IMF Working Paper

WP/98/56

INTERNATIONAL MONETARY FUND

Monetary and Exchange Affairs Department

Public Sector Efficiency and Fiscal Austerity

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April 1998

Abstract

This paper uses a simple model to analyze the forces that determine the size of the public sector and the quality of workers employed in that sector. Workers are heterogeneous, and the public sector chooses an employment strategy that maximizes a social welfare function $U(s,Y)$ that depends on the share of the labor force employed in public service s and private sector output Y. The government is fully informed about worker productivity. By examining the welfare properties of the possible outcomes, we are able to illuminate situations in which policies that seek to constrain the public sector may or may not improve economic efficiency.

JEL Classification Numbers: H1, H4, J31

Keywords: Governance; public sector, labor markets

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CONTENTS

SUMMARY

We present a simple model of governance to understand the stylized facts concerning public sector wages and employment in developing countries. Evidence from many developing countries shows that 1) public sectors have been declining in absolute terms; 2) wages have been declining relative to the private sector; 3) the wage structures have been compressed such that in comparison to the private sector, the upper end of the pay scale has declined more than the lower end; and 4) employment reduction has not taken place.

Unlike the passive role assigned to the public sector in economic models, we assume the public sector to prove an input into the private sector. Output in each sector is assumed to be a result of the endogenous choice of worker quality in the public sector. The model is characterized by full information and a competitive labor market in which workers are paid according to their true productivity. Choices of the public sector are assumed to be set through the maximization of its utility function, which depends on public sector employment and private sector output net of the economic costs of taxation.

Our analysis characterizes the choices that will be made by the public sector and reveals that such governments will always pursue labor market strategies in which they emphasize hiring lower-quality workers. While such governments will maximize their own utility functions, they typically will not choose a level of public sector output or employment that is "optimal" in the sense of maximizing net private sector output. Instead they will "purchase" additional employment at the cost of reduced private sector output.

Our central finding is that in this setting there is potential scope for improving output (and potentially growth) in such countries by imposing a fiscal constraint. Obviously, one can overshoot, but our model helps to identify such cases. While extensions to the model for alternative public sector production functions, information structures, and dynamic properties should be pursued, we are optimistic that the framework here will prove useful.

I. INTRODUCTION

Economic models often regard the role of government to be one of defining tax and spending policies in a context in which exhaustive government spending makes no direct contribution to the production process. The standard prescription that emerges from this approach is one of finding appropriately non-distortionary tax policies and setting overall tax and spending levels to achieve aggregate demand objectives. From the public finance perspective, however, the public sector is typically assumed to produce public goods which enhance welfare. This occurs not only through government provision of goods such as parks and museums, for example, but also through the provision of public goods that enhance the productivity of factors in the private sector (such as when an improved legal and regulatory framework reduces transactions costs and promotes increased market efficiency.[2]

This paper focuses on an important determinant of the government's contribution to private sector productivity -- the level of human capital employed in the public sector. If government produces a crucial public input for the private sector -- we might call it `governance'-- using both physical and human capital, it must compete for these resources with the private sector. It raises revenues by means of taxation and purchases labor services from the market on the same terms as the private sector. Because these resources are indirectly productive in the private sector, the efficiency of their allocation between the private and public sectors has important implications for the aggregate productivity of domestic resources.

A variety of sources, many in impressionistic form, suggest that in the specific context of developing countries, the allocation of human capital to the public sector may often be inadequate. This has been considered to be an important cause of administrative bottlenecks in such countries.[3] We will focus on one alleged reason for the emergence of such an inefficiency --the value placed by policy makers on the scale of public sector employment. Historically, developing countries have expanded public sector employment for a variety of reasons: as a substitute for unemployment insurance, for domestic political gains, and as dictated by early approaches to development, which placed a considerable emphasis on planning, nationalization and government-project led growth. Governments in such countries have often attempted to maximize employment -- or at least resist retrenchment -- in the context of stabilization. Fiscal restraint has often been achieved through cuts in public sector wages or nominal wage freezes rather than employment reductions (see Kraay and Van Rijckeghem (1995)). Consequently, real wages in the public sector in many developing countries have declined over the last two decades, occasionally reaching levels substantially below comparable private sector levels (see Haque and

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[2] An example of the latter approach is Barro (1990), who assumed that the government produces a public good which the private sector uses as an input into its production process.

[3] See Haque and Sahay (1996) and Lindauer and Nunberg (1994) among others for some evidence and discussion of this issue.

Sahay (1996)).[4]The result has been to deprive the public sector of employees with large stocks of human capital.

A public sector which is starved of human capital in response to domestic political motives will have restricted capacity to produce public goods that may be vital for economic development. Consequently, an important question that arises in this context is what this state of affairs implies for the behavior of foreign donors. The latter are in control of a policy instrument--in the form of the quantity of aid disbursed to the country--which can in principle affect the wage and employment policies of the domestic government. The specific question that the donors face is thus whether the relaxation of its budget constraint through an expansion of aid will move the recipient government toward or away from the socially optimal level of provision of public goods, given the distortion introduced by an artificial employment objective.

This paper attempts to model and understand the productivity implications of the aspects of public sector wage policy described above -- specifically, the payment of low average wages relative to the private sector and the existence of wage compression within the public sector -- with a view to addressing the policy implications. Its structure is as follows. We begin by presenting a more complete description of some stylized facts concerning public sector wage policy in developing countries in the next section. Section III presents a simple analytical model to explain these stylized facts. Its development proceeds in two stages: first we characterize the wage and employment decisions made by a public sector that does not have an explicit employment objective, and then we explore the implications of introducing such an objective. We derive implications for wages in the public sector as well as for output in the private sector. The implications for donor policy are derived in Section IV, after the congruence of the model with the stylized facts is established. The final two sections contain a discussion of possible extensions and some concluding remarks.

II. STYLIZED FACTS REGARDING GOVERNMENT WAGE POLICY IN DEVELOPING COUNTRIES

Since the public sector has traditionally been regarded as a black box, there is little systematic evidence available on input utilization in the government or on the quality of its output. Reliable data on the structure of public sector wages and employment are not available for most developing countries. The studies that do provide information on some limited aspects of public

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[4] The response to declining real wages has often been to allow nominal wage cuts but increase the provision of real perks. In some cases, the perks are now larger than the salaries. However, perks remain an inefficient and costly means of payment. Their high maintenance costs could also be an important element in the inability to control expenditure in many countries while also providing greater rent-seeking opportunities. Rent seeking may be more desirable now as the perks might not be valued at an amount that is equivalent to their cost.

sector management are only meant to provide a snapshot of the public sector at a point in time.[5]It is not possible, therefore, to derive from them panel data of sufficient length to allow a reasonably sophisticated empirical investigation.[6] The available evidence on the evolution of public sector wages suggests the following observations:

1. Many developing countries have experienced declines in the real wage paid to public sector employees during recent years. The decline appears to be higher at the upper levels of the public sector wage distribution than at the lower ones, resulting in wage compression, a reduction in the variance of wage levels within the government. Figure 1 illustrates this phenomenon for several countries. With a base year of 1975=100, the figure shows the 1985 wage level at the lowest (solid) and highest (hatched) wage levels in the public sector. Note that with one exception, real wage declines were experienced at both the highest and lowest wage levels in the public sector in this sample.[7] The numbers at the end of each country's bar group present the ratio of the wage indices given in the figure for each country, expressing the relative 1985 real wage index for those at the lowest end of the wage scale as a multiple of the relative 1985 wage index for those at the highest end, converted to an index number. Since 1975 is the base year, a ratio in excess of 100 thus indicates an increase in wage compression. The countries are ranked in decreasing order of wage compression during the 1975-85 period. Note that wage compression is observed for all the countries in the sample except Morocco and Benin.

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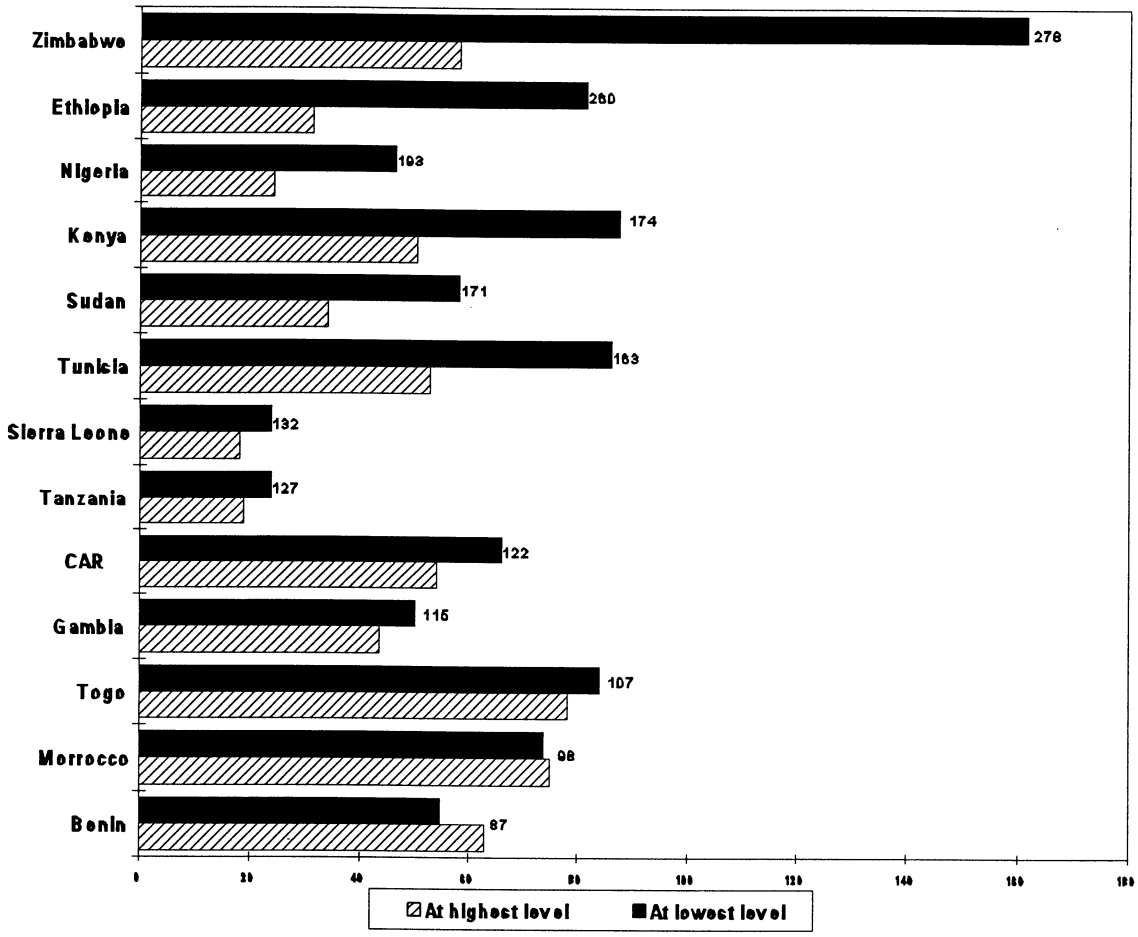
[5] See Lindauer and Nunberg (1994), Chaudhry *et al.* (1994) and Van Ginneken (1991).

[6] The information that is available is itself affected by public sector inefficiencies. For example, increasing public sector inefficiency leads to the problems of ghost workers that makes it difficult accurately to record public sector employment (see Lindauer and Nunberg (1994)).

[7] See van Ginnekin (1991), Lindauer and Nunberg (1994), Chaudhry *et al.* (1994) and Haque and Sahay (1996).

Figure 1: Real public sector wages and wage compression: 1975-1985

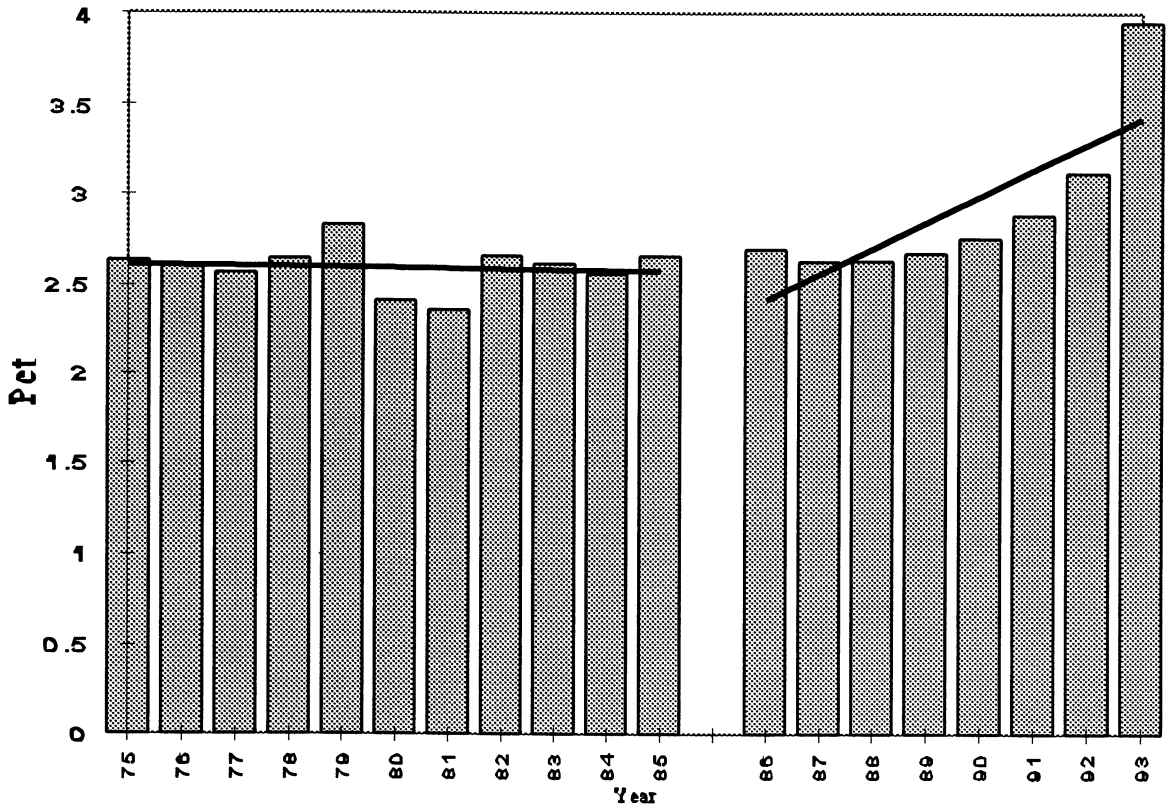


2. In addition to the absolute decline in real public sector wages, there has been a decline in the wage for workers in the public sector relative to those in the private sector in several developing countries.[8] Unfortunately, this must often be measured indirectly. Through the last two decades, for example, the average public sector wage relative to per capita income declined sharply for the countries in Figure 1. Moreover, increases in domestic output did not translate into

[8] While real wages have been declining in developing countries, recent data on real wage levels in the government sector in transition economies indicate that in the initial years after liberalization real wages declined quite sharply in most countries. Flanagan (1995) finds that in the Czech Republic during the transition, full-time employees in the private sector earn considerably more than their counterparts in the state sector. After controlling for schooling and potential experience, survey results show that workers (owners) in new private firms earn 18 (43) percent more than respondents in current or former state enterprises. These large differentials for workers of equivalent human capital raise the concern that the public sector will be hard pressed to retain qualified personnel.

commensurate increases in the real public sector wage (see Kraay and van Rijckeghem (1995)). Where the information is available to make direct comparisons, public sector wages have been found to be substantially lower than private sector wages in many developing countries.[9] At managerial levels, the wage in the public sector is often substantially lower than the private sector (see Haque and Sahay (1996)).

Figure 2: Share of labor force in the public sector



3. During this period of compression and decline in real public sector wage levels, the share of the labor force employed in the sector remained relatively constant. The situation is illustrated in the left-hand portion of Figure 2, which shows the percentage of population employed in the

[9] In developing countries, it is appropriate to compare salaries of government officials to those in the formal private sector because the skill requirements are more comparable than for the private sector as a whole, and for that reason the relevant opportunity cost is likely to be the wage in the formal private sector. The results presented here are based on this comparison.

public sector in a group of developing countries drawn from the previous sample[10] from 1975 through 1985, a period of time corresponding to that for which we have relative wage data. This steady share of employment has occurred despite the fall in wages in the public sector relative to other sectors. While in more recent years, the right-hand portion of Figure 2 suggests that there may have been actual increases in the share of labor employed in the public sector, there is little or no evidence of an increase in the relative wage paid to public employees.

III. PRODUCTION AND CHOICE

In this section we develop a model intended to explain these observations. We begin by introducing the basic structure of the model and exploring the types of labor market options open to the public sector. We then discuss the social welfare function and characterize the strategy that would be chosen by an optimizing government.

A. Production and labor market strategies

Consider a simple economy in which a private sector produces output Y using a quasi-linear production function which depends upon quality-adjusted labor input, capital, and the output of the public sector. The form of the production function is given by:

$$Y = q_p(1 - s)\, N + AG^{\gamma}K^{\alpha} \qquad \textbf{(1)}$$

where:

q_p	=	mean quality of workers in the private sector
N	=	the aggregate labor force
s	=	share of labor force employed in the public sector
G	=	public sector output
K	=	private sector capital stock (fixed)
A, γ, α	=	production function parameters, $0 < \gamma, \alpha < 1$ with $\gamma + \alpha < 1$

The restriction on the sum $\gamma + \alpha$ obviously implies that private sector output is characterized by decreasing returns to scale in labor, capital, and public sector services.

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[10] The number of countries varies across years according to the availability of data.

The output of the public sector is an intermediate input with no direct consumption value.[11] This output is produced using a linear production relationship which depends on the quality-adjusted amount of labor employed.[12] Thus we have:

$$G = q_g \cdot s \cdot N \qquad \textbf{(2)}$$

where, q_g is the mean quality of public servants.

Each worker in the economy is characterized by a `quality level' or productivity ϱ The productivity levels ϱ are uniformly distributed on the unit interval (0,1) with density N, so the average quality of the labor force is ½. Since worker productivity is fully known by both worker and employer, competitive labor markets imply that each worker will be paid ϱ whether he is employed in the public or the private sector.

The public sector has some flexibility in the quality level of workers it employs, depending upon the fraction of the labor force it seeks to hire. At one extreme, the government can seek the most productive workers first until it realizes its hiring goals (which we might characterize as a `cherry picking' labor market strategy). In this case the average quality of the labor force will be given by $q_g = 1 - \frac{s}{2}$. On the other hand, it might hire the least productive first, employing a `bottom feeding' approach to the labor market, in which case the average labor force quality would be $\frac{s}{2}$. Figure 3 illustrates the range of possible choices which arises from each of these strategies.

The vertical axis indicates mean quality level, and the horizontal axis measures the share of the labor force employed. The top and bottom boundaries of the triangular region illustrate the relationship between public sector employment and the average quality of the public sector labor force using the `cherry picking' and `bottom feeding' strategies, respectively. Points within the triangular shaded region identify pairs (s,q_g) which may be realized using hiring strategies intermediate between those described above. Note that the `quality level' q_g is the *average* quality of workers employed in the government. For any level of public sector employment s there is a range of average quality levels achievable via the pursuit of alternative labor market strategies. If all workers are to be employed by the government ($s = 1$) then clearly there is only a single quality level which can be realized, namely $q_g = \frac{1}{2}$. As the share of workers to be employed is reduced, flexibility increases.

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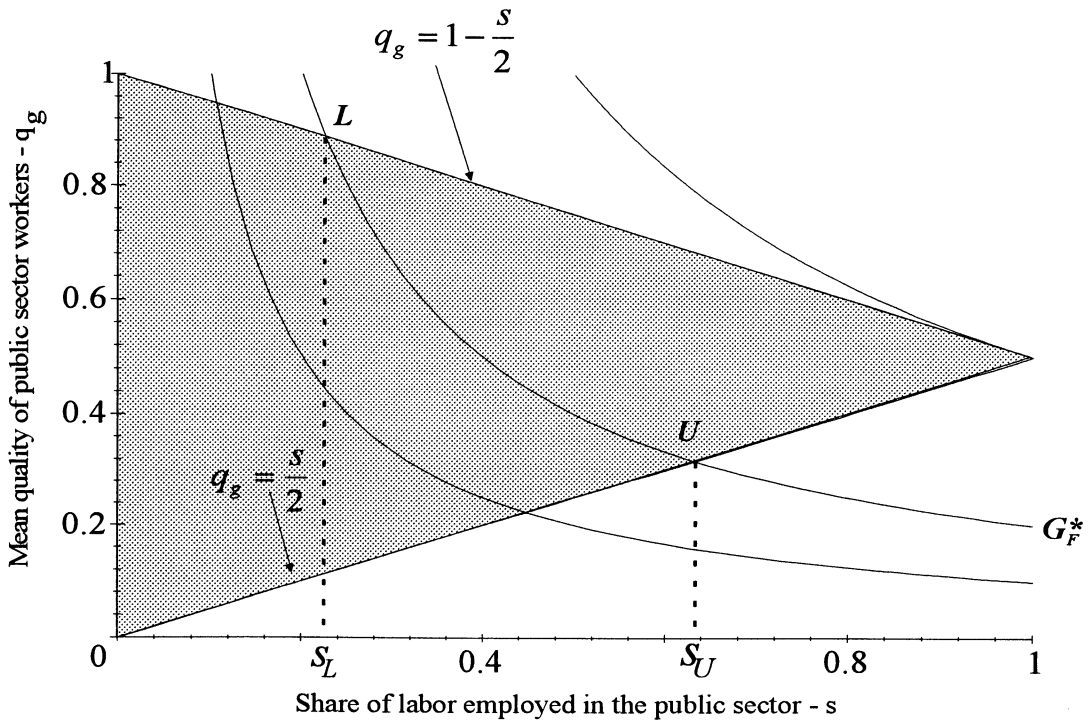
[11] Therefore in the context of this model, Y represents the economy's GNP.

[12] A more general production function for public sector output, of which equation 2 is a special case, is discussed in Section V. The restricted version is used in this section for the sake of transparency.

Figure 3: Public sector choice set with G -isoquants



Given the production function specified in equation 2, there is a simple relationship which identifies the pairs (s, q_g) which will provide a particular level of public sector production. Given labor force N and level of public sector production G, 2 implies that:

$$q_g = \frac{G}{s \,.\, N} \tag{3}$$

Several such `isoquants' are indicated in Figure 3 with movement to the right and up indicating higher levels of G.

The production relationship specified in equation 1 and the shared pool of heterogeneous labor determine a relationship between private sector output and public sector production. The distribution of worker productivity implies that

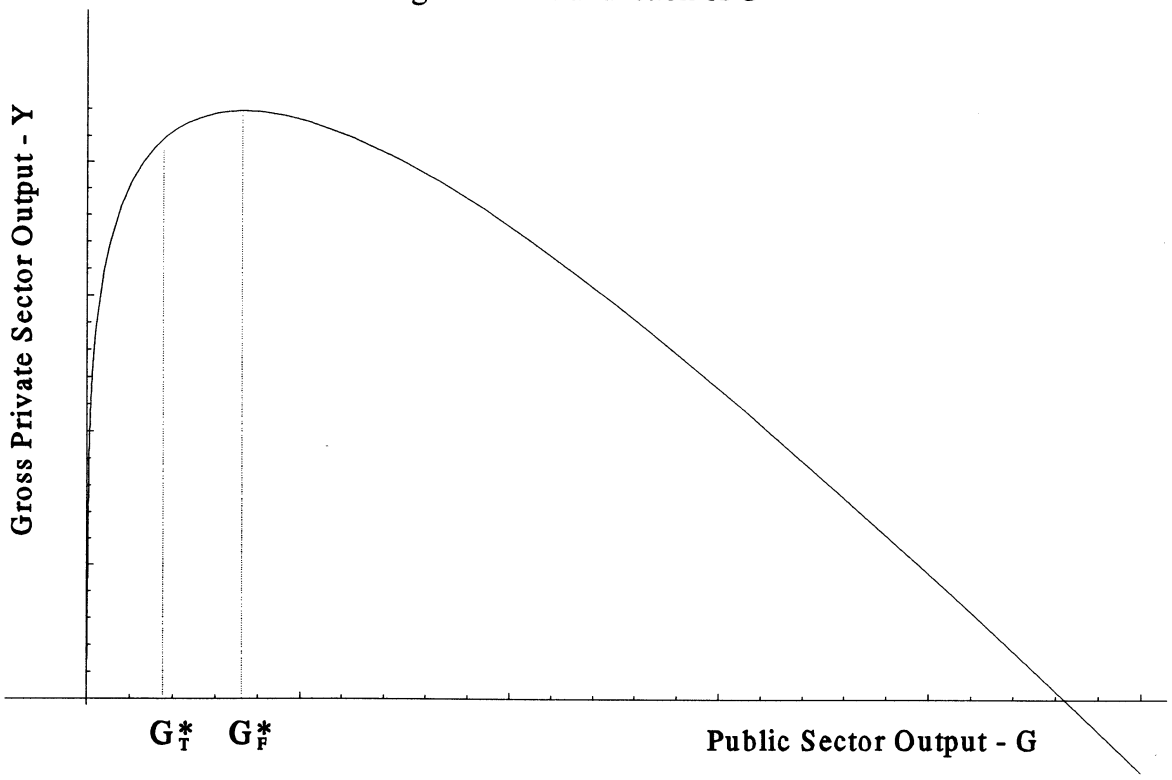
$$\frac{1}{2} = s \,.\, q_g + (1 - s) \,.\, q_p \tag{4}$$

Solving for q_p, substituting into 1, and simplifying we obtain:

$$Y = \frac{N}{2} - G + AG^{\gamma}K^{\alpha} \qquad \textbf{(5)}$$

This indicates that for this model private sector output depends on the level of public sector output, but not on how G is produced. Equation 5 implies that for any level of G there is a unique associated level of output Y. We can therefore also regard the *'G* -isoquants' illustrated in Figure 3 as `iso-output' contours. As the public sector contemplates alternative labor market strategies, use of (s, q_g) pairs on the same contour will be associated with the same level of private sector output.

Figure 4: Y as a function of G



The relation between G and Y is illustrated in Figure 4. To derive its properties, note that by differentiating equation 5 we can solve for the level of public sector output which maximizes private sector output Y:

$$\frac{\partial\left(\frac{N}{2} - G + AG^{\gamma}K\alpha\right)}{\partial G} = 0 \qquad \textbf{(6)}$$

which implies that the optimal level of public good production G_F^* is given by:[13]

$$G_F^* = (A\gamma K^{\alpha})^{\frac{1}{1-\gamma}} \tag{7}$$

This identifies the optimal iso-output contour, labeled G_F^*, in figure 3. Notice that the share of public sector employment can lie anywhere between s_L and s_U in the figure, and the optimal (s, q_g) combination is indeterminate, and may occur anywhere along the arc LU.

If this level of public sector output is made available, private sector output will be:

$$Y_F^* = \frac{N}{2} + (1-\gamma)\ (AK^{\alpha}\gamma^{\gamma})^{\frac{1}{1-\gamma}} \tag{8}$$

By contrast, if public sector output is set to $G = 0$, then private sector output is clearly $Y = \frac{N}{2} < Y^*$. If public sector output is maximized, then private sector output is given by:

$$Y = A\left(\frac{N}{2}\right)^{\gamma} K^{\alpha} \tag{9}$$

B. The public sector budget constraint

Given complete information regarding productivity, workers in both the public and private sectors will be paid their productivity ϱ. Thus the government wage bill will be equal to the level of public sector output sNq_g. Because the government's output is a public good, it cannot be sold in the market. We assume that two sources of revenue are available to the government to finance its wage bill: taxes T and foreign transfers F. The public sector budget constraint is then:

$$G = F + T \tag{10}$$

Imposition of taxes generates reductions in private sector output of magnitude $H(T)$, with

$$H(0) = 0,\ \frac{\partial H(T)}{\partial T} \geq 0,\ \textit{and}\ \frac{\partial^2 H(T)}{\partial T^2} > 0 \tag{11}$$

If the government were to be in the fortunate position of having access to sufficient levels of F to finance G_F^* determined in equation 7 without levying taxes, then it will actually be able

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[13] The meaning of the subscript F is explained below.

to achieve the private sector output level Y_F^* given in 8.[14] In the more usual situation, taxes are required to satisfy the budget constraint 10, so that the maximal private sector output net of taxes which can be achieved will be less than Y_F^*. Private sector losses due to the tax are then given by $H(G-F)$ and the size of government which maximizes net private sector output $Y-H$ will be determined by the equation

$$G_T^* = \left(\frac{\gamma A K^{\alpha}}{1 + H'} \right)^{\frac{1}{1-\gamma}} \tag{12}$$

Of course, this would provide an *explicit* solution for the optimal size of the public sector only if H' were constant. In general, H' depends upon G and thus, via 10 on F. Then the optimal size of the public sector will be implicitly defined by equality 12. Thus the solution for the optimal size of the public sector will be:

$$G_T^* = G_T^*(F) \tag{13}$$

with:

$$0 < \frac{\partial G_T^*}{\partial F} = \frac{\frac{1}{1-\gamma} \left(\frac{\gamma A K^{\alpha}}{1+H'} \right)^{\frac{1}{1-\gamma}} \left(\frac{H''}{1+H'} \right)}{1 + \frac{1}{1-\gamma} \left(\frac{\gamma A K^{\alpha}}{1+H'} \right)^{\frac{1}{1-\gamma}} \left(\frac{H''}{1+H'} \right)} < 1 \tag{14}$$

An increase in F will increase the optimal value of G, essentially because it reduces the tax-collection cost associated with financing an increase in public sector output.[15] The maximum net private sector output achieved with this public sector would then be given by:

$$Y_T^* = \frac{N}{2} + \left(\frac{\gamma A K^{\alpha}}{1 + H'} \right)^{\frac{\gamma}{1-\gamma}} \frac{A K^{\alpha}}{1 + H'} (1-\gamma) - H(T) \tag{15}$$

with:

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[14] Thus the subscript F refers to purely aid-financed public good production.

[15] Notice that if $H' = 0$, then $G' = 0$ as well.

$$T = \left(\frac{\gamma A K^{\alpha}}{1 + H'} \right)^{\frac{1}{1-\gamma}} - F \qquad \textbf{(16)}$$

C. Public sector behavior with an employment objective

Given this structure and set of possible choices, what labor market strategy will be adopted by the public sector? To capture the role of an employment objective, we assume that the choices made by the public sector are determined by a utility or social welfare function

$$U\ (s,\ Y - H(T)) \qquad \textbf{(17)}$$

which depends on the share of the labor force employed in the public sector as well as on private sector output net of losses associated with tax collection. We assume that the marginal utilities U_s and U_Y are non-negative, and that the public sector utility function itself is concave. The inclusion of s enables representation of the employment goals of governments and is particularly well suited to representation of the political goals of individuals in the public sector who seek to establish a basis of support by providing employment to a substantial portion of the electorate.

Given this utility function, the marginal rate of substitution $\frac{U_s}{U_Y}$ measures the marginal willingness to sacrifice private sector output for increasing public sector employment. Governments which are particularly subject to political pressure, face well-organized opposition movements, or must submit to frequent or proximate electoral scrutiny might be thought of as being characterized by high levels of $\frac{U_s}{U_Y}$.

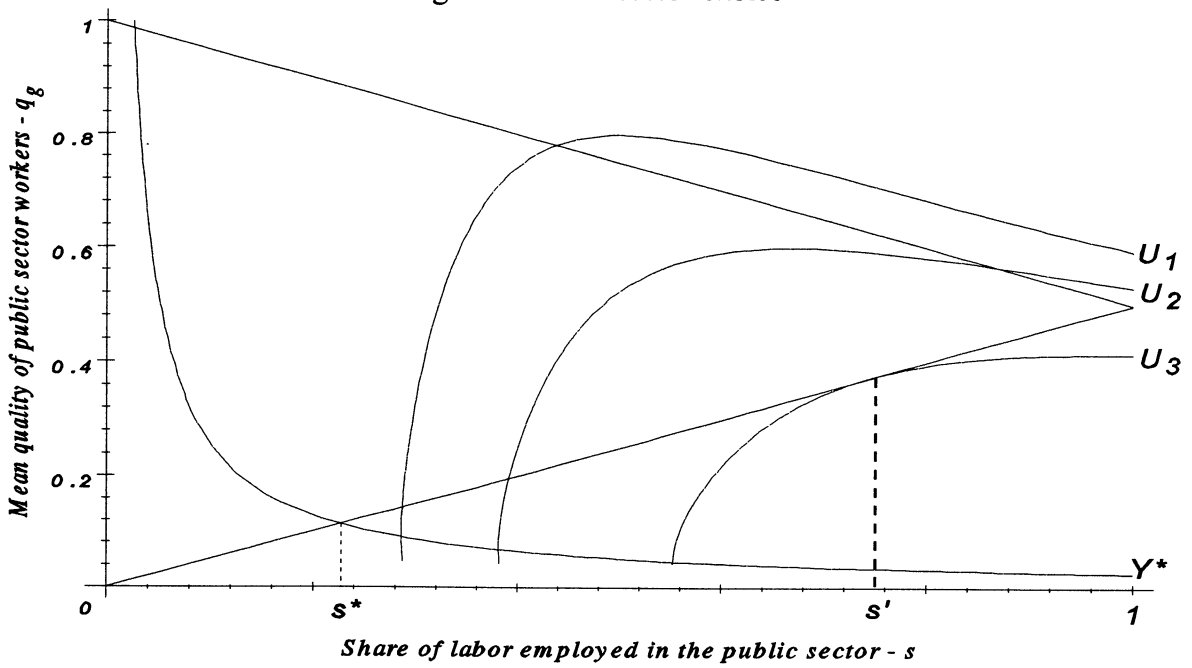
To characterize the choice made by an optimizing government, consider the set of options and `iso-output' contours facing the decision maker, illustrated in Figure 5. The single iso-output contour is associated with the value Y^*, the maximal level of private sector output. The utility function 17 will define an indirect welfare function over choices (s,q_g) and Figure 5 illustrates three indifference curves.

Note the intersection between this contour and the lower boundary of the feasible area. This is associated with a share of labor employed in the public sector given by:

$$s^* = \sqrt{\frac{2}{N} \left(\frac{\gamma A K^{\alpha}}{1 + H'} \right)^{\frac{1}{1-\gamma}}} \qquad \textbf{(18)}$$

This point identifies the largest possible level of public sector employment consistent with the level of private sector output Y. If the public sector utility function attached no value to s,

Figure 5: Public sector choice



then any point along the contour would be equally desirable and would dominate all other feasible choices. Given the assumption that $U_s > 0$, however, points on an `iso-output' contour are not all equally desirable, as indicated by the indifference curves. Movement down and to the right along the iso-output contour holds Y constant, but increases s and thus improves public sector utility. The choice which maximizes public sector utility will be located on the lower boundary of the feasible set, an example being s' illustrated in Figure 5. This implies:

Proposition 1 *A government which maximizes utility function U(s,Y - H(T)) will always be a `bottom feeder' in the labor market, choosing a policy which favors the least qualified workers available.*

Along this lower boundary, we have $q_g = \frac{s}{2}$, so that $G = \frac{s^2N}{2}$. Substituting this into equation 5 we can characterize the objective of the public sector as one of choosing s to maximize:

$$U\left(s,\ \frac{N}{2} - \frac{s^2N}{2} + A\left(\frac{s^2N}{2}\right)^{\gamma} K^{\alpha} - H\left(\frac{s^2N}{2} - F\right)\right) \qquad \textbf{(19)}$$

Maximization of this requires that s be chosen so that:

$$\frac{U_s}{U_Y} = sN\left(1 - \gamma AK^{\alpha}\left(\frac{2}{s^2N}\right)^{1-\gamma} + H'\right) \qquad \textbf{(20)}$$

Substitution of the value s^* from equation 18 into equation 20 shows that at s^* the value of the right hand side of equation 20 is zero. This demonstrates that a utility maximizing public sector will not in general choose to employ s^* unless $U_s = 0$ or $U_Y = \infty$. The optimal choice of s for such a government will lie between s^* and $s = 1$. We are thus led to:

Proposition 2 *A government which maximizes utility function U(s,Y - H(T)) will not in general choose an employment strategy which maximizes private sector output, but rather will `purchase' higher public sector employment by sacrificing private sector output until condition 20 is satisfied.*

The analysis also provides us with an understanding of how governments will respond to increasing fiscal constraints. Consider again the condition which characterizes optimal choice for the public sector and suppose that the government experiences an exogenously imposed decline in foreign transfers F. This causes the required tax burden $\frac{s^2N}{2} - F$ to increase and, given the properties identified in 11 above, this will result in an increase in H'. Optimization then requires choice of a level s at which $\frac{U_s}{U_Y}$ is greater, which given the concave utility function can be achieved by reducing s. But the `bottom feeding' strategy then implies a reduction in the average quality of public sector workers, as well as a compression of the public sector wage distribution. This argument allows us to present:

Proposition 3 *If a government which maximizes utility function U(s,Y - H(T)) is subject to external constraints on the level of public sector resources, the average quality of workers in the public sector will be reduced, and the public sector wage distribution will be compressed.*

IV. Observed behavior and policy implications

A. Consistency with stylized facts

This model provides a very simple way of understanding the several empirical studies of public sector behavior in developing economies. For example, the analysis of Kraay and Van Rijckeghem (1995) indicates a strong negative impact on public sector wages in developing countries resulting from implementation of SAF/ESAF or `standby' programs. As implied by Proposition 3, reductions in worker quality and public sector wages are exactly what we would expect from such fiscal constraints.

Studies of public sector wages[16] in developing countries have also indicated striking levels of wage compression - both developing over time and relative to the private sector. The model presented above will in any event result in a public sector with greater wage compression than

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[16] For example, Van Ginnekin (1991), Lindauer and Nunberg (1994), Chaudhry *et al* (1994) and Haque and Sahay (1996)

the private sector. The `bottom feeding' strategy adopted by the public sector is achieved by hiring only those workers in the lower portion of the quality spectrum. The public sector also will choose a mean worker quality lower than the private sector. These two facts imply public sector wage compression. Furthermore, to the extent that developing countries have been subject to increasing levels of fiscal constraint over the past two decades, our model predicts that they would respond by choosing lower levels of s, further exacerbating the wage compression problem.

B. Policy implications

Suppose that the maximization of net private sector output (GNP) is adopted as a welfare criterion. Given that government output consists of a productive intermediate good and that fiscal austerity implies both a reduction in public sector employment as well as in the average quality of workers in the public sector. Does the introduction of fiscal austerity--say via the reduction of foreign transfers--impose an `excess burden' on the economy in the form of a contraction in net private output? The model permits us to observe that, unlike what is commonly supposed, aid reductions that induce such changes cannot uniformly be judged to be either desirable or undesirable. If a government has a sufficiently small $\frac{U_s}{U_Y}$, either from a large U_Y (perhaps a country with very low per capita income) or from a relatively small level of U_s (perhaps due to political stability or a regime which is otherwise not subject to electoral pressure), then its chosen level of public sector employment s may be close enough to s^* that imposing a discrete constraint on the public sector may indeed result in actual declines in Y, as s contracts from a value $s_0 > s^*$ to $s_1 < s^*$.

On the other hand, if a government has a relatively large $\frac{U_s}{U_Y}$, then imposing restrictions on the public sector may actually increase Y. Whether this is so depends on the magnitude of the gap between s and s^* as well as on the severity of the imposed fiscal constraint. This leads to our central result:

Proposition 4 *If, for some value of foreign assistance F_0 the equilibrium is one where $\frac{U_s}{U_Y} > 0$, there exists a value F_1 such that $F_1 < F_0$, and $Y(F_1) > Y(F_0)$.*

Thus, while the reduction in the quality of the public sector labor force and the contraction in public sector employment will obviously reduce public sector output, private sector output will nevertheless increase, unless the initial distortion is small and the fiscal constraint is very severe. The reason is that the positive weight placed on public employment in the government's objective function tends to create a public sector which is excessively large relative to the optimum ($s > s^*$), so the reduction in F pushes public employment closer to the optimal level.

Intuitively, this result holds because, in the initial distorted equilibrium, the value placed on public sector employment by the domestic government causes it to oversupply public goods in a context in which its incentives to do so are not tempered by the need to finance the production of such goods by levying distortionary taxes. The reduction of aid penalizes the

provision of public goods by increasing the need for distortionary tax financing, thus discouraging the production of such goods and moving the economy closer to the undistorted optimum.

V. Extensions

The model presented above was based on a simple and tractable production function for public services in which the tradeoff between `quality' (as represented by q_g) and quantity (as represented by s) took on a particularly simple form. Such a representation may not be warranted for some, perhaps even most types of productive activities in the public sector.[17] The model also presumed that employers possessed full information about worker productivities, so that no information asymmetries complicated the relation between wages and worker quality. This meant that there was no necessity for individuals to signal the government or private sector employers concerning their productivity. In this section we offer some thoughts on possible extensions to the model, particularly as regards these two issues.

A. Modeling the tradeoff between quality and quantity

Providing a more detailed model of the tradeoff between quality and quantity within the public sector workforce will require consideration of more complex production functions for the sector. An alternative approach would be to consider a public sector whose objective function depended directly on the quality of its employees. However, this seems a less promising way to extend the model. It seems quite reasonable that governments should be concerned about net private sector output. Furthermore, when continuation of government power depends on the extent of public support (either due to electoral considerations or the simple desire to reduce the support for rebellion) it seems plausible that the public sector should be concerned about the number of workers it employs, or the share s of the labor force employed. Moreover, both of these assumptions appear to be consistent with observed behavior. However, it is hard to justify why the government should be concerned about actual employee quality, except to the extent that it adversely affects public sector output G and hence net private sector output.

Let us consider, then, extending the model of public sector production to allow more complex tradeoffs between quality and quantity. For example, we could adopt an approach in which worker productivity and total public sector output is adversely affected by the productivity of the lowest quality workers employed. An example which would capture this would be to let $\underline{q}$ represent the quality of the *least productive* worker employed in the public sector, and then to represent public sector output by

$$G = q_g \cdot sN \cdot \underline{q} \qquad \textbf{(21)}$$

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[17] See Kremer (1993) for an excellent discussion of these issues.

Such an approach is in the spirit of Kremer's (1993) `O-ring' approach to production and development, and might be promising in terms of capturing the behavior of governments who hire low quality workers *on average*, but still seek to ensure a minimum standard of competency, for example by insisting that all workers at least pass a civil service exam.

While such a production function would certainly move an optimizing public sector off from the lower boundary of its choice set, and would increase the mathematical difficulty of the model somewhat, it would seem to leave intact the basic intuitive structure of our results. Governments who care about both public sector employment and private sector output will choose a position near the bottom of the labor quality spectrum, using greater quantity (to the extent possible) rather than quality. This frees up higher quality workers for the private sector (enhancing private sector output) and increases the number of workers who depend upon the government for employment, presumably strengthening their electoral position. All of this will still be true even if public sector production is described by equation 21.

An alternative approach would be to use a more general production function in which output depends on both the quality q_g and the share s of workers in the public sector. Suppose, for example, that we have:[18]

$$G = N\,(q_g^{\sigma} + v \,.\, s^{\sigma})^{\frac{1}{\sigma}} \qquad \textbf{(22)}$$

For $\sigma = 1$ this implies that quality and quantity are perfect substitutes. In the limit, as $\sigma \to 0$, we have the same tradeoff between quality and quantity as implied in equation 2 above. With this production relationship, private sector output will depend not only on the level of output G but also upon the mixture (s, q_g) of quantity and quality chosen by the public sector. This contrasts with the situation presented above, in which we established (in equations 3 through 5) independence between Y and the way in which G is produced.

Equation 22 provides for a constant elasticity of substitution between quality and quantity. Combining equations 1 and 4 observe that private sector output is given by:

$$Y = N\left(\frac{1}{2} - s \,.\, q_g\right) + AK^{\alpha}G^{\gamma} \qquad \textbf{(23)}$$

then by substituting equation 22 we obtain:

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[18] We already know this is so, since the model analyzed above is the special case for the specific parameter value $\sigma=1$

$$Y = N\left(\left(\frac{1}{2} - s \,.\, q_g\right) + AK^{\alpha}\left(q_g^{\sigma} + v \,.\, s^{\sigma}\right)^{\frac{\gamma}{\sigma}}\right) \qquad \textbf{(24)}$$

Assuming revenue collection costs H are negligible, the government then seeks to choose (s, q_g) to maximize $U(Y,s)$. First order conditions for solution of this problem would be:

$$U_Y \,.\, \frac{\partial Y}{\partial q_g} = 0 \Rightarrow \frac{s}{\gamma AK^{\alpha}} = (q_g^{\sigma} + vs^{\sigma})^{\frac{\gamma-\sigma}{\sigma}} q_g^{\sigma-1} \qquad \textbf{(25)}$$

$$U_s + U_Y \,.\, \frac{\partial Y}{\partial s} = 0 \Rightarrow \frac{U_s}{U_Y \,.\, N} = q_g - AK^{\alpha}(q_g^{\sigma} + vs^{\sigma})^{\frac{\gamma-\sigma}{\sigma}} \gamma v s^{\sigma-1} \qquad \textbf{(26)}$$

Conditions 25 and 26 will identify an interior solution in which the public sector maximizes $U(Y,s)$ by choosing an outcome which is intermediate between the extreme `bottom feeding' and `cherry picking' strategies[19].

Introducing collection costs in this set-up means modifying equation 24 to include an additional term giving costs as a function of required revenues. This would take the form of: $-H(G - F)$. Equations 25 and 26 would be modified accordingly, and values of s and q_g could be found to maximize the government's objective function. Such values would be functions of F, and for suitable values of the parameters, a reduction in F could be shown to imply an increase in $Y - H$.[20]

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[19] It is relatively easy to construct illustrative examples. Let $U(s, Y) = (Y + 2) \,.\, (s+1)^{\frac{1}{10}}$ and set other parameters as follows: $N = 100$, $H = 0$, $A = K = 1$, $\alpha = 0.1$, $\gamma = 0.3$, $\sigma = 0.2$, and $v = 0.7$ Then solution for the optimum gives $(s, q_g) = (0.658, 0.484)$, which satisfies the inequality $\frac{s}{2} < q_g < 1 - \frac{s}{2}$, and thus illustrates a situation in which the public sector pursues an interior labor market strategy.

[20] We already know this is so, since the model worked out previously was precisely derived from this one by imposing a specific value of the parameter σ - i.e., $\sigma = 1$.

B. Time and information

There are a variety of other considerations that could be brought into this framework that might provide additional insights concerning the structure of these economies and the impacts of policy. Obviously labor markets are not always characterized by perfect information, and it would be interesting to consider a public sector which must hire workers for a probationary period to learn about their productivity. Such a model would also be essentially static. An additional useful extension would be to consider the implications for growth of the economic structure presented above.

VI. Conclusions

We have presented a simple model which provides for an endogenous determination of worker quality in the public sector. The model is characterized by full information and a competitive labor market in which workers are paid according to their true productivity. The public sector is neither passive nor economically unproductive. It is assumed to set policy by making those choices which maximize a utility function which depends on public sector employment and private sector output net of the economic costs of taxation.

Our analysis characterizes the choices that will be made by the public sector, and reveals that such governments will always pursue labor market strategies in which they emphasize hiring of lower quality workers. Our analysis also suggests that while such governments will maximize their own utility functions, they typically will not choose a level of public sector output or employment which is `optimal' in the sense of maximizing net private sector output. Instead they will `purchase' additional employment at the cost of reduced private sector output. This model provides a simple way to understand the stylized facts concerning public sector wages and employment in developing countries. Our central finding is that in this setting there is potential scope for improving output (and potentially growth) in such countries by imposing a fiscal constraint. Obviously, it is also possible to overshoot with such policies: reductions in public sector production do not monotonically increase national output. Our model helps to identify cases in which such `overshooting' might be a concern.

While extensions to the model to enable explicit consideration of alternative public sector production functions, information structures, and dynamic properties should be pursued, we are cautiously optimistic that the framework of this paper will prove useful for understanding these complex and important problems.

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WP/98/56

INTERNATIONAL MONETARY FUND

Monetary and Exchange Affairs Department

Public Sector Efficiency and Fiscal Austerity

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April 1998

IMF WORKING PAPER

INTERNATIONAL MONETARY FUND