Individual data</i>	
<i>Retained workers</i>	
No control for individual characteristics	+0
At 1979 and 1984 mean values of characteristics and	
at eight years of specific experience in 1979 and thirteen in 1984	-1
at eight years of specific experience in both 1979 and 1984	-17
At 1979 mean values of characteristics and	
at eight years of specific experience in both 1979 and 1984	-25
<i>New hires</i>	
At 1979 and 1984 mean values of characteristics and	
at fifteen years of general experience in both 1979 and 1984	-6
At 1979 mean values of characteristics	
at fifteen years of general experience in both 1979 and 1984	-25

Source: Calculations based on data from ONFP, Côte d'Ivoire.

patterns of employment generation which suggest other factors that may have contributed to employment stagnation.

Employment Generated by New Firms

During the period 1979–84, 2,037 new firms were formed, accounting for 65 percent of the firms in the modern sector as of 1984. However, this very high rate of entry produced only 25,853 new jobs, just 15 percent of total employment. Most of the entering firms in this period were very small: 80 percent employed fewer than 10 people, and an additional 10 percent employed from 10 to 19 people (see table 9). The average size of entering firms was a mere 13 employees, compared with 135 in the surviving sample. The low level of employment in new firms during the recent recession is very different from the employment in new firms established before 1979 (see table 10). Between 1974 and 1979, 1,241 firms created 45,687 jobs, for an average firm size of

Table 9. *Size and Sectoral Distribution of Entering Firms, 1979–84*

<i>Firms' characteristics</i>	<i>Firms</i>		<i>Employment</i>		
	<i>Number</i>	<i>Percentage of total</i>	<i>Number of workers</i>	<i>Percentage of total</i>	<i>Average size</i>
<i>Size^a</i>					
1–9	1,622	79.4	5,669	21.9	3.5
10–19	208	10.2	2,802	10.8	13.5
20–29	55	2.7	1,317	5.1	23.9
30–49	65	3.2	2,470	9.6	38.0
50–99	52	2.6	3,611	14.0	69.4
100–199	22	1.1	3,168	12.3	144.0
200–299	8	0.4	1,907	7.4	238.4
300–499	2	0.1	815	3.2	407.5
500–999	2	0.1	1,021	4.0	510.5
1000 +	1	0.1	3,073	11.9	3,073.0
Total	2,037	100.0	25,853	100.0	12.7
<i>Sector</i>					
Private	2,023	99.3	21,704	83.9	10.1
Public	14	0.7	4,149	16.1	296.4
<i>Traded goods</i>					
Primary	20	1.1	4,814	17.6	221.1
Manufacturing	231	11.4	5,875	21.6	25.0
<i>Nontraded goods</i>					
Energy	0	0	0	0	0
Construction	54	2.6	1,365	5.0	25.2
Transportation	26	1.4	1,223	4.5	47.0
Commerce	1,295	63.8	5,739	21.1	4.3
Services	330	15.9	3,341	12.3	10.1
Finance	15	0.8	550	2.0	23.9
State ^b	66	3.2	4,316	15.9	61.6

a. Firm size is measured by number of employees.

b. The state sector includes public and private administration.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

37 employees, compared with just 13 in the recessionary period. Employment creation fell by over 40 percent despite the 25 percent drop in real wages for comparable new employees in 1989.

What underlies the disappointing rate at which new jobs were created between 1979 and 1984? Sectoral disaggregation shows a marked decline of employment in public sector enterprises. In the period 1974 and 1979, 30 percent of the employment generated in the modern sector was in firms 50 percent or more publicly owned. Between 1979 and 1984, this percentage fell to 16 percent. The decline in the rate at which public firms were created accounted for 45 percent of the reduction in employment generation. The severe budgetary problems faced by the government led to the cuts in public sector employment and would seem to preclude using an expansion of public firms to increase employment, even if that were considered to be desirable.

If private sector expansion is to be sought instead, it is important to have an

Table 10. *Size and Sectoral Distribution of Entering Firms, 1974-79*

<i>Firms' characteristics</i>	<i>Firms</i>		<i>Employment</i>		
	<i>Number</i>	<i>Percentage of total</i>	<i>Number of workers</i>	<i>Percentage of total</i>	<i>Average size</i>
<i>Size^a</i>					
1-9	782	63.0	3,340	7.3	4.3
10-19	183	14.7	2,373	5.2	13.0
20-29	74	6.0	1,813	4.0	24.5
30-49	64	5.2	2,474	5.4	38.7
50-99	53	4.3	3,683	8.1	69.5
100-199	44	3.5	6,107	13.4	138.4
200-299	15	1.2	3,438	7.5	229.2
300-499	14	1.1	5,232	11.5	373.7
500-999	6	0.5	3,900	8.5	650.0
1000 +	6	0.5	13,327	29.2	2,221.2
Total	1,241	100.0	45,687	100.0	36.8
<i>Sector</i>					
Private	1,103	89.0	32,651	71.0	29.5
Public	138	11.0	13,036	29.0	94.4
<i>Traded goods</i>					
Primary	36	2.9	4,012	8.8	111.4
Manufacturing	167	13.4	19,128	41.9	114.5
<i>Nontraded goods</i>					
Energy	4	0.3	513	1.1	128.3
Construction	45	3.6	9,857	21.6	219.0
Transportation	35	2.8	1,424	3.1	40.7
Commerce	660	53.1	5,555	12.2	8.4
Services	184	14.8	3,193	7.0	17.4
Finance	63	5.1	724	1.6	11.5
State ^b	48	3.9	1,281	2.7	26.7

a. Firm size is measured in number of employees.

b. The state sector includes public and private administration.

Source: Calculations based on data from ONFP, Côte d'Ivoire.

idea of the shifts in growth that have occurred within the modern sector. As shown in tables 9 and 10, the pattern of entry shows a substantial movement toward the nontraded goods sector. The commercial and services sectors, which together accounted for 80 percent of all new firms in the 1984 survey, had the lowest average firm size and the highest entry rate (defined as the number of new firms as a proportion of all firms in the sector). The state sector, comprising public and private administration, also increased in relative importance. All together, the percentage of new jobs created by the nontraded goods sector went from 49 to 61 percent. The absolute number of jobs created by new firms declined by 27 percent in the nontraded goods sector, with almost all of the fall due to a decline in construction. In the transportation, commerce, and service sectors the number of jobs created by new firms remained roughly the same.

The 54 percent decline in the number of jobs created by new firms in the traded goods sector is due entirely to the decline in jobs created by new manufacturing firms; employment in the primary sector did not fall. Manufacturing firms contribution to new firms' employment fell by 48 percent, from 42 to 22 percent of the total, more than offsetting the small absolute increase in the primary goods sector. The overall decline occurred despite the depreciation of the CFAF relative to the currencies of Côte d'Ivoire's main trading partners over the 1980-84 period.

Employment Change in Surviving and Exiting Firms

We examined the more detailed data to see if the changes in employment in preexisting firms differed substantially from that of entering firms or if sectoral variation emerges within this set. Table 11 presents the pattern of employment change among surviving firms and the employment loss due to firm closure. Firms in the traded goods sector accounted for 40 percent of employment among surviving and existing firms in 1979. Among surviving firms only, traded goods employment was 44 percent in 1979 and 49 percent in 1984. Most of the movement in the nontraded goods sector, however, was dominated by the large drop in construction, mainly attributable to the decrease in government investment. If construction is excluded, it appears that surviving nontraded goods firms suffered less of a decrease in employment (with a net loss of 835 jobs) than did traded goods firms, which lost nearly 7,000 workers. Among surviving firms, the decline in employment in the traded goods sector was 9 percent, considerably less than that suffered by new firms.

As would be expected, there is a direct positive correlation between firm age and size, and the survival rate through the recession. The level of employment, however, does not respond as straightforwardly to these variables. Surviving firms employing fewer than 10 workers did experience a decline in total employment from 1979 to 1984, but employment rose in all other size categories up to 300 employees. For surviving firms, the largest percentage decline in

Table 11. *Size and Age Distribution of Surviving and Exiting Firms, by Employment, 1979*

Firms' characteristics	Surviving			Exiting firms		Survival rate
	Number (1979)	Employment		Number (1979)	Employment (1979)	
		1979	1984			
<i>Size</i>						
1-9	350	1,680	1,501	1,305	5,456	0.21
10-19	162	2,180	2,434	336	4,518	0.33
20-29	80	1,949	2,246	143	3,435	0.36
30-49	113	4,368	4,617	102	3,785	0.53
50-99	111	7,862	9,159	124	8,536	0.47
100-199	106	5,172	14,663	77	10,794	0.58
200-299	37	8,992	9,008	34	8,295	0.52
300-499	43	17,026	13,205	25	9,021	0.63
500-999	37	26,088	26,474	12	8,949	0.76
1000+	36	95,601	62,434	3	4,772	0.92
Missing	4	—	—	3	—	—
Total	1,079	180,839	145,741	2,164	67,511	0.33
<i>Age (years)</i>						
0-1	54	2,395	285	236	3,439	0.22
2-5	243	25,159	1,085	709	14,694	0.26
6-10	208	19,784	28,420	449	16,415	0.32
11-15	173	19,563	14,429	269	10,532	0.39
16-20	144	35,293	18,877	165	8,536	0.47
21-25	86	25,829	38,198	94	4,668	0.48
26+	115	46,745	44,185	1,017	6,940	0.52
Missing	53	6,071	262	135	2,287	—
<i>Sector</i>						
Primary	50	21,212	19,755	68	7,835	0.42
Manufacturing	227	57,669	52,196	206	12,251	0.52
Energy	2	3,394	5,243	13	1,348	0.13
Construction	47	34,118	6,553	93	14,602	0.34
Transportation	49	19,475	19,574	59	3,167	0.45
Commerce	454	13,398	11,210	1,167	12,271	0.28
Services	134	18,000	14,460	292	7,664	0.31
Finance	38	4,149	6,359	105	1,490	0.27
State	74	9,394	10,129	158	6,883	0.32

— Not available.

Source: Calculated from the 1979 and 1984 Enquêtes de Main d'Oeuvre, ONFP, Côte d'Ivoire.

employment (35 percent) occurred among those employing more than 1,000 workers.

Although firms established for less than five years suffered the most severe decline in employment (a net loss of more than 26,000 jobs, or more than 95 percent of its labor force), it is only in surviving firms aged twenty-one to twenty-five years that employment increased. The number of jobs also dropped for preexisting firms older than twenty-five years.

IV. CONCLUSIONS

Aggregate data provide a misleading account of the behavior of real wages and employment. For Côte d'Ivoire, the overall figures suggest that employment in the modern sector fell by 16 percent from 1979 to 1984 while real wages rose by 18 percent. The reduction in employment is underestimated, however, as the coverage of the survey in 1984 was wider than that of 1979 and thus took into account more than 1,000 firms that had existed in 1979 but were not surveyed. After correcting for the expanded coverage in the later survey, the decline in employment is estimated to be 31 percent.

Similarly, although aggregate figures suggest very little change in the number of firms, a large turnover of firms took place. Almost half the firms went out of business during this period, to be replaced by an almost equal number of new enterprises. The new firms, however, were much smaller on average than those that they replaced, so that employment declined sharply. The high rate of closure was responsible for two-thirds of the decline in employment during the recession, and contraction in surviving firms accounted for the remaining third lost. Public firms provided 29 percent of the jobs generated by new enterprises from 1974 to 1979, but during the recession this dropped to 16 percent.

The decline in employment should not be attributed to the increase in real wages which appears at the aggregate level. Decomposition of the data shows that wages seem to have fallen in response to the contraction that took place in many sectors of the economy. Although workers' education, training, and firm-specific experience increased over the period, our estimates indicate that by the end of the recession employees were receiving substantially less for the same attributes and experience than they were at the beginning of the period. A new worker in 1984, with the same attributes as the average new employee in 1979, would be paid 25 percent less in real terms in 1984.

The decline in real wages varied across sectors. The largest proportion of employees facing a wage decline occurred in the agricultural and public sectors. Within public sector firms, real wages of retained workers, which were 13 percent less than those paid by private firms in 1979, fell to 19 percent less in 1984 and from 4 to 16 percent less for those newly hired.

The government was forced to cut investment, employment, and real wages during the recession, which clearly contributed to the decline in employment we have analyzed. Our survey does not suggest solutions for the government of Côte d'Ivoire. It does indicate, however, that further declines in wages are unlikely to provide the answer: real wages dropped throughout the period, and clearly this was not sufficient to offset other deterrents to employment. The government must look to other incentives and conditions to generate the recovery in employment it seeks.

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Sources of Growth in East African Agriculture

Uma Lele

A dynamic agricultural sector is critical for alleviating Sub-Saharan Africa's current economic crisis, and for laying the foundations of sustained future growth. In recent years, however, agriculture has performed poorly in many African countries. Efforts to assist its recovery, often through structural adjustment lending, have suffered from inadequate information about country- and region-specific factors, and from an emphasis on macroeconomic policies without complementary interventions at the sector level. The article describes the patterns of agricultural growth in Kenya, Malawi, and Tanzania, and examines price and nonprice aspects of three sets of factors: initial endowments and subsequent exogenous developments, general economic influences, and sectoral issues and policies. It suggests that government action at the sectoral and subsectoral levels in such critical areas as land policy, smallholders' access to inputs, and agricultural research needs to be combined with macroeconomic reforms to achieve sustained and broadbased agricultural growth.

Countries at early stages of development in Africa depend overwhelmingly on agricultural growth for employment, foreign exchange, government revenue, and food. Although African agriculture is generally believed to have performed poorly, there are relatively few detailed studies that document the causes of its poor performance (or, in the exceptional cases, the sources of growth). Some growth theorists (Solow, Kuznets, and others) have tended to emphasize the importance of nonconventional inputs (technological progress and knowledge) relative to that of conventional factors of production (land, labor, and capital) in the process of modernization, and some among them (Schumpeter, Schultz, and Harry Johnson) have focused on particular forms of capital and the complementarity among them in determining the process of knowledge acquisition and technical progress.

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In a specifically African context, some analysis has focused on adverse price incentives and excessive government intervention as critical constraints (World Bank 1984, 1986), while others have criticized the recent emphasis on "getting prices right" as excessive (Lipton 1987). Some analysts have argued that among the nonprice factors, technological constraints are the most binding (Mellor 1984). Others have stressed the inadequate institutional, human capital, and physical infrastructural environment (Lele 1988b), and still others have decried the large-scale bias of the agricultural strategies pursued by many African governments (Johnston and Kilby 1975). The extent to which prices automatically induce the relaxation of the various nonprice constraints, and the ability of public policy to loosen technological, institutional, and organizational constraints, are also matters of much debate in the literature (Hayami and Ruttan 1985; Mundlak 1988; Lele and Mellor 1988).

This article examines key price and nonprice factors in agricultural growth and distribution in three East African countries, Kenya, Malawi, and Tanzania. Formal modeling of the range of issues and length of time covered here would require comprehensive and reliable data, which are not available. The approach used combines quantitative analysis of some factors with a broader political-economic analysis for other issues as appropriate.

The issues are introduced in section I, a brief overview of agricultural performance in the three countries. Sections II–IV highlight three sets of factors in agricultural performance: (i) the countries' "luck," that is, their natural endowments (including physical and human capital) at independence and subsequent external developments outside their control; (ii) the general economic environment and strategies; and (iii) sectoral policies. All three sets of factors have price and nonprice aspects. Section V briefly discusses a critical issue—food security policies and prospects—that exemplifies the interplay between the three sets of factors. Section VI offers some conclusions.

I. OVERVIEW OF POSTINDEPENDENCE AGRICULTURAL PERFORMANCE IN KENYA, MALAWI, AND TANZANIA

The macroeconomic context for agricultural production has varied substantially among the three countries (as suggested by table 1), creating differential employment and income-earning opportunities within and outside agriculture. In most cases Kenya has the strongest economic indicators and Tanzania the weakest. Per capita annual income in 1965 (when all had achieved independence) was highest in Kenya (\$103), followed by Tanzania (\$76) and Malawi (\$63). Malawi's social indicators were and are the lowest, with the exception of primary school enrollment and access to safe water (levels of which were higher than in Tanzania in 1965).

This varying economic health is also found in the agricultural sector. Between 1970 and 1985 only Kenya experienced an increase in total output and exports across all its main agricultural commodities (table 2). Equity objectives

Table 1. *Macroeconomic Indicators for Kenya, Malawi, and Tanzania, 1967-84*

<i>Indicator</i>	<i>Kenya</i>	<i>Malawi</i>	<i>Tanzania</i>
<i>Growth rates (percent)</i>			
Gross domestic product (GDP) (real)	5.7	5.1	3.8
Population	3.9	3.0	3.3
Per capita GDP	1.8	1.3	0.5
Inflation (consumer price index)	10.9	9.3	14.6
Agriculture (real)	3.9	3.9	2.7
Manufacturing (real)	9.3	2.5	5.4
Mining (real)	3.2	—	-5.6
Exports (real)	1.4	5.6	-1.8
Imports (real)	1.5	3.3	0.3
<i>Shares of GDP</i>			
Investment	23.2	24.4	20.8
Total saving	19.7	13.0	14.0
Net exports	-3.5	-8.7	-8.8
Current account deficit	5.8	6.7	10.0
Fiscal deficit	4.1	7.1	7.5
Central bank claims on government	4.1	6.1	9.8
<i>Export ratios</i>			
Total debt/exports	116.1	207.0	279.3
Debt service/exports	13.7	17.8	8.9

— Negligible.

Note: All growth and inflation rates were calculated using ordinary least squares; all are significant at the 0.05 level.

Source: International Monetary Fund (1985).

were also well served in Kenya, with the share of small farmers' production in exports and food output rising substantially mainly due to expansion of the total cropped area and, to a lesser extent, increases in yields. In the case of maize (table 3), the tendency for yields to fall with the movement of population into marginal areas was offset by the increasing use of fertilizer and high-yield varieties.

In Malawi, estate production increased impressively, while per capita smallholder maize output stagnated and output of other smallholder crops either declined or showed no trend. Estate sector tobacco yields increased considerably, with an average differential of four times the smallholder yields (Lele 1987). Malawi also had a larger differential between the land productivity of its tobacco estates and smallholders sectors (4:1) than did Kenya in its tea and coffee production (2:1) (Lele and Meyers 1987). Kenya's smallholder gains have been slow and steady since the late 1950s, whereas Malawi's export crop output expanded very rapidly in the 1970s and peaked at the end of the 1970s and in the early 1980s. Because Malawi's strong agricultural growth arose primarily in the estate sector, agricultural employment and income have been more narrowly distributed than in Kenya. This has constrained internal demand for food and food imports relative to those in Kenya and allowed greater agricultural exports.

Table 2. *Average Annual Percentage Growth in Volume of Agricultural Exports and Production, Kenya, Malawi, and Tanzania, 1970-85*

Commodity	Kenya		Malawi		Tanzania	
	Exports	Production	Exports	Production	Exports	Production
<i>Coffee</i>	3.8				0.8	
Smallholder		6.0				2.3
Estate		1.0*				-4.1
<i>Tea</i>	7.5				1.9	
Smallholder		13.5				13.7
Estate		5.5	5.2	4.5		1.0
<i>Sugar</i>						
Smallholder		16.9				
Estate		5.3	28.1	14.7		0.8*
<i>Dairy</i>						
Smallholder		8.5				
Estate		0.0*				
<i>Rice</i>						
Smallholder		2.8		-2.7*		
<i>Cotton</i>						
Smallholder		4.9	-12.5	1.1*	-2.3	1.6
<i>Tobacco^a</i>					-4.7*	
Smallholder				0.3*		-4.8*
Estate						-7.5
Burley			14.1	15.4		
Flue-cured			9.2	10.4		
<i>Groundnuts</i>						
Smallholder			-13.2	-7.2		
<i>Cloves</i>						
Smallholder and estate					-2.7*	
<i>Sisal</i>						
Estate (mainly)					-5.9	
<i>Cashewnuts</i>						
Smallholder					-6.8	
<i>Horticultural</i>	12.7					

* Statistically insignificant (all other figures significant at the 0.05 level).

a. In Malawi, burley and flue-cured figures refer to estate production; smallholder production includes dark-fired, sun-air cured, and oriental tobacco.

Source: Lele and Myers (1987).

Table 3. *Food Sources: Average Annual Percentage Growth in Maize Production, Cereal Imports, and Food Aid, 1970-85*

Source	Kenya	Malawi	Tanzania
<i>Maize</i>			
Production	3.9	1.5*	2.1
Official purchases	2.4*	19.1	1.1*
Official sales	9.2	23.7	1.9
Net cereal imports	5.1	-4.1	3.3
Food aid	43.1 ^a	28.6	23.5

* Statistically insignificant (all other figures significant at 0.05 level).

a. Started from a low base during 1970 to 1978 and increased dramatically in 1979.

Source: Lele and Meyers (1987).

While Kenya and Malawi increased the world market share of their major export crops, Tanzanian agricultural exports from both large and small farms have performed poorly. Coffee and tea exports increased slightly (with the share of smallholders in total output increasing, albeit from a very small base) but exports of all other major crops have declined. As in Malawi, smallholder production shifted away from agricultural exports and into food crops.

All three governments have operated *de jure* or *de facto* monopolies on purchases and sales of maize and other major cereals. Officially purchased and sold output showed substantial year-to-year fluctuations, particularly since the late 1970s, reflecting changes in total output and large shifts in the proportion of that output handled by official and informal markets.

Fluctuations in official maize purchases have risen substantially since independence, as the share of small producers in the total has grown. Small farmers (and especially the lowest-income households) tend to sell grain in the harvest season to meet cash requirements and then to buy it back in the postharvest season. This tendency has increased with growing land pressure, as households have less to sell and a greater need to purchase from the market. In a period of crop shortfall, therefore, marketing parastatals are faced with both declining inventories and increasing demand, whereas the reverse tends to be the case in good crop years (Lele and Candler 1981).

Over the 1970–85 period as a whole, Malawi was generally a net maize exporter, while Kenya and Tanzania were net importers (although Kenya was a net exporter during most of the 1970s) (table 3). Food aid dependence has also been greater in Kenya and Tanzania than in Malawi, and has increased over time.

Several factors in the economic environment may have a bearing on Malawi's ability to export cereals, in contrast to that of Kenya and Tanzania. Both Kenya and Tanzania have higher rates of urbanization and population growth than Malawi (table 4). Kenya and Malawi, however, have greater population concentration on arable land. All these could reduce net per capita cereal availability. Malawi's skewed distribution of income and assets, discussed below, however, also affected internal effective demand adversely (Lele 1987).

Country experience with diversification out of agriculture has varied. Table 4 shows that the share of agriculture in GDP had declined by the early 1980s in Kenya and Malawi. In Tanzania, however, agriculture's share in GDP and exports had increased, despite the adoption of industrial promotion measures such as the channeling of public investment, with donor support, into heavy industry and agroprocessing (Lele 1984; Lele and Meyers 1987).

II. THE "LUCK" FACTOR: ENDOWMENTS AT INDEPENDENCE, EXTERNAL SHOCKS, AND AID

Kenya, Malawi, and Tanzania are former British colonies or protectorates with relatively similar ecological conditions and many of the same crops. At independence, agriculture was the most important sector. The three inherited

Table 4. *Economic and Social Development Indicators, Kenya, Malawi, and Tanzania*

<i>Indicator</i>	<i>Year</i>	<i>Kenya</i>	<i>Malawi</i>	<i>Tanzania</i>
<i>Sectoral share (percent)</i>				
<i>Agriculture's share in:</i>				
GDP	1967-73	34	44	41
	1982-84	33	40	52
Employment	1965	84	91	88
	1980	78	83	86
Exports	1967-73	75	97	78
	1979-81	57	94	79
Industry's share in GDP	1967-73	12	11	12
	1982-84	16	12	10
<i>Land density</i>				
Population (millions)	1965	9.5	3.9	11.7
	1985	20.2	7.0	22.2
<i>Land area</i>				
Millions of hectares	1985	56.4	9.4	88.4
Arable as percentage of total ^a	1985	26	37	56
Arable land: hectares per capita ^a	1965	1.54	0.89	4.23
	1985	0.73	0.50	2.23
<i>Social indicators</i>				
Population (average annual percentage rate)	1965-73	3.8	2.8	3.2
	1980-85	4.1	3.1	3.5
GNP per capita (current U.S. dollars)	1965	103	63	76
	1986	300	160	250 ^b
Life expectancy (years)	1965	45	39	43
	1985	54	45	52
Infant mortality rate (per thousand)	1965	112	199	138
	1985	91	156	110
Population per physician	1965	12,820	46,900	21,700
	1981	10,140	53,000	19,810
<i>School enrollment (percentage of age group)</i>				
Primary	1965	54	44	32
	1984	97	62	87
Secondary	1965	4	2	2
	1984	19	4	3
Safe water access (percentage of population)	1973	15	33	13
	1980	28	41	34
Urbanization (average annual growth rate)	1965-80	9.0	7.8	8.7
Road density (kilometers per 100 square kilometers of land)	1965	7.4	10.8	1.8
	1985	11.3	12.1	9.2

a. Arable defined as cultivable rainfed land.

b. Use of overvalued official exchange rate overstates GNP per capita.

Sources: Sectoral share, land area: Lele and Meyers (1987); population, social indicators: World Bank (1986b, 1987, 1988); except GNP per capita for 1965: International Monetary Fund (1987); infant mortality and safe water access: World Bank (1985, 1986a); and road density: Lele (1988a).

similar agricultural structures, consisting of many small African farms and a modern agricultural sector operated by European settlers. Kenya had the largest European settlement, the most advanced economy, and a relatively more developed physical infrastructure and institutional base. Kenya also had the lowest share of agriculture in GDP, employment, and exports, reflecting its more advanced state of structural transformation, while Malawi had the highest (table 4).

Tanzania is well-endowed in terms of per capita arable land, although pockets of land pressure exist, whereas land pressure has been substantial in Kenya and Malawi since independence and has been exacerbated by population growth, which has been highest in Kenya (see table 4). Differences in land quality and rainfall make production possibilities more limited in Malawi than in Kenya or Tanzania. While only 26 percent of Kenyan land is arable (relative to 37 and 56 percent in Malawi and Tanzania, respectively), 16 percent of that land is of very high quality, whereas in Malawi and Tanzania medium-potential land dominates. Malawi has only a single rainy season, allowing cultivation once a year, compared to the bimodal rainfall pattern in Kenya and Tanzania.

Access to land—and especially differential access on the part of different groups—is a key determinant of patterns of agricultural growth. Land in Malawi, for instance, is divided into three broad classifications. Customary land is held by the state for smallholder cultivation; it accounts for over two-thirds of all land in Malawi. Private land is held under both leasehold and freehold; all estate cultivation is on private land. Public land is mainly composed of forest reserves and game parks.

Since 1964, the quantity of customary land available for cultivation by smallholders in Malawi has declined by more than 700,000 hectares, which is almost 10 percent of total customary area (Mkandawire and Phiri 1987), and the proportion of households with less than one hectare of land has increased sharply, now exceeding 50 percent of all households. Little is known about the recent evolution of smallholder land availability in Kenya, but the average size of smallholder farms fell from a mean of 2.3 hectares in 1974 to 1.7 hectares in 1979. Detailed data on land ownership or access are unavailable for Tanzania, but more than three-quarters of farmers in Tanzania cultivate smallholdings of less than 2 hectares, and government policy has discouraged private ownership and private farming.

Kenya possesses the best transportation network of the three countries, some of which was constructed before independence by European settlers involved in the large-scale production of coffee, tea, maize, and dairying. Kenya has also invested significant resources in transportation. Malawi had higher road density—10.8 kilometers per 100 square kilometers of land in 1965, compared with 7.4 in Kenya and only 1.8 in Tanzania—but it is landlocked, while both Kenya and Tanzania have good ports. Transportation problems have escalated for Malawi since the 1980s as the war in Mozambique has cut off Malawi's major transportation route for exports. Tanzania's transportation needs have

been high due both to poor initial conditions and the large size of the country. The growth in road density for Tanzania (table 4) is somewhat deceptive, as most roads in Tanzania are in poor condition.

Economic growth and stability in the three countries have been affected by terms of trade volatility, oil price hikes, worldwide recession, and escalating interest rates on foreign debt. Unfavorable movements in terms of trade have been the main external shocks, with Kenya suffering the greatest loss in barter terms, followed by Malawi and Tanzania (figure 1). Kenya and Malawi in particular have incurred higher interest payments on foreign loans as they increased the proportions of their debt owed to private sources. Because Tanzania relied more heavily on concessional assistance, it suffered less from interest rate changes. Tanzania's income terms of trade loss was the greatest, however, owing to stagnation in the volume of its exports.

Other external shocks include the effects of droughts, wars, and the movement of refugees, all of which have had substantial effects on one or more of the three countries, but from which Malawi has suffered most. For example, between 1967 and 1977, an estimated 330,000 Malawian migrant workers (or three-quarters of its total population living abroad) returned from Rhodesia (Zimbabwe) and South Africa, mostly to settle on scarce agricultural land in the Southern Region (Christiansen and Kydd 1983). The subsequent closure of Malawi's port outlets in Mozambique in the early 1980s increased the insecurity of transport and its cost. By 1988 the hostilities also drove 700,000 refugees (equivalent to 10 percent of Malawi's population) across Mozambique's borders into Malawi. Other shocks include the breakup of the East African community, affecting Kenya and Tanzania, closure of their common border in February 1977, and Tanzania's involvement in the Ugandan war in 1979.

Levels of external aid represent another factor over which recipient countries may exercise little direct control. Official development assistance (ODA) as a proportion of recipients' government expenditure is summarized in figure 2. The ODA share peaked in the late 1970s and began to decline in Malawi and Tanzania as donors took account of poor project portfolios and the need for macro policy reforms. As recipients began to undertake reforms, however, ODA levels again increased in 1982 and 1983. Although ODA to Tanzania dropped sharply (owing to its reluctance to undertake macroeconomic policy reforms), in 1984 aid was still higher in per capita terms in Tanzania (US\$25) than in Kenya (US\$21) or Malawi (US\$23) (Cancian 1987).

III. THE IMPACT OF GENERAL ECONOMIC POLICIES ON AGRICULTURAL GROWTH

Public Expenditure Patterns

It is not currently possible to estimate rates of return to different categories of public expenditure for the three countries under study: the limitations of available methods and the lack of reliable and comprehensive data preclude

Figure 1. *Index of International Barter Terms of Trade for Kenya, Malawi, and Tanzania, 1967-84*

Key: — Kenya - - - - Malawi - . - - Tanzania

Source: Ansu (1986).

Figure 2. *Official Development Assistance as a Percentage of Government Expenditure in Kenya, Malawi, and Tanzania, 1970-84*

Key: — Kenya - - - - Malawi - . - - Tanzania

Source: Cancian (1987).

accurate and compelling analysis. Even if it were possible, such modeling would not provide conclusive evidence on the causes of the differential rates. Expenditure patterns can be examined however, in terms of their intersectoral balance, their stability and predictability, the shares of recurrent and capital expenditures, and labor versus operating costs in the total, and, to some degree, the extent to which resources were returned to the agriculture sector. Such an analysis was carried out for Tanzania by the World Bank in 1983, and was undertaken for Kenya and Malawi by the MADIA project. The detailed results are published in Lele and Meyers (1987); here I summarize key findings.

Tanzania had a higher overall share of government expenditures in GDP at the end of the 1970s than Kenya and Malawi, despite having a lower share at the beginning of the decade. Over the 1967 to 1984 period, on average, Tanzania had the highest fiscal deficits and central bank claims on the government (as a share of GDP), the highest inflation rates, and the lowest share of investment in GDP (see table 1). Tanzanian programs focused heavily on industrial promotion, while Kenya and Malawi had smaller spending programs and a more even intersectoral balance of expenditures.

Malawi's expenditures on social services were the lowest of the three. Tanzania's gains in the social sector, while impressive on several fronts (especially primary education), remained limited in public health and secondary education.

Despite Kenya's and Malawi's relatively favorable expenditure patterns compared with Tanzania's, the efficiency in the use of public funds, including development projects undertaken with donor assistance, was low. Of the twenty-four agricultural and rural development projects supported by the World Bank in Kenya, Malawi, and Tanzania and completed in the period 1965 to 1985, ten had zero or negative rates of return (Jones 1985). In Malawi, for example, construction of office buildings and housing for field staff has constituted a much larger share of agricultural investments than is standard for other countries in the region according to the World Bank's analysis. These expenditures, while necessary at early stages of development, reduce the funds available for more directly productive uses, such as agricultural research and dissemination—which helps to explain the problems of slow technological adoption by small farmers (discussed below). In both Kenya and Tanzania agroprocessing (excluding tea and coffee in Kenya) and integrated rural development projects in marginal areas (supported by the World Bank and other donors) had very low economic rates of return. Within the agricultural sector, development projects financed in Tanzania experienced greater and more frequent shortfalls in recurrent and operating expenditures than in the other countries, and less stability and predictability.

Taxation of Agriculture

Because agriculture constitutes such a large proportion of total exports in these countries, any taxation of exports will fall mainly on the agricultural sector. One measure of the taxation of agriculture is the differential between

producer and international prices for export crops. The differential has several components: that due to exchange rate disequilibrium, processing charges, marketing costs (transport, storage, and administration), and the proportion held by marketing agents above those costs.

The extent to which exchange rate overvaluation has taxed agricultural exports is suggested by figure 3, which shows the paths of the exchange rates for the three countries over the 1970–86 period. Tanzania's exchange rate became increasingly overvalued, mainly due to higher levels of inflation (see table 1), while the rates of the other two remained relatively stable or depreciated.

The differentials between producer and international prices for the main export crops of the three countries are shown in table 5. The extent of proces-

Figure 3. *Index of Trade-Weighted Exchange Rates at Purchasing-Power Parity, 1970–86*

Key: — Kenya ——— Malawi -.-.- Tanzania

Note: Purchasing power parity exchange rates were calculated using geometric weighting:

$$\text{Real exchange rates} = \text{RER}_i = E_i \frac{P^f}{P_i}, \text{ where } E_i = \sum_j (e_{ij})^{\alpha_{ij}}, P^f = \sum_j (P_j)^{\alpha_{ij}}$$

e_{ij} = bilateral exchange rate between home country i and trading partner j in units of foreign currency per unit of domestic currency.

P_j = inflation rate in j (CPI)

α_{ij} = share of partner j in trade of country i

P_i = domestic inflation (CPI)

j = main trading partners ($j = 1 \dots 10$)

i = domestic/home country ($i = 1, 2, 3$)

Source: Ansu (1986).

sing differs between the crops, and the marketing margin, partially due to different unit transportation costs, varies across the three countries, being highest in Malawi.

In Kenya, the producer prices of its two main export crops—coffee and tea—were determined directly by international prices, with only processing and marketing costs being deducted. Kenya also offered the same price incentives to smallholder and estate tea and coffee producers (barring the slightly higher costs involved in the marketing of small farm production).

In Malawi the right to grow burley and flue-cured tobacco has been reserved for estates, which sell their output at open auctions. Smallholders are only allowed to produce dark-fired, sun-cured, and oriental tobacco, and must sell their crops directly to the Agricultural Development and Marketing Corporation (ADMARC), a monopsony marketing parastatal. Small farmers receive on average one-half the price earned by estates and one-quarter of the world price. This has increased the subsistence orientation of the smallholder sector, and the demand for establishment of new estates (see the discussion of land policies below).

Smallholder producer prices for tobacco and coffee in Tanzania were substantially below world prices in the early 1970s, and in the 1980s an overvalued exchange rate further reduced their value to one-quarter of the world price. Although cotton price ratios remained somewhat better, the poor general structure of incentives has dampened export production in Tanzania.

Table 5. *Ratios of Producer to International Prices, 1970–86*

Year	<i>Kenya, Smallholder</i>		<i>Malawi</i>			<i>Tanzania, Smallholder</i>		
	Coffee	Tea	Smallholder tobacco	<i>Estate tobacco</i>		Tobacco	Cotton	Coffee
				Burley	Flue-cured			
1970	0.85	0.56	0.22	0.42	0.56	0.41	0.68	—
1971	0.88	0.66	0.24	0.39	0.66	0.49	0.59	—
1972	0.98	0.63	0.23	0.40	0.63	0.46	0.57	0.57
1973	1.02	0.64	0.24	0.59	0.95	0.45	0.35	0.44
1974	1.01	0.57	0.25	0.68	0.92	0.40	0.31	0.41
1975	1.02	0.64	0.25	0.52	0.73	0.41	0.45	0.32
1976	0.89	0.59	0.23	0.53	0.76	0.37	0.39	0.29
1977	0.94	0.71	0.30	0.70	0.88	0.40	0.43	0.33
1978	0.90	0.61	0.30	0.58	0.86	0.44	0.52	0.37
1979	0.92	0.65	0.29	0.53	0.77	0.37	0.51	0.29
1980	0.98	0.75	0.27	0.54	0.46	0.31	0.47	0.37
1981	0.86	0.64	0.21	0.81	0.62	0.23	0.42	0.36
1982	0.82	0.56	0.28	0.59	0.59	0.16	0.39	0.28
1983	0.94	1.02	0.26	0.31	0.44	0.20	0.35	0.24
1984	0.77	0.64	0.26	0.31	0.40	0.13	0.32	0.23
1985	0.87	0.74	0.22	0.27	0.36	0.15	0.46	0.23
1986	0.96	0.85	0.25	0.50	0.52	0.25	0.88	0.26

— Not available.

Note: Exchange rates estimated at purchasing-power parity.

Source: Lele (1988a).

Kenya's pricing policies have favored the production of coffee and tea vis-à-vis maize. The maize producer price was fixed by the government and increased at about 10 percent annually to correct the low prices set in the early 1970s. After reaching parity with world prices, it has subsequently been adjusted annually to remain by and large in line with international prices. The high returns to coffee and tea producers in Kenya also reflect the premium earned on world markets for Kenya's high quality arabica coffee and small-holder tea.

In contrast, official prices for export crops in Tanzania and for the small-holder sector in Malawi have provided incentives for production of food crops (table 6). In 1972, the ratio of producer prices of coffee to maize favored coffee production twice as much in Kenya and Tanzania as it did in Malawi. By 1984, however, Kenyan prices favored coffee over maize at a ratio more than twice that paid in Tanzania and nearly three times that in Malawi. Tobacco-to-maize price ratios in Tanzania were three times the levels found in Malawi in 1971; in the early 1980s the ratios were roughly parallel, and by 1985 the Tanzanian ratio dropped below that of Malawi. Tanzania's informal maize market prices were 100 to 800 percent higher than official prices, depending on year and location, so that export crop production was even more disadvantaged than the price ratios in the table suggest.

Since the introduction of structural adjustment programs in the 1980s, correction of exchange rate and producer price distortions has shifted some re-

Table 6. *Ratios of Official Export Producer Prices to Maize Producer Prices, 1967-85*

Year	Coffee			Cotton		Tobacco	
	Kenya	Malawi	Tanzania	Malawi	Tanzania	Malawi	Tanzania
1967	—	9.79	—	2.67	—	6.09	—
1968	—	10.07	—	3.23	—	4.30	—
1969	—	14.69	—	3.38	—	6.83	—
1970	27.2	11.66	—	3.28	—	7.84	—
1971	19.1	8.03	—	3.37	4.23	7.71	22.31
1972	20.0	9.90	18.75	2.87	4.58	7.32	24.17
1973	23.7	9.49	15.96	3.43	4.35	5.97	21.88
1974	21.7	10.73	13.33	4.34	3.42	4.86	18.91
1975	15.3	11.19	7.00	3.77	2.73	6.05	14.29
1976	32.9	8.75	10.00	2.25	2.50	5.40	9.66
1977	44.7	8.70	18.75	3.52	2.50	6.24	10.90
1978	31.7	11.28	12.81	3.94	2.71	7.80	10.67
1979	36.8	12.54	10.67	4.19	2.82	7.88	10.51
1980	27.6	8.94	11.42	3.25	3.00	6.31	8.95
1981	22.6	7.58	12.36	3.24	3.20	6.53	9.64
1982	25.8	4.50	9.93	2.45	2.47	4.03	7.41
1983	22.7	9.35	8.67	3.39	2.69	7.56	9.96
1984	22.0	8.33	10.40	3.31	2.73	6.61	7.61
1985	21.2	—	6.75	3.56	2.10	8.11	6.30

— Not available.

Source: Lele and Meyers (1987).

sources from food to export crops. But growing food demand, heavy population pressure on land, and stagnant productivity are tending to push food prices upward. Achieving a significant aggregate agricultural supply response will require raising productivity which involves a range of nonprice factors at the sectoral level. It is to these factors that we now turn.

IV. SECTORAL POLICIES AND FACTORS INFLUENCING GROWTH

Agricultural yields vary significantly among the three countries, with Kenya's coffee, tea, and maize yields being two to three times as high as Tanzania's or Malawi's (Lele 1988a). A substantial part of the differential can be explained by the fact that more than 60 percent of the maize-growing area in Kenya is under hybrid varieties, compared with less than 5 percent in Malawi and 10 percent in Tanzania. A supportive price regime is clearly critical to Kenya's success in this area. Nonetheless, other factors are also of importance: land and labor policies, the access of farmers to inputs and the output of agricultural research, and institutions providing credit, extension, marketing, and information. These and other nonprice factors can critically affect the ability of producers to apply their labor in ways that enhance yields.

Land

The production environment in the three countries has been profoundly affected by the way production units in each country have been legally defined and by the differential rights of these units to cultivate, own, or transfer land and to produce specific crops. Access to markets also varies according to the type of production unit. Some key features of each country's landholding arrangements are summarized below.

In Malawi, customary rights to cultivate and transfer smallholder land are conferred by traditional tribal chiefs, while the expansion of estate agriculture has been determined by explicit government policies. Burley and flue-cured tobacco production has been reserved for estates through a licensing policy that accompanies the establishment of leaseholds on unused customary land. The size of a landholding alone is not a criterion for specification of status in Malawi.

The rapid growth of Malawi's estate agriculture has brought a more unequal distribution of rural land. Between 1970 and the 1980s estate tobacco cultivation grew from 10,000 to 39,000 hectares and estate sugar area from 2,600 to about 15,000 hectares (Ranade 1985, 1986). Although the mean area of tobacco estates has fallen from 34 hectares in 1976 to 11 hectares in 1985, the average estate is still far larger than the average smallholder farm—55 percent of smallholdings are 1 hectare or less. In addition, much of the growth of estates has been in the Central and Southern regions, where population pressure on the land is most severe, and evidence suggests that at least 75 percent of estate land is unutilized (Minister Agriculture Limited and others 1982). There

is little new registration of customary land, and no land market exists for holdings operated in customary areas.

In Kenya, land titles and licenses to grow export crops have been far more freely available than in Malawi, as shown by the fact that smallholder tea hectareage has increased almost tenfold between 1970 and 1985, and coffee hectareage has doubled. Land registration drives in smallholder farming have also been more extensive in Kenya than in Malawi or Tanzania. In 1983, well over 80 percent of the land in Western, Nyanza, Central, and Eastern provinces, where 62 percent of the population lives, had been registered. There is also an active land market. While the spread of institutional credit for small farmers is much greater in Kenya than in the other two countries, significant barriers to land access remain as a result of small farmers' limited access to institutional finance.

In Tanzania the traditional tribal village authority was abolished and replaced with public ownership of land, without the individual right of ownership, sale, or registration. The government nationalized many private estates in the 1970s and prevented the development of further private landownership. In the early 1970s large commercial farms and private corporate estates accounted for more than 90 percent of official wheat sales; by the early 1980s they handled only 5 percent, with public estates making up the rest. Private corporate estates made up 25 percent of official tobacco procurement in the early 1970s; the share had fallen by the early 1980s to 5 percent, with peasant producers (with holdings of less than 10 hectares) producing 90 percent.

The policy of forced "villagization" resulted in the resettlement of more than 9 million people (about 60 percent of the population) into 6,000 villages by mid-1975. A communal cultivation policy was also introduced, whereby husbandry practices and acreage for different crops were dictated by local heads of the (then) Tanzanian African National Unity (TANU) Party. Given the fragile nature of the soils (the original reason for sparse population settlements), increased population density caused by villagization led to rapid soil degradation. The poor siting and large size of the new villages increased walking distances to farms and fuelwood costs and caused deforestation. Because more labor was required to obtain the necessary fuelwood to cure these crops, this had a highly adverse effect on smallholder tobacco and pyrethrum production. The government's response—to promote collective village wood lots—met with little success.

Labor

Labor markets and policies have evolved in different ways in the three countries. As a result, although all three rely heavily on highly labor-intensive handhoe cultivation, intercountry labor costs vary widely, and like the differences in allowable land use, these differences have had an impact on agricultural output.

In Kenya, the *de jure* minimum wage is not enforced and is higher than that

paid in the smallholder sector, where hired labor accounts for as much as 50–60 percent of tea and coffee employment (Lele and Meyers 1986). Despite rapid population growth, employment opportunities have grown commensurately, particularly in areas of high-value crops, and real wages have fallen much less than in Malawi or Tanzania.

In Malawi, a shortage of land in the smallholder sector, discriminatory price and land policies, and the return of migrants from Zimbabwe and South Africa have tended to increase wage employment, part-time employment among women from households with little or no land (Christiansen and Kydd 1983), and tenancy in the estate sector. Agricultural wage employment grew from 38,000 in 1969 to 148,000 in 1978 and to 194,000 in 1983, almost half of total estimated wage employment (Ranade 1986). As macroeconomic difficulties have mounted since the early 1980s, the real rural wage rate in Malawi has declined.

Owing to the preferential treatment of estates in Malawi, gross margins (that is the difference between cash revenue and cash costs, excluding labor costs, as a proportion of the value of sales) for estate producers have been much higher than for smallholder cultivation—two to three times higher for some crops. Tenant farmers receive from the estate owner only a third of the auction price on burley tobacco—their situation has been much worse. While returns per hectare have been slightly higher for burley than maize, the reward for the labor involved is much lower, and where access to land makes it possible, tenants have moved into maize production (Minister Agriculture Limited and others 1982).

	<i>Gross margins 1981/1982 (kwacha)</i>		
	<i>Burley tobacco</i>	<i>Flue-cured tobacco</i>	<i>Maize</i>
Per hectare			
Estate	1,228		
Smallholder	398	794	
Tenant	151		138
Per person-day, per hectare	0.47		1.84

In Tanzania, labor shortages have resulted from enforcement of minimum wage laws, restriction of movement of labor across regional boundaries, encouragement of trade unions on estates, and political pressure (before 1986) that discouraged the use of hired labor by small and medium-size farmers. This has created a disincentive for the production of labor-intensive crops such as coffee, tea, sisal, and tobacco. Despite regulation of the money wage, real wages in Tanzania have fallen more sharply since the early 1970s than in the other two countries, reflecting the overall decline in the economy.

Fertilizer

A major factor in efforts to raise crop yields is the availability and application of fertilizer, especially under conditions of heavy population pressure on land and dwindling reserves of uncultivated arable land. The use of fertilizer is

influenced by the ratio of its nutrient price to the output price, and the physical response coefficients of the technology employed. Information and access through extension, credit, and marketing services may also influence adoption of fertilizer.

As table 7 shows, nutrient prices relative to maize prices are higher in Malawi (even after a small subsidy on fertilizers) than in Kenya, partly reflecting Malawi's higher transportation costs and frequent devaluations. More than 60 percent of fertilizer consumption in Malawi is now estimated to be used by small farmers, and more than 80 percent of that is on maize. In Kenya less than 43 percent is used by small farmers, and only 20 percent of that is used on maize, the rest being applied principally to tea, coffee, and sugar. Fertilizer use on coffee and tea is more profitable than on maize in Kenya as international tea and coffee prices are passed on to Kenyan farmers. The timely distribution of fertilizer to tea and coffee producers by the Kenya Tea Development Authority and by the coffee cooperatives has also supported its use. In the period 1974 to 1985, fertilizer nutrient consumption grew more rapidly in Malawi and Kenya; Tanzania experienced a decrease in usage.

Increasing fertilizer use is a major issue in Kenya and Malawi, owing to growing population pressure on land. In the 1980s, Malawi subsidized fertilizer. Kenya has had difficulties in expanding fertilizer use due to import restrictions reflecting shortages of foreign exchange for imports and problems in the distribution of the appropriate products and amounts at the right times. Almost

Table 7. *Ratios of Fertilizer Nutrient Price to Maize Price and Rates of Explicit Fertilizer Subsidy in Kenya, Malawi, and Tanzania, 1972-87*

Year	Kenya		Malawi		Tanzania	
	Price ratio	Subsidy rate (percent)	Price ratio	Subsidy rate (percent)	Price ratio	Subsidy rate (percent)
1972	4.6	0	8.7	—	—	—
1973	6.2	0	8.7	—	—	—
1974	5.9	0	15.6	—	—	75
1975	7.3	0	10.5	—	7.0	66
1976	6.5	0	10.5	—	6.6	—
1977	4.2	0	10.5	—	6.6	—
1978	4.5	0	10.5	—	5.6	50
1979	5.6	0	7.5	—	8.1	—
1980	7.0	0	8.8	—	6.0	—
1981	7.2	0	7.8	—	5.1	60
1982	6.9	0	9.1	—	4.1	60
1983	6.1	0	9.0	25	5.6	60
1984	5.6	0	9.9	29	6.0	60
1985	—	0	12.2	23	5.5	0
1986	3.7	0	12.5	23	5.0	0
1987	3.4	0	10.0	17	5.0	0

— Not available.

Note: The fertilizer prices are transformed to reflect their nutrient contents, and the ratios are computed as: price of 1 kilogram of nutrient per the price 1 kilogram of maize.

Source: Lele, Christiansen, and Kadiresan (1988).

all of Tanzania's fertilizer is financed by aid donors, but internal distribution is a problem far worse than in Kenya or Malawi. Not only is transport infrastructure poor, but in 1983 all fertilizer had to be distributed through only thirteen retail outlets. Elsewhere I have argued that given the growing land pressure, limited purchasing power of rural households, and rising food and fertilizer prices, a subsidy on fertilizer for the benefit of resource-poor farmers is critical to ensure their food security (Lele, 1987; Lele, Christiansen, and Kadiresan, 1988).

Research

Increasing the application of fertilizer depends critically on the ability of national agricultural research systems to develop profitable technological packages adapted to the conditions of each agricultural region. Both Kenya and Malawi have had excellent agricultural research systems for their major export crops financed through levies on these crops. Foodcrop research presents a mixed picture. While very weak on adaptive on-farm research, Kenya's hybrid maize program has been quite successful in developing an improved seed distribution program and in ensuring its rapid adoption. These successes are reflected in the high percentage of Kenya's total maize area under improved maize—but much of this gain was achieved in the 1960s, and relatively little subsequent progress has taken place. Malawi's hybrid maize research program faces the question whether research should focus on flint or hybrid dent maizes. Hybrids are more sensitive to growing conditions and thus their yields are more variable, though higher on average than traditional varieties. Low current adoption of hybrid dent varieties reflects the small farmers' inability to bear the risk of variable output, as well as strong consumer preference for flint maize, its better storability, and inadequate access to credit and extension.

Tanzania's research system collapsed in the 1970s in part because of the breakup of the East African Community, upon which Tanzania had depended for research, especially in tea and coffee. Cotton research suffered from the sudden withdrawal of the British Cotton Research Corporation (CRC) in 1975, while tobacco research was plagued by shortages of qualified personnel, lack of continuing and reliable funds for recurrent expenditures and foreign exchange for critical supplies, and the breakdown of the transport system. The recent decision of many external lenders and aid agencies to invest in agricultural research is long overdue but seems to be overloading the country's capacity to manage such research effectively. Similar problems with financing for research have surfaced in Malawi and Kenya. Another common defect of these efforts has been excessive emphasis on the provision of physical capital and external technical assistance; the substance of research and the optimal use of available human capital have begun to receive attention only recently, but much progress is needed on this front for research to have any impact.

V. FOOD SECURITY: COUNTRY POLICIES AND DONOR RESPONSE

The role of government in food price stabilization has tended to acquire increasing importance with the increased dependence of rural households on the market for food. For example, in Malawi's Southern Region and the semi-arid marginal areas in Kenya more than 80 percent of the rural households regularly have a food deficit. With their low purchasing power, even an efficient market could not meet the consumption needs of low-income households, especially those in remote rural areas. If the burden of adjustment is not to fall most heavily on these households, especially given the frequency of droughts and shortages referred to earlier, government assistance is required. Despite major differences in ideology and approach, the governments of Kenya, Malawi, and Tanzania have each pursued the objectives of food security.

Objectives and Means

Government policy has aimed to provide protection for producers, consumers, and the government itself. (As usual, of course, not all the objectives are fully consistent.) Specifically, governments have tried to:

- Increase total food output, including production in more remote areas
- Stabilize prices and supplies by providing a guaranteed market for food-crop production and a fixed official pan-territorial producer price¹
- Ensure adequate supply of white maize to the politically sensitive urban areas at fixed consumer prices, to maintain political support and limit inflation and pressure for increased wages
- Control external food trade and thus the internal food situation
- Reduce the commercial activities of Asians and other ethnic minorities.

Means to achieve these goals generally have been similar in the three countries. National buffer stocks of maize have been created in all three, funded by donors or with borrowed capital. Marketing agencies in each country have increasingly attempted to replace private traders as purchasing agents and greatly expanded their purchasing centers during the 1970s—by the early 1980s Kenya had 600 centers and Malawi had 1,000. Likewise, the three discouraged the commercial activities of Asians (and in Kenya's case, of other African ethnic groups), and Malawi prohibited Asians from living in all but the four major cities. Kenya and Tanzania both established restrictions on the movement of stocks by private agents regardless of ethnic origin—restrictions more strictly implemented during periods of shortage to facilitate government purchases.

1. Cleaver and Westlake (1987) have argued that inelastic aggregate demand and large year-on-year supply shifts would be likely to produce substantial price variation under a free market. Our study of Nigeria, where public intervention in most traditional foodcrops is absent, supports this observation (Lele, Oyejide, Bumb, and Bindlish 1988).

Agencies in both countries located sales points mainly in a few major urban centers, and both have been criticized for purchasing rural grain surpluses without making active efforts to sell them in rural areas. Malawi, through its bush markets, however, has had a more active rural sales policy for food and fertilizers.

In periods of shortages, increased sales by government agencies in urban areas can indirectly alleviate pressure on rural food supplies by discouraging private agents from buying rural supplies at high prices (the Malawian government's inability to protect rural food supplies after the liberalization of the grain market and rising urban prices in 1987 reflects this point).

These objectives, and the methods used to achieve them, have often been at odds with some of the conditions specified in donor-supported structural adjustment programs. Adjustment programs have attempted to increase (1) the private sector's role in grain marketing, (2) reliance on external trade in addition to domestic production, (3) the efficiency of the public-sector marketing boards, and more recently, (4) the food security of the population. The liberalization of domestic and foreign trade implied in these programs has faced considerable resistance in Kenya and Tanzania and has also produced misgivings in Malawi.

The role of donor advice and conditionality in the policy reforms of the 1980s has been extensively examined in the World Bank's research project, *Managing Agricultural Development in Africa*, and a range of material has been produced on this issue. The following section merely touches on some of the findings of these documents as they relate to the critical issue of food security. The interested reader is referred to the comprehensive volumes (Lele and Meyers 1987, Lele and others 1989) or to the original sources on which they are based for further information.

Outcomes

Judgments about the effects of these policies are controversial, partly owing to differences in interpretation, but also because of a continued lack of consensus on the real purpose of the policies. For example, disagreements over the desirability of price stability or domestic self-sufficiency continue to arise.

The budgetary effects are probably the least contentious issue. All three governments have subsidized maize operations, although maize producer prices have been brought into line with international prices, and official consumer prices have increased substantially. In Tanzania, the National Marketing Corporation's overdrafts were about 2.8 billion shillings (around US\$250 million; billion is 1,000 million) in 1983, while a recent European Economic Community study of the National Cereals and Produce Board in Kenya estimates accumulated losses to be nearly 5 billion shillings (about US\$300 million). These compare with total central government expenditure on agriculture of K Sh131 million in Kenya for 1986 and T Sh545.1 million for Tanzania in 1983. Employment in foodcrop parastatals has also grown significantly, even as their operations have declined (Lele and Christiansen 1988).

While the costs involved are significant, and the need for improved parastatal efficiency is universally accepted, mitigating factors have been noted. For instance, year-to-year price stabilization and other government objectives are loss-making but may be regarded as legitimate functions and are not undertaken by the private sector (Cleaver and Westlake 1987). In addition, donors have tended to attribute parastatal losses to managerial and administrative inefficiency, while the boards have often had very little latitude in the tasks with which they have been charged. For instance, governments want to set consumer prices low to maintain urban political support and low wages, but the consequent low producer prices preclude sufficient procurement of grain to meet urban demand, which is already encouraged by the low prices. While high producer prices increase the supplies marketing parastatals can command, raising producer prices narrows or eliminates the marketing margin needed to cover the operating costs of parastatals. Governments have been unwilling to allow prices to vary to reflect transport and storage costs, even though studies show that allowing greater price variability will reduce the cost of supply stabilization operations (Pinckney 1986).

The costs of borrowing capital to cover operating losses have made up a large percentage of total costs, yet parastatal capitalization has received little donor attention. Some critics, while noting that lack of funds to pay for grain purchases has contributed to the poor performance of parastatals, have called for retrenchments rather than improvements in financing. Adjustment programs have imposed limits on the growth of credit, which have induced food-crop parastatals to issue script for purchases or to cut their procurement. The shortage of working capital has undermined the stability and predictability of food prices and supplies. This has had an adverse effect on small farmers' willingness to diversify their meager resources out of foodcrops into export crop production (Lele 1988b and forthcoming). There is, however, little recognition in donor circles of the fundamental importance of a stable and predictable food policy on household food security, and in turn on the allocative decisions of rural households which affect the production of export crops. To help with promoting exports, donors have shown greater willingness to relax credit ceilings for the purchase of export crops, but this, while necessary, is not sufficient to increase production.

Some donors have criticized the boards for building larger than needed grain stocks and relying less on external trade. Increasing dependence on trade, however, brings some problems. Kenya and Tanzania's growing food imports, referred to earlier, have amounted to between 10 and 20 percent of their annual export earnings. Given the instability of and the stagnant or declining dollar-denominated value of their export earnings, policymakers cannot be certain that foreign exchange will be available to meet the increased food import bill. Moreover, sharply fluctuating food surpluses and deficits internally and in neighboring countries, poor early warning systems, and the demonstrated unreliability of food imports and aid have made governments nervous about increasing their reliance on trade. The volatility of the food situation is illus-

trated by Malawi's rapid change from a regular food exporter to food importer, due to the influx of refugees. High domestic transport costs from ports to consuming areas, and physical limits on transportation capacity caused by poor infrastructure, further raise the costs and risks of increased trade dependence. Finally, there is the matter of consumer preference; imported yellow maize is not a perfect substitute for white maize, and this affects the political popularity of governments.

Reducing spatial and temporal price variability has been a major aim of government policy. Enthusiasm for a government role in this area may depend on one's belief about the strength of the markets in question—how stable prices would have been in the absence of government intervention is not known in East Africa. However, the West African MADIA countries (Cameroon, Nigeria, and Senegal), which have few restrictions on internal trade or prices, have experienced more volatile and higher food prices because private markets are not as well integrated in these countries as is believed by many (Lele and Candler 1981, Lele 1987).

Kenya has a relatively strong private sector, while Tanzania suffers from poor internal transportation and an inadequate flow of timely and reliable market information. Malawi lacks adequate credit for traders, who also face increased costs and shortages of vehicles and fuels. These problems were exacerbated by an import compression policy dictated by external transport bottlenecks at the same time that reform programs were reducing the number of government buying centers (Lele and Candler 1981; Lele and others 1989).

The adjustment process in all three countries has tended to cut the role of the public sector. To be successful, however, such measures require alleviation of the constraints on the operation of the private sector and the establishment of a regulatory and facilitating role for government; efforts to do this have just begun but are too slow in relation to the speed of the attempted reduction of the public sector's role. Meanwhile, government restrictions on Asian traders have exacerbated the weak commercial system; due to the weak indigenous trading sector this policy has reduced private trading activity in the short run and in some eyes has increased the need for government involvement (Lele and Meyers 1986).

The extent to which inadequate markets for foodcrops limit the adoption of new technology and the importance of price support are additional important issues which are no longer given the importance assigned to them in donor advice in the 1960s and 1970s.

Finally, despite their long-term merits, programs for liberalization of grain markets have faced a dilemma in practice. Economic crises and external shocks are more likely to induce government adoption of reform programs than are calmer periods, but the crises have resulted in inadequate preparation as liberalization programs are adopted. Bad luck has also played a part: in Kenya, for instance, a donor's call for liberalization in 1983 was followed by the worst drought of the century and in Malawi in 1987 by an increased flow of refugees. The mixed outcomes from liberalization have tended to reinforce the faith of

governments in the importance of public intervention. Receptivity to the principle of liberalization is greater now in Africa than ever before, however, and many adjustment programs have been in the right general direction if not at the right speed.

VI. SUMMARY AND CONCLUSIONS

The common and contrasting experiences of Kenya, Malawi, and Tanzania in the postindependence period indicate the complexity of the task African policymakers have faced in spurring agricultural growth. The extent, direction, and distribution of growth is the product of the interaction of the policies adopted toward the economy and the agricultural sector, and of factors beyond a government's control—initial resource endowments and external events.

Evidence from the MADIA project has shown that Kenya was the luckiest of the three countries and made good use of its inheritances to achieve healthy growth. Kenya now faces major problems, however, as opportunities for raising output through area expansion dwindle away. In particular, the issue of land distribution and the need for policies and institutions that will increase the productivity of resources need to be addressed. While the increasing levels of food aid and imports could suggest to some a need to diversify out of their (very successful) export crops and into food crops, available evidence shows that some countries that have diversified too quickly out of their existing exports have done poorly.

Of the three countries, Malawi has operated against the heaviest odds, has produced commendable rates of economic growth in the agricultural sector, and has responded positively to external shocks and donor advice. The estate orientation may have been seen to be necessary given the desire to stimulate rapid growth and the limited resources available to achieve this (Lele and Agarwal 1988). Malawi's poorer record on equity, however, suggests that government policies must support, rather than discriminate against, the small-holder sector if growth is to be broadbased and sustained—the quick resumption of overall growth in Malawi may now be constrained by the extreme poverty of most of its populace.

Although Tanzania had good initial endowments and has enjoyed substantial donor support, it lost ground relative to Kenya and Malawi in the growth of its agricultural sector. Some of Tanzania's social achievements appear to have been bought at a considerable cost in terms of agricultural output and could not be sustained.

Finally, the findings of the MADIA project excerpted here highlight the intricacy of the relations among the wide range of factors that shape development and economic performance. In particular, the example of food security policies and problems illustrates the need for a better understanding of the interplay between macroeconomic and sectoral policies and constraints (and between donor and recipient perceptions of policy priorities) to improve the prospects for long-term, sustainable, and equitable growth.

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