Public-Private Sector Wage Comparisons and Moonlighting in Developing Countries

Evidence from Côte d'Ivoire and Peru
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(List continues on the inside back cover)
Public-Private Sector Wage Comparisons and Moonlighting in Developing Countries

Evidence from Côte d'Ivoire and Peru
The Living Standards Measurement Study

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by statistical offices in developing countries. Its goal is to foster increased use of household data as a basis for policy decisionmaking. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.
Public-Private Sector Wage Comparisons and Moonlighting in Developing Countries

Evidence from Côte d'Ivoire and Peru

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ABSTRACT

The continuing economic crises faced by developing countries have placed public employment and compensation under increased scrutiny. Since the government wage bill forms a high proportion of recurrent public spending, cutting it is often viewed as an attractive way of reducing fiscal deficits. This can be accomplished by paring employment or by reducing salaries of civil servants. Most countries have maintained employment but have allowed salaries to erode through inflation. Whether this is the best approach to reducing the wage bill depends heavily on the answer to a deceptively straightforward question: are government workers overpaid vis-a-vis wage earners in the private sector? There are surprisingly few empirical studies that deal systematically with this issue for developing countries. The small body of research that does exist uses standard Ordinary Least Squares (OLS) regression techniques and shows mixed results in terms of both direction and magnitudes of wage differentials.

This study analyzes public-private sector pay differentials in two developing countries, Côte d'Ivoire and Peru, using unusually comprehensive micro data sets - the 1985 Côte d'Ivoire Living Standards Survey (CILSS) and the 1985/86 Peru Living Standards Survey (PLSS). Explicit attention is given to the endogeneity of sector choice. We estimate switching regressions models using Full Information Maximum Likelihood (FIML) and compare the results to those obtained using OLS. For both countries, we find striking differences between the OLS and FIML estimates. The OLS results suggest that public sector wages are higher than private sector wages, but the FIML estimates show that public sector wage offers are well below those in the private sector. Thus, an important methodological conclusion of our study is that standard OLS regressions on samples of public and private sector employees are likely to yield seriously biased estimates of pay structures, and hence a wrong assessment of the wage gap.

We further explore our main finding that public sector wages are "too low" by considering the commonly observed phenomenon of "moonlighting" (double jobbing). After finding that moonlighting is more prevalent among government workers than among those in the private sector, we consider whether our FIML estimates of the public-private wage gap can help explain why government workers are likely to have second jobs. Our probit analysis shows that the wage disadvantage of civil servants is an important determinant of moonlighting. We consider this as additional confirmation of our main finding that public sector wages are lower than private sector wages. We conclude that a further erosion of public sector wages can be expected to result in more moonlighting by civil servants.

Our research has an important policy message: Fiscal pressures will continue to call for reductions in the government wage bill via reductions in pay or in employment. Our evidence suggests that the time has come to prescribe the latter acknowledging that, of the two approaches, it is likely to be less palatable in the short-term but more effective in the long-run.

1/ The CILSS was conducted jointly by the World Bank and the Direction de la Statistique of the Ministère de l’Economie et des Finances of Côte d'Ivoire. The PLSS was sponsored by the World Bank, Instituto Nationale de Estadistica and the Central Bank of Peru.
Suggestions and comments from staff of Welfare and Human Resources Division contributed to this study throughout its course. Discussions with Dennis de Tray significantly improved the presentation of the material. Brenda Rosa deserves thanks for typing and retyping the various drafts.
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1. **INTRODUCTION**

Governments in both developing and industrialized countries employ a large part of the labor force. A survey conducted by the International Monetary Fund shows that the share of government employment (non-agricultural) is 24.2 percent in OECD countries. For developing countries it is 54.4 percent in Africa, 36.0 percent in Asia and 27.4 percent in Latin America (Heller and Tait, 1984). In Less Developed Countries (LDCs), the severe economic crises of recent years has increased the pressure by policy makers and lending agencies to make economies more productive. The public sector has not escaped this pressure. Given the size of the government as an employer, it is not surprising that the public wage bill has come under increased scrutiny.¹ In the light of fiscal constraints that make a reduction of the wage bill all but unavoidable, policy makers have two options: reduce wages or reduce employment.

A recent review of the World Bank's operational experience with public sector pay and employment shows that, virtually without exception, 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 chosen as the obvious remedy. Though some progress in reducing the wage bill can be made by freezing recruitment or preventing guaranteed hiring of, say, university graduates, in many countries the actual dismissal of civil servants is considered politically unfeasible.

Transparent wage reductions (or freezes) are equally unpalatable. Hence, it is not surprising to find that wage cuts have been undertaken in

¹ For a thorough discussion of issues related to government compensation and employment, see World Bank (1983) and Nunberg (1987).
various disguised forms: covert methods of reducing wages seem to be preferred in attempting to cut the size of the wage bill. Perhaps the least difficult (most disguised) way of reducing public wages is through inflationary erosion. In a recent paper in the World Bank Observer, Lindauer, et al (1988) show, for a sample of African countries, that the growth in real starting salaries was negative almost everywhere for the period 1975-1983. Annual reductions of more than 10 percent were the rule, not the exception. In some cases the annual reductions exceeded 30 percent.

In sum, it would appear that the general response to increased fiscal constraints on the government wage bill has been one that maintains public employment while reducing real wages. Whether or not this is the best policy to deal with the problem depends heavily on the answer to the 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.2/

The answer to this question has not only implications 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 first of all will lead to a discouraged public work force. But distortionary effects on the private sector may also occur, through, for instance, moonlighting activities (see Mazumdar, 1987).

2/ If the public sector is very large, it may dominate the modern sector in such a way that the private sector is forced to follow the government's wage and employment policies. In such a case it is difficult, if not impossible, to establish the relevant benchmark.
Still, simple and important as the question may be, for LDCs there are surprisingly few empirical studies that deal with the issue of public-private sector wage comparisons in a systematic and convincing manner. In general, making such comparison on the basis of average wages is very misleading, if not meaningless, since no adjustment is made for differences in education levels and work experience between both sectors. Hence, many studies use standard Ordinary Least Squares (OLS) regression techniques in which wage-determining attributes (e.g., education and experience) are controlled for in assessing the public-private wage differential. There are numerous such studies for the industrialized world, especially for Canada and the US.3/ As regards the developing world, a search of the literature revealed but a handful of studies which addresses this issue empirically. More serious than the lack of research, as we will argue in Sections 2 and 3, is that these studies all suffer from a methodological flaw that casts doubts on some of the findings.

In this paper we will make public-private sector wage comparisons 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), the details of which are discussed below.

The paper is structured as follows. In Section 2, we briefly review the literature on public-private sector pay differentials in developing countries and indicate why, in our opinion, the available studies may have

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produced misleading results. We will formalize this argument in Section 3, develop the model used in this study, and present our estimation results.

The main conclusion is the same for both countries: at the time of the data surveys, public wages were well below those in the private sector. This raises another important issue: 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 well known to be widespread among civil servants in LDCs. Moonlighting is likely to reduce productivity in the principal (public sector) job and may also have consequences for employment and wages in the private sector. We consider the moonlighting issue in Section 4. Our results link lowered public wages to a greater incidence of moonlighting and therefore provide additional support for the conclusion that public wages are too low. In Section 5 we will summarize and discuss our results and draw conclusions for public employment and wage policies, as well as for future research.
2. 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 approach compares averages (and trends therein) between the two groups of workers, either on an aggregate basis or stratified by skill/qualification levels (education) or by job characteristics (occupation). Examples are the studies by Bennell (1981), Heller and Tait (1984), and Lindauer, Meesook, and Suebsaeng (1987), and the numerous country economic memoranda of the World Bank (listed in Nunberg, 1987). Although these descriptive analyses do shed light on the policy issues at stake, the comparison of average wages can be deceptive because they do not systematically analyze the role of worker background characteristics in determining remuneration.

The second group of studies, of which there are only a handful, attempts to assess the pay differential by using multivariate analysis. The conceptual framework used 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 post-school 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: a legitimate one that comes from differences in endowments of wage-determining attributes (the explanatory variables), and a second that arises from differences 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 several 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 sector workers. Third, each study uses some variant of the Mincerian earnings function, and finally 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. The results of the studies we reviewed are summarized in Table 1. As is readily seen, there is much variation in both the direction and magnitudes of the estimated 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-a-vis private sector workers. The former receive a modest 14% surplus, while the latter earned about 30% more than private sector workers.

House (1984) decomposed the public-private sector wage gap for different levels of work experience and education, for both male and female workers. He reports a pure earnings advantage of both men and women in the public sector, but that for women is much larger than for men. The estimated
TABLE 1: A Review of Findings of Public-Private Sector Wage Differentials

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>YEAR</th>
<th>COUNTRY</th>
<th>SAMPLE</th>
<th>FINDINGS</th>
</tr>
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<tbody>
<tr>
<td>CORBO and STELCNER (1983)</td>
<td>1978</td>
<td>Chile</td>
<td>Employment Survey</td>
<td>-21% (in favor of private sector)</td>
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<td></td>
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<td>Santiago: Males</td>
<td>-5% (in favor of private sector excluding PEM workers)</td>
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<td>HOUSE (1984)</td>
<td>1979</td>
<td>Cyprus</td>
<td>Survey of Wages, Salaries and Hours of Work</td>
<td>Education</td>
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<td>Males &amp; Females</td>
<td>Work Experience (Years)</td>
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<td>2-5 yrs.</td>
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<td>Graduate</td>
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<td>Males</td>
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<td>Females</td>
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<td>Secondary General</td>
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<td>Females</td>
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<tr>
<td>LINDAUER &amp; SABOT (1983)</td>
<td>1971</td>
<td>Tanzania</td>
<td>National Urban Mobility, Employment and Income</td>
<td>Gov't. vs. Private Sector: 14%</td>
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<td></td>
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<td></td>
<td>Survey, Males</td>
<td>Parastal vs. Private Sector: 29%</td>
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<td>Gov't. vs. Parastatal: 5%</td>
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<td>MOHAN (1986)</td>
<td>1978</td>
<td>Colombia</td>
<td>City Study - DANE Survey</td>
<td>No Difference</td>
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<td>Males</td>
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<td>Returns to Primary schooling lower in Public Sector</td>
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<td>Returns to Post-Primary schooling higher in Public Sector</td>
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<tr>
<td>PSACHAROPOULOS, ARRIAGADA</td>
<td>1984</td>
<td>Colombia</td>
<td>National Household Survey, Males</td>
<td>Returns to Education and Experience</td>
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<td>and VELEZ (1987)</td>
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<td>1970</td>
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<td>1970 Census, Males</td>
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<td>1975</td>
<td>Colombia</td>
<td>DANE Urban Market Survey, Males</td>
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<td>1978</td>
<td>Malaysia</td>
<td>Special Survey, Males</td>
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<td>1977</td>
<td>Greece</td>
<td>Special Survey, Males</td>
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<td></td>
<td>1984</td>
<td>Venezuela</td>
<td>National Household Survey, Males</td>
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</table>

| Levels:1/ | Primary | 0.85 | 0.74 |
|           | Secondary | 2.34 | 1.58 |
|           | University | 5.54 | 6.59 |
|           | Experience | 8%  | 9%  |

1/ Coefficients on dummy variables
surplus ranges from 5% (women with vocational training and more than 10 years of experience) to 109% (university graduates with more than 10 years of experience). The rents are less, but still substantial, for male government employees, ranging from -5% to 46%.

For Chile, Corbo and Stelcner (1983) find that private sector workers receive a modest wage premium of 5% which rises to 20% if PEM (Minimum Employment Program) workers are included among public sector workers. 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 survey by Psacharopoulos (1983) on Brazil, Colombia, Greece, Malaysia, and Portugal reports that, in each country, returns to both education and experience are higher in the private sector than in the public sector. Highly educated workers in the government sector do not have a wage advantage, while less educated public sector workers may receive a wage premium. Similar results for Colombia are reported by Psacharopoulos, Arriagada and Velez (1987).

Steier (1987) reports that, in Venezuela in 1975, average public sector wages were higher than private sector wages at all educational levels, except post-secondary (about the same), but that by 1984, public sector wages were lower at all schooling levels. Moreover, while in 1975 the returns to schooling and experience were higher for private sector 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.

The study by Komenan (1987) on Côte d'Ivoire for 1984 finds that, with the exception of university education, the returns to schooling are higher for civil servants than for private sector workers, while returns to work experience are higher in the private sector.

As stated above, the standard procedure used in all these studies is to test for the equality of the wage structure in the two sectors after the estimation of the wage equation by 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 up 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 are misleading.

In the next section we will formalize this argument and develop a model that tests for the existence of selectivity bias. We will 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/lower than in the private sector?
3. THE MODEL AND ESTIMATION RESULTS

3.1 A Switching Regression Model for Public-Private Sector 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. First, we lay out the structure of the model (see also Maddala, 1983, p. 261). This is followed by a discussion of the selection equation and the associated estimation issues. Finally, we demonstrate the conditions under which OLS estimates are biased.

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

\[ \ln w_1 = X_1 \beta_1 + u_1 \]  
\[ \ln w_2 = X_2 \beta_2 + u_2 \]

where \( \ln w_1 \) is the natural log of wages in section i, \( \beta_1 \) is the vector of coefficients associated with wage-determining attributes \( X \), and \( u_1 \) is a disturbance term, to be further discussed below.

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. Secondly he/she may or may not be chosen for the job. The likelihood of not being chosen is a cost to the prospective

\footnote{For the sake of exposition, we assume that public sector jobs are the preferred ones; the argument is symmetrical.}
employee who compares it with the expected benefits. The probability of obtaining a public job depends on characteristics of the individual that are used by the employer to select a worker from the queue.

We assume, for the time being, that expected benefits to the employee are equal, or proportional, to the difference in the (log) wage rates between the two sectors. Thus, an individual will be in the public sector if

\[(\ln w_1 - \ln w_2) > Z_1 \gamma_1 + \epsilon_1 \]  

where \(Z_1\) is a vector of characteristics that are associated with the probability of obtaining a public job and \(\epsilon_1\) is a disturbance term to be discussed below. Substituting (1) and (2) into (3), and combining all explanatory variables (which may be common in \(Z_1\) and \(X\)) and disturbance terms in \(Z\) and \(\epsilon\), yields:

\[I^* = Z_\gamma + \epsilon\]  

Thus \(I^*\) is a partially observed index that describes the selection process. We observe the outcome (public or private sector job) depending on whether \(I^*\) is positive or negative.

Note that this single equation summarizes a two-step process. First, the expected wage differential must be large enough for the individual to make it worthwhile to try to obtain a public job. This choice to apply is explained 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. Explanatory variables are the person's attributes in the eyes of the employer. The outcome of the two levels of choices is one group of public sector workers (I* ≥ 0) who apply and receive a public wage offer, and another group of private sector workers (I* < 0), who either do not apply or apply but do not receive a public wage offer. In principle, one could acknowledge those two levels of choice more explicitly with two selection equations (Poirier, 1980; Abowd and Farber, 1982; Hendricks and Kahn, 1984), but since the expected wage differential is to be estimated in a study as this and is therefore by definition unknown, the distinction between the first and second choice equations lies mainly in the variable measuring the cost of applying. The data sets used for this study do not contain any such measure. It then becomes nearly impossible 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 .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 £, and the linear specification in (4) approximates the nonlinear relationship implied by a model with two selection equations.5/ To the

5/ In fact, one could add a third decision to the two above, which is the decision to participate in the "formal" sector of labor force, i.e. as a private or public employee, as opposed to not working or being self-employed. While that is clearly beyond the focus of the paper, it shows that the sample of wage and salary employees is self-selected and that parameter estimates may be affected by this.
extent that by this the model is misspecified, the parameter estimates are biased.

Later in this paper we shall see a sectoral difference in nonpecuniary benefits of employment and incidence of moonlighting. When nonpecuniary benefits are proportional to the wage rates, the selection equation remains the same.\textsuperscript{6} When they are not proportional, the differential in proportions enters the selection equation directly.\textsuperscript{7} It is part of the intercept in $Z_1Y_1$ if the proportions are constant. If they are not constant, the differential is part of the explanatory variables in $Z_1$ to the extent that these capture the behavior of people in response to the nonpecuniary benefit differential.

As public sector workers are more frequently observed to hold a second job, a time allocation element enters the sectoral choice,\textsuperscript{8} but it is not necessarily clear that the public sector is therefore more preferred: the second job may be taken out of a need to earn more income in order to adequately support the family. $Z_1Y_1$ will also contain this effect of time allocation, modeled indirectly as a "reduced form".

\textsuperscript{6} If nonpecuniary benefits are a fraction $p$ of total compensation $E_i$ for work, we have $\ln w_1 - \ln w_2 = \ln[(1-p)E_i] - \ln[(1-p)E_2] = \ln E_1 - \ln E_2$. Equation (3) can thus be expressed in either $\overline{E}_1$ or $w_1$.

\textsuperscript{7} $\ln w_1 - \ln w_2 = \ln E_1 - \ln E_2 + \ln(1-p_1) - \ln(1-p_2) = \ln E_1 - \ln E_2 + (p_2 - p_1)$.

\textsuperscript{8} Even if moonlighting did not occur, time allocation is a factor in the sectoral choice when hours of work differ. This would suggest that the appropriate measure of $w_i$ is weekly or monthly earnings. In that case, however, the coefficients $\beta_i$ would measure the effect of $X$ both as wage-determining attributes and as correlates of time allocation. We will interpret $w_i$ as hourly earnings.
Since the sectoral choice may well be a lifetime choice for some (most?) people and be based on expected average long run returns, one might observe short run wage shortfalls for people who yet choose to work in that sector. A short run business cycle may hurt those workers, but past prosperity or expected future gains may offset current losses. Nevertheless, this is a source of error, captured by the disturbance term \( \epsilon_1 \) in selection equation (3) (and thus also in (4)).

In summary, the selection process will represent supply and demand factors. The difference of wage offers will matter, at least to the worker, and consequently all variables included in the vector \( X \) 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 all 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 employee 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 \( \epsilon \). We shall assume that \( (u_1, u_2, \epsilon) \) follows a trivariate normal distribution with non-zero covariances.

It has been shown (e.g., Olsen, 1980) that the estimates of models like the one used here are sensitive to the distributional assumption. Such
sensitivity is reduced if the vector Z includes variables that affect, based on theoretical reasons, the selection process but 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 (i.e., 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, X overlaps Z almost entirely, so caution in interpretation applies.

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 (i.e., the wage offers). In relation 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 represent conditional or accepted wages, i.e., wage rates conditional upon being selected into that sector. The expected accepted wages can be written as follows (Heckman, 1979):

\[ E[\ln w_1 | I^* \geq 0] = X\beta_1 + \sigma_1\epsilon_1 \quad (6) \]
\[ E[\ln w_2 | I^* < 0] = X\beta_2 + \sigma_2\epsilon_2 \quad (7) \]

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 \(\sigma_{1\varepsilon}\) is the covariance between \(u_1\) and \(\varepsilon\). 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 \(\sigma_{1\varepsilon} = \sigma_{2\varepsilon} = 0\).

We can readily test for this by estimating the model by maximum likelihood techniques. Note that it is quite plausible that the assumption is violated since "preference" or "taste" variables, as well as unmeasured productivity-enhancing traits, may influence both the selection process and the wage.10/

### 3.2 Data and Estimation Results

We estimate the model developed above for Côte d'Ivoire and Peru. Both countries share some of the characteristics that are relevant to the issue at hand. For instance, both face severe budgetary constraints and both have identified the government wage bill as a target for budget reduction. As Table 2 shows, they have also shown the typical pattern of wage erosion for public sector employees, but the change in real wages is much more dramatic.

---

10/ For example, a "taste" for risk-taking and entrepreneurship may make it more likely that an individual chooses a career in the private sector. Such an individual is also likely to be more successful (has a higher wage) than the average private employee. For public employees nepotism or "connections" may both increase the chances of obtaining a public job and the wage received.
for Peru. The important observation is that, relative to real wages in the private sector, public sector wages have decreased significantly.

TABLE 2: Real Wage Indices for Public and Private Employees in Côte d'Ivoire and Peru: selected years

<table>
<thead>
<tr>
<th>Year</th>
<th>Côte d'Ivoire</th>
<th>Peru</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public Sector</td>
<td>Private Sector</td>
</tr>
<tr>
<td>1979</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1984</td>
<td>95.6</td>
<td>113.4</td>
</tr>
</tbody>
</table>

Sources: For Peru, INE (1996); For Côte d'Ivoire, République de la Côte d'Ivoire (1985) and Komenan (1987).

Thus for both countries it seems timely to make an assessment of the public wage levels relative to those in the private sector.

The data for Côte d'Ivoire come from the Côte d'Ivoire Living Standards Survey (CILSS) conducted jointly by the World Bank and the Direction de la Statistique of the Ministère de l'Economie et des Finances of Côte d'Ivoire. This household survey collects information on 1600 households per year, nationwide. We will use the first year (1985) data of this survey, which has become a permanent activity of the Direction de la Statistique. The wage sector is relatively small in Côte d'Ivoire, as compared to 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 prior to the interview. Our analysis is based on this sample of wage earners.
The data for Peru stem from the Peruvian Living Standards Survey (PLSS) conducted between June 1985 and July 1986, jointly by the World Bank, the Instituto Nationale de Estadistica and the Central Bank of Peru. This survey contains detailed socioeconomic information on 5,000 households nationwide. The analysis for Peru is confined to a sample of 1013 urban male wage earners in Lima, who were over 14 years of age and who reported positive earnings during the week prior to the interview.

It should be noted that the remuneration measure used for both countries comprises cash and the value of in-kind benefits, such as food, housing, and transportation allowances. For brevity's sake, we will use the term "wage".

Table 3 presents the definitions and summary statistics of all variables used in the analysis for Côte d'Ivoire. 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 25.9 percent of the government labor force is female versus only 14.9 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

11/ The CILSS and the PLSS contain virtually identical information. They were both developed by the Living Standards Measurement Study (LSMS) of the World Bank. More information on these specific surveys and LSMS in general can be found in Ainsworth and Munoz, 1986; Grootaert and Arriagada, 1986; Stelcner, Arriagada and Moock, 1987.
TABLE 3: Definitions and Summary Statistics of the Variables Used for the Côte d'Ivoire Analysis

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
<th>Private Sector</th>
<th>Public Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N = 301</td>
<td>N = 212</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Standard</td>
</tr>
<tr>
<td>LNW</td>
<td>Log of hourly wage rate (CFAs)**</td>
<td>5.557</td>
<td>1.29</td>
</tr>
<tr>
<td>AGE</td>
<td>Age in years</td>
<td>32.554</td>
<td>10.16</td>
</tr>
<tr>
<td>GESEX</td>
<td>General work experience</td>
<td>13.135</td>
<td>9.36</td>
</tr>
<tr>
<td>EXPOCC</td>
<td>Occupation specific experience</td>
<td>7.399</td>
<td>7.58</td>
</tr>
<tr>
<td>YRS-APP</td>
<td>Years apprenticeship</td>
<td>1.166</td>
<td>2.20</td>
</tr>
<tr>
<td>YRS-TECH</td>
<td>Years technical training</td>
<td>1.734</td>
<td>1.58</td>
</tr>
<tr>
<td>RRR</td>
<td>Reading, writing &amp; arithmetic skills*</td>
<td>1.973</td>
<td>1.37</td>
</tr>
<tr>
<td>NAT</td>
<td>Nationality: Non-Ivorian</td>
<td>.275</td>
<td>.44</td>
</tr>
<tr>
<td>FEMALE</td>
<td>Female</td>
<td>.149</td>
<td>.35</td>
</tr>
<tr>
<td>YRSCHL</td>
<td>Total years of schooling</td>
<td>5.269</td>
<td>4.94</td>
</tr>
<tr>
<td>YRS-EL</td>
<td>Years elementary schooling</td>
<td>3.561</td>
<td>2.84</td>
</tr>
<tr>
<td>YRS-H1</td>
<td>Years junior high school</td>
<td>1.215</td>
<td>1.69</td>
</tr>
<tr>
<td>YRS-H2</td>
<td>Years senior high school</td>
<td>.322</td>
<td>.89</td>
</tr>
<tr>
<td>YRS-UN</td>
<td>Years university</td>
<td>.169</td>
<td>.83</td>
</tr>
<tr>
<td>DIP-EL</td>
<td>Elementary school diploma</td>
<td>.478</td>
<td>.50</td>
</tr>
<tr>
<td>DIP-H1</td>
<td>Junior high school diploma</td>
<td>.182</td>
<td>.38</td>
</tr>
<tr>
<td>DIP-UPP</td>
<td>Higher diploma</td>
<td>.089</td>
<td>.28</td>
</tr>
<tr>
<td>DIP-TECH</td>
<td>Technical diploma</td>
<td>.202</td>
<td>.40</td>
</tr>
</tbody>
</table>

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

** Wages are measured in CFA's; 50 CFA equal 1 FF; 10 FF = $1 US, in 1985. The averages reflect CFA 595 in the private sector and CFA 1173 in the public sector.

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 makes very young entry into the private sector.
possible. Worthy of special notice is also the difference in the average wage rates: public sector employees earn on average almost twice as much as private wage earners.

Table 4 presents definitions and summary statistics for the study on Lima.12 As in Côte d'Ivoire, public sector workers show on average a higher level of education, though the difference is less than two years. However, while 22 percent of public sector workers have a university diploma, only 8 percent of private sector employees have one. Public sector workers are slightly older and more likely to be married. Again, on average, public sector 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).13 We also estimated equations (1) and (2) separately with OLS. The complete estimation results are presented in Annex A together with a brief explanation. For our purpose here, these results are best summarized in a number of experience-wage profiles.

Figures I and II show the experience-wage profiles for an average (across both sectors) employee in Côte d'Ivoire and Peru, respectively, based on both OLS and on FIML estimates. Starting from age 18, we let occupational

12/ Note that in the Lima sample, GEXPR represents all potential experience accumulated since leaving school, including job specific experience. Thus, GEXPR and EXPOCC overlap. In the Côte d'Ivoire sample, GEXPR stops where EXPOCC starts: GEXPR measures experience prior to entering the current occupation, and has no overlap with EXPOCC.

13/ See van der Gaag and Vijverberg (1988) for the derivation of the likelihood function.
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

<p>| TABLE 4: Definitions and Summary Statistics of the Variables Used for the Peru Analysis |
|------------------------------|--------------------------------|-------------------------------|</p>
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
<th>Private Sector</th>
<th>Public Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N = 759</td>
<td>N = 254</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard Mean</td>
<td>Standard Mean</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard Deviation</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>LNW</td>
<td>Log of hourly wage rate*</td>
<td>1,598</td>
<td>1,910</td>
</tr>
<tr>
<td>(Intis at June 1985 price)</td>
<td></td>
<td>0.85</td>
<td>0.66</td>
</tr>
<tr>
<td>AGE</td>
<td>Age in years</td>
<td>33.7</td>
<td>37.6</td>
</tr>
<tr>
<td>GEXPR</td>
<td>Potential work experience</td>
<td>18.1</td>
<td>20.4</td>
</tr>
<tr>
<td>EXPOCC</td>
<td>Job specific experience</td>
<td>7.5</td>
<td>10.6</td>
</tr>
<tr>
<td>TRAIN</td>
<td>Vocational Training %</td>
<td>0.37</td>
<td>0.48</td>
</tr>
<tr>
<td>MARRIED</td>
<td>Married or cohabiting %</td>
<td>0.35</td>
<td>0.69</td>
</tr>
<tr>
<td>FYRSCHL</td>
<td>Father's years of schooling</td>
<td>5.8</td>
<td>6.5</td>
</tr>
<tr>
<td>MYRSCHL</td>
<td>Mother's years of schooling</td>
<td>4.0</td>
<td>4.8</td>
</tr>
<tr>
<td>YRSCHL</td>
<td>Total years of schooling</td>
<td>9.2</td>
<td>11.0</td>
</tr>
<tr>
<td>SPLYRSC1</td>
<td>Years of primary school</td>
<td>4.8</td>
<td>4.9</td>
</tr>
<tr>
<td>SPLYRSC2</td>
<td>Years of secondary</td>
<td>3.5</td>
<td>4.2</td>
</tr>
<tr>
<td>SPLYRSC3</td>
<td>Years of post-secondary</td>
<td>0.9</td>
<td>1.9</td>
</tr>
<tr>
<td>PUBSCHL</td>
<td>School last attended was public %</td>
<td>0.82</td>
<td>0.87</td>
</tr>
<tr>
<td>DIPLOMA1</td>
<td>Secondary technical %</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>DIPLOMA2</td>
<td>Post-secondary non-university %</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>DIPLOMA3</td>
<td>University %</td>
<td>0.08</td>
<td>0.22</td>
</tr>
</tbody>
</table>

* In June 1985, 20 intis = $1 US. The averages reflect 7.09 intis in the private sector and 8.39 intis in the public sector.
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 sector employees. For Peru, private sector wages eventually will exceed those in the public sector, but in Côte d'Ivoire public sector wages are always higher than private wages.

The conclusion based on the FIML estimates is quite different: public wage offers are lower than private wage offers for workers with average characteristics, throughout the working lifetime. This conclusion holds for both countries. The main differences between the two sectors arise from a general difference in the level of remuneration as well as from different returns to years of schooling. Coefficients of the experience, diploma and parental education variables are not significantly different.

When a worker accepts employment in a sector he will receive an expected wage as given in equation (6) or (7). At the same time, he rejects (or is not chosen for) a job in the other sector. The expected wage rejected by a public and private worker can be written, respectively, as:

\[ E[\ln w_2 | I^* \geq 0] = \beta_2 + \sigma_2 \lambda_1 \]  
\[ E[\ln w_1 | I^* < 0] = \beta_1 + \sigma_1 \lambda_2 \]  

The advantage a worker has in accepting a, say, public job is therefore given by \( E[\ln w_1 | I^* \geq 0] - E[\ln w_2 | I^* \geq 0] \). The private sector worker may enjoy a similar difference, calculated by reversing the subscripts in this expression.
Figure I

-Côte D'Ivoire-
Experience-Wage Profiles
Average Wage Earners

Explanation
(1) = OLS private sector
(2) = OLS public sector
(3) = FIML private sector
(4) = FIML public sector
Figure II

Peru -
Experience-Wage Profiles
Average Male Wage Earners

Explaination
(1) = OLS private sector
(2) = OLS public sector
(3) = FIML private sector
(4) = FIML public sector
Table 5 calculates the various wage measures for an average worker. Wage offers from the private sector exceed those of the public sector by 36 percent in Côte d'Ivoire (1985) and by 94 percent in Peru (1985/86). That does not mean that every average worker would reject a public sector job offer: variation in unobserved productive characteristics will still make public employment a preferred choice for some, otherwise average, workers. Those who accept a public sector job received an average wage offer of, in Peru, 8.25 intis. Their unobserved productive characteristics are worth 5.03 intis, i.e., the selectivity effect. Such workers rejected jobs offers with an average wage of 6.34 intis from the private sector, a difference of 1.91 intis. Statistically, this difference is insignificant. In comparison, the difference accruing to an average private sector worker equals 3.97 intis on an average wage of 6.43 intis.

In Côte d'Ivoire, an average worker in the private sector receives a wage of about CFA 699 which is CFA 520 more than the estimated rejected public wage. Both are larger than the returns to public employment: there, the difference equals CFA 385 on a wage of CFA 600.

The bottom part of Table 5 shows the statistical significance of the wage difference of every worker in each sector.\(^{14}\) In Côte d'Ivoire, every worker is better off in the sector where (s)he 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.

\(^{14}\) Since non-Ivorian workers in Côte d'Ivoire do not hold public sector jobs, no public wage offer can be calculated for them. They are omitted from the calculations.
TABLE 5: Comparing the Various Wage Measures

<table>
<thead>
<tr>
<th></th>
<th>Côte d'Ivoire (CFA)</th>
<th>Peru (intis)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Private Sector</td>
<td>Public Sector</td>
</tr>
<tr>
<td>Wage Offer</td>
<td>414.9</td>
<td>6.34</td>
</tr>
<tr>
<td></td>
<td>304.8</td>
<td>3.22</td>
</tr>
<tr>
<td>Selectivity Effect</td>
<td>283.9</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>295.9</td>
<td>5.03</td>
</tr>
<tr>
<td>Accepted Wage</td>
<td>698.8</td>
<td>6.43</td>
</tr>
<tr>
<td></td>
<td>599.7</td>
<td>8.25</td>
</tr>
<tr>
<td>Rejected Wage</td>
<td>179.3</td>
<td>2.46</td>
</tr>
<tr>
<td></td>
<td>214.9</td>
<td>6.34</td>
</tr>
<tr>
<td>Difference</td>
<td>519.5</td>
<td>3.97</td>
</tr>
<tr>
<td></td>
<td>384.8</td>
<td>1.91</td>
</tr>
<tr>
<td>(t-stat)^a</td>
<td>(8.99)</td>
<td>(7.00)</td>
</tr>
<tr>
<td></td>
<td>(7.15)</td>
<td>(.43)</td>
</tr>
</tbody>
</table>

% of Sectoral Workers with

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>Insignif. Neg. Diff.</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Insignif. Pos. Diff.</td>
<td>5.5</td>
<td>13.2</td>
<td>65.4</td>
</tr>
<tr>
<td>Signif. Pos. Diff.</td>
<td>94.5</td>
<td>86.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

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.

The conclusion is the following. In Côte d'Ivoire (1985), public wage offers are below private wage offers. Through selection among the two sectors, workers sort themselves into the sector where they are 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.

In Peru (1985/86), there is also evidence of workers sorting themselves according to their comparative advantage. However, public wage offers to workers who do indeed accept them are so low that there are no monetary benefits for the worker to this positive selection. As regards the "realism" of the latter result, it is interesting to note that in 1987, after
much labor unrest among civil servants, the Government of Alan Garcia increased public sector wages by more than 50% (Bonner, 1988).

In section 5 we will draw the policy implications from these findings, but first we will test the hypothesis that the public-private wage gap indeed contributes to the phenomenon of moonlighting by government workers. If it does, we have additional evidence that public wages are indeed too low, strengthening the case for accepting the FIML results over the OLS results.
4. MOONLIGHTING

For the purpose of this study we define moonlighting as having a second income earning activity, i.e. in addition to the primary job. As shown in Table 6, moonlighting is much more prevalent among civil servants than among wage earners in the private sector. For Lima we find 26.7 percent of public sector employees to have secondary jobs, versus 14.3 percent of employees in the private sector. In Côte d'Ivoire, where the phenomenon seems less prevalent, these numbers read 9.9 and 4.6 percent, respectively.

Table 7 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 not much 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 second jobs are in self-employment.

15/ The primary job is defined as the one in which the respondent works the most hours.

16/ Moonlighting is not necessarily an illegal activity. Working on a second job can take place after regular work hours or during the weekend. However, casual observations on absenteeism among civil servants in LDCs suggest that some of it takes place during the day. Thus, respondents to the survey may have been reluctant to reveal moonlighting activities. Therefore the results in Table 5 should be interpreted as lower bound estimates.
TABLE 6: Second Job Holdings by Sector (percentage)

<table>
<thead>
<tr>
<th></th>
<th>Côte d'Ivoire</th>
<th>Peru</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sector</td>
<td>9.9</td>
<td>26.7</td>
</tr>
<tr>
<td>Private Sector</td>
<td>4.6</td>
<td>14.3</td>
</tr>
<tr>
<td>All Employees</td>
<td>6.8</td>
<td>17.4</td>
</tr>
</tbody>
</table>

TABLE 7: Statistics on Moonlighting Behavior by Public Sector Workers

<table>
<thead>
<tr>
<th></th>
<th>Côte d'Ivoire</th>
<th></th>
<th>Peru</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moonlighters</td>
<td>Non-</td>
<td>Moonlighters</td>
<td>Non-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moonlighters</td>
<td></td>
<td>Moonlighters</td>
</tr>
<tr>
<td>Age</td>
<td>39.0</td>
<td>36.3</td>
<td>41.0</td>
<td>36.3</td>
</tr>
<tr>
<td>(7.6)</td>
<td>(8.8)</td>
<td>(11.8)</td>
<td>(12.4)</td>
<td></td>
</tr>
<tr>
<td>Years of Schooling</td>
<td>7.1</td>
<td>9.4</td>
<td>11.4</td>
<td>10.9</td>
</tr>
<tr>
<td>(6.2)</td>
<td>(5.1)</td>
<td>(3.6)</td>
<td>(3.9)</td>
<td></td>
</tr>
<tr>
<td>Vocational training</td>
<td>%</td>
<td>-</td>
<td>.53</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>.14</td>
<td>.27</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>%</td>
<td>-</td>
<td>.85</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Job</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly wage</td>
<td>1381</td>
<td>1195</td>
<td>8.85</td>
<td>8.66</td>
</tr>
<tr>
<td>(2348)</td>
<td>(1597)</td>
<td>(6.6)</td>
<td>(11.3)</td>
<td></td>
</tr>
<tr>
<td>Hours per week</td>
<td>39.9</td>
<td>42.9</td>
<td>39.1</td>
<td>46.7</td>
</tr>
<tr>
<td>(14.3)</td>
<td>(14.6)</td>
<td>(12.2)</td>
<td>(16.2)</td>
<td></td>
</tr>
<tr>
<td>Second Job</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours per week</td>
<td>9.7</td>
<td>-</td>
<td>13.3</td>
<td>-</td>
</tr>
<tr>
<td>(7.3)</td>
<td>(10.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-employed</td>
<td>%</td>
<td>.91</td>
<td>.75</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Standard deviations are in parentheses. Monetary values are CFA's for the Côte d'Ivoire and Intis at June 1985 prices for Peru.
Before presenting the results of our analysis of the effect of public-private wage differentials on the moonlighting phenomena, it is useful to recall the main question of this paper: are public wages higher or lower than wages in the private sector? The FIML estimation results show that public wages are lower. The time-series data available (e.g. Lindauer, et al., 1987) show that public wages have been severely eroded by inflation during recent years. Our data on Peru and Côte d'Ivoire also show that, relative to private sector wages, public wages have recently decreased significantly. All this sketches a consistent picture.\(^{17}\) In addition, we observe that moonlighting is much more prevalent among public sector employees than among private wage earners. We will now test whether our estimates of the public-private wage differential can help explain moonlighting by civil servants. If so, we will take that as further evidence that public wages are "too low" as compared to private wages.

For expositions of the economics of moonlighting, see Brown, 1983; Joll, et. al, 1983, and Shishko and Rostker, 1976. An important assumption in the literature is that individuals make their labor supply decisions sequentially. First, they try to obtain a public sector job; then, given the income earned in this job and the opportunities offered in the private sector, they decide on whether or not to take a second job. This is a very reasonable assumption, although there are numerous sequences depending upon relative

---

\(^{17}\) The recent wage increase for government workers in Peru is also consistent with our FIML results, but would be rather puzzling if the OLS findings are to be believed.
wages in the main and second jobs, unobserved "tastes" for the two jobs, and, most important perhaps, constraints on the choice of hours in the two jobs.\(^{18/}\)

The simplest model to test for the effect of wages in the public and private sector is given in columns 1 of Table 8 for Côte d'Ivoire and Lima, 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, \textit{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 \(W_{GOV}\) is the predicted accepted wage received by the civil servant, while \(W_{PRIV}\) is the private wage offer to public employees as predicted by our FIML estimates.\(^{19/}\) \(W_{PRIV}\) is used as a proxy for earnings potential in the private sector, since, as shown in Table 6, moonlighters are usually self-employed ("informal" sector) rather than wage earners ("formal" sector). The implicit 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 (PCCONS) as a proxy for the "need" to earn extra income from a second job. The estimation results

\(^{18/}\) Under an alternative scenario, workers choose for the public sector, knowing that they have better opportunities in that sector for 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.

\(^{19/}\) In terms of the model described in Section 3, \(\ln(W_{GOV}) = X\hat{\beta}_1 + \sigma_1^\epsilon \hat{\lambda}_1\) (see equation (6)) and \(\ln(W_{PRIV}) = X\hat{\beta}_2 + \sigma_2^\epsilon \hat{\lambda}_1\) (see equation (8)) where "\(\hat{\cdot}\)" indicates estimated values.
TABLE 8: Results of Moonlighting Analysis; Probit Estimates for Public Employees a/

<table>
<thead>
<tr>
<th></th>
<th>Côte d'Ivoire Means</th>
<th>Peru Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Intercept</td>
<td>-.966</td>
<td>-5.458</td>
</tr>
<tr>
<td></td>
<td>(4.60)</td>
<td>(2.02)</td>
</tr>
<tr>
<td>Per Capita Household</td>
<td>7.41</td>
<td>-.051</td>
</tr>
<tr>
<td>Consumptionb/</td>
<td>[7.1]</td>
<td>(1.53)</td>
</tr>
<tr>
<td>(POCONS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earnings from Main Jobb/</td>
<td>3.95</td>
<td>-.157</td>
</tr>
<tr>
<td>(PRIMINC)</td>
<td>[3.9]</td>
<td>(1.65)</td>
</tr>
<tr>
<td></td>
<td>[-3.02]</td>
<td>[-3.12]</td>
</tr>
<tr>
<td>Other Incomeb/</td>
<td>3.34</td>
<td>-.011</td>
</tr>
<tr>
<td>(OTHER)</td>
<td>[5.5]</td>
<td>(.37)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Wage (WPU) c/</td>
<td>10.23</td>
<td>-.022</td>
</tr>
<tr>
<td></td>
<td>[11.7]</td>
<td>(.67)</td>
</tr>
<tr>
<td>Private Wage Offer c/</td>
<td>3.70</td>
<td>.058</td>
</tr>
<tr>
<td>(WPRIV)</td>
<td>[4.7]</td>
<td>(.76)</td>
</tr>
<tr>
<td></td>
<td>[.93]</td>
<td>(1.62)</td>
</tr>
<tr>
<td>Household Size</td>
<td>8.4</td>
<td>-.010</td>
</tr>
<tr>
<td></td>
<td>[4.5]</td>
<td>(.32)</td>
</tr>
<tr>
<td></td>
<td>[-.19]</td>
<td>[-.12]</td>
</tr>
<tr>
<td>Years of Schooling</td>
<td>9.2</td>
<td>-.018</td>
</tr>
<tr>
<td>(YRSCHL)</td>
<td>[5.3]</td>
<td>(.42)</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>36.5</td>
<td>.256</td>
</tr>
<tr>
<td>(AGE)</td>
<td>[8.7]</td>
<td>(1.80)</td>
</tr>
<tr>
<td></td>
<td>[4.9]</td>
<td>(4.97)</td>
</tr>
<tr>
<td>Age squared/100</td>
<td>1406.7</td>
<td>-.322</td>
</tr>
<tr>
<td></td>
<td>[661.0]</td>
<td>(1.75)</td>
</tr>
<tr>
<td></td>
<td>[-6.22]</td>
<td>[-6.23]</td>
</tr>
<tr>
<td>Vocational Training</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(TRAIN)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or Cohabitib/</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(MARRIED)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female (FEMALE)</td>
<td>0.26</td>
<td>-.682</td>
</tr>
<tr>
<td></td>
<td>[0.44]</td>
<td>(1.96)</td>
</tr>
<tr>
<td></td>
<td>[-13.15]</td>
<td>[-12.57]</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-65.96</td>
<td>-61.63</td>
</tr>
</tbody>
</table>

a/ t-values in ( ); standard deviation in [ ], marginal effect on percentage probability in { }.

b/ in CFA 10,000's and 100 intis.

c/ in CFA 100's and intis.
generally confirm our expectations. All coefficients on PCCONS and on both wage variables have the expected signs, and the wage effects are significant in Peru. The results for the Côte d'Ivoire lack statistical significance, which is probably due to the fact that only 10% of government workers reported having a second job.

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

In terms of the standard labor supply literature, the coefficient on PRIMINC reflects the "unearned" income effect, while that on WPRIV yields the wage effect. In column (3) we push this approach one step further by including a proxy variable for household income earned by other members of the family (OTHER INCOME). Other income is calculated as total household consumption minus PRIMINC, the wage income of the public employee. Finally, we add a number of variables such as household size, age, experience and education, to see whether these characteristics have an additional direct effect on the probability of moonlighting (i.e., other than through their effect on wages).

Again, the estimation results generally confirm our expectations. Most importantly, if public earnings (PRIMINC) 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\(^{20}\) while 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 secondary job, \textit{ceteris paribus}.\(^{21}\)

Thus, this analysis 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 3: wages in the private sector exceed those in the public sector.

\(^{20}\) The other income effect in Lima is small, but statistically significant at the 7 percent level. It also has the wrong sign, which is probably due to reversed causation: to satisfy the income need of the household, other household members pitch in, too, and generate a higher "other" income. Thus, the work effort of others may be positively correlated with the moonlighting effort of our public sector worker.

\(^{21}\) Moonlighting behavior of female workers may well be somewhat different from that of males, but the sample is too small to warrant a separate analysis.
5. **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 (e.g. Newey, 1987) but we are not aware of any available tests for the more elaborate model employed here.

Secondly, 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 respectively. 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 LDCs, 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 the Côte d'Ivoire and Peru wage offers in the public sector are well below those in the private sector. Note, however, that our comparisons are based on monetary remuneration only. Although this wage measure includes 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, such benefits are usually more prevalent in the public than in the private sector. Table 9 shows the percentage of workers who receive these benefits.

| TABLE 9: Non-Monetary Benefits for Public and Private Sector Employees (percentages) |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Côte d'Ivoire                                 | Peru            |                 |                 |                 |
| Public                                        | Private         | Public          | Private         |                 |
| 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            |
Intangibles, such as pressure on the job, type of work or job security are not included in the Table. However, in Côte d'Ivoire 54.7 percent of public workers have a signed contract, as compared to 33.2 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 forego 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.22/

Still we think that our basic result that public wage offers are well below those in the private sector, will not be significantly altered if such benefits are taken into account. Evidence that seems to support our conclusion 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 sector wage differential is an important determinant of moonlighting. A further erosion of public sector 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 job? 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

22/ For a discussion of the economics of nonwage labor costs, see Hart (1984).
counter to recent evidence on this issue for the Côte d'Ivoire (Lavy and Newman, 1988). A second explanation is that some people are unwilling to forego 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 non-wage benefits in public and private sector 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 on-going economic crisis in which many countries find themselves calls for better educated and highly motivated civil servants to promote productivity and to provide advice to policy makers 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.
ANNEX A

DETAILED ESTIMATION RESULTS

The Tables in this Annex show the Full Information Maximum Likelihood (FIML) estimates of the switching regression model. Table A.1 shows the results of the wage equations for Côte d'Ivoire, together with the OLS-estimates.

The model was first estimated without any restrictions on the coefficients, i.e. all elements of the vectors \( \beta_1 \) and \( \beta_2 \) were allowed to differ. We subsequently restricted subsets of the coefficients to be equal between the two sectors. The results in the Table show the best specification: allowing the diploma and experience variables to differ between the two sectors resulting in an insignificant improvement of the model, as indicated by a Chi-square test. However, if we further restrict the model, e.g. by forcing the years of schooling variables to have the same impact in both sectors, the model performs worse. The same method was used to find the best specification for Peru. (Table A.2)

The corresponding sector choice equations are presented in Table A.3. A detailed discussion of the results for the Côte d'Ivoire can be found in van der Gaag and Vijverberg (1988) and for Peru, in Stelcner, van der Gaag and Vijverberg (1987).
TABLE A.1: FIML and OLS Estimates of Log-Wage Equations for the Public and Private Sector: Côte d'Ivoire
(t-values in parentheses)

<table>
<thead>
<tr>
<th></th>
<th>FIML - Estimates</th>
<th>OLS - Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public Sector</td>
<td>Private Sector</td>
</tr>
<tr>
<td>INTERCEPT</td>
<td>2.993 (10.20)</td>
<td>3.586 (19.02)</td>
</tr>
<tr>
<td>NAT</td>
<td>-</td>
<td>-125 (1.06)</td>
</tr>
<tr>
<td>FEMALE</td>
<td>-.0735 (-.61)</td>
<td>.122 (.82)</td>
</tr>
<tr>
<td>DIP-EL</td>
<td>.401 (2.69)</td>
<td>.415 (.54)</td>
</tr>
<tr>
<td>DIP-HI</td>
<td>.443 (3.18)</td>
<td>.179 (.95)</td>
</tr>
<tr>
<td>DIP-UPP</td>
<td>.390 (1.56)</td>
<td>.551 (1.83)</td>
</tr>
<tr>
<td>DIP-TECH</td>
<td>.042 (.50)</td>
<td>-.036 (.32)</td>
</tr>
<tr>
<td>RRR</td>
<td>.154 (1.50)</td>
<td>1.26 (1.73)</td>
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<tr>
<td>YRS-EL</td>
<td>.050 (1.13)</td>
<td>.010 (.27)</td>
</tr>
<tr>
<td>YRS-H1</td>
<td>.191 (4.24)</td>
<td>.039 (.82)</td>
</tr>
<tr>
<td>YRS-H2</td>
<td>.007 (.08)</td>
<td>-.102 (-.88)</td>
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<td>YRS-UN</td>
<td>.221 (6.42)</td>
<td>.259 (3.74)</td>
</tr>
<tr>
<td>YRS-TECH</td>
<td>.049 (1.72)</td>
<td>.108 (3.10)</td>
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<td>YRS-APP</td>
<td>-.003 (-.14)</td>
<td>.014 (.27)</td>
</tr>
<tr>
<td>EXPOCC</td>
<td>.097 (7.82)</td>
<td>.53 (2.70)</td>
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<td>EXPOCCQ/100</td>
<td>-.150 (-3.54)</td>
<td>-.513 (-.79)</td>
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<tr>
<td>GEXPER</td>
<td>.021 (2.06)</td>
<td>-.023 (1.28)</td>
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<tr>
<td>GEXPERQ/100</td>
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<td>1.007 (1.95)</td>
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<tr>
<td>$\sigma_{ii}$</td>
<td>.690 (6.71)</td>
<td>.909 (9.45)</td>
</tr>
<tr>
<td>$\rho_{ie}$</td>
<td>.913 (22.39)</td>
<td>-.779 (-12.39)</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-820.66</td>
<td>.631 .609</td>
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</table>

TABLE A.2: FIML and OLS Estimates of Log-Wage Equation for the Public and Private Sectors: Peru (t-statistics in parenthesis)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Public FIML Estimates</th>
<th>Public OLS Estimates</th>
<th>Private FIML Estimates</th>
<th>Private OLS Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERCEPT</td>
<td>-1.154 (-2.17)</td>
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<td>.795 (1.37)</td>
<td>.164 (.81)</td>
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<tr>
<td>GEXPR</td>
<td>.030 (3.98)</td>
<td>.020 (1.33)</td>
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<td>.001 (.08)</td>
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<td>-.005 (-.10)</td>
<td>-.058 (-1.87)</td>
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<td>.068 (.56)</td>
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<td>.021 (.18)</td>
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<td>-.044 (-.27)</td>
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TABLE A.3: Estimates of the Switching Equations (t-values in parenthesis)

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Source: Côte d'Ivoire, see van der Gaag and Vijverberg (1988); Peru, see Stelcner, van der Gaag and Vijverberg (1987).
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