THE DETERMINANTS OF INDUSTRIAL-SECTOR EARNINGS IN SENEGAL

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The paper presents an econometric framework for testing the determinants of the industrial-sector earnings in Senegal¹. Using relatively rich data from the 1976 Industrial Census it is possible to test several hypotheses and generate estimates, some of which could not be obtained within the context of developing countries before. The main results relate to the earnings effects of sex, ethnic background, occupational attainment, and industry characteristics.

1. Introduction

Although efficient development of human resources is considered to be one of the key determinants of economic development, relatively few analytical studies of labor markets and the wage determination process in the developing countries have been undertaken so far. This paper presents a quantitative analysis of the industrial earnings structure in the Republic of Senegal. Since no adequate data existed until very recently, previous research in this area was primarily institutional in nature, occasionally presenting sketchy quantitative evidence from limited micro surveys.¹ The present study brings this institutional information into an analytical framework and uses data from the 1976 Senegalese Industrial Census to examine earnings differentials among men and women, 11 occupational (skill) categories and three ethnic (national) groups in 30 industries. Grouped data are available on 48,294 individuals, of whom 2,703 are women, 2,273 are non-Africans and 1,115 are Africans from other countries. (See tables 1 and 2 for the distribution among the occupational/skill categories.) While Senegalese men are clearly the dominant group, the Census provides relatively rich information on women and two other ethnic (national) groups.

Knowledge of earnings differentials among well-defined groups of workers is of course valuable in its own right and for comparative purposes. The

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¹See especially Pfeffermann (1968), Mackintosh (1975), and Bloch (1978).

Table 1
Number of full-time workers (N) in the sample by ethnic and skill groups.

Skill group	Senegalese		Other African		Non-Africans	
	N_S	%	N_{OA}	%	N_{NA}	%
Employers	91	(0.20)	11	(0.99)	280	(12.32)
High-level management	302	(0.67)	20	(1.79)	687	(30.21)
High-level technicians	687	(1.53)	26	(2.33)	531	(23.36)
Technicians and first-line supervisors	2,077	(4.63)	70	(6.28)	459	(20.19)
Skilled (white collar) employees	5,328	(11.87)	195	(17.49)	169	(7.44)
Skilled workers	9,223	(20.54)	146	(13.09)	41	(1.80)
Semi-skilled (white collar) employees	5,446	(12.13)	154	(13.81)	74	(3.26)
Semi-skilled workers	11,241	(25.02)	183	(16.41)	17	(0.75)
Unskilled laborers	9,034	(20.12)	271	(24.31)	7	(0.31)
Apprentices	1,378	(3.07)	28	(2.51)	4	(0.18)
Others	99	(0.22)	11	(0.99)	4	(0.18)
Total	44,506	(100)	1,115	(100)	2,273	(100)

Table 2
Number of women (N^F) in the sample by ethnic and skill groups.

Skill group	Senegalese		Other Africans		Non-Africans	
	N_S^F	%	N_{OA}^F	%	N_{NA}^F	%
Employers	5	(0.22)	1	(1.70)	27	(6.48)
High-level management	13	(9.57)	1	(1.70)	38	(9.11)
High-level technicians	21	(0.93)	4	(6.78)	52	(12.47)
Technicians and first-line supervisors	80	(3.58)	3	(5.09)	120	(28.78)
Skilled (white collar) employees	437	(19.60)	18	(30.50)	130	(31.17)
Skilled workers	181	(8.12)	2	(3.39)	9	(2.16)
Semi-skilled (white collar) employees	288	(12.93)	15	(25.42)	32	(7.67)
Semi-skilled workers	216	(9.69)	11	(18.64)	5	(1.20)
Unskilled laborers	937	(42.19)	4	(6.78)	3	(0.72)
Apprentices	33	(1.47)	0	(0.000)	0	(0.000)
Others	16	(0.71)	0	(0.000)	1	(0.24)
Total	2,227	(100)	59	(100)	417	(100)

results from this study also provide a better understanding of the earnings differentials in the other francophone African countries because of the similarities in their labor market institutions and the paucity of information on labor markets in these countries. Understanding the determinants of the wage structure is also important for several other reasons. Depending on

their nature, large wage differentials may signal inefficient allocation of resources. Information on the determinants of wages is also essential for understanding the operation of aggregate labor markets and for the formulation of a reasonable incomes policy. Finally, wage inequality has been shown to play an important part in explaining overall income inequality.² As a result, questions concerning the distribution of income can be better answered with an understanding of the source and degree of earnings differentials.

The format of the paper is as follows: section 2 briefly reviews the labor market institutions which are relevant for the formulation of the analytical model. Section 3 contains the analytical framework and section 4 presents the empirical findings. Concluding observations are in section 5.

2. Institutional framework³

The Senegalese labor market institutions are similar to those of other 'French-speaking' African countries. The trade union movement is weak and generally dependent on the government.⁴ Industrial and labor relations are to a large degree governed by the 1964 Senegalese Labor Code and the several subsequent legal provisions. The 1964 Code closely resembles the 1952 French Overseas Labor Code and grants considerable authority to the government and its agencies. Article 195 of the Code, for instance, establishes the Employment Service which is to be informed of all vacancies and which is also supposed to authorize all hirings.⁵ Workers must be registered with the Service and, in order to be employed, they must also hold a valid working permit. The working permit states their skill (occupational) category, which to a large degree determines their wage level.⁶

In most firms, the overall wage level depends directly on the base wages of the individual categories, which are changed irregularly by government

²See, for example, Blinder (1974) and Fields (1977) for estimates of the effects of unequal wages on total income inequality.

³In view of the analytical orientation of this study, the relevant institutions are reviewed here in a rather concise way. The reader is referred to Deschamps (1964), Massé (1966), Pfeffermann (1968), Lecaillon and Germidis (1974), Mackintosh (1975), and Bloch (1978), for detailed descriptions of Senegalese institutions.

⁴The weakness of unions derives *inter alia* from their fragmentation, poverty, inefficiency of operation, corruption of middle-level officials, and the gulf between the leaders and the workers. See Pfeffermann (1968, ch. 5).

⁵As Bloch (1978, p. 14) states: 'The Service's placement is not mandatory, but neither party can decline without informing the (Employment) Service, in writing, of their "guly motivated" reasons.' It is also generally agreed that the modern-sector enterprises comply with the law but that jobs in the informal sector are usually filled by word-of-mouth.

⁶The system of categories is part of the Collective Agreements which were established in (and have remained virtually unchanged since) the late 1950's. Each agreement covers one industry and provides a detailed description of each job (skill) category in that industry together with the corresponding base wage. For details of this system and the description of practical aspects, see Mackintosh (1975) and Bloch (1978).

decreases.⁷ As a result, many firms furnish additional employee compensation in the form of supplements to hourly wage rates as well as various monthly and annual bonuses and premiums.

The available evidence on the firm-internal wage structure indicates that age and seniority usually have an effect on wages only insofar as they translate into a higher job category within the firm. These findings are not surprising in view of the economically weak trade unions and the predominant part played by the skill (occupational) categorization.

The average earnings presented in table 3 indicate that varying degrees of both economic differentials and labor market discrimination⁸ may exist among the three ethnic groups. Knowledge of the institutional and social structure would also lead to this expectation. The country's historical ties with France and the data in table 3 suggest that significant differentials still exist in favor of the expatriate group.⁹ This is understandable given that a large part of the business capital in Senegal continues to be French-owned and that the Senegalese government is itself heavily oriented toward France.

Table 3
Average annual earnings ($\bar{Y}$) of full-time workers by ethnic and skill groups.^a

Skill group	Senegalese $\bar{Y}_s$	Other Africans $\bar{Y}_{OA}$	Non-Africans $\bar{Y}_{NA}$ &
Employers	24.11	30.73	35.25
High-level management	27.09	21.05	47.94
High-level technicians	15.74	16.58	30.70
Technicians and first-line supervisors	9.01	14.06	26.00
Skilled (white collar) employees	5.75	8.55	10.96
Skilled workers	4.50	4.46	16.54
Semi-skilled (white collar) employees	4.11	4.55	8.76
Semi-skilled workers	3.39	3.93	20.29
Unskilled workers	2.25	3.71	5.86
Apprentices	2.23	2.89	1.00
Others	2.26	1.82	0.75
Overall	4.37	6.30	32.80

^aEarnings are expressed in 100,000 of CFA.

⁷For example, the base hourly wage of an unskilled worker in the non-agricultural sector (S.M.I.G.) changed only twice in the 1960s. The increases were 10% in 1961 and 15% in 1968. Subsequently, due to the escalated inflation, the wage was increased 15% in August 1973, 15% in 1974, and 60% in November 1974.

⁸The term discrimination is used in Becker's (1956) sense and refers to differentials which are not accounted for by economic factors.

⁹For a detailed discussion of the French influence in Senegal, see Pieffermann (1968).

The governmental policy (Decree No. 67-1359 of 1967) of priority hiring for Senegalese nationals might be expected to affect negatively the earnings of the lower skilled other Africans. However, table 3 reveals no major earnings differentials between the Senegalese and other Africans working in the same occupational groups. Finally, since women constitute a growing fraction of the industrial labor force, it is also of interest to ascertain the relative magnitude of sex differentials.

3. Analytical framework

Assuming that within the existing constraints firms minimize costs for any given level of output and workers maximize their utility with respect to all the consumption commodities, including leisure, it is in principle possible to derive labor demand and supply functions which determine the wage and employment for each occupational (skill) group. In the reduced form wage equation, earnings are then usually related to the extent of labor market discrimination and various economic and institutional variables.

3.1. Sex and ethnic group differentials (discrimination)

The Senegalese industrial census does not provide enough information on each worker to permit an accurate decomposition of overall earnings differentials into their economic and discrimination components. However, the data make it possible to identify the residual earnings differentials among several groups of workers after controlling for their occupational and industry (institutional) characteristics. In particular, one can estimate the residual earnings differentials (1) between men and women, and (2) among the Senegalese, other African and non-African workers. For each occupational category the earnings data are broken down along the second criterion but they are not furnished separately for men and women. However, the census does provide the numbers of Senegalese, other African and non-African men and women working in each occupational category. With this information I use two closely related models to estimate the various residual differentials which can under certain assumptions be regarded as the discrimination coefficients.¹⁰

Let A , N , and S be dummy variables taking on value 1.0 if a given occupational group of workers is composed of other Africans, non-Africans and Senegalese, respectively, and 0.0 otherwise. An observed average wage, W , in an occupational category can then be seen in a logarithmic form as

$$\ln W = A \ln W_{oa} + N \ln W_{na} + S \ln W_s \quad (1)$$

¹⁰If the included occupational and industry (institutional) variables constitute all the relevant 'economic' variables or if the omitted variables are uncorrelated with sex and ethnic variables, then the estimates of sex and ethnic group differentials are precisely Becker's (1956) and Arrow's (1972) discrimination coefficients.

where W_{oa} is the average wage that other Africans earn in a given occupational category, W_{na} is the corresponding average wage of non-Africans, and W_s is the average wage of the Senegalese. Letting F_{oa} , F_{na} , and F_s be the proportion of women among the other African, non-African and Senegalese workers in each skill category, respectively, it is possible to express the wage of each group of workers as a geometric average of the male and female wages,

$$\ln W = A[F_{oa} \ln W_{oa}^f + (1 - F_{oa}) \ln W_{oa}^m] + N[F_{na} \ln W_{na}^f + (1 - F_{na}) \ln W_{na}^m] + S[F_s \ln W_s^f + (1 - F_s) \ln W_s^m], \quad (2)$$

where superscripts *f* and *m* stand for female and male, respectively. Letting W_c be the wage that any worker of a given qualification would earn in the absence of discrimination, it is possible to define $d_{oc}^m \equiv (W_{oa}^m - W_c)/W_c$, $d_{nc}^m \equiv (W_{na}^m - W_c)/W_c$, and $d_{sc}^m \equiv (W_s^m - W_c)/W_c$ to be the proportionate wage (dis) advantage that the male other African, non-African and Senegalese workers have, respectively, compared to the wage that would exist in the absence of discrimination. Similarly, let $d_{oa}^{fm} \equiv (W_{oa}^f - W_{oa}^m)/W_{oa}^m$, $d_{na}^{fm} \equiv (W_{na}^f - W_{na}^m)/W_{na}^m$, and $d_s^{fm} \equiv (W_s^f - W_s^m)/W_s^m$ be the relative wage differentials between equally qualified females and males in each of the three ethnic (national) groups. Eq. (2) can then be rewritten as

$$\ln W = A[\ln W_{oa}^m + F_{oa}(\ln W_{oa}^f - \ln W_{oa}^m)] + N[\ln W_{na}^m + F_{na}(\ln W_{na}^f - \ln W_{na}^m)] + S[\ln W_s^m + F_s(\ln W_s^f - \ln W_s^m)], \quad (3)$$

and, since for small differences between any two variables *Y* and *Z*, $(Y - Z)/Z \approx \ln Y - \ln Z$, eq. (3) can in turn be closely approximated by

$$\ln W = A[\ln W_c + d_{oa}^{fm} F_{oa} + d_{oc}^m] + N[\ln W_c + d_{na}^{fm} F_{na} + d_{nc}^m] + S[\ln W_c + d_s^{fm} F_s + d_{sc}^m]. \quad (4)$$

The advantage of eq. (4) is that for each group it relates the observed wage, *W*, to the wage which would exist in the absence of discrimination, W_c , and to the degree of sex and national (ethnic) wage discrimination. Since W_c is generally unobservable, eq. (4) can be made operational by replacing $\ln W_c$ by a linear stochastic function of its determinants, $\beta_0 + X'\beta + u$, to obtain

$$\ln W = A[\beta_0^{oa} + d_{oa}^{fm} F_{oa}] + N[\beta_0^{na} + d_{na}^{fm} F_{na}] + S[\beta_0^s + d_s^{fm} F_s] + X'\beta + u, \quad (5)$$

where $\beta_o^{oa} = \beta_o + d_{oc}^m$, $\beta_o^{na} = \beta_o + d_{nc}^m$ and $\beta_o^s = \beta_o + d_{sc}^m$. The terms β_o^{oa} , β_o^{na} , and β_o^s are intercepts, X' is a (row) vector of variables that determine the wage in the absence of discrimination and β is the corresponding vector of parameters. The error term, u , is assumed to be uncorrelated with X , F , A , N , and S .¹¹

The model in eq. (5) predicts that β is by construction identical for all the ethnic and sex groups, with non-stochastic differences in $\ln W_c$ being due to different endowments of X' among these groups. If β is truly identical for all the groups, then eq. (5) can be estimated in its present form, which is parsimonious and easily interpretable. Results based on eq. (5) are presented in the next section.

Alternatively, if the prediction $\beta = \beta^s = \beta^{oa} = \beta^{na}$ does not hold, the appropriate model is of the form

$$\ln W = A[\beta_o^{oa} + X'_{oa}\beta^{oa} + d_{oa}^{fm}F_{oa}] + N[\beta_o^{na} + X'_{na}\beta^{na} + d_{na}^{fm}F_{na}] \\ + S[\beta_o^s + X'_s\beta^s + d_s^{fm}F_s] + u. \quad (6)$$

In this specification the female-male differential is given by d_i^{fm} for each of the three groups, while the remaining intergroup differentials can be decomposed into those due to different endowments, X'_i , intercepts, β_o^i , and payoffs to endowments, β^i . The second model, given by eq. (6), therefore allows for different endowment payoffs to different groups ($\beta^s \neq \beta^{oa} \neq \beta^{na}$),¹² but it is less parsimonious than its counterpart in eq. (5).

The model in eq. (6) is clearly more general than its constrained version in eq. (5). At the same time, while both models exploit the information that wages of the three ethnic groups are determined in related institutional settings, they assume that the error term, u , has the same variance in the three groups. The tests of this assumption are also reported in section 4.

Finally, in order for eqs. (5) and (6) to be estimable, it is necessary to identify the variables in vector X' . This is done by incorporating the effects of relevant economic and institutional factors into these equations.

3.2. Economic and institutional factors

The expression $\ln W_c = \beta_o + X'\beta + u$ is a reduced form equation determining

¹¹The sex differentials (discrimination coefficients) are given for each group directly by d_{oa}^{fm} , d_{na}^{fm} , and d_s^{fm} . The differentials among the three groups can be calculated as $d_{os}^m = \beta_o^{oa} - \beta_o^s$ for the male workers, and as $d_{os} = d_{os}^m + (d_{oa}^{fm}F_{oa} - d_s^{fm}F_s)$ and $d_{ns} = d_{ns}^m + (d_{na}^{fm}F_{na} - d_s^{fm}F_s)$ for all the workers (male and female). As the referee suggested, one might alternatively assume that the distribution of earnings is lognormal which would lead to proportional rather than additive discrimination coefficients and a logarithmic form of analysis. In this paper, given the space limit, I decided to follow the Becker (1956), Arrow (1972), and Ashenfelter (1972) tradition of treating the coefficients in an additive fashion.

¹²Since intergroup differences in β were not admissible in the model given by eq. (5), the first model is a special constrained version of the second one.

the wage in the absence of discrimination. This means that the X' vector should contain all the exogenous variables of the relevant supply and demand functions that determine W_c . For the purposes of this study I have approximated this reduced form equation by

$$\ln W_c = \beta_0 + (OCCUP)' \beta_1 + I' \beta_2 + u, \quad (7)$$

where β_0 is a scalar parameter, whereas β_1 and β_2 are vector parameters corresponding to the (row) vectors $(OCCUP)'$ and I' of occupational and industry-specific variables.

Since human capital characteristics are usually correlated with an individual's occupational achievement and since individual human capital characteristics are unavailable from the Industrial Census, the vector $OCCUP$ of ten dummy variables¹³ is used to account for occupational attainment and to approximate the wage effects of schooling, training, and experience. Skill differentials of course also reflect rents to scarce talents (ability), the distribution of tastes, and compensating differentials.

The variables comprising vector I' should account for different degrees of bargaining power and ability to pay as well as for compensating differentials due to diversities in tastes, prestige, and hardship of work.¹⁴ In order to capture the inter-industry differences in ability to pay, I have included the industry ratio of revenues net of non-labor cost to value added, (π/VA) , in the I' vector of each industry.¹⁵

Together with their ability to pay, the employers' willingness to pay — an inverse concept to that of the employers' bargaining power — determines the amount by which W exceeds the wage that a worker would accept in the best alternative employment. It is hypothesized that, *ceteris paribus*, W is positively related to an industry's vulnerability to financial losses from strikes, slowdowns, absenteeism, labor turnover, and poor product quality. As a result, the industry ratio of capital to value added, (K/VA) , is used in

¹³Each variable is coded 1.0 if a group of workers belongs to the given skill group and 0.0 otherwise. The apprentice group is used as a base. Since the occupational categories are somewhat heterogeneous, the explanatory power of the model may not be as high as it would be with a more precise categorization.

¹⁴Industries also differ in the distribution of total compensation between wages and fringe benefits. As described below, the Senegalese data enable us to include all the pecuniary fringe benefits in the dependent variable, $\ln W$, so that inter-industry variation in the form of compensation is taken into account directly. Whenever there is imperfect labor mobility and the cost of living differs among regions, one should also account for industry differentials due to geographic location. However, Senegalese industries are located almost totally in the Dakar-Cape Verde area so that geographic location factors are relatively unimportant.

¹⁵If one defines profit in the usual way as $\pi^* = R - WL - H$, where R is the gross revenue, WL the labor cost and H the non-labor cost, the present measure of ability to pay can be formulated as $\pi = R - H$. The advantage of using π instead of π^* is that π gives the total amount that can be divided between labor and management (shareholders) according to their relative bargaining power. In contrast, π^* is a residual measure which includes the actual labor cost and is hence affected by labor's bargaining power.

the I' vector to account for the relative importance of capital and hence the losses that an industry would suffer from (partial) idleness and/or suboptimal use of its fixed inputs. The K/VA ratio is measured in value form as the stock of gross fixed capital over value added. In addition to being a measure of the industry's willingness to pay, however, K/VA may also be positively related to the non-pecuniary benefits that a worker derives from working in the industry — prestige and favorable working conditions. To the extent that this is so and the pecuniary and non-pecuniary benefits are substitutes in workers' utility functions, the coefficients which correspond to K/VA in eqs. (5) and (6) will underestimate the effect that K/VA has as an indicator of willingness to pay.

Given that the profitability of an industry is controlled for through π/VA , it can also be expected that the industry's ratio of investment to value added, INV/VA , exerts a negative effect on labor's earnings. Whether the industrial expansion is financed internally or by external borrowing, the funds available for labor compensation are smaller the greater the investment expenditure per unit of value added. Hence, holding π/VA constant, the variable INV/VA is expected to serve as an additional (inverse) indicator of the industry's ability to pay.

Finally, while the Senegalese trade unions are relatively weak, it is possible to test if their bargaining power and wage gains vary inversely with the ratio of labor costs to total production costs. Although this Marshallian condition is valid only when the price elasticity of product demand exceeds the elasticity of factor substitution, several studies have found a negative relationship between wages and the ratio of labor to total cost [see Hendricks (1975)]. Accordingly, the earnings effect of the ratio of labor cost to value added, LC/VA , is also tested.

As is evident from the foregoing discussion, it is the rich industry characteristics that make the present analysis rather unique among comparable studies in economic development. As a result, the question naturally arises as to the reliability of the variables contained in the I' vector. While it was not possible to test the reliability of the figures reported by individual firms, consistency checks could be performed at the industry-level where detailed balance sheets were available. Inspection indicates that for each industry the reported data are internally consistent.

The following section contains the econometric results based on eqs. (5) and (6) with vector X' specified according to the analytical framework of this section.

4. Empirical results

The estimates in tables 4–6 correspond to eqs. (6) and (5). The empirical strategy is first to estimate the unconstrained equation (6) for each of the

Table 4
Unconstrained WLS estimates for three ethnic (national) groups: S, OA,
and NA.^a

	Senegalese (S)	Other Africans (OA)	Non-Africans (NA)
Constant = apprentices	0.589 (4.422)	0.954 (3.808)	0.153 (0.229)
Employers	2.414 (4.825)	1.769 (3.990)	3.404 (5.087)
High-level technicians	2.573 (8.757)	1.709 (4.645)	3.759 (5.640)
High-level technicians	2.064 (9.557)	1.738 (5.084)	3.399 (5.090)
Technicians and first-line supervisors	1.538 (9.564)	1.439 (5.088)	3.288 (4.912)
Skilled (white collar) employees	1.076 (7.678)	0.903 (3.558)	2.576 (3.752)
Skilled workers	0.873 (6.515)	0.384 (1.490)	2.673 (3.832)
Semi-skilled (white collar) employees	0.747 (5.352)	0.422 (1.640)	2.134 (3.108)
Semi-skilled workers	0.582 (4.417)	0.248 (0.981)	3.057 (4.122)
Unskilled laborers	0.096 (0.712)	0.214 (0.860)	1.890 (2.260)
Others	-0.420 (0.872)	-0.430 (0.971)	-0.536 (0.570)
π/VA	-0.129 (0.914)	0.344 (1.359)	0.314 (1.880)
K/VA	0.031 (3.795)	-0.014 (0.784)	0.015 (1.470)
INV/VA	-0.549 (4.138)	0.337 (1.131)	0.259 (1.420)
LC/VA	0.196 (2.005)	-0.079 (0.396)	-0.593 (5.132)
% Women	0.088 (0.453)	0.055 (0.214)	-0.358 (2.009)
R^2	0.85	0.80	0.97
N	299	174	180

^aThe dependent variable is the natural logarithm of the average annual earnings of a given skill group in a given industry. Observations are weighted by the square root of the number of people in a given group. Values in parentheses are absolute t -ratios.

Table 5
Decomposition of the predicted average compensation ($\hat{W}$) of median earners: calculations based on estimates in table 4.

Industry	Occupation/skill		Residual sex differential in pay ^a $\ln W^f - \ln W^m$ (iii)	Total predicted earnings $\ln W^f$ (iv) = (i) + (ii) + (iii)	Overall sex differential $W^f - W^m$
	Contribution to $\ln W^f$ (i)	Contribution to $\ln W^f$ (ii)			
S f	Location	Location			
	Textiles	Semi-skilled workers	1.1716	1.1853	-0.049
OA f	Fish canning	Semi-skilled workers	1.1716	1.1351	
	Hotels and restaurants	Skilled employees	1.8567	1.9082	0.710 ^c
	(1) Hotels and restaurants	Technicians and supervisors	2.3927	2.4442	-0.368 ^c
	(2) Hardware retailing	Semi-skilled employees	1.3756	1.4490	
NA f	Printing	High-level managers	3.7592	3.6095	-0.449
	Miscellaneous commerce	Employers	3.4038	3.0129	
			-0.0331		

^aRefers to the estimated coefficient on % women in table 4.

^bThe calculation is based on estimated coefficients which both individually and as a group are not significantly different from zero (see table 4).

^cThe median value fell between two categories corresponding to different skill levels and industry characteristics.

Table 6
Maximum likelihood estimates of semi-constrained (1) and fully constrained (2) equations.^a

	(1)	(2)
Constant = apprentices (S)	0.689 (5.848)	0.702 (6.095)
Constant = apprentices (OA)	0.685 (5.551)	0.797 (6.108)
Constant = apprentices (NA)	0.994 (5.873)	1.015 (6.050)
Employers (S)	1.744 (8.925)	1.708 (11.821)
High-level managers (S)	1.992 (11.898)	1.958 (13.573)
High-level technicians (S)	1.730 (11.598)	1.675 (12.718)
Technicians and first-line supervisors (S)	1.599 (12.416)	1.561 (12.176)
Skilled (white collar) employees (S)	1.062 (8.705)	1.035 (8.500)
Skilled workers (S)	0.837 (7.034)	0.784 (6.545)
Semi-skilled (white collar) employees (S)	0.714 (5.853)	0.684 (5.607)
Semi-skilled workers (S)	0.570 (4.851)	0.549 (4.653)
Unskilled laborers (S)	0.180 (1.500)	0.206 (1.743)
Others (S)	-0.520 (1.733)	-0.454 (1.966)
π/VA (S)	-0.271 (1.897)	0.003 (0.028)
π/VA (OA)	0.274 (1.148)	
π/VA (NA)	0.385 (2.278)	
K/VA (S)	0.034 (3.988)	0.021 (3.426)
K/VA (OA)	-0.023 (1.230)	
K/VA (NA)	0.011 (1.068)	
INV/VA (S)	-0.542 (3.971)	-0.219 (2.051)
INV/VA (OA)	0.231 (0.756)	
INV/VA (NA)	0.240 (1.429)	

Table 6 (continued)

	(1)	(2)
<i>LC/VA</i> (S)	0.109 (0.111)	-0.092 (1.265)
<i>LC/VA</i> (OA)	0.189 (0.977)	
<i>LC/VA</i> (NA)	-0.504 (5.389)	
% Women (S)	-0.072 (0.364)	-0.091 (0.455)
% Women (OA)	0.043 (0.172)	-0.001 (0.004)
% Women (NA)	-0.110 (0.759)	-0.126 (0.894)
R^2	0.94	0.93
N	653	653
Log likelihood	-1935.1	-1956.2

*In each occupational category the estimated coefficient of other Africans (OA) and non-Africans (NA) can be calculated by multiplying the reported Senegalese (S) coefficient by the value of constant (OA)/constant (S) and constant (NA)/constant (S), respectively.

The dependent variable is the natural logarithm of the average annual earnings of full time workers of a given skill (occupational) category in a given industry. Observations are weighted by the ratio of the square root of the number of people in a given group to the relative standard deviation of the residuals where the relative standard deviation is the ratio of the standard deviation of the OLS residuals of a given group to those of S.

Values in parentheses are the absolute asymptotic t -ratios.

three ethnic groups and then to impose the constraint given by eq. (5). For each industry the census provides us with data on: (a) the number of men and women of each ethnic group per skill category, (b) the total annual compensation (labor cost) of each ethnic group per skill category,¹⁶ and (c) the industry-specific characteristics discussed earlier. As a result, the natural logarithm of the average annual compensation of each ethnic group in a given skill category of a given industry is used as the dependent variable. This leads to 299 observations for the Senegalese, 174 observations for the other Africans and 180 observations for the non-Africans. Since each observation represents a different number of individuals, the weighted least squares (WLS) method is used for estimation. The reported R^2 can of course be expected to exceed the value which would be obtained with ungrouped data.

¹⁶Both the numbers of workers and compensation figures refer to permanent employees.

The results in table 4 are based on eq. (6). As far as the estimated coefficients and t -ratios are concerned, estimates from eq. (6) are identical with those obtained by applying the WLS method to each ethnic group separately. In order to ascertain the relative fit (R^2) of each of these group-specific regressions, the results reported in table 4 are in fact based on three WLS regressions. The companion single regression specified in eq. (6) is based on 653 observations, generates identical estimates of the coefficients and t -statistics, and has $R^2 = 0.94$.

The estimates in table 4 reveal relatively similar occupational (skill) differentials in the three ethnic groups. In each group employers, high-level managers and high-level technicians (engineers) receive almost identical compensation. Technicians and first-line supervisors earn 8% to 25% less than these top three categories and skilled employees trail this top group roughly by 30% to 50%.¹⁷ Skilled workers and semi-skilled employees earn about the same and dominate semi-skilled workers and unskilled laborers. A slight exception is the non-African group where relatively similar earnings are observed in the skilled and the (poorly represented) unskilled categories or workers and employees. Another observed difference is that, *ceteris paribus*, apprentices earn as much as skilled employees among the other Africans whereas they are near the bottom of the hierarchy in the other two ethnic groups.

The estimated effects of the industry-specific variables provide mixed support to the hypotheses advanced earlier and suggest that the three ethnic groups differ in terms of the wage effects of industry characteristics. Overall, the Senegalese and the non-Africans constitute the most polar examples with the other Africans falling between. The profitability of an industry seems to have a positive effect on the earnings of non-Africans and the coefficient is also positive but less statistically significant for the other Africans; the effect is negative but not significantly different from zero for the Senegalese. It appears therefore that the industry's ability to pay, as proxied by π/VA , has no positive effect on the compensation of the Senegalese — a group that is located disproportionately in the lower parts of the occupational hierarchy (see table 1). In contrast, the non-Africans are primarily in the upper occupational echelons and, not surprisingly, derive considerable pecuniary benefits from an industry's profitability. Other Africans are represented fairly evenly in all occupational groups. Profitability seems to have a positive effect

¹⁷In interpreting the results it must be remembered that the dummy variable coefficient (multiplied by 100) does not equal the percentage effect of that variable being explained. Using the notation from eq. (7), where $\beta_i = (\beta_i^1, \dots, \beta_i^n)$ are the coefficients of the occupational (*OCCUP*) dummy variables, the percentage effect of variable *OCCUP*_{*i*} on $\ln W$ is given by $\gamma_i = \exp(\beta_i^1) - 1$. For $\beta_i^1 > \beta_j^1 > 0$ it follows that $\gamma_i > \beta_i^1$, $\gamma_j > \beta_j^1$, and $\gamma_i/\gamma_j > \beta_i^1/\beta_j^1$. Hence, given that in table 4 all the significant coefficients on the occupational dummies are positive, a ratio of any two coefficients which is greater (less) than unity underestimates (overestimates) the actual percentage difference that the two occupations have on the dependent variable.

on their earnings but the standard error of the estimate is too large to warrant a definite conclusion.

Capital intensity has the expected positive effect on earnings among the Senegalese and the non-Africans, although in the case of the latter the effect is not highly significant. The effect is not significantly different from zero among other Africans. In most other studies of this type capital intensity is strongly associated with higher wages. At the same time, almost none of the numerous studies include ability to pay variables such as π/VA or INV/VA . The present findings suggest that the exclusion of the ability to pay variables from the regressions may provide an artificial boost to the willingness to pay variables such as K/VA . Replicating the three ethnic regressions with π/VA and INV/VA omitted indicates that this is indeed the case for the non-Africans and the other Africans, though not for the Senegalese.

Holding profitability constant, the ratio of investment to value added definitely exerts a negative effect on the earnings of the Senegalese. In the case of other Africans and non-Africans the effect is positive but not statistically different from zero at conventional levels of significance. It hence appears that the Senegalese workers not only do not benefit directly from an industry's profitability but that they also experience lower earnings in industries characterized by higher INV/VA , *ceteris paribus*. In contrast, the non-Africans (and to a less definite extent the other Africans) benefit from higher π/VA without any corresponding loss in earnings attributable to higher rates of investment. Investment is clearly a dynamic process and our findings, based on cross-sectional data, must therefore be regarded as preliminary. The results suggest, however, that while the non-Africans (and perhaps other Africans) benefit from higher profits, higher rates of investment are financed primarily at the expense of earnings among the Senegalese workers.

The estimated coefficient of the ratio of labor cost to value added is negative and significant among the non-Africans, negative but insignificant among the other Africans, and positive and significant among the Senegalese. The observed heterogeneity is not totally surprising and does not necessarily contradict the theoretical prediction which applies to collective bargaining settings and presumes that the price elasticity of product demand exceeds the elasticity of factor substitution. In view of the weak nature of trade unionism in Senegal, the findings with respect to the Senegalese and other Africans are not unreasonable. The significant negative coefficient in the non-African regression can be explained by the existence of individual bargaining power and/or the fact that many non-Africans derive their income at least partly from profit sharing — a system which is reflected in the positive coefficient on π/VA . In the latter case their share of profit would be of course negatively related to the ratio of total labor cost to value added.

The estimated earnings differentials between the sexes — d_s^{fm} , d_{oa}^{fm} , and d_{na}^{fm}

— throw new light on the issue of sex discrimination in development. Everything else equal, it is impossible to reject the hypothesis that the Senegalese and other African women earn as much as their male counterparts ($d_s^{fm} = d_{oa}^{fm} = 0$). Yet among the non-Africans, women are found to earn 30.1% less than men¹⁸ — a differential which is very close to those observed in the western world.

While these results are important, they are clearly not the only measure of possible economic discrimination. After all, the coefficients in table 4 measure only overall sex differentials for individuals with the same occupational attainment and industrial affiliation. Therefore, they can be properly interpreted as indicating that on average there are no earnings differentials between African men and women in the same occupation/industry group, whereas there are significant differentials between non-African men and women within these groups. While these findings are *per se* informative, they say nothing about other possible facets of discrimination, namely unequal access to educational opportunities, occupational attainment, and industrial affiliation.

The census data fortunately permit us to calculate some measures of male-female earnings differentials which are due to different attainment of men and women in terms of occupational and industry affiliation. To the extent that male and female workers have identical distributions of tastes and talents (productive attributes), one should, for instance, observe that in the absence of discrimination the median male and female earners are found in industries and occupations which provide them with identical compensation. In other words, under the assumption of equal tastes and talents it is possible to measure sex discrimination not only as the coefficient d^{fm} but also as unequal representation of men and women in higher and lower paying industries and occupations.

Table 5 identifies the industrial and occupational location of the median-paid man and woman of each ethnic group. The table also contains the decomposition of the (logarithm of) predicted median earnings into parts which can be attributed to industry affiliation, occupational attainment, and a residual differential in pay as measured by d^{fm} . The figures are calculated from estimates in table 4 and the corresponding raw data on π/VA , K/VA , INV/VA , and LC/VA . The method used is to (i) calculate for each ethnic group the average annual earnings of men and women in every occupational category (cell) in a given industry, (ii) combine these categories from all industries and rank them by their level of earnings, and (iii) identify the categories (cells) to which the median-paid man and woman of a given ethnic

¹⁸As was pointed out during the derivation of eq. (4), for small differences the estimated coefficient $d^{fm} = \ln W^f - \ln W^m$ is a good approximation to the female-male relative wage differential $(W^f - W^m)/W^m$. However, for more sizable differentials it is preferable to use the exact correspondence, $(W^f - W^m)/W^m = \exp(d^{fm}) - 1$, which for the estimate in table 4 implies a relative differential $(W^f - W^m)/W^m = \exp(-0.358) - 1 = -0.301$ or -30.1% .

group belong.¹⁹ The occupational levels and the industry characteristics corresponding to these 'median categories (cells)' are then used for calculating the results in table 5.

Comparing the median male and female earners in three ethnic groups reveals that at least for the Senegalese, the overall sex differentials are not too far off the (residual) sex differentials reported in table 4. The median Senegalese man and woman are in the same occupational group (semi-skilled workers) and hence the predicted contribution of skill to their (logarithm of) compensation is identical (1.1716). The industry affiliation of the median Senegalese man and woman differs (textiles versus fish canning) and results in a negative 4.9% female-male relative wage differential. Since no significant sex differential was found in the Senegalese equation reported in table 4, the 'residual sex differential in pay' is taken to be zero in table 5.²⁰ The combined results from tables 4 and 5 thus strongly suggest that the overall sex discrimination among the Senegalese industrial labor force participants is very small.

The results for median other Africans are highly unreliable for two reasons. First, the estimated coefficients on industry variables are not significantly different from zero (see table 4). This of course makes the estimate of the industry contribution to $\ln W^i$ very imprecise. Secondly, the median value for other African women fell between two categories corresponding to different skill levels and industry characteristics. In view of the small number of other African women in our sample (see table 2), the arbitrary selection of the median category makes enormous difference for the estimation of the overall sex differential. As can be seen from table 5, the major difference between the two categories is in terms of the skill level (technicians and first-line supervisors versus semi-skilled employees). The resulting range for the overall female-male relative wage differential lies between 71% and -37%. There is clearly little value to be derived from these results.

In contrast, the results for the non-Africans are rather precise in that the values below and above the median are very similar.²¹ The overall female-male differential is estimated at -44.9%, an (absolute) increase of almost 15% from the -30.1% estimate of d^{fm} in table 4. In comparison to her male counterpart the median non-African woman benefits quite substantially from

¹⁹For each ethnic group the formula for deriving the average male earnings $\bar{W}^m$, is

$$\bar{W}^m = B / (L^m + \bar{d}^{fm} L^f),$$

where B is the total annual compensation (labor cost) of permanent workers in the given category (cell) and L^i is the total number of permanent workers of sex i in that cell. An alternative procedure that is beyond the scope of this paper would be to decompose the relative earnings inequality using the method proposed by Chiswick and Mincer (1972).

²⁰The term 'residual sex differential in pay' refers to the differential which may exist while holding the industry and skill characteristics constant. It is equal to the coefficient on the % women variable reported in table 4.

²¹There is even less deviation in the Senegalese data due to the large sample size.

her industry affiliation but suffers from the lower estimated payoff to her impressive occupational attainment (employer). When the residual sex differential reported in table 4 is also taken into account, the median woman's earnings lag those of the median man by about 45%.²²

The estimates of sex discrimination reported in tables 4 and 5 are instructive. They suggest that no discrimination in pay exists among the African men and women working in the same industry and occupation. Moreover, the Senegalese results in table 5 indicate that discrimination may also be minimal in the process by which working men and women are allocated into occupations and industries. The estimates for non-Africans are strikingly different and conform quite closely to the estimates from Western countries. Although these findings are useful, a note of caution is in order. The present sex discrimination estimates pertain only to the industrial sector labor force and hence do not provide information about discrimination which may exist in the remaining sectors of the economy. Moreover, it is evident from tables 1 and 2 that women are severely underrepresented in our sample and that discrimination may in fact exist in the form of a barrier to enter the industrial labor force. Since women constitute 18.4% of the non-Africans, 5.3% of the other Africans and 5.0% of the Senegalese in this industrial sample, further investigation into the labor force participation of men and women is clearly needed before firmer conclusions can be drawn with respect to a more broadly defined concept of economic discrimination in Senegal. Two factors are probably of special importance here. First, the relative underrepresentation of African women in our sample is likely to exist because African women have to undergo more stringent screening in order to get a job which would be enumerated in the industrial census (i.e., a formal sector job). If this is so, these women are discriminated against in terms of access to the labor force — a phenomenon which cannot be captured by the measures of this study. In contrast, a different type of screening for the non-African women may lead to a relatively greater industrial labor force participation of these female workers but also possibly to a greater vulnerability in terms of conventional discrimination as measured in this study. The second factor is that the more thorough screening (selectivity) of African women may make them vulnerable to another form of discrimination which cannot be detected by this investigation. In particular, the census does not provide information on individual worker characteristics, or even the average human capital characteristics by sex and race within industry and occupation cells. At the same time African women are likely to have superior individual (human capital) characteristics because of the extra screening. Discrimination may therefore exist in that women may receive lower wages than men, holding constant their individual characteristics.

²²The Chiswick and Mincer (1972) decomposition of income inequality could be used to throw more light on this issue.

The final conclusion to be derived from tables 4 and 5 is that, for occupational groups equal to or higher than semi-skilled workers, industry affiliation does affect earnings but occupational attainment is the more dominant factor. However, the relevant industry characteristics appear to determine the earnings of common laborers as much as does their (admittedly low) skill/occupational attainment. This suggests that in those countries where a substantial part of the labor force is still relatively low-skilled, institutional and firm- or industry-specific characteristics may play a very significant part in determining the wage structure and the efficiency of resource allocation. The results hence support the use of both human capital and institutional variables in labor market analyses of the less developed countries.

4.1. Theoretical restrictions and ethnic group differentials

Results presented so far are based on eq. (6) which presumes that the theoretical predictions of eq. (5), $\beta = \beta^s = \beta^{oa} = \beta^{na}$, need not hold. This section tests the validity of these restrictions.

Since the occupational variables are binary, the imposition of the restrictions implied in eqs. (5) and (7) leads to the following estimating equation:

$$\begin{aligned} \ln W = & A[\beta_0^{oa} + (OCCUP)'_o \beta_1^{oa} + d_{oa}^{fm} F_{oa}] \\ & + N[\beta_0^{na} + (OCCUP)'_{na} \beta_1^{na} (\beta_0^{na} / \beta_0^{oa}) + d_{na}^{fm} F_{na}] \\ & + S[\beta_0^s + (OCCUP)'_s \beta_1^{oa} (\beta_0^s / \beta_0^{oa}) + d_s^{fm} F_s] + I' \beta_2 + u, \end{aligned} \quad (8)$$

where β_1^{oa} is a (column) vector of coefficients corresponding to the (row) vector of $(OCCUP)'_i$ variables and $(\beta_0^{oa} / \beta_0^{oa})$ and $(\beta_0^s / \beta_0^{oa})$ are proportionality parameters ensuring that the occupational profile is identical for the three groups except for the overall levels of earnings given by the intercept terms β_0^{oa} , β_0^{na} and β_0^s . Eq. (8) thus corresponds directly to eq. (5) in that it allows for different sex and ethnic intercepts but constrains the earnings profiles to be the same with respect to the occupational and industry variables.

As can be seen from its form, eq. (8) is non-linear with respect to some of its parameters. Assuming that the error terms u come from a normal distribution with variance σ_u^2 , it is possible to obtain maximum likelihood estimates based on the following (logarithm of the) likelihood function:

$$L = -\frac{653}{2} \ln 2\pi - \frac{653}{2} \ln \sigma_u^2 - \frac{1}{2\sigma_u^2} \sum_{i=1}^{653} (\ln W_i - \gamma Z)^2, \quad (9)$$

where γZ is the right-hand side of eq. (8) minus u and the number 653 refers

to the full sample size. Since the full sample is composed of three ethnic subsamples, the assumption of identical variance, σ_u^2 , may not be realistic. The Goldfeld-Quandt tests indeed suggest that the three regressions reported in table 4 have different variances of the residuals. As a result, in addition to weighting individual observations by the square root of the number of people in the cell, the other African and non-African observations were also weighted by the ratios of the estimated standard deviations $\hat{\sigma}_{u,s}/\hat{\sigma}_{u,oa}$ and $\hat{\sigma}_{u,s}/\hat{\sigma}_{u,na}$, respectively. The resulting parameter estimates, obtained by maximizing the likelihood function by the Gauss-Newton method,²³ are reported in table 6.

Estimates in column (1) of table 6 result from imposing an identical occupation-earnings profile (except for the intercept) on all three ethnic groups but allowing the industry variables to have effects which are ethnic-group specific. These estimates therefore come from a semi-constrained equation which constitutes a hybrid form between eqs. (5) and (6). Estimates in column (2) of the table come from a fully-constrained version of the equation and hence correspond directly to eqs. (5) and (8).

The results in both columns of table 6 suggest that, holding occupational attainment and industry characteristics constant, the average Senegalese and other Africans earn virtually identical incomes. Their incomes in turn constitute about two-thirds to three-fourths of the average non-Africans' earnings. Although these constrained estimates provide broad and easily interpretable results, they must be used with caution. Based on the reported log likelihood values of the two constrained equations and the log likelihood value of the corresponding unconstrained equation one obtains $-2 \log$ likelihood ratios equal to 67.7 for the semi-constrained equation and 109.9 for the fully-constrained one. The corresponding critical values of χ^2 (20) and χ^2 (28) are sufficiently lower at conventional significance levels to prevent one from accepting the validity of the imposed constraints.

It appears therefore that eq. (6) provides more reliable estimates of the determinants of earnings of the three ethnic groups than does eq. (5) or even a semi-constrained combination of eqs. (5) and (6). This implies that the occupational-earnings profiles are significantly different for the three ethnic groups and that the difference cannot be expressed in terms of a single parameter for any two groups (i.e., by $\beta_a^o - \beta_{na}^o$, $\beta_a^o - \beta_{oa}^o$, and $\beta_{na}^o - \beta_{oa}^o$). The results of the likelihood ratio test also support the earlier finding that the effect of industry characteristics on earnings varies among the three groups. This finding is also important in view of the fact that the fully-constrained version of the equation leads to coefficient estimates on π/VA , K/VA , INV/VA , and LC/VA which have the theoretically predicted signs. However, a simple comparison of these estimates with the unconstrained ones indicates that this outcome is simply due to the aggregation of diverse ethnic-group specific effects.

²³For a description see Malinvaud (1980).

The imposition of the constraints reported above constituted an attempt to sharpen the testing ability of the model while at the same time testing an economic hypothesis about the nature of the determinants of earnings. In an additional attempt to improve the testing potential of the model I also estimated the three ethnic equations jointly by the generalized least squares (GLS) procedure in a seemingly unrelated regressions framework. Since the residuals from the three equations are correlated, this technique promises more efficient estimates. At the same time, it requires the existence of an identical number of observations in terms of occupation *cum* industry mix for each of the three ethnic groups. To achieve this it was necessary to eliminate a considerable number of observations. This loss of degrees of freedom appears to have more than offset the gain in efficiency stemming from this procedure. The GLS results are therefore not reported. They can be obtained from the author upon request.

5. Concluding remarks

In several respects the data used in this study provide substantially richer information about determinants and structure of earnings in the industrial (modern) sector of Senegal than can be found in other studies of this nature.²⁴ In view of the fact that fringe benefits constitute a considerable (and perhaps not constant) fraction of the total compensation package (labor cost), our ability to use the total average earnings of full-time workers constitutes an improvement over most studies measuring the structure of earnings and its determinants. Similarly, the industry characteristics available in the sample permit the test of several hypotheses that could not be explored earlier within the context of developing countries. Finally, the data provide considerable insight into the issue of ethnic and sex earnings differentials.

The main results and policy conclusions can be summarized as follows:

(i) Substantial variance in earnings exists both within the three ethnic groups and among them.

(ii) On average the Senegalese earn slightly less than the other Africans working in Senegal and only about one-seventh to one-eighth as much as the non-Africans (see bottom of table 3). This differential is due primarily to the different distribution of the three ethnic groups in the occupational hierarchy (table 1) and the substantial non-African–African earnings differentials that exist within all occupational groups (tables 3 and 4). The differential varies across occupational categories and is largest in the middle and lower occupational ranks (tables 3 and 4). To the extent that human capital characteristics of the Senegalese and non-African workers are similar within individual occupational categories, the observed earnings differentials contain

²⁴See, for instance, the study of the manufacturing sector of Kenya by House and Rempel (1976) or the strictly human capital earnings function approach reported by Chiswick (1977).

sizable discrimination components and the government policy ought to be geared toward reducing them. Moreover, education and training policies should focus on supplying more Senegalese nationals into the higher skill groups.

(iii) In general, occupational attainment as well as institutional and industry characteristics appear to be important determinants of earnings.²⁵ For occupational categories equal to or higher than 'semi-skilled workers' occupational achievement appears to play the more important part. However, among the unskilled workers industry characteristics seem to affect the level of earnings as much as or more than the relatively low occupational attainment. This finding is important for policy purposes in countries where a substantial part of the labor force is relatively unskilled. In particular, measures designed to improve labor market efficiency or distribution of income should take into account institutional and industry- or firm-specific factors such as profitability and the investment rate. For instance, the findings in table 4 indicate that, *ceteris paribus*, the non-African-Senegalese earnings differential is higher in firms characterized by higher profitability and/or investment rate. Although policy conclusions based on purely cross-sectional data must be tentative, it appears that earnings differentials due to variance in profitability could be diminished by policies aimed at increasing the competitiveness in the product markets and the speed of entry and exit by firms into individual sectors. By reducing factor price differentials across sectors and ethnic groups, these policies would have beneficial allocational implications as well.

In contrast, it is rather difficult to formulate unambiguous policy suggestions concerning the rate of investment without more information about other aspects of the Senegalese economy and the government's objectives with respect to investment and growth *per se*. To the extent that marginal investment is productive, the K/VA and INV/VA coefficients in the Senegalese regression of table 4 merely indicate that there exists a trade-off between the present and future earnings of the Senegalese workers.

(iv) Holding occupational and industry characteristics constant, African women covered by the census seem to earn as much as their male counterparts. In contrast, holding the same characteristics constant, the non-African women earn about 30% less than non-African men. Evaluating this differential at the level of a median earner supports the finding of minimal discrimination among the Senegalese and widens the overall sex differential among the non-Africans to about 45%. Since African women are under-represented in the census relative to non-African women, the observed discrepancy in the sex discrimination between the African and non-African women is compatible with labor market discrimination in terms of a barrier against African women to enter the industrial (modern) sector labor force.

²⁵ However, the industry characteristics are not statistically significant for the other African-group.

Moreover, since individual (human capital) characteristics are unavailable in this data set, it is impossible to check whether barriers to entry (extra screening) of women imply that women must have superior human capital characteristics to obtain a given occupational/skill position and hence effectively receive a lower wage than comparable men.

Since these forms of sex discrimination may be important, further research in this area is clearly needed. The present findings suggest that, in attempting to reduce the degree of sex discrimination, the government ought to focus its policies on the severe underrepresentation of Senegalese women in the industrial (modern sector) labor force. If these policies are effective and if the findings from both the more developed countries and the non-African part of this sample provide any guidance, then sex discrimination in pay between equally qualified men and women may be expected to emerge as women become a larger part of the labor force and the development process proceeds.

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