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OCCUPATIONAL GENDER SEGREGATION AND EFFECTS ON WAGES IN BRAZIL

Ana Maria H.C. Oliveira

Doctoral Student of Demography at CEDEPLAR/UFMG

Rua Curitiba, 832/9º, Belo Horizonte, MG, 30170-120, Brazil
e-mail: ahermeto@cedeplar.ufmg.br

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INTRODUCTION

Female labor force participation in Brazil has increased steadily in the last decades. Census data indicate an increase in the crude participation rate from 13.6% in 1950 to 26.9% in 1980. More recently, the crude participation rate of urban women rose from 30.3% in 1976 to 47.2% in 1999 (IBGE, 2001). The age-specific profile of the female labor force participation rates shifted between the seventies and the eighties. The former profile presented a peak at the 20-24 age group and a slight decline from that age group on. The latter profile did not present the early peak with increasing rates in the age groups until the 40-44 strata. In sum, the rise in crude labor force participation observed in the eighties and nineties was accompanied by a change in the period age-profile, which is compatible with an increase in the labor force participation rate of married women. The most recent period was also marked by the fertility transition in Brazil. Total fertility rate (TFR) was almost constant between 1940 and 1970, declining from 6.21 to 5.76 in the period. In 1970/80 the TFR declined to 4.35, reaching 2.7 in the 1980/1991 period.

The first purpose of this paper is to measure the occupational sex segregation of non-agricultural labor force during the most recent period (1981 to 1999) – a period marked both by fertility decline and increase in the female labor force participation. Second, occupational sex segregation by marital status (married and single) is measured with the purpose of bringing the dimension of household labor division in the calculation of segregation indexes trends. In addition, occupational sex segregation by groups of hours of work and labor market segmentation is measured. Groups of hours of work are measured by the division of hours worked between part-time and full-time. Urban labor market segmentation is measured by formal and informal sectors. The descriptive part of the paper will be oriented by a theoretical discussion on the role of gender relations, women's work orientation, and their relationship with marital status, groups of hours of work, and labor market segmentation.

Trying to better understand the persistence of the occupational sex segregation in Brazil, I propose the construction of an integration typology at the level of the 3-digit occupational titles, that allows to capture the process of location of men and women in occupations with different sex compositions. The construction of this occupational integration typology uses men's and women's percentages in an occupation as a base for the classification rather than female over or under-representation.

The analysis of the influence of changes in occupational segregation on men's and women's earnings should help to clarify the mechanisms that maintain gender inequality in the labor market. The question to be answered is how the gender composition of jobs influences men's and women's earnings. Some theoretical considerations are made on the determinants of men's and women's earnings. The empirical approach entails estimating earnings functions for men and women which combine socioeconomic and demographic characteristics to wage determination with measures of occupational gender segregation.

OCCUPATIONAL GENDER SEGREGATION: METHODOLOGICAL ASPECTS

The results about the extent of the occupational sex segregation are affected by the chosen indexes as well as they are by other methodological aspects (Anker 1997; Williams 1979; Hakim 1992, 1993; Jacobs 1989). Some methodological features determining the results are choice of the baseline population and the occupational classification. The lack of consistency in the occupational classification - definition of occupations and number of categories - over a period affects the reliability of the summary measures and it may undermine comparison of data in a time series. The

detailing level of the occupational classification also determines the estimated segregation values, since the measures are sensitive to the number of categories; there is a tendency that the more aggregated the occupational groups, the smaller the degree of occupational segregation[1].

Summary measures characterize the overall level of occupational sex segregation. They are a step before performing a detailed examination of the female participation pattern. The latter is more informative than summary measures, but it has to be complemented by such indexes for an analysis of trends of the segregation degree. Segregation indexes are scalar summaries of complex segregation curves that represent the sex composition of all occupations. Three indexes are applied in this study: Duncan and Duncan dissimilarity index; size-standardized dissimilarity index; and index of global association under saturated log-linear model. All these measures have their strong and weak points, documented by several studies, among others, Duncan and Duncan (1955), Williams (1979), Semyonov and Scott (1983), Hakim (1992, 1993), Jacobsen (1994), Charles and Grusky (1995).

Duncan and Duncan Dissimilarity Index (D)

The technique more commonly used to measure the segregation is the dissimilarity index proposed by Duncan and Duncan (1955). This index can assume several forms to measure the segregation among two groups of people, for example, men and women, in any number of different classifications, for example, occupations. In this case we compare male and female workers across all occupations. The index of occupational sex segregation indicates the proportion of men (women) that would have to change occupations in order to maintain the sex ratio of each occupation equal to the sex ratio of the labor force as a whole (Williams 1979; Bianchi and Rytina 1986; Jacobs 1989; Jacobsen 1994; Charles and Grusky 1995; Psacharopoulos and Tzannatos 1992). This index can be expressed through equation 1:

$$D = \sum_{j=1}^{J} \left| \left(\frac{F_j}{F} \right) - \left(\frac{M_j}{M} \right) \right| .100.\tfrac{1}{2} \qquad (1)$$

where: J = total number of occupations; F_j = number of individuals of a group (women) in occupation j; F = number of female workers in overall labor force; M_j = number of individuals in the comparison group (men) in occupation j; M = number of male workers in overall labor force; D = percentage of the labor force that should change occupations to yield the perfect correspondence between the sex ratio of each occupation and the sex ratio of the overall labor force.

The values assumed by D vary from a minimum value of 0, when there are no differences among male and female occupational distributions – complete integration – to a maximum of 100 – complete segregation. This index uses the implicit definition of integration as the situation in which the proportional representation of each sex in each occupation is the same of the total labor force[2]. The dissimilarity index allows comparison of periods with different female labor force participation rates, since it is invariable to transformations on the sex ratio.

[1] Studies related to this subject vary in their occupational classification, making difficult the comparison of the results. For example, Hakim (1992) uses 550 occupational units e 15 broader occupational groups; Bianchi and Rytina (1986) use 12 occupational groups; Bielby and Baron (1986) use 7 groups; Presser and Kishor (1991) use 11. See Anker (1997) for further discussion.

[2] For example, if women were 40% of the labor force, the index would be 0 if every occupation was 40% female. So, the absolute numbers of men and women in the labor force are not crucial, but men and women's relative distribution across occupations.

In the case of a change in the occupational structure, the decline in the dissimilarity index would be caused by the faster growth in the integrated occupations as opposed to the segregated ones. This is the case even when the proportion of women in the occupational categories remains the same. When a shift of the sex composition occurs, the decline in the index would be caused by the increase in the female share in male occupations or by the decrease in the female ones, in other words, caused by the decline of the occupational segregation within the categories.

Size-Standardized Dissimilarity Index (D_s)

The size-standardized dissimilarity index is the absolute measure of segregation that controls for the effect of the occupational structure, using all occupations as if they were of the same size, computed over a fixed number of comparable occupational categories (Williams 1979; Semyonov and Scott 1983; Charles and Grusky 1995). The size-standardized dissimilarity index (D_s) is expressed by equation 2:

$$D_s = \sum_{j=1}^{J} \left| \left[\frac{\left(\frac{F_j}{T_j}\right)}{\sum_{j=1}^{J}\left(\frac{F_j}{T_j}\right)} \right] - \left[\frac{\left(\frac{M_j}{T_j}\right)}{\sum_{j=1}^{J}\left(\frac{M_j}{T_j}\right)} \right] \right| .100.\frac{1}{2} \qquad (2)$$

where: T_j = total number of men and women in occupation j = M_j + F_j; the numerators (F_j/T_j) and (M_j/T_j) index the female and male proportions in occupation j; the denominators adjust such values on the proportions in the other occupations.

D_s is not affected by the shape of the occupational distribution, since it standardizes each one of the J occupations to the same size, not allowing that changes in the size of the occupations in time affect the value of the index, therefore not being contaminated by compositional effects. Despite the fact that the size standardized dissimilarity index solves the problem of the size, its weighting procedure generates a biased estimate, increasing the impact of small categories and decreasing the influence of the largest categories. While this standardization eliminates a kind of marginal dependence, it has the perverse effect of introducing a new dependence on the rate of female labor force participation (Jacobs 1989; Semyonov 1980; Charles and Grusky 1995; Jacobsen 1994).

Given the magnitude of the industrial restructuring in the 80's, in particular the mobility of jobs from manufacturing to services sector, the use of an index that does not reflect changes in the size of the occupations is advantageous. The standardized index eliminates the dependence of the occupational structure, but it does that at the cost of loosing the scale invariance of the original index. In a way, all conventional indexes are problematic. None of them controls simultaneously for changes in the occupational structure and sex composition of the labor force.

Global association index under saturated log-linear model

The index intends to eliminate simultaneously the forms of marginal dependence. An indicator of occupational sex segregation controlling for sex composition and occupational structure of the labor force is available in the context of the log-linear models, using measures that are functions of cross-product odds ratio. Charles and Grusky approach (1995) is an adaptation of a set of association models that are consistent with the conventional practice of summarizing the variability in only one parameter. The starting point is a multiplicative model expressed by equation 3:

$$m_{ij} = \alpha\beta_i\gamma_j e^{(Z_i v_j)} \qquad (3)$$

where: i = sex index; j = occupation index; m_{ij} = expected frequency in the cell (i, j); α= average; β_i = marginal effect of ith sex; γ_j = marginal effect of jth occupation, Z_i = indicative variable of sex (Z_1=0; Z_2=1) and v_j = value for the jth group of occupations.

This model can be rewritten as a saturated log-linear model:

$$\ln m_{ij} = \lambda + \lambda_i^S + \lambda_j^O + \lambda_{ij}^{SO} \qquad (4)$$

where: i = sex index (1=men, 2=women); j = index of the occupational category; m_{ij} = expected frequency in the cell (i, j); λ = average; λ^S_i = marginal effect for sex; λ^O_j = marginal effect for occupation; λ^{SO}_{ij} = effect of sex-occupation interaction.

When the model represented by equations 3 and 4 is adequate, the following results occur, being $M_j = m_{j1}$ and $F_j = m_{j2}$[3] :

$$\ln(\beta_2) = \frac{1}{J}\left[\sum_{j=1}^{J} \ln\left(\frac{F_j}{M_j}\right)\right] \qquad (5)$$

$$v_j = \ln\left(\frac{F_j}{M_j}\right) - \left[\frac{1}{J}\sum_{j=1}^{J} \ln\left(\frac{F_j}{M_j}\right)\right] = \ln\left(\frac{F_j}{M_j}\right) - \ln(\beta_2) \qquad (6)$$

The main sex effect, $\ln(\beta_2)$, is the average of the logarithms of the sex ratios. Occupation effects, v_j, are the deviations of the ratio of women on men in occupational group j in relation to the mean ratio of all groups, that is, the deviation of the group in relation to the female representation (positive estimates of the parameter indicate female overrepresentation, and negative, male). The effects are not affected by variations in lines totals (occupational structure or relative size of occupational groups) and columns totals (sex composition or female proportion in the labor force). The interaction terms can be used to generate a new segregation index not affected by variations of the sex ratio and of the occupational distribution:

$$A = \exp\left(\frac{1}{J}\cdot\sum_{j=1}^{J} v_j^2\right)^{\frac{1}{2}} = \exp\left(\frac{1}{J}\cdot\sum_{j=1}^{J}\left\{\ln\left(\frac{F_j}{M_j}\right) - \left[\frac{1}{J}\cdot\sum_{j=1}^{J}\ln\left(\frac{F_j}{M_j}\right)\right]\right\}^2\right)^{\frac{1}{2}} \qquad (7)$$

The resulting association index, A, is the standard deviation of the distribution of the representation ratio, using unweighted occupations (each occupation is of equal size). That is, it indicates the factor by which women are disproportionally represented in the average occupation. In a perfectly integrated labor market A=1 (Charles 1992; Charles and Grusky 1995).

Integration Typology of Occupations

Trying to better understand the persistence of the occupational sex segregation in Brazil, I propose the construction of an integration typology at the level of the 3-digit occupational titles, that allows to capture the process of location of men and women in occupations with different sex compositions. The construction of this occupational integration typology uses men's and women's

[3] The notation is maintained from the other equations to emphasize the connection between the conventional segregation indices and the measures derived of log-linear models.

percentages in an occupation as a base for the classification rather than female over or under-representation.

Considering a degree of random variation around the average female proportion in the non-agricultural labor force, I propose a wider range around this average for every year, instead of an artificial border line in the distribution of the occupations. This implies in a refinement of the dichotomic vision of the labor market as divided in male work and female work, using a trichotomic classification of the occupations, according to the typology that defines what constitutes an integrated occupation, predominantly female or predominantly male (Hakim, 1993). Some examples of typologies to define the category of integrated occupations are: Bianchi & Rytina (1986) propose an interval of 40 percentile points around the female proportion in the labor force; Jacobs (1989) proposes an interval of 40 percentile points around a medium point imposed theoretically of a female proportion of 50% of the labor force; Reskin & Padavik (1994) define the complete equality in the labor market as the female portion being 50% of the labor force and an interval of 20 percentile points; and Hakim (1992) proposes a range of integrated occupations defined as those inside the interval of 20 percentile points around the mean point of the female proportion in the labor force.

Considering that the hypothesis of the interval around the female proportion in the labor force as a whole would be more realistic than the total equality in the labor market, which requests that women represent 50% of the labor force, the occupations not segregated or integrated are defined as those occupations placed in an interval around the sex ratio of the non-agricultural labor force as a whole, located in the width of 20 percentile points around the average female labor force participation for every year over the period. Occupations on each side of this interval are predominantly female – which have a female proportion of women above the upper threshold – or male – which have a proportion of women below the lower threshold.

OCCUPATIONAL GENDER SEGREGATION: EVIDENCES FOR BRAZIL, 1981-1999

Table 1 presents the scalar indexes in the 1981-1999 period[4]. These indexes were calculated for three levels of detailing of the occupational titles: 7 (1-digit), 59 (2-digit), and 257 (3-digit) occupations. Results confirm the general proposition that a higher aggregation level of occupations underestimates segregation indexes (Anker, 1997). The dissimilarity index D in 1981 was 36.8% for the level of 7 broad occupational groups, 57.9% for 59 occupations and 66.6% for 257 occupations. Results also indicate that the occupational sex segregation in Brazil failed to decline in the level of 1-digit occupational titles, but the declines were remarkable in the level of 2- and 3-digit, which is indicated by all indexes. Brazilian segregation index A at the level of 1-digit is below the level calculated by Weeden (1998) to the United States in 1990 – 4.9.

[4] The calendar-year 1991 is not included in the table because the Demographic Census was carried on that year instead of the household survey; and 1994 PNAD was also not carried.

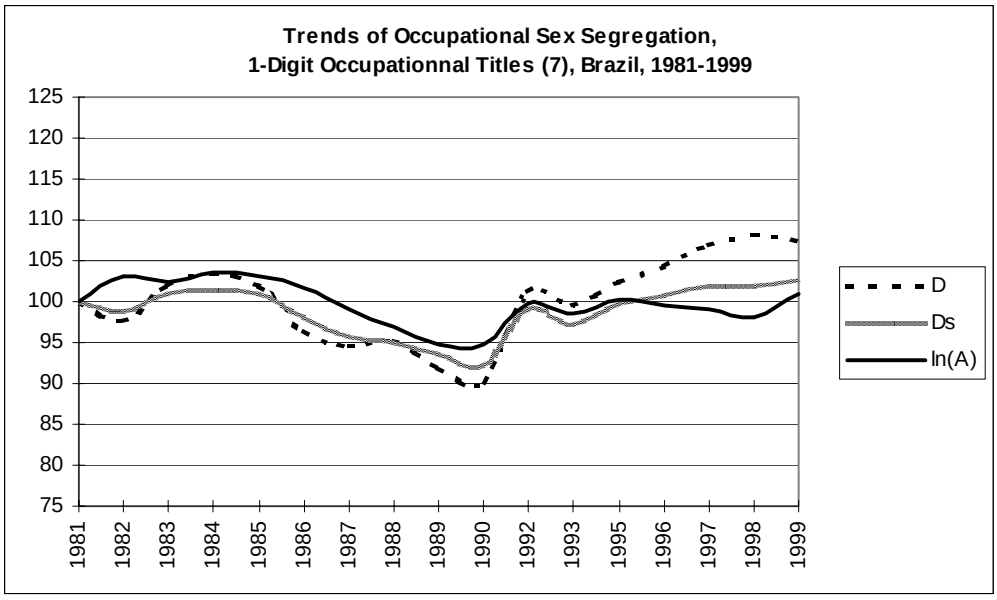
Table 1: Scalar Indexes of Occupational Sex Segregation in Brazil, 1981-1999

	Aggregate Groups of Occupations (7)			Detailed Groups of Occupations (59)			Detailed Occupations (257)		
Year	A	D	Ds	A	D	Ds	A	D	Ds
1981	3.64	36.76	42.78	8.16	57.88	52.77	36.98	66.60	62.52
1982	3.79	35.87	42.28	9.06	57.26	52.50	29.59	65.77	62.43
1983	3.75	37.43	43.16	9.00	56.57	53.03	26.66	65.41	61.10
1984	3.81	37.99	43.39	9.43	56.70	52.65	35.07	66.31	62.10
1985	3.79	37.45	43.22	8.44	55.81	51.52	32.83	64.71	62.13
1986	3.72	35.43	41.97	8.08	55.01	51.84	44.01	64.17	61.13
1987	3.60	34.74	40.95	7.96	54.28	53.26	33.20	63.29	59.86
1988	3.50	35.01	40.69	8.21	54.00	51.59	34.11	63.41	60.58
1989	3.40	33.80	40.01	7.78	52.56	49.91	45.13	62.38	59.04
1990	3.39	33.14	39.40	7.64	53.05	51.34	34.07	61.86	59.89
1992	3.63	37.19	42.32	8.40	54.36	50.98	24.91	63.02	58.89
1993	3.57	36.63	41.60	7.81	54.02	50.47	36.87	62.28	58.54
1995	3.65	37.67	42.70	7.39	53.94	51.13	21.57	61.56	57.79
1996	3.61	38.38	43.09	6.91	52.99	49.06	21.46	60.64	57.96
1997	3.59	39.27	43.59	6.58	53.69	48.94	21.42	60.74	56.62
1998	3.55	39.73	43.55	7.44	53.53	48.30	22.72	60.84	55.28
1999	3.69	39.46	43.88	6.89	53.19	48.21	25.04	60.06	55.31

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-1999.

Figures 1 to 3 present graphically the time trends in the relative[5] segregation indexes. It can highlighted that the curves at 1-digit level presents a trend of decline in the eighties and then a reversion in the nineties, turning upward.

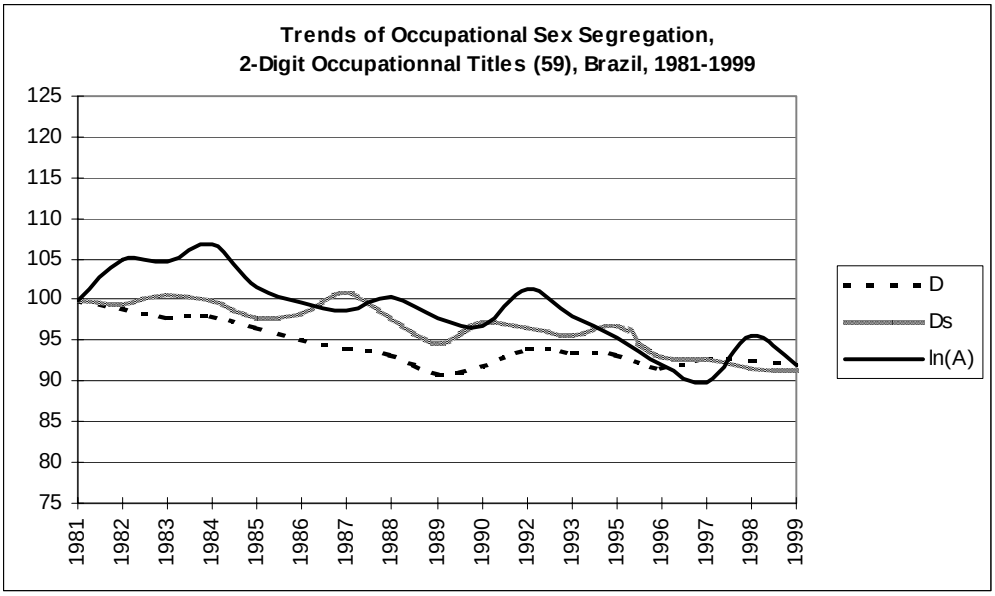
Figure 1



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

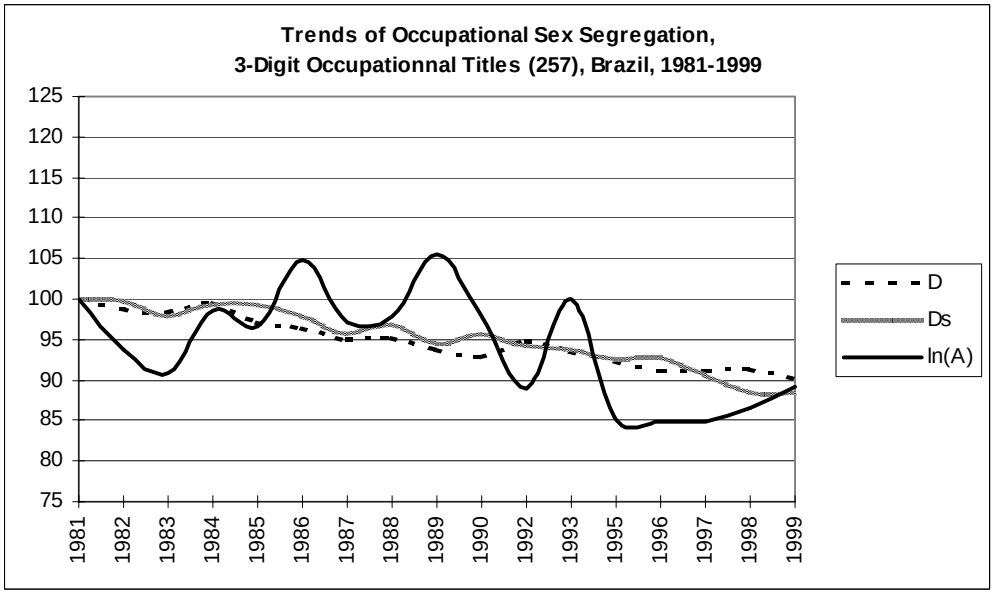
[5] All indexes are compared with the values in 1981, that is equal to 100.

Figure 2



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

Figure 3



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

In spite of the increasing female proportion in Brazilian labor force, from 33.4% in 1981 to 41.7% in 1999 (Table 2), men and women are still both concentrated in the occupations with predominance of its respective sex.

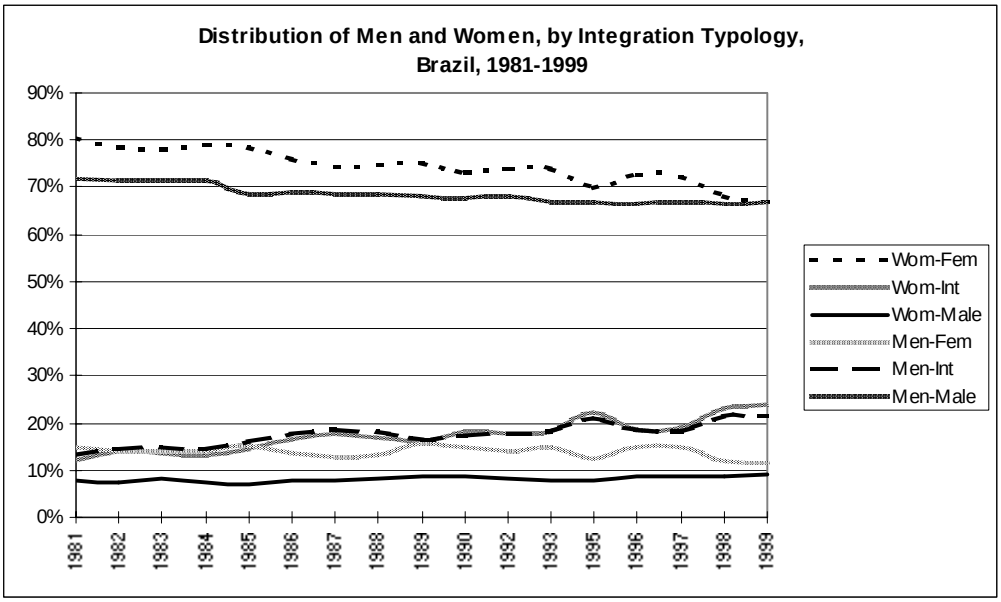
Table 2: Female Proportion in Brazilian Labor Force over Time, 1981-1999, and by Specific Attributes in 1999

Year	% Female	Attributes	% Female
1981	33.4%	Total	41.7%
1982	34.7%	Married	36.0%
1983	35.1%	Single	51.2%
1984	35.9%		
1985	36.0%	Part Time	63.4%
1986	36.9%	Married	67.3%
1987	37.1%	Single	58.6%
1988	37.7%	Full Time	37.3%
1989	38.0%	Married	30.4%
1990	38.5%	Single	49.4%
1992	39.3%		
1993	39.7%	Informal Sector	43.2%
1995	40.8%	Married	39.6%
1996	40.8%	Single	48.6%
1997	40.9%	Formal Sector	40.4%
1998	41.1%	Married	32.8%
1999	41.7%	Single	54.0%

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

Male and female distributions by the defined occupation types don't change substantially between 1981 and 1999. This can be visualized in Figure 4. Among women the variation is larger, primarily with a decline in their proportion in predominantly female occupations and a concomitant increase in integrated occupations. On the other hand, male workers show a downward trend of the proportions in both predominantly male and predominantly female occupations, with a correspondent increase in integrated occupations. It is worth to mention that the number of predominantly female occupations is smaller; this implies that women are more concentrated in few occupations, while men are in a wider set of occupations.

Figure 4



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

The trends shown in the figures are elucidating, but there is no way to access the importance of these changes just by visual inspection. A test of the model of constant segregation over time is performed in the data set at 1-digit level. The test consists of contrasting the conditional independence model against the model of constant sex segregation over time. The former has the margins adjusted for the years (SxY + OxY). The latter also has the margins adjusted for the years, but the interaction between sex and occupation is assumed constant during all years (SxY + OxY + SxO). Results are presented in the first portion of Table 3.

Table 3: Occupational Sex Segregation over Time in Brazil, 1981-1999 and Patterns of Occupational Sex Segregation by Specific Attributes, 1999

Fit Statistics from Log-linear Models

Models	G^2	df	ΔG^2	Δdf	%	BIC
Occupational Sex Segregation over Time, 1981-99						
Conditional Independence (S x Y + O x Y)	140737988.5	102				
Constant Sex Segregation (S x Y + O x Y + S x O)	841104.0	96	139896884.5	6	99.4%	840578.6
Total, by Marital Status (Married and Single)						
Conditional Independence (S x MS + O x MS)	11014563.7	12				
Constant Sex Segregation (S x MS + O x MS + S x O)	235815.1	6	10778748.5	6	97.9%	235795.1
Total, by Groups of Hours of Work (Full and Part-Time)						
Conditional Independence (S x H + O x H)	10839064.4	12				
Constant Sex Segregation (S x H + O x H + S x O)	454360.7	6	10384703.7	6	95.8%	454340.7
Total, by Sector (Formal and Informal)						
Conditional Independence (S x ST + O x ST)	11410964.1	12				
Constant Sex Segregation (S x ST + O x ST + S x O)	241759.9	6	11169204.1	6	97.9%	241740.0
Full Time, by Marital Status (Married and Single)						
Conditional Independence (S x MS + O x MS)	9349178.8	12				
Constant Sex Segregation (S x MS + O x MS + S x O)	161141.7	6	9188037.0	6	98.3%	161121.7
Part Time, by Marital Status (Married and Single)						
Conditional Independence (S x MS + O x MS)	1266644.2	12				
Constant Sex Segregation (S x MS + O x MS + S x O)	93235.2	6	1173409.0	6	92.6%	93215.2
Formal Sector, by Marital Status (Married and Single)						
Conditional Independence (S x MS + O x MS)	4414485.5	12				
Constant Sex Segregation (S x MS + O x MS + S x O)	107446.0	6	4307039.5	6	97.6%	107426.0
Informal Sector, by Marital Status (Married and Single)						
Conditional Independence (S x MS + O x MS)	6838446.7	12				
Constant Sex Segregation (S x MS + O x MS + S x O)	67827.6	6	6770619.1	6	99.0%	67807.6

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1999.
Notes: O = occupation; S = sex; Y = year; MS = marital status; H = hours of work; ST = sector.

The constant sex segregation model fails to fit in terms of the chi-square test, since it is significant – this is not a surprising result given the enormous sample size used. The fit evaluated by the percentage decline in the scaled deviance shows a fit of around 99%; this indicates that although there are statistically significant improvements to be explained by the time variation of sex segregation, around 99% of the cells fit can be explained by the model of constant sex segregation over time.

Having these results in mind, I examined the role of marital status and market work flexibility in a specific year – 1999. I do not review theories of occupational segregation by sex; some theoretical issues are briefly mentioned in this section. The purpose is to highlight points linking occupational segregation by sex with marital status and with job flexibility. These points will inform the discussion of the empirical results. Anker (1997) presents a review of the theories of occupational segregation by sex. He classifies these theories in three broad categories: neo-

classical and human capital theories, institutional and labor market segmentation theories, and non-economic and feminist/ gender theories.

The neo-classical theory endorses the rational choice paradigm and can be divided into two groups: supply and demand aspects. An important supply factor for the empirical discussion in this item is associated with the possibility of an intermittent labor market career, often caused by a strong commitment to household tasks that are associated with marital status and the presence of young children. The issue of women's work commitment is associated with the supply side of this theory. The demand factors associated with the neo-classical theory are associated with three dimensions. First, labor regulation may affect differentially the hiring costs by sex, leading to a pattern of sex segregation. Second, there may be sex discrimination and segregation due to employers' preferences. Finally, the characteristics of a job may enable a matching between workers and firms that leads to occupational segregation in line with the wage compensating differentials model. Overall, the neo-classical theories stress the role of general and specific human capital accumulation and the links between family and job related issues (Anker 1997).

The institutional and labor market segmentation theories differentiate labor market segments in a dual structure, primary and secondary, in accordance with payments, promotion rates, turnover rates, level of education, on-the-job training, etc. To the extent that women are overcrowded in the secondary labor market this becomes an alternative theory of occupational segregation by sex (Anker 1997). Other types of labor market segmentation in developing countries are associated with the informal sector, notably with respect to self-employed people and casual or unprotected wage laborers – this type of segmentation may also affect occupational segregation by sex along this same theoretical line.

The feminist/ gender theories stress characteristics that are not related to the labor market. The sexual division of labor between market and household activities is caused by the patriarchal system, leading to the cumulative effect of gender constructs, social norms, and the sex stereotyping of occupations. The sex stereotyping of occupations is considered an important dimension of the occupational sex segregation (Anker 1997). This non-economic emphasis contrast with the accumulation of specific human capital in market and household activities advanced by the neo-classical model.

Anker (1997) also addresses the issue of occupational flexibility in terms of hours worked and labor turnover. Women may "choose" more flexible occupations due to the impact of household tasks that are differentiated by sex because of either productivity differentials or the patriarchal system. Other lines argue that the occupational flexibility comes after the sex stereotyping of occupations defines the typically female occupations. Two important issues are connected with flexibility. First, flexibility is associated with trends in female employment, employment stability, and the part-time jobs. Second, flexibility is associated with the issue of choice against constraint in women's family life, which is also associated with debates regarding women's work orientation.

For the sake of refining the role of occupational segregation by sex and marital status, two other dimensions are included in the analysis. First, there is the segmentation between part-time and full-time occupations, very much along the lines stressed by the literature. Second, there is the segmentation between formal and informal sectors. A description of the female proportion by these specific attributes for 1999 is presented in Table 2. There are evidences of a greater proportion of women in the single labor force, even when refined by groups of hours of work and sectors, except for the part-time specification, where the presence of women is heavier in the married labor force.

Moreover, women are the majority of the part-time labor force and are in greater extent in the informal sector relative to the formal one.

Models presented in Table 3 test the role of all dimensions in segregation by sex at the 1-digit level. The test of constant segregation by marital status is rejected; this means that marital status plays a statistically significant role in the occupational segregation by sex. On the other hand, the percentile decline in statistical deviance is 97.9%, which indicates that a great deal of the segregation is actually not affected by marital status. Figure 5 shows the relative level[6] of segregation measured by ln(A), we note that segregation by sex is higher among married than single workers, as expected, given the greater female proportion among the latter.

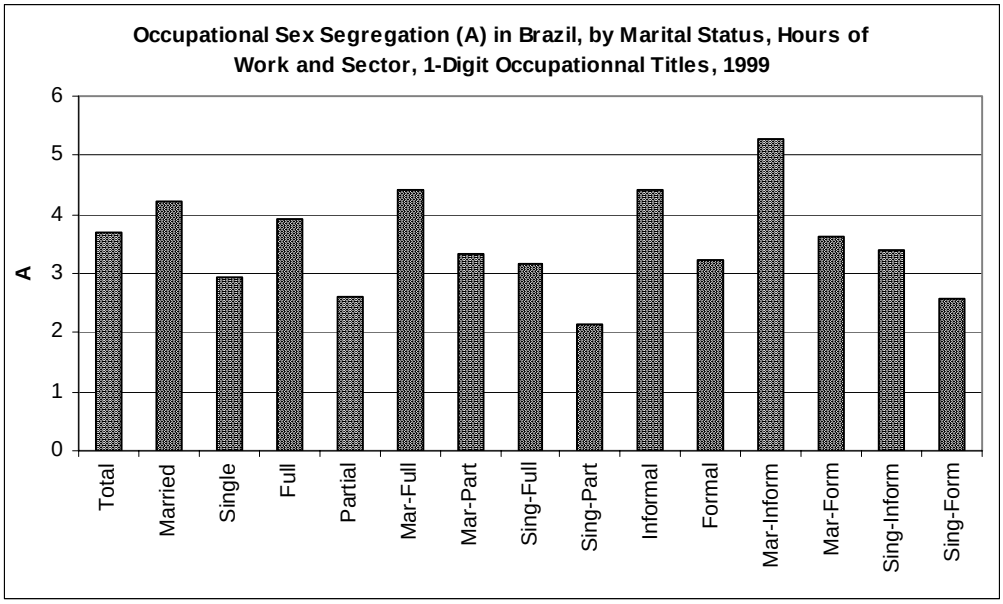
The test of constant segregation by groups of hours of work (part-time and full-time) is also rejected. The same argument used before also applies, that is, a large decline in the statistical deviance can be explained by the constant sex segregation model. Figure 5 indicates that the relative level of sex segregation measured by ln(A) is lower among part-time than among full-time workers[7].

The test of constant segregation by sector (formal and informal) is rejected. As in the former exercises, the decline in statistical deviance is substantial, lending support to the idea that the constant sex segregation model by sector is very important. The level of segregation presented in Figure 5 is much lower in the formal than in the informal sector. This result contrasts with the one obtained by groups of hours of work above. If full-time and formal sector jobs were representatives of the same type of primary occupations, then the relative index should go to the same direction. This is not what happened, full-time workers have higher segregation by sex than part-timers, but the formal sector has lower segregation by sex than the informal sector.

[6] The relative level of ln(A) is always measured with respect to the total level among all workers differentiated by sex.

[7] Teachers are not classified as all other occupations. They are considered separately, given the specificities of their work, that is, their part-time work should be considered full-time as extra-hours worked are not computed.

Figure 5



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1999.

Alternative tests presented at Table 3 are associated with the role of marital status in each of the two groups of hours of work (full and part-time) and the two groups by sector (formal and informal). All tests rejected the null hypothesis of constant occupational segregation by marital status within the categories of hours of work and the groups by sector. This finding suggests the importance of marital status to the determination of occupational segregation by sex. Nevertheless, the finding is less important to the extent that the decline in the scaled deviance is high in all cases explored. The results in Figure 5 indicate that the relative segregation by sex and marital status is as important as for part-time than full-time workers. Single part-time workers present the lowest segregation level by sex – this finding may be suggesting that the lower level of occupational segregation among part-timers is caused by a compositional effect. Full-time workers present a segregation level that is also differentiated by marital status. The role of marital status by sector is also presented in Figure 5, where it can be seen that marital status is more important to the informal (higher relative segregation among married workers in the informal sector) than the formal sector. Overall, the findings indicate that singles are less segregated by sex than married workers, a great deal of this result may be associated with life cycle and also with work orientation aspects[8].

GENDER COMPOSITION OF OCCUPATIONS AND WAGES: METHODOLOGICAL ASPECTS

Despite the sharp rise in women's labor force participation and their higher representation in integrated occupations, the gender gap in earnings narrowed only slightly during the two last decades. The analysis of the influence of changes in occupational segregation on men's and women's earnings should help clarify the mechanisms that maintain gender inequality in the labor market. The question to be answered is how the gender composition of jobs influences men's and women's earnings. Some theoretical considerations are made on the determinants of men's and women's earnings. The empirical approach entails estimating earnings functions for men and

[8] The age/cohort effect has not been controlled for in these exercises, and it is important to notice that this may affect the results.

women which combine the human capital approach – socioeconomic and demographic characteristics – to wage determination with measures of occupational gender segregation.

Some stylized facts on the feminization level of the occupations are: (1) men and women tend to hold different jobs; (2) occupational segregation is persistent; (3) men and women earn less as the female proportion in the occupation rises; (4) negative relation between wages and female proportion is stronger among men than among women. Several empirical cross-section studies (see, for example, Groshen, 1991; MacPherson and Hirsch, 1995; Petersen and Morgan, 1995; Hansen and Wahlberg, 2000) discusses the fact that individual wages shift systematically with the gender composition of occupations, but in spite of the apparently agreement regarding the stylized facts, the magnitude and interpretation of the connection between wages and gender composition in Brazil is rarely examined.

Theoretically, in a search of alternative explanations of gender disparities, the discussion about how structural factors maintain wage differentials between men and women focus on occupational segregation and the relationship between job characteristics and earnings levels. Information on how occupational sex segregation stratifies earnings leads to the question of why sex segregation persists and why predominantly female occupations pay less. In this sense, an increase in the supply of women willing and able to enter the labor market, coupled with an expansion of low-wage service jobs, could lower wages.

The estimation of the relation between wages and gender composition is based on earnings functions (following MacPherson and Hirsch, 1995):

$$\ln W_{if} = \Sigma \beta_{kf} X_{ikf} + \Theta_f FEM_{if} + e_{if}$$
$$\ln W_{im} = \Sigma \beta_{km} X_{ikm} + \Theta_m FEM_{im} + e_{im}$$

where f and m subscripts indicate female and male; $\ln W_i$ = log of the hourly/wages of individual i; X_k = intercept and variables, indexed by k, that measures observable skill and demographic individual characteristics, occupation's characteristics and region; β_k = constant and corresponding coefficients of the variables in X; FEM = measure of the femaleness of the occupation – the female proportion in the occupation of the individual[9]; Θ = coefficient of FEM; e = error term with zero mean and constant variance. By estimating separate earnings functions for men and women, it is assumed that the effects of the gender composition differ by sex, since the high degree of occupational sex segregation distinguishes the male and female employment structures.

The interpretation of Θ_f and Θ_m depends on the causes of the occupational segregation and on the ways FEM and wage rates are related. Some explanations for the occupational segregation are: human capital differentials, employer discrimination, restrictions to labor mobility and pre-market differences of family and educational background and the socialization process (Oliveira, 1997). The gender composition effect reflects an occupational crowding: women can be concentrated in particular occupations, due to their preferences or to past and current barriers to alternative occupations. This crowding compresses the wages to a level below the one of similarly qualified workers in other occupations and the interoccupational mobility is insufficient to equalize wages. The crowding model is useful to explain why $\Theta_f < 0$, but not why $\Theta_m < 0$, since if men don't face the same barriers that women do, there are no reasons for them to accept lower wages in predominantly female occupations when higher wages are available in predominantly male occupations. If $\Theta_m < 0$, predominantly female occupations attract less skilled men. In other words,

[9] Proportion of women in 3-digit occupational titles, which were matched to be consistent over time, computed in an annual basis.

if women face barriers to better remunerated occupations, low-wage occupations would attract a disproportionally large number of women and a small proportion of men, so that there would be a negative correlation between FEM and male and female wages.

The "quality sorting" hypothesis related to the explanation for the relation wage – gender composition argues that if women, but not men, are concentrated in low wages occupations due to discriminatory barriers, the gender composition of an occupation turns to be a labor quality index for men, and in less extent, for women. Thus, over time, low-wage occupations with a concentration of women would attract low skilled men and would lose high skilled women. Consequently, all workers in predominantly female occupations would have lower average wages and productivity. Other line of reasoning are models of tastes for discrimination which posit that employer, employee or consumer prejudices induce to lower wages for women in predominantly female occupations. But, if men and women are differently rewarded in occupations, those discrimination models would predict a weaker (or positive) relation between wages and FEM for men compared to women and a higher gender wage gap in predominantly female occupations.

GENDER COMPOSITION OF OCCUPATIONS AND WAGES: EVIDENCES FOR BRAZIL, 1981-99

In an attempt to answer the question of whether gender composition has a negative effect on male and female wages in Brazil in the last two decades, I will focus on the interpretation of the coefficients of the relation wages-FEM. Tables 4 and 5 presents the estimated coefficients of the relation wages-FEM, Θ, from cross-section regressions of the log of female and male wages, estimated year by year, from 1981 to 1999. First, there is a non-adjusted specification, only with FEM as independent variable at the right side of the equation. Then, there is an adjusted specification of the wage equation, whose coefficients include a set of controls over the period: years of education, age and squared age, dummies for marital status (married=1 vs. single=0), hours of work (full-time=1 vs. part-time=0), sector (informal=1 vs. formal=0), metropolitan area, industries (9) and regions (5).

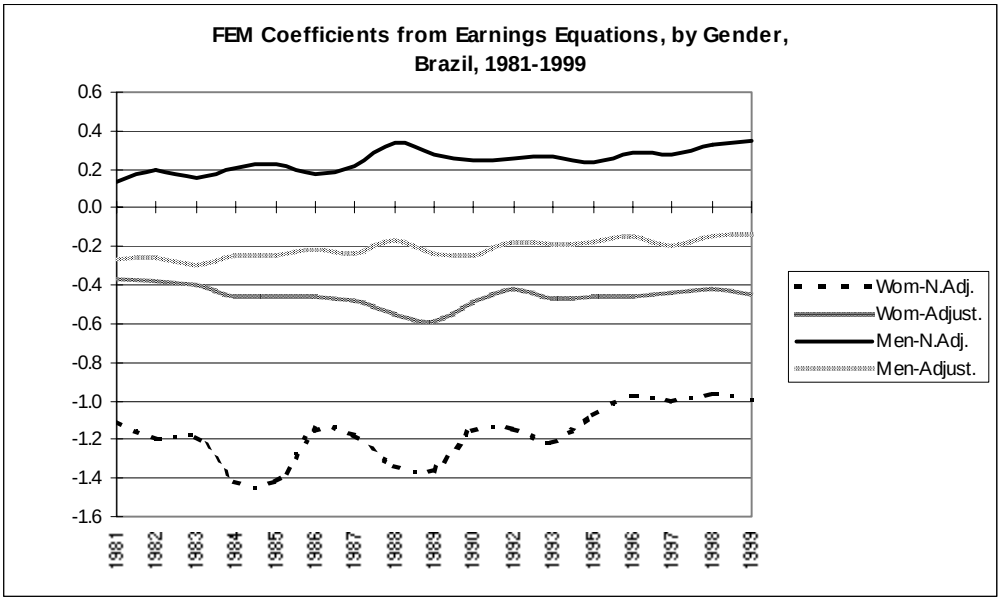
The comparison between non-adjusted and adjusted FEM coefficients suggests the relevance of the controls for individual and occupational characteristics. As it can be seen in Figure 6, positive and higher non-adjusted coefficients were found for men, while the most negative ones were found for women. Negative coefficients indicate that wages decline with the increase of the female proportion, and positive coefficients indicates the opposite. So, without controls, rather than being penalized to be in predominantly female occupations, men benefit from this situation, while women are penalized in terms of wages. This is the case that, for the whole period, (Θ_f - Θ_m) is negative, so the gender gap would increase with the increase of the female proportion.

The inclusion of education and other control variables decreases the magnitude of male coefficients and increases the female ones, accounting for a more linear wage-FEM relation. This suggests that compositional effects are very significant; that is, gender composition effects do not operate in isolation of the other structural changes[10]. The adjusted coefficients indicate that the gender composition effect is substantial and different for men and women, showing a stable trend in the period, still male and female curves are slightly divergent. Negative values of Θ indicate that wages are lower for men and, in greater extent, for women in a predominantly female occupation than in a predominantly male occupation. Again, this is the case that (Θ_f - Θ_m) is negative, so the gender gap increases with the increase of the female proportion. In addition, a divergent trend of

[10] This will be further explored in prospective papers.

men's and women's adjusted curves is showed in Figure 6, suggesting that the gender wage gap is actually increasing.

Figure 6



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

Alternative specifications of cross-section models lead to refined inferences about the relation between wages and gender composition. Estimating separate earnings functions for each category of the integration typology of occupations, it is assumed that gender effects differ by the feminization level of the occupation. Here, the FEM variable is excluded, and a dummy for sex (women=1 vs. men=0) is included, since the computation is made for the joint database[11]. Table 6 shows the estimated coefficients for Brazil, from 1981 to 1999.

[11] Descriptive features of occupations, by the integration typology, are shown in the appendix.

Table 4: Estimates of Coefficients of the Female Earnings Equations, Brazil, 1981-1999

	1981	1982	1983	1984	1985	1986	1987	1988	1989
MODEL 1									
Intercept	2.5164 ***	2.6003 ***	2.3808 ***	2.4861 ***	2.5888 ***	2.8502 ***	2.5653 ***	2.5169 ***	2.6112 ***
Fem	-1.1050 ***	-1.1921 ***	-1.1850 ***	-1.4173 ***	-1.4141 ***	-1.1592 ***	-1.1803 ***	-1.3400 ***	-1.3550 ***
R^2	0.0970	0.1091	0.1071	0.1373	0.1269	0.1003	0.0963	0.1066	0.1078
MODEL 2									
Intercept	0.0110	-0.1484 ***	-0.1967 ***	-0.1986 ***	-0.1467 ***	0.3459 ***	0.0221	-0.2492 ***	0.0899 *
Age	0.0744 ***	0.0792 ***	0.0745 ***	0.0772 ***	0.0772 ***	0.0689 ***	0.0712 ***	0.0756 ***	0.0691 ***
Age2	-0.0008 ***	-0.0008 ***	-0.0008 ***	-0.0008 ***	-0.0008 ***	-0.0007 ***	-0.0007 ***	-0.0008 ***	-0.0007 ***
Marital status	0.1301 ***	0.1450 ***	0.1358 ***	0.1463 ***	0.1651 ***	0.1560 ***	0.1704 ***	0.1594 ***	0.1495 ***
Years of education	0.1142 ***	0.1181 ***	0.1171 ***	0.1175 ***	0.1199 ***	0.1195 ***	0.1222 ***	0.1226 ***	0.1239 ***
Metropolitan area	0.2243 ***	0.2255 ***	0.2292 ***	0.1812 ***	0.2001 ***	0.1029 ***	0.1429 ***	0.2201 ***	0.1989 ***
Southeast	0.1208 ***	0.0747 ***	0.0421 ***	-0.0089	-0.0556 ***	0.0283 *	0.0225	0.0803 ***	-0.0036
South	0.0794 ***	0.0961 ***	0.0799 ***	0.0515 ***	-0.0194	0.0073	-0.0022	0.0778 ***	0.0082
Northeast	-0.2274 ***	-0.2485 ***	-0.2573 ***	-0.2970 ***	-0.3671 ***	-0.3182 ***	-0.3029 ***	-0.3296 ***	-0.4480 ***
Center-west	0.1526 ***	0.1295 ***	0.1318 ***	0.0843 ***	0.0731 ***	0.0973 ***	0.1044 ***	0.1385 ***	0.0323 *
Modern manufactur.	0.1469 ***	0.2027 ***	0.1233 ***	0.1441 ***	0.2013 ***	0.1418 ***	0.1429 ***	0.1933 ***	0.0751 *
Traditional manufac.	-0.0562 *	0.0195	-0.1219 ***	-0.0845 ***	-0.0316	-0.0140	-0.1027 **	-0.0382	-0.0736 *
Building construct.	0.0469	0.1453 ***	-0.0356	0.0865	0.0946 *	0.0678	-0.0440	0.0931	-0.0315
Distributive services	-0.0738 **	-0.0346	-0.1234 ***	-0.1281 ***	-0.0805 ***	0.0012	-0.0707 *	-0.0455	-0.0845 **
Productive services	0.1440 ***	0.1934 ***	0.1259 ***	0.1434 ***	0.2068 ***	0.1058 ***	0.1665 ***	0.1851 ***	0.1472 ***
Personal services	-0.0004	0.0471	-0.0192	-0.0380	0.0221	0.0216	0.0392	0.0161	-0.1030 ***
social services	-0.2792 ***	-0.2181 ***	-0.3050 ***	-0.3340 ***	-0.3284 ***	-0.2355 ***	-0.2130 ***	-0.2357 ***	-0.2725 ***
Government	0.0294	0.0770 **	-0.0555 *	-0.0371	0.0781 **	0.0553	0.0018	-0.0225	-0.1537 ***
full-time	-0.3273 ***	-0.3095 ***	-0.2936 ***	-0.2787 ***	-0.2689 ***	-0.3037 ***	-0.3249 ***	-0.3089 ***	-0.3328 ***
Informal	-0.2778 ***	-0.2363 ***	-0.2447 ***	-0.2974 ***	-0.2768 ***	-0.1004 ***	-0.1659 ***	-0.2595 ***	-0.1960 ***
Fem	-0.3653 ***	-0.3746 ***	-0.4027 ***	-0.4645 ***	-0.4611 ***	-0.4604 ***	-0.4833 ***	-0.5458 ***	-0.5928 ***
R^2	0.6302	0.6422	0.6390	0.6547	0.6464	0.5753	0.5861	0.5999	0.5631

	1990	1992	1993	1995	1996	1997	1998	1999	
MODEL 1									
Intercept	2.5244 ***	2.4057 ***	2.4346 ***	2.6047 ***	2.5806 ***	2.5992 ***	2.5790 ***	2.5549 ***	
Fem	-1.1519 ***	-1.1482 ***	-1.2126 ***	-1.0789 ***	-0.9739 ***	-1.0059 ***	-0.9652 ***	-0.9923 ***	
R^2	0.0841	0.0852	0.0890	0.0816	0.0670	0.0693	0.0659	0.0674	
MODEL 2									
Intercept	-0.1174 **	-0.1346 **	-0.0981 *	0.1774 ***	0.3143 ***	0.1172 ***	0.1829 ***	0.1215 ***	
Age	0.0691 ***	0.0643 ***	0.0674 ***	0.0567 ***	0.0554 ***	0.0573 ***	0.0566 ***	0.0581 ***	
age2	-0.0007 ***	-0.0006 ***	-0.0007 ***	-0.0005 ***	-0.0005 ***	-0.0005 ***	-0.0005 ***	-0.0005 ***	
marital status	0.1628 ***	0.1089 ***	0.1013 ***	0.1148 ***	0.1115 ***	0.1002 ***	0.0826 ***	0.0953 ***	
years of education	0.1250 ***	0.1053 ***	0.1105 ***	0.1104 ***	0.1117 ***	0.1112 ***	0.1078 ***	0.1072 ***	
metropolitan area	0.1652 ***	0.2334 ***	0.2235 ***	0.2027 ***	0.1951 ***	0.2324 ***	0.2139 ***	0.1935 ***	
Southeast	-0.0657 ***	0.2057 ***	0.0301 *	0.1387 ***	0.1721 ***	0.1731 ***	0.1843 ***	0.1842 ***	
South	0.0022	0.1959 ***	0.1015 ***	0.1471 ***	0.1731 ***	0.1873 ***	0.1743 ***	0.1607 ***	
Northeast	-0.4606 ***	-0.2467 ***	-0.3785 ***	-0.2611 ***	-0.2387 ***	-0.2269 ***	-0.1935 ***	-0.2161 ***	
Center-west	0.0547 ***	0.1903 ***	0.1452 ***	0.1191 ***	0.1554 ***	0.1698 ***	0.1564 ***	0.1475 ***	
modern manufactur.	0.2805 ***	0.2084 ***	0.1784 ***	0.1416 ***	0.0151	0.1222 ***	0.1555 ***	0.1553 ***	
traditional manufac.	0.0332	0.0363	0.0447	0.0379	-0.0980 ***	0.0236	-0.0079	-0.0216	
building construct.	0.0784	0.1348 *	0.0955	0.3076 ***	0.0145	0.3000 ***	0.1957 ***	0.0689	
distributive services	0.0230	0.0661 *	0.0652 *	0.0332	-0.0830 **	0.0267	0.0080	-0.006	
productive services	0.2456 ***	0.3096 ***	0.2984 ***	0.2595 ***	0.1164 ***	0.2831 ***	0.2716 ***	0.2654 ***	
personal services	0.1421 ***	0.1510 ***	0.1604 ***	0.1619 ***	0.0598 *	0.2110 ***	0.2370 ***	0.2723 ***	
social services	-0.0810 **	-0.0953 **	-0.0946 **	0.0005	-0.0989 ***	0.0141	0.0002	-0.0077	
Government	0.1432 ***	0.0947 **	0.1248 ***	0.2362 ***	0.1043 ***	0.2870 ***	0.2977 ***	0.3153 ***	
full-time	-0.3485 ***	-0.3619 ***	-0.3876 ***	-0.4349 ***	-0.4477 ***	-0.4366 ***	-0.4614 ***	-0.4492 ***	
Informal	-0.0875 ***	-0.2961 ***	-0.2579 ***	-0.1240 ***	-0.1354 ***	-0.1680 ***	-0.2112 ***	-0.2322 ***	
Fem	-0.4920 ***	-0.4238 ***	-0.4660 ***	-0.4564 ***	-0.4590 ***	-0.4410 ***	-0.4173 ***	-0.4476 ***	
R^2	0.5647	0.5543	0.5475	0.5285	0.5142	0.5340	0.5340	0.5399	

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.
Note: Levels of significance: *** = 0.01l; ** = 0.05; * = 0.10.

Table 5: Estimates of Coefficients of the Male Earnings Equations, Brazil, 1981-1999

	1981	1982	1983	1984	1985	1986	1987	1988	1989
MODEL 1									
Intercept	2.2074 ***	2.2126 ***	2.0110 ***	1.9637 ***	2.0816 ***	2.4433 ***	2.1309 ***	1.9628 ***	2.0646 ***
Fem	0.1360 ***	0.1921 ***	0.1586 ***	0.2015 ***	0.2302 ***	0.1746 ***	0.2177 ***	0.3337 ***	0.2812 ***
R^2	0.0008	0.0017	0.0011	0.0018	0.0023	0.0015	0.0022	0.0047	0.0033
MODEL 2									
Intercept	-0.0956 ***	-0.1044 ***	-0.2620 ***	-0.4016 ***	-0.3924 ***	0.0657 *	-0.2667 ***	-0.3333 ***	-0.1214 ***
Age	0.0893 ***	0.0909 ***	0.0868 ***	0.0921 ***	0.0910 ***	0.0891 ***	0.0944 ***	0.0907 ***	0.0885 ***
age2	-0.0009 ***	-0.0009 ***	-0.0009 ***	-0.0009 ***	-0.0009 ***	-0.0009 ***	-0.0010 ***	-0.0009 ***	-0.0009 ***
marital status	0.2780 ***	0.2690 ***	0.2862 ***	0.2826 ***	0.2945 ***	0.2963 ***	0.2593 ***	0.2711 ***	0.2458 ***
years of education	0.1222 ***	0.1263 ***	0.1251 ***	0.1249 ***	0.1293 ***	0.1258 ***	0.1253 ***	0.1270 ***	0.1297 ***
metropolitan area	0.0961 ***	0.1040 ***	0.0907 ***	0.0445 ***	0.0501 ***	0.0028	0.0086	0.0785 ***	0.0454 ***
Southeast	0.0958 ***	0.0136	-0.0267 ***	-0.0861 ***	-0.1045 ***	0.0142	-0.0092	0.0656 ***	-0.0285 *
South	0.0491 ***	-0.0041	-0.0287 ***	-0.0589 ***	-0.0660 ***	0.0095	-0.0270 **	0.0315 **	-0.0157
Northeast	-0.1128 ***	-0.1693 ***	-0.1865 ***	-0.2122 ***	-0.2423 ***	-0.2044 ***	-0.2121 ***	-0.2102 ***	-0.3427 ***
Center-west	0.1108 ***	0.0533 ***	0.0205 **	0.0150	-0.0100	0.1133 ***	0.0494 ***	0.0773 ***	0.0015
modern manufactur.	0.2036 ***	0.1647 ***	0.1313 ***	0.2401 ***	0.3100 ***	0.1721 ***	0.2435 ***	0.1552 ***	0.0920 ***
traditional manufac.	-0.0765 ***	-0.0883 ***	-0.1194 ***	-0.0299 *	0.0428 ***	-0.0334	-0.0185	-0.1274 ***	-0.1455 ***
building construct.	-0.1066 ***	-0.1072 ***	-0.2214 ***	-0.0917 ***	-0.0199	-0.0730 ***	-0.0297	-0.1527 ***	-0.1734 ***
distributive services	-0.0556 ***	-0.0615 ***	-0.0906 ***	0.0231	0.0956 ***	-0.0114	0.0179	-0.0792 ***	-0.0551 *
productive services	0.1291 ***	0.1114 ***	0.0995 ***	0.1854 ***	0.2666 ***	0.0857 ***	0.1996 ***	0.1327 ***	0.1214 ***
personal services	-0.0942 ***	-0.1121 ***	-0.1553 ***	-0.0791 ***	0.0186	-0.1530 ***	-0.0577 **	-0.1372 ***	-0.2393 ***
social services	-0.2268 ***	-0.2273 ***	-0.2709 ***	-0.1641 ***	-0.0966 ***	-0.1896 ***	-0.1386 ***	-0.2742 ***	-0.2385 ***
Government	-0.1770 ***	-0.1915 ***	-0.2196 ***	-0.1486 ***	-0.0078	-0.1625 ***	-0.1500 ***	-0.2602 ***	-0.3121 ***
full-time	-0.3610 ***	-0.3456 ***	-0.2790 ***	-0.3259 ***	-0.2966 ***	-0.3566 ***	-0.3842 ***	-0.3663 ***	-0.3857 ***
Informal	-0.1406 ***	-0.1533 ***	-0.1335 ***	-0.1600 ***	-0.1336 ***	0.0535 ***	-0.0832 ***	-0.1911 ***	-0.1075 ***
Fem	-0.2695 ***	-0.2556 ***	-0.2963 ***	-0.2523 ***	-0.2477 ***	-0.2204 ***	-0.2422 ***	-0.1701 ***	-0.2404 ***
R^2	0.5502	0.5749	0.5602	0.5526	0.5529	0.5115	0.5240	0.5331	0.4912

	1990	1992	1993	1995	1996	1997	1998	1999	
MODEL 1									
Intercept	2.0393 ***	1.8822 ***	1.8734 ***	2.1023 ***	2.1132 ***	2.1114 ***	2.0935 ***	2.0328 ***	
Fem	0.2469 ***	0.2585 ***	0.2692 ***	0.2408 ***	0.2917 ***	0.2818 ***	0.3324 ***	0.3441 ***	
R^2	0.0027	0.0035	0.0036	0.0033	0.0048	0.0045	0.0063	0.0072	
MODEL 2									
Intercept	-0.2493 ***	-0.1873 ***	-0.1785 ***	-0.1264 ***	-0.0858 **	-0.0471	-0.2065 ***	-0.2178 ***	
Age	0.0847 ***	0.0758 ***	0.0753 ***	0.0750 ***	0.0731 ***	0.0710 ***	0.0736 ***	0.0710 ***	
age2	-0.0009 ***	-0.0008 ***	-0.0007 ***	-0.0007 ***	-0.0007 ***	-0.0007 ***	-0.0007 ***	-0.0007 ***	
marital status	0.2772 ***	0.2319 ***	0.2392 ***	0.2406 ***	0.2486 ***	0.2326 ***	0.2125 ***	0.2352 ***	
years of education	0.1270 ***	0.1085 ***	0.1144 ***	0.1183 ***	0.1162 ***	0.1144 ***	0.1150 ***	0.1129 ***	
metropolitan area	0.0375 ***	0.0941 ***	0.0878 ***	0.1056 ***	0.1086 ***	0.1239 ***	0.1027 ***	0.0773 ***	
Southeast	-0.0531 ***	0.1986 ***	0.0817 ***	0.1550 ***	0.1985 ***	0.1991 ***	0.2294 ***	0.2123 ***	
South	-0.0228 *	0.1690 ***	0.1171 ***	0.1432 ***	0.1949 ***	0.1826 ***	0.2144 ***	0.1874 ***	
Northeast	-0.3453 ***	-0.1498 ***	-0.2284 ***	-0.1980 ***	-0.1550 ***	-0.1650 ***	-0.1269 ***	-0.1467 ***	
Center-west	0.0111	0.1324 ***	0.1438 ***	0.1265 ***	0.1740 ***	0.1547 ***	0.1854 ***	0.1722 ***	
modern manufactur.	0.2491 ***	0.2400 ***	0.2336 ***	0.2737 ***	0.2123 ***	0.2242 ***	0.2607 ***	0.2358 ***	
traditional manufact.	0.0149	-0.0020	-0.0057	0.0976 ***	0.0616 ***	0.0597 ***	0.1094 ***	0.0853 ***	
building construct.	0.0789 ***	-0.0115	-0.0520 **	0.1488 ***	0.0890 ***	0.1007 ***	0.1620 ***	0.1278 ***	
Distributive services	0.1160 ***	0.0639 ***	0.0426 **	0.1329 ***	0.0954 ***	0.1043 ***	0.1586 ***	0.1311 ***	
productive services	0.2584 ***	0.2777 ***	0.2663 ***	0.3060 ***	0.2664 ***	0.3175 ***	0.3522 ***	0.3499 ***	
personal services	0.0442 *	0.0302	0.0204	0.1438 ***	0.1003 ***	0.1673 ***	0.2251 ***	0.2359 ***	
social services	-0.0365 *	-0.0916 ***	-0.1100 ***	-0.0234	-0.0502 **	-0.0425 **	-0.0050	-0.0173	
Government	0.0330	-0.0376 *	-0.0818 ***	0.0755 ***	0.0722 ***	0.1271 ***	0.2273 ***	0.2428 ***	
full-time	-0.4120 ***	-0.4178 ***	-0.4330 ***	-0.4911 ***	-0.5225 ***	-0.4932 ***	-0.4958 ***	-0.4538 ***	
Informal	-0.0971 ***	-0.2660 ***	-0.2344 ***	-0.1455 ***	-0.1240 ***	-0.1796 ***	-0.1936 ***	-0.2086 ***	
Fem	-0.2431 ***	-0.1810 ***	-0.1893 ***	-0.1785 ***	-0.1464 ***	-0.1944 ***	-0.1453 ***	-0.1325 ***	
R^2	0.5139	0.4993	0.4926	0.5075	0.4823	0.5007	0.5102	0.5021	

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.
Note: Levels of significance: *** = 0.01l; ** = 0.05; * = 0.10.

Table 6: Estimates of Coefficients of Earnings Equations, by the Integration Typology of Occupations, Brazil, 1981-1999

(continues)

	1981		1982		1983		1984		1985		1986		1987		1988		1989	
FEMALE OCCUPAT.																		
Intercept	0.0621		-0.0318		-0.1587	***	-0.1480	***	-0.1199	***	0.3688	***	-0.0103		-0.1913	***	0.0801	
Sex	-0.2938	***	-0.2809	***	-0.2678	***	-0.3160	***	-0.3372	***	-0.2501	***	-0.2852	***	-0.3249	***	-0.3196	***
Age	0.0764	***	0.0789	***	0.0747	***	0.0769	***	0.0777	***	0.0683	***	0.0694	***	0.0745	***	0.0702	***
age2	-0.0008	***	-0.0008	***	-0.0008	***	-0.0008	***	-0.0008	***	-0.0007	***	-0.0007	***	-0.0008	***	-0.0007	***
marital status	0.1598	***	0.1708	***	0.1656	***	0.1542	***	0.1672	***	0.1766	***	0.1542	***	0.1754	***	0.1535	***
years of education	0.1087	***	0.1103	***	0.1079	***	0.1138	***	0.1199	***	0.1095	***	0.1179	***	0.1104	***	0.1147	***
metropolitan area	0.2141	***	0.2160	***	0.2197	***	0.1799	***	0.1883	***	0.1010	***	0.1371	***	0.2207	***	0.2011	***
Southeast	0.1394	***	0.0841	***	0.0691	***	-0.0122		-0.0598	***	0.0151		0.0295	*	0.0952	***	0.0023	
South	0.1085	***	0.1153	***	0.1172	***	0.0587	***	0.0095		0.0205		0.0316	*	0.1112	***	0.0401	**
Northeast	-0.2019	***	-0.2296	***	-0.2304	***	-0.3119	***	-0.3575	***	-0.3186	***	-0.3154	***	-0.3049	***	-0.4392	***
Center-west	0.1760	***	0.1489	***	0.1598	***	0.0860	***	0.0672	***	0.0931	***	0.0937	***	0.1525	***	0.0440	**
modern manufactur.	0.1064	***	0.1441	***	0.1065	***	0.1096	**	0.1905	***	0.1548	***	0.2216	***	0.2400	***	0.0349	
traditional manufac.	-0.1231	***	-0.0437		-0.1305	***	-0.1243	***	-0.0450		-0.0671	*	-0.0466		-0.0654		-0.1726	***
building construct.	-0.0667	*	-0.0413		-0.1342	***	-0.0007		0.0122		-0.0375		0.0009		0.0292		-0.1010	*
distributive services	-0.0646	**	-0.0278		-0.1178	***	-0.0393		-0.0141		-0.0018		-0.0899	*	-0.0199		-0.1052	***
productive services	0.0916	***	0.1321	***	0.0998	***	0.0104		0.1017	***	0.0837	**	0.1214	***	0.1661	***	0.0944	**
personal services	-0.0967	***	-0.0451		-0.0883	***	-0.1021	***	-0.0451		-0.0521		0.0657		-0.0530		-0.2244	***
social services	-0.4504	***	-0.3692	***	-0.4505	***	-0.4774	***	-0.4636	***	-0.3835	***	-0.2333	***	-0.4012	***	-0.5006	***
Government	0.0234		-0.0124		-0.0934	***	-0.1047	**	0.1212	***	0.0173		0.0333		-0.0916	**	-0.2159	***
full-time	-0.2983	***	-0.2947	***	-0.2720	***	-0.2601	***	-0.2538	***	-0.2852	***	-0.3083	***	-0.3094	***	-0.3112	***
Informal	-0.2573	***	-0.2592	***	-0.2414	***	-0.2924	***	-0.2639	***	-0.0847	***	-0.2233	***	-0.2643	***	-0.1578	***
R^2	0.6410		0.6371		0.6389		0.6460		0.6580		0.5693		0.5960		0.5876		0.5575	
INTEGRATED OCCUP.																		
Intercept	-0.0253		-0.1043	*	-0.2345	***	-0.2778	***	-0.2387	***	0.3557	***	-0.1596	**	-0.2332	***	-0.0630	
Sex	-0.2821	***	-0.2847	***	-0.3059	***	-0.2786	***	-0.3178	***	-0.3085	***	-0.2889	***	-0.3302	***	-0.3242	***
Age	0.0922	***	0.0917	***	0.0940	***	0.0947	***	0.0937	***	0.0873	***	0.0920	***	0.0938	***	0.0860	***
age2	-0.0010	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0010	***	-0.0008	***
marital status	0.2241	***	0.2446	***	0.2340	***	0.2397	***	0.2742	***	0.2371	***	0.2470	***	0.2348	***	0.2240	***
years of education	0.0956	***	0.1116	***	0.1157	***	0.1056	***	0.1137	***	0.1025	***	0.1176	***	0.1179	***	0.1263	***
metropolitan area	0.0906	***	0.1156	***	0.1121	***	0.0928	***	0.1034	***	0.0164		0.0739	***	0.0770	***	0.0651	***
Southeast	-0.0104		0.0034		-0.0651	***	-0.0761	***	-0.1157	***	-0.0113		-0.0330	*	0.0077		-0.0622	**
South	-0.0216	***	0.0087		-0.0406	*	-0.0110		-0.0719	***	-0.0008		-0.0363		-0.0488	*	-0.0001	
Northeast	-0.2104	***	-0.1890	***	-0.2201	***	-0.2348	***	-0.3028	***	-0.2285	***	-0.2566	***	-0.3019	***	-0.3671	***
Center-west	0.0743	***	0.1014	***	0.0240		0.0579	***	0.0155		0.0945	***	0.0870	***	0.0868	***	0.0306	
modern manufactur.	0.2281	***	0.1919	***	0.0932		0.1046	**	0.1724	***	0.0710		0.0551		0.0957		0.1359	
traditional manufac.	-0.0996	*	-0.1523	***	-0.3221	***	-0.2336	***	-0.1728	***	-0.2459	***	-0.2329	***	-0.2439	***	-0.2161	***
building construct.	0.2010		0.0036		0.0507		-0.2193	***	-0.1457	***	0.4112	***	-0.1153	*	0.0742		-0.2545	*
distributive services	-0.0486		-0.1906	***	-0.2763	***	-0.2570	***	-0.1473	***	-0.2071	***	-0.2215	***	-0.1967	***	-0.2225	***
productive services	0.3476	***	0.2255	***	0.0300		0.0628		0.1535	***	0.1295	**	0.0896	*	0.2085	***	0.1030	
personal services	0.5072	***	0.1771	***	0.0357		-0.1530	***	0.0362		0.1289	**	-0.0648		0.2168	***	0.0195	
social services	-0.1369	**	-0.3127	***	-0.3963	***	-0.4208	***	-0.3259	***	-0.3929	***	-0.3001	***	-0.3679	***	-0.3845	***
Government	0.2486	***	0.1370	***	0.0085		-0.0763	*	-0.1403	***	0.1161	*	-0.1444	***	0.0224		-0.1229	
full-time	-0.3856	***	-0.3274	***	-0.3432	***	-0.3233	***	-0.3506	***	-0.3593	***	-0.3697	***	-0.3656	***	-0.4401	***
Informal	-0.1468	***	-0.0982	***	-0.0607	***	-0.0797	***	-0.0552	***	0.0950	***	0.0077		-0.1664	***	0.0000	
R^2	0.5181		0.6157		0.5719		0.5249		0.5196		0.5192		0.5271		0.5616		0.5326	
MALE OCCUPATIONS																		
Intercept	-0.0818	***	-0.0963	***	-0.2516	***	-0.4055	***	-0.3868	***	0.0252		-0.2411	***	-0.3677	***	-0.1427	***
Sex	-0.1904	***	-0.1999	***	-0.1920	***	-0.1542	***	-0.1486	***	-0.1065	***	-0.1761	***	-0.1581	***	-0.1270	***
Age	0.0874	***	0.0906	***	0.0856	***	0.0919	***	0.0900	***	0.0896	***	0.0935	***	0.0909	***	0.0897	***
age2	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0009	***	-0.0010	***	-0.0009	***	-0.0009	***
marital status	0.2636	***	0.2466	***	0.2571	***	0.2599	***	0.2651	***	0.2708	***	0.2444	***	0.2421	***	0.2211	***
years of education	0.1261	***	0.1291	***	0.1273	***	0.1293	***	0.1301	***	0.1318	***	0.1262	***	0.1305	***	0.1300	***
metropolitan area	0.0936	***	0.0994	***	0.0870	***	0.0370	***	0.0452	***	0.0045		0.0037		0.0794	***	0.0480	***
Southeast	0.1069	***	0.0114		-0.0302	***	-0.0879	***	-0.0916	***	0.0273	**	0.0004		0.0718	***	-0.0269	*
South	0.0424	***	-0.0224	**	-0.0462	***	-0.0735	***	-0.0725	***	-0.0002		-0.0354	**	0.0331	**	-0.0449	***
Northeast	-0.1037	***	-0.1778	***	-0.1954	***	-0.2142	***	-0.2397	***	-0.2071	***	-0.1990	***	-0.2049	***	-0.3484	***
Center-west	0.0981	***	0.0215	*	-0.0029		-0.0025		-0.0165		0.1176	***	0.0473	***	0.0637	***	-0.0193	
modern manufactur.	0.2042	***	0.1627	***	0.1160	***	0.2348	***	0.3031	***	0.1566	***	0.2452	***	0.1340	***	0.0721	***
traditional manufac.	-0.0663	***	-0.0884	***	-0.1286	***	-0.0292	*	0.0420	***	-0.0120		-0.0040		-0.1274	***	-0.1439	***
building construct.	-0.0875	***	-0.0832	***	-0.1982	***	-0.0578	***	0.0066		-0.0477	**	-0.0063		-0.1369	***	-0.1502	***
distributive services	-0.0319	*	-0.0359	**	-0.0735	***	0.0468	***	0.1163	***	0.0133		0.0395	*	-0.0589	***	-0.0132	
productive services	0.1192	***	0.1074	***	0.1097	***	0.2217	***	0.3041	***	0.0879	***	0.2352	***	0.1113	***	0.1437	***
personal services	-0.1857	***	-0.1980	***	-0.2414	***	-0.1312	***	-0.1471	***	-0.1777	***	-0.2183	***	-0.2907	***	-0.3662	***
social services	-0.1942	***	-0.1980	***	-0.2486	***	-0.1208	***	-0.0532	***	-0.1466	***	-0.1152	***	-0.2426	***	-0.1983	***
Government	-0.2364	***	-0.2310	***	-0.2779	***	-0.1876	***	-0.0239		-0.2080	***	-0.1617	***	-0.2902	***	-0.3519	***
full-time	-0.3577	***	-0.3458	***	-0.2466	***	-0.3309	***	-0.2705	***	-0.3507	***	-0.3949	***	-0.3405	***	-0.3657	***
Informal	-0.1603	***	-0.1672	***	-0.1732	***	-0.1954	***	-0.1801	***	0.0183	**	-0.1165	***	-0.2219	***	-0.1504	***
R^2	0.5560		0.5675		0.5603		0.5600		0.5504		0.5167		0.5082		0.5338		0.4788	

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.
Note: Levels of significance: *** = 0.01l; ** = 0.05; * = 0.10.

Table 6: Estimates of Coefficients of Earnings Equations, by the Integration Typology of Occupations, Brazil, 1981-1999

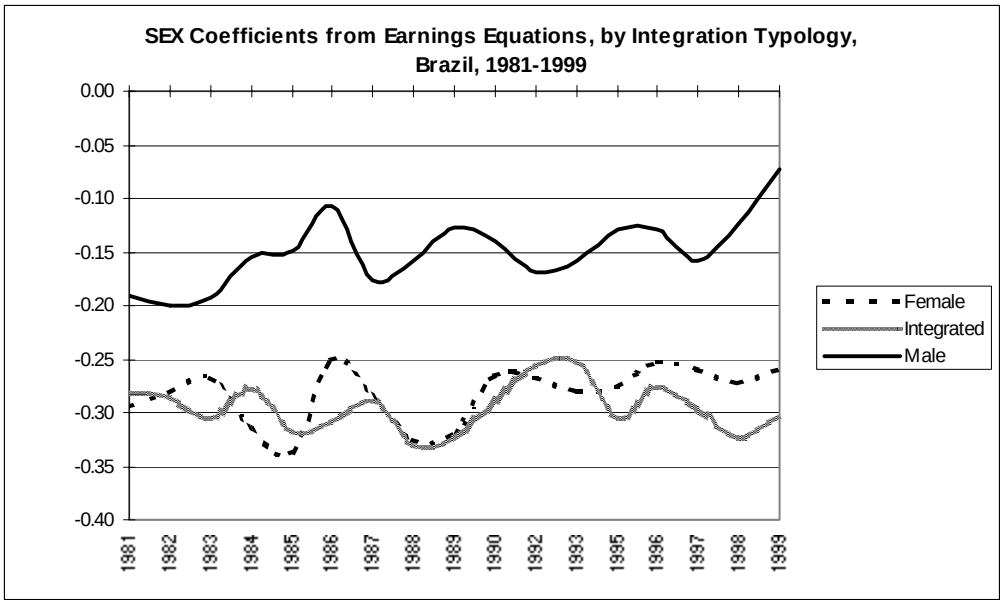
(conclusion)

	1990		1992		1993		1995		1996		1997		1998		1999	
FEMALE OCCUPAT.																
Intercept	-0.1335	***	-0.0780		0.0392		0.1426	***	0.2700	***	0.1331	***	0.1124	***	0.2278	***
Sex	-0.2663	***	-0.2681	***	-0.2801	***	-0.2769	***	-0.2528	***	-0.2604	***	-0.2732	***	-0.2593	***
Age	0.0699	***	0.0655	***	0.0665	***	0.0583	***	0.0549	***	0.0564	***	0.0588	***	0.0578	***
age2	-0.0007	***	-0.0007	***	-0.0007	***	-0.0006	***	-0.0005	***	-0.0005	***	-0.0006	***	-0.0006	***
marital status	0.1581	***	0.1218	***	0.1169	***	0.1314	***	0.1216	***	0.1120	***	0.0953	***	0.0887	***
years of education	0.1164	***	0.0979	***	0.1030	***	0.1040	***	0.1003	***	0.1003	***	0.0988	***	0.0914	***
metropolitan area	0.1598	***	0.2235	***	0.2183	***	0.2066	***	0.2067	***	0.2280	***	0.2013	***	0.1900	***
Southeast	-0.0407	***	0.2106	***	0.0414	***	0.1531	***	0.1929	***	0.2080	***	0.2021	***	0.2036	***
South	0.0523	***	0.2024	***	0.1202	***	0.1652	***	0.1989	***	0.2348	***	0.2024	***	0.1670	***
Northeast	-0.4334	***	-0.2634	***	-0.3790	***	-0.2508	***	-0.2222	***	-0.2035	***	-0.1782	***	-0.2094	***
Center-west	0.0702	***	0.1761	***	0.1447	***	0.1565	***	0.1903	***	0.1814	***	0.1703	***	0.1499	***
modern manufactur.	0.2721	***	0.1852	***	0.0931	*	0.1839	***	0.1219	***	0.1647	***	0.2234	***	0.1714	***
traditional manufac.	-0.0479		-0.0527		-0.1248	***	-0.0109		-0.1290	***	-0.0309		0.0403		-0.0932	***
building construct.	-0.0314		-0.0073		-0.1188	*	0.0532		-0.0235		0.1184	**	0.1224	**	-0.0453	
distributive services	0.0242		0.0548		-0.0296		0.0469		-0.0368		0.0347		0.0702	**	0.0010	
productive services	0.1898	***	0.2404	***	0.1137	***	0.2407	***	0.0780	**	0.2188	***	0.3028	***	0.1160	***
personal services	0.0493		0.0506		-0.0124		0.0781	**	0.0317		0.1611	***	0.2460	***	0.2238	***
social services	-0.2537	***	-0.2735	***	-0.3445	***	-0.1507	***	-0.2148	***	-0.1377	***	-0.0735	***	-0.1710	***
Government	0.0819	**	0.0238		-0.0730	*	0.2465	***	0.1688	***	0.2736	***	0.2962	***	0.2634	***
full-time	-0.3397	***	-0.3513	***	-0.3782	***	-0.4195	***	-0.4091	***	-0.4102	***	-0.4402	***	-0.4410	***
Informal	-0.0619	***	-0.2763	***	-0.2480	***	-0.0887	***	-0.0978	***	-0.1179	***	-0.1634	***	-0.1855	***
R^2	0.5560		0.5560		0.5441		0.5360		0.5049		0.5323		0.5349		0.5197	
INTEGRATED OCCUP.																
Intercept	0.0401		-0.1433	*	-0.1754	*	0.1108		0.0252		0.1250		-0.0556		-0.2629	***
Sex	-0.2887	***	-0.2562	***	-0.2526	***	-0.3058	***	-0.2762	***	-0.2965	***	-0.3234	***	-0.3031	***
Age	0.0787	***	0.0814	***	0.0767	***	0.0746	***	0.0733	***	0.0725	***	0.0747	***	0.0713	***
age2	-0.0008	***	-0.0008	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***
marital status	0.2762	***	0.1881	***	0.2137	***	0.2032	***	0.2073	***	0.1865	***	0.1646	***	0.1883	***
years of education	0.1225	***	0.1017	***	0.1150	***	0.1157	***	0.1133	***	0.1144	***	0.1153	***	0.1240	***
metropolitan area	0.0716	***	0.1064	***	0.1168	***	0.1145	***	0.0990	***	0.1598	***	0.1552	***	0.1377	***
Southeast	-0.0718	***	0.2213	***	0.0767	***	0.1482	***	0.1629	***	0.1362	***	0.1924	***	0.1962	***
South	-0.0048		0.2534	***	0.1279	***	0.1498	***	0.1676	***	0.1340	***	0.2021	***	0.2057	***
Northeast	-0.3818	***	-0.1059	***	-0.2359	***	-0.2124	***	-0.2098	***	-0.2131	***	-0.1617	***	-0.1642	***
Center-west	0.0381		0.2001	***	0.1806	***	0.1440	***	0.1485	***	0.1438	***	0.2022	***	0.1982	***
modern manufactur.	0.0178		0.0439		0.1337		-0.1006		0.0007		-0.0486		-0.0326		0.0965	*
traditional manufac.	-0.2782	***	-0.2449	***	-0.0934		-0.2730	***	-0.1372	*	-0.2537	***	-0.2353	***	-0.1115	**
building construct.	-0.0293		-0.1301		0.4198	***	0.0862		0.2907		0.0536		0.1448		0.1208	*
distributive services	-0.2097	**	-0.2517	***	-0.1182		-0.2044	***	-0.0895		-0.1798	***	-0.1070	*	-0.1021	**
productive services	0.1309		0.1535	**	0.1616	**	0.0219		0.2471	***	0.2676	***	0.3102	***	0.1812	***
personal services	0.1218		0.0803		0.1608	*	0.2834	***	0.3803	***	0.3275	***	0.3124	***	0.2534	***
social services	-0.3875	***	-0.3877	***	-0.2604	***	-0.3486	***	-0.1704	**	-0.3128	***	-0.2527	***	-0.2249	***
Government	-0.0323		-0.0160		0.1786	**	0.1006		0.3702	***	0.2772	***	0.2715	***	0.1825	***
full-time	-0.4248	***	-0.4179	***	-0.4747	***	-0.4847	***	-0.5303	***	-0.5121	***	-0.5181	***	-0.4595	***
Informal	-0.0682	***	-0.1836	***	-0.1383	***	-0.0932	***	-0.1053	***	-0.1531	***	-0.1859	***	-0.1300	***
R^2	0.5796		0.5359		0.5175		0.5526		0.5475		0.5715		0.5776		0.5511	
MALE OCCUPATIONS																
Intercept	-0.3019	***	-0.1519	***	-0.2133	***	-0.1277	***	-0.0590		-0.0848	**	-0.1377	***	-0.2130	***
Sex	-0.1403	***	-0.1696	***	-0.1587	***	-0.1283	***	-0.1296	***	-0.1584	***	-0.1230	***	-0.0722	***
Age	0.0863	***	0.0730	***	0.0757	***	0.0741	***	0.0734	***	0.0711	***	0.0710	***	0.0689	***
age2	-0.0009	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0007	***	-0.0006	***
marital status	0.2558	***	0.2100	***	0.2082	***	0.2086	***	0.2241	***	0.2059	***	0.1959	***	0.2125	***
years of education	0.1273	***	0.1097	***	0.1135	***	0.1165	***	0.1168	***	0.1139	***	0.1136	***	0.1111	***
metropolitan area	0.0390	***	0.1071	***	0.0857	***	0.1046	***	0.1081	***	0.1241	***	0.1044	***	0.0741	***
Southeast	-0.0678	***	0.1862	***	0.0731	***	0.1381	***	0.1910	***	0.1801	***	0.2159	***	0.1923	***
South	-0.0624	***	0.1389	***	0.1024	***	0.1165	***	0.1843	***	0.1575	***	0.1839	***	0.1602	***
Northeast	-0.3604	***	-0.1611	***	-0.2348	***	-0.2072	***	-0.1528	***	-0.1790	***	-0.1410	***	-0.1598	***
Center-west	-0.0106		0.1215	***	0.1329	***	0.0833	***	0.1548	***	0.1370	***	0.1490	***	0.1482	***
modern manufactur.	0.2587	***	0.2507	***	0.2486	***	0.2946	***	0.1855	***	0.2350	***	0.2647	***	0.2526	***
traditional manufac.	0.0415	*	0.0288		0.0268		0.1302	***	0.0597	**	0.0935	***	0.1369	***	0.1197	***
building construct.	0.1165	***	0.0359	*	-0.0021		0.1972	***	0.0957	***	0.1457	***	0.1857	***	0.1826	***
distributive services	0.1716	***	0.1191	***	0.0974	***	0.1971	***	0.1351	***	0.1670	***	0.2119	***	0.2234	***
productive services	0.2815	***	0.2861	***	0.3587	***	0.3867	***	0.2549	***	0.2970	***	0.3133	***	0.4290	***
personal services	-0.0967	***	-0.1102	***	-0.0443		-0.0024		-0.1386	***	0.0076		0.0474	*	0.1161	***
social services	0.0275		-0.0346		-0.0435	**	0.0438	**	-0.0359		0.0157		0.0277		0.0537	***
Government	0.0545	**	-0.0359		-0.0666	***	0.0770	***	-0.0050		0.1318	***	0.2220	***	0.2814	***
full-time	-0.3856	***	-0.4059	***	-0.4030	***	-0.4588	***	-0.5150	***	-0.4463	***	-0.4755	***	-0.4076	***
Informal	-0.1123	***	-0.2990	***	-0.2732	***	-0.1844	***	-0.1600	***	-0.2147	***	-0.2249	***	-0.2578	***
R^2	0.4936		0.4823		0.4841		0.4908		0.4661		0.4754		0.4821		0.4896	

Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.
Note: Levels of significance: *** = 0.01l; ** = 0.05; * = 0.10.

Emphasizing only the SEX coefficients, it is possible to visualize the differences between the gender effects in each of the integration types of occupations at Figure 7. Negative values of the SEX coefficients for all types of occupations reflect a gender wage gap that penalizes women in any situation. Less negative values are observed in predominantly male occupations, which indicate that, controlling for individual and occupational variables, those are the occupations where women are better off.

Figure 7



Source: Special Tabulations from Brazilian Household Sample Survey (PNAD), IBGE, 1981-99.

CONCLUDING REMARKS

Some conclusions can be highlighted. The first is associated with the time variation of occupational segregation by sex. The second is associated with the role of marital status in occupational segregation by sex. The occupational sex segregation in urban Brazilian has declined at higher levels of occupational detailing. The model of constant segregation over time was statistically rejected in the period 1981-99, but the observed decline in statistical deviance is strong enough to suggest that the model of constant segregation over time is quite persuasive to the Brazilian case. A detailed analysis of the occupational segregation by sex controlled by marital status, groups of hours worked, and sector was performed for the year 1999. This second battery of tests always rejected the hypothesis of constant segregation by marital status, groups of hours worked, and sector. Nevertheless, the decline in scaled deviance suggests that the hypothesis of constant segregation is quite appealing. In urban Brazil single workers present a lower level of occupational segregation by sex than married workers do. The role of marital status seems to carry over to groups of hours worked and sector. Marital status plays an important role among full-timers and part-timers and in the informal sector. This is an important finding that should be explored with further research. If marital status plays an important role in occupational segregation by sex, then issues of gender stereotyping and work orientations should be taken into consideration. This is a line of research to be pursued in the future.

Other line of conclusions refers to the effects of gender composition on men's and women's wages. Trying to answer the question of whether gender composition has a negative effect on male and female wages in Brazil in the last two decades, coefficients of the relation wages-FEM were estimated from cross-section regressions of the log of female and male wages, from 1981 to 1999. First, there is a non-adjusted specification, only with FEM as independent variable at the right side of the equation. Then, there is an adjusted specification of the wage equation, whose coefficients include a set of controls over the period. Positive and higher non-adjusted coefficients were found for men, while the most negative ones were found for women. Negative coefficients indicate that wages decline with the increase of the female proportion, and positive coefficients indicates the opposite. So, without controls, rather than being penalized to be in predominantly female occupations, men benefit from this situation, while women are penalized in terms of wages. This is the case that, for the whole period the gender gap would increase with the increase of the female proportion. The inclusion of education and other control variables decreases the magnitude of male coefficients and increases the female ones, accounting for a more linear wage-FEM relation. This suggests that compositional effects are very significant; that is, gender composition effects do not operate in isolation of the other structural changes. The adjusted coefficients indicate that the gender composition effect is substantial and different for men and women, showing a stable trend in the period, still male and female curves are slightly divergent. Estimates indicate that wages are lower for men and, in greater extent, for women in a predominantly female occupation than in a predominantly male occupation. Again, the gender gap increases with the increase of the female proportion and a divergent trend of men's and women's adjusted curves suggests that the gender wage gap is actually increasing.

Alternative specifications of cross-section models lead to refined inferences about the relation between wages and gender composition. Estimating separate earnings functions for each category of the integration typology of occupations, it is assumed that gender effects differ by the feminization level of the occupation. Negative values of the sex variable coefficients for all types of occupations reflect a gender wage gap that penalizes women in any situation. Less negative values are observed in predominantly male occupations, which indicate that, controlling for individual and occupational variables, those are the occupations where women are better off.

The analysis of the pervasiveness of occupational segregation by gender and its persistence over time in Brazil and the examination of the linkage between segregation and earnings disparities represents an initial foray into establishing empirical links between changes in occupational segregation by sex and the earnings gap between men and women. These conclusions can be used to add alternative perspectives to the debate about gender inequalities in the Brazilian labor market and appropriate policies to deal with it.

DATA SETS, GLOSSARY AND DEFINITIONS

Data Sets: Demographic Household Surveys (PNADs) from 1981, 1982, 1983, 1984, 1985, 1986, 1987,1988, 1989, 1990, 1992, 1993, 1995, 1996, 1997, 1998 and 1999 of the Brazilian Census Bureau (IBGE). Special tabulation generated from the magnetic data.

Sample: Economically active men and women in non-agricultural occupations in urban areas; with non-missing information.

Marital Status:

Married: all men and women in union - heads of the household or married to a household head.

Single: all men reported as sons in the households and all women reported as daughters in the households; and single household heads.

Groups of Hours of Work:
Full Time Workers: Men and women that work more than 30 hours per week; including teachers, whose threshold is 15 hours.
Part Time Workers: Men and women that work 30 hours or less per week.

Sector:
Formal Workers: Men and women employed as wage laborers covered by the social security card, employees in the public sector and employers.
Informal Workers: Men and women employed as wage laborers not covered by the social security card and self-employed men and women.

REFERENCES

Anker, R. and Hein, C. 1986. *Sex Inequalities in Urban Employment in the Third World*. New York: St. Martin's Press.

Anker, R. 1997. Theories of Occupational Segregation by Sex: An Overview. *International Labor Review*, 136(3).

Baker, Michael; Nicole M. Fortin. 1999. Occupational Gender Composition and Wages in Canada: 1987-1988. *NBER Working Paper # 7371*.

Bianchi, S.M. and Rytina, N. 1986. The Decline in Occupational Sex Segregation during the 1970's. *Demography*, 23(1): 79-86.

Bielby, W.T. and Baron, J.N. 1986. Men and Women at Work: Sex Segregation and Statistical Discrimination. *American Journal of Sociology*, 91(4): 759-99.

Blau, Francine D.; Patricia Simpson; Deborah Anderson. 1998. Continuing Progress? Trends in Occupational Segregation in the United States over the 1970's and 1980's. *NBER Working Paper # 6716.*

Charles, M. 1992. Cross-National Variation in Occupational Sex Segregation. *American Sociological Review*, 57: 483-502.

Charles, M. and Grusky, D.B. 1995. Models for Describing the Underlying Structure of Sex Segregation. *American Journal of Sociology*, 100 (4): 931-71.

Duncan, O.D. and Duncan, B. 1955. A Methodological Analysis of Segregation Indices. *American Sociological Review*, 20: 210-17.

England, P. 1981. The Failure of Human Capital Theory to Explain Occupational Sex Segregation. *Journal of Human Resources*, 17: 358-70.

_____. 1992. *Comparable Worth: Theories and Evidence*. New York: Aldine Gruyter.

England, Paula; George Farkas; Barbara S. Kilbourne; Thomas Dou. 1988. Explaining Occupational Sex Segregation and Wages: Findings from a Model with Fixed Effects. *American Sociological Review*, 53(4): 544-58.

Goldin, C. (1990) *Understanding the Gender Gap*. New York: Oxford University Press.

Groshen, Erica L. 1991. The Structure of the Female/Male Wage Differential: Is it Who You Are, What You Do, or Where You Work? *Journal of Human Resources*, 26(3): 457-72.

Grusky, D.B. and Charles, M. (1998) 'The Past, Present, and Future of Sex Segregation Methodology". *Demography*, 35(4): 497-504.

Hakim, C. 1992. Explaining Trends in Occupational Segregation: the Measurement, Causes and Consequences of the Sexual Division of Labor. *European Sociological Review*, 8(2): 127-52.

_____. 1993. Segregated and Integrated Occupations: a New Approach to Analyzing Social Change. *European Sociological Review*, 9(3): 289-314.

Hansen, Jörgen; Roger Wahlberg. 2000. *Occupational Gender Composition and Wages in Sweden.* (manuscript)

IBGE. 2001. *Síntese de Indicadores Sociais.* Rio de Janeiro: IBGE.

Jacobs, J.A. 1989. Long-Term Trends in Occupational Segregation by Sex. *American Journal of Sociology*, 95: 160-73.

Jacobsen, J.P. 1994. *The Economics of Gender*. Cambridge, MA: Blackwell Publishers.

Kilbourne, Barbara S.; George Farkas; Kurt Beron; Dorothea Weir; Paula England. 1994. Returns to Skill, Compensating Differentials, and Gender Bias: Effects of Occupational Characteristics on the Wages of White Women and Men. *American Journal of Sociology*, 100(3):689-719.

Kon, Anita. 1995. *A Estruturação Ocupacional Brasileira: Uma Abordagem Regional.* Brasília: SESI.

MacPherson, David A.; Barry T. Hirsch. 1995. Wages and Gender Composition: Why Do Women's Jobs Pay Less? *Journal of Labor Economics*, 13(3): 426-71.

Miller, Paul W. 1987. The Wage Effect of the Occupational Segregation of Women in Britain. *The Economic Journal*, 97(388): 885-96.

Oliveira, A.M.H.C. 1997. *A Segregação Ocupacional por Sexo no Brasil*. Master's Thesis, CEDEPLAR/UFMG-Brazil.

Petersen, Trond; Morgan, Laurie. 1995. Separate and Unequal: Occupation-Establishment Sex Segregation and the Gender Wage Gap. *American Journal of Sociology*, 101(2): 329-65.

Polachek, Solomon W. 1981. Occupational Self-Selection: A Human Capital Approach to Sex Differences in Occupational Structure. *Review of Economics and Statistics*, 63(1): 60-69.

Presser, H.B. and Kishor, S. 1993. Economic Development and Occupational Sex Segregation in Puerto Rico. *Population and Development Review*, 17: 53-85.

Psacharopoulos, G. and Tzannatos, Z. 1992. *Women's Employment and Pay in Latin America: Overview and Methodology*. Washington, D.C.: The World Bank.

Reskin, Barbara F.; Roos, Patricia A. 1990. *Jobs Queues, Gender Queues: Explaining Women's Inroads into Male Occupations*. Philadelphia: Temple University Press.

Reskin, B.F., Padavik, I. 1994. *Women and Men at Work***.** Thousand Oaks, CA, Pine Forge Press.

Rios-Neto, Eduardo L.G.; Oliveira, Ana M.H.C. "Occupational Sex Segregation in Brazil: Marital Status and Market Work Flexibility". Paper presented at "Women in the Labour Market in Changing Economies: Demographic Issues" IUSSP Seminar, Rome, September 1999.

Robinson, Derek. 1998. Differences in Occupational Earnings by Sex. *International Labour Review*, 137(1): 3-31.

Semyonov, M. 1980. The Social Context of Women's Labor Participation: Comparative Analysis. *American Journal of Sociology*, 86:534-50.

Semyonov, M., Scott, R.I. 1983. Industrial shifts, female employment, and occupational differentiation: the dynamic model for American cities, 1960-1970. *Demography*, 20(2): 163-176.

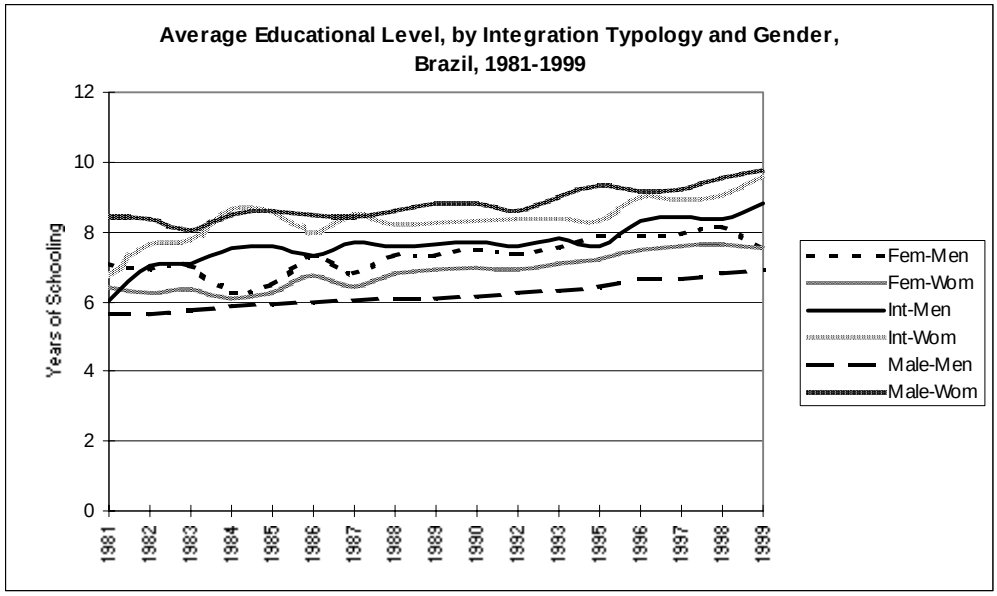
Tienda, M., Smith, S.A. and Ortiz, V. 1987. Industrial Restructuring, Gender Segregation and Sex Differences in Earnings. *American Sociological Review*, 52: 195-210.

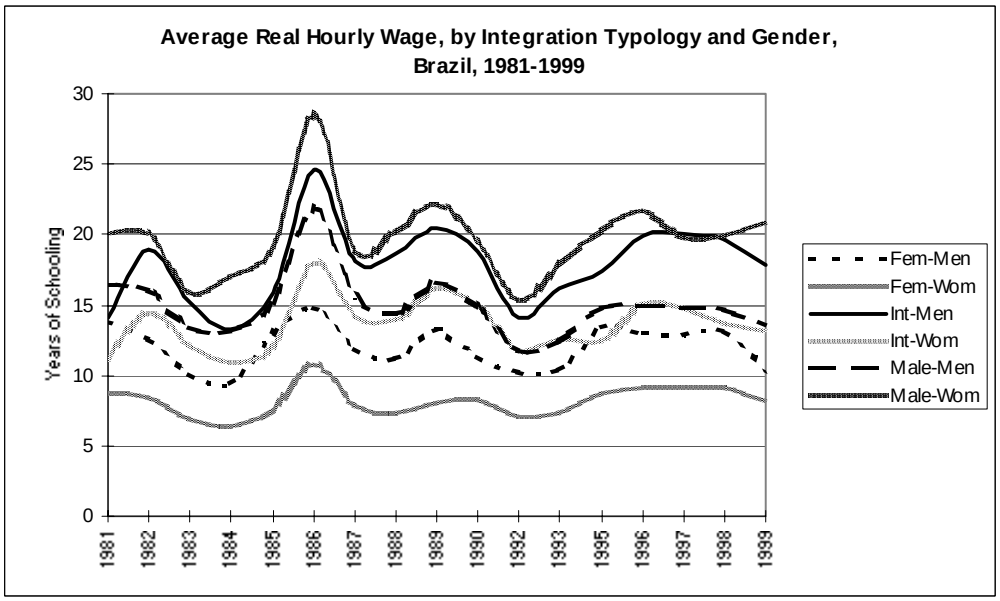
Tomaskovic-Devey, D. 1993. *Gender and racial inequality at work: the sources and consequences of job segregation.* New York, Ithaca Press.

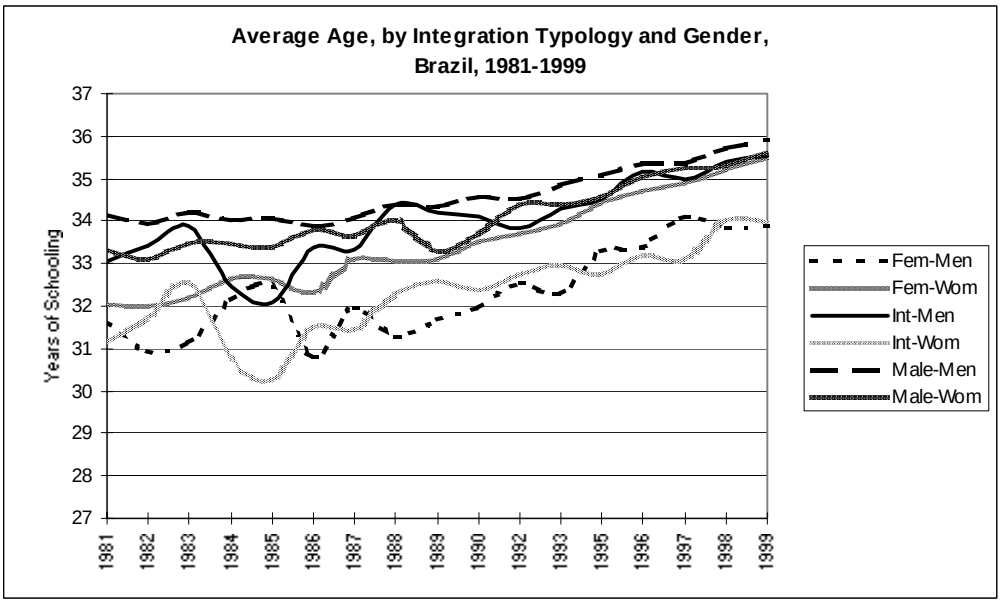
Weeden, K.A. 1998. "Revisiting Occupational Sex Segregation in the United States, 1910-1990: Results from a Log-linear Approach". *Demography*, 35(4): 475-487.

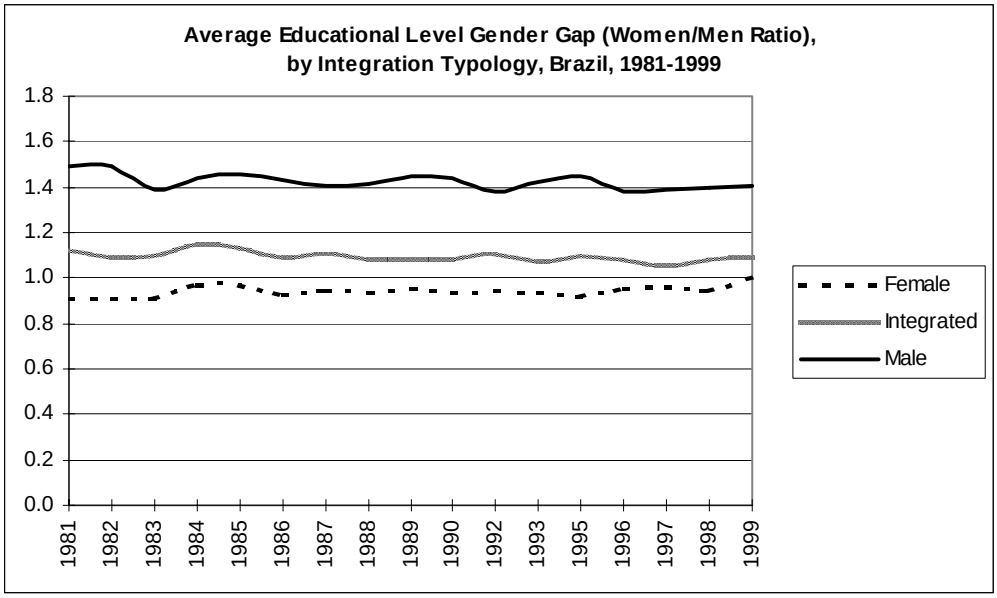
Williams, G. 1979. The changing U.S. labor forces and occupational differentiation by sex. *Demography*, 16(1): 73-87.

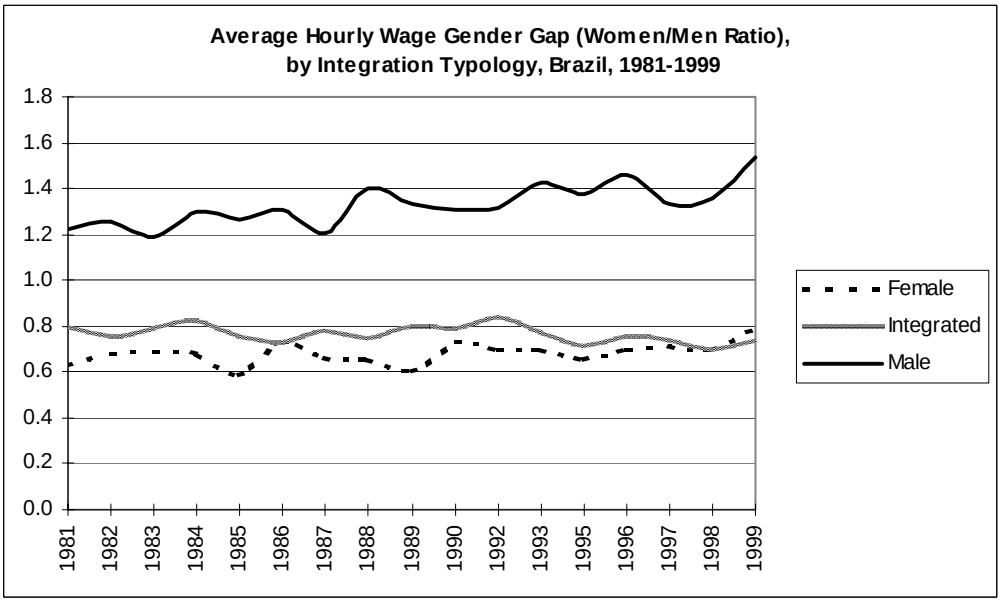
Appendix: Descriptive Features of Occupations, by the Integration Typology, Brazil, 1981-99

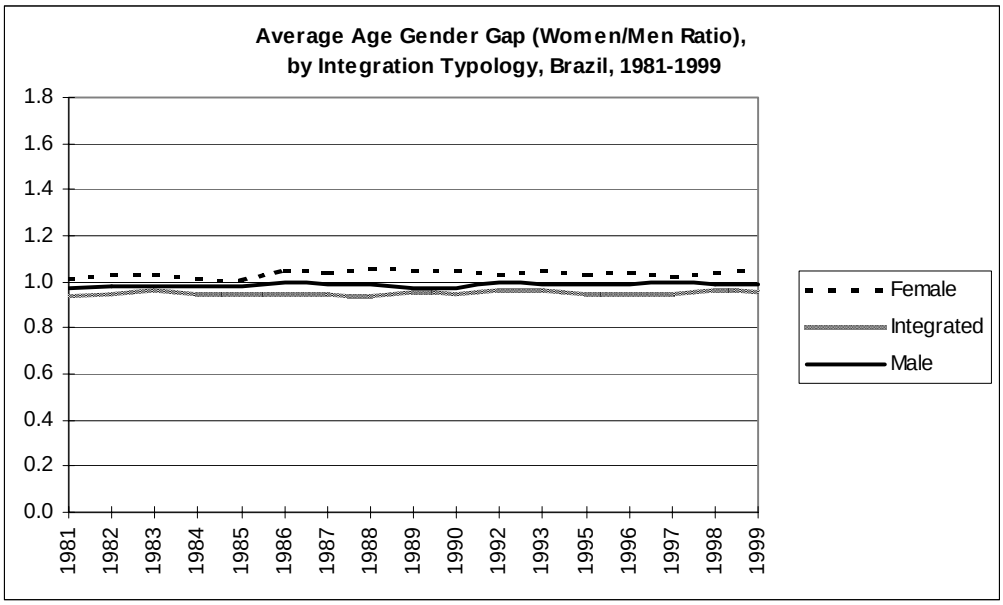





Average Age, by Integration Typology and Gender, Brazil, 1981-1999
Years of Schooling
37
36
35
34
33
32
31
30
29
28
27
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1992
1993
1995
1996
1997
1998
1999
Fem-Men
Fem-Wom
Int-Men
Int-Wom
Male-Men
Male-Wom


Average Educational Level Gender Gap (Women/Men Ratio),
by Integration Typology, Brazil, 1981-1999
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1992
1993
1995
1996
1997
1998
1999
Female
Integrated
Male


Average Hourly Wage Gender Gap (Women/Men Ratio),
by Integration Typology, Brazil, 1981-1999
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1992
1993
1995
1996
1997
1998
1999
Female
Integrated
Male


Average Age Gender Gap (Women/Men Ratio),
by Integration Typology, Brazil, 1981-1999
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1992
1993
1995
1996
1997
1998
1999
Female
Integrated
Male