

**Associations of changes in age-education structure  
with earnings of female and male workers in Brazil**  
Ernesto Amaral<sup>1</sup> (amaral@tamu.edu), Guilherme Gonçalves<sup>2</sup>,  
Samantha Faustino<sup>2</sup>, Madeline Pye<sup>1</sup>

### **Objective**

Our aim is to analyze how the age-education structure of female and male workers affected female and male earnings in Brazil between 1991 and 2010. Previous studies considered earnings of male workers, but they did not include earnings of female workers.

### **Background**

An increase in female labor force participation could contribute to reducing economic inequality. In Brazil, an increase in female participation in the labor market has been occurring since the 1970s. This increase occurred regardless of age, race, marital status, socioeconomic status, or region of residence.

Even with these improvements, gender inequality continues to be a serious social problem in Brazil. Women earn less than men, even controlling for education. While differences in income have not been eliminated, they have been significantly reduced, especially within the formal labor market.

### **Data and methods**

We analyze data from the 1991, 2000, and 2010 Brazilian Demographic Censuses. We aggregated the microdata in cells by micro-region, sex, age, education, and year. We estimated: (1) the logarithm of mean real hourly earnings from main occupation; and (2) the distribution of men and women by age-education groups in each year and micro-region. We introduced area fixed-effects in order to consider regional disparities around the country. We also estimated ordinary least squares regressions, which resulted in similar results as the ones from fixed-effects models.

### **Preliminary results**

Overall, women experience higher negative effects related to cohort size than men between 1991 and 2010. Proportions of women by age-education groups had positive and negative associations with female earnings. Negative coefficients are observed in 0–4 and 9+ education groups. This result might be a sign that women in lower-paying jobs (0–4 education group) and upper-paying jobs (9+) are experiencing competition in the labor market, compared to women in middle-paying jobs (5–8). However, these results are not statistically significant.

Distribution of males by age-education groups had positive effects on male earnings, with significant results experienced mostly by those above 25 years of age. The strongest positive magnitudes are observed for age-education groups from 25–34 age group with 9+ years of schooling to 50–64 age group with 5–8 years of schooling. Only proportion in the 50–64 age group with 9+ years of schooling had a negative coefficient among men.

### **Final considerations**

Estimation of models with sex-age-education groups was an improvement on previous studies. However, there are many non-employed women who do not compete with employed women in the job market. Our present model has endogenous estimates, because the proportion of women in the sex-age-education groups does not consider women who are not competing in the job market.

Future improvements of this model should consider the correlation that is present between female and male shares to better estimate trends on earnings. The number of children ever born, the level of education, and socioeconomic status influence women's decisions to participate in the labor market. Thus, it is necessary to use instrumental variables to correct information on females who are economically active within the population before these independent variables are included in the models. The new distribution of employed women, estimated with instrumental variables, would not be influenced by individual characteristics of women.

---

<sup>1</sup> Texas A&M University.

<sup>2</sup> Universidade Federal de Minas Gerais, Brazil.

**Table 1. Fixed-effects estimates on the logarithm of mean real hourly earnings of women and men (dependent variable), Brazil, 1991, 2000, and 2010**

Variables	Coefficients (standard errors)	
Constant	-1.529 (1.714)	
<b>Year</b>		
1991	ref.	
2000	0.341*** (0.0131)	
2010	0.589*** (0.0306)	
<b>Age-education indicators</b>	<b>Males</b>	<b>Females</b>
15-24 years; 0-4 years of schooling	ref.	-0.230*** (0.0105)
15-24 years; 5-8 years of schooling	0.306*** (0.0105)	0.0589*** (0.0105)
15-24 years; 9+ years of schooling	0.717*** (0.0105)	0.543*** (0.0105)
25-34 years; 0-4 years of schooling	0.360*** (0.0105)	0.0433*** (0.0105)
25-34 years; 5-8 years of schooling	0.818*** (0.0105)	0.424*** (0.0105)
25-34 years; 9+ years of schooling	1.330*** (0.0105)	1.024*** (0.0105)
35-49 years; 0-4 years of schooling	0.561*** (0.0105)	0.158*** (0.0105)
35-49 years; 5-8 years of schooling	1.195*** (0.0105)	0.640*** (0.0105)
35-49 years; 9+ years of schooling	1.840*** (0.0105)	1.341*** (0.0105)
50-64 years; 0-4 years of schooling	0.630*** (0.0105)	0.281*** (0.0105)
50-64 years; 5-8 years of schooling	1.388*** (0.0106)	0.801*** (0.0107)
50-64 years; 9+ years of schooling	2.121*** (0.0106)	1.519*** (0.0106)
<b>Distribution of people by age-education groups</b>	<b>Males</b>	<b>Females</b>
15-24 years; 0-4 years of schooling	3.234* (1.817)	-0.189 (1.712)
15-24 years; 5-8 years of schooling	2.821 (1.902)	0.177 (1.797)
15-24 years; 9+ years of schooling	2.784 (2.026)	-1.339 (1.803)
25-34 years; 0-4 years of schooling	3.156* (1.783)	2.667 (1.801)
25-34 years; 5-8 years of schooling	0.195 (1.881)	1.175 (2.096)
25-34 years; 9+ years of schooling	7.416*** (1.927)	-3.097 (1.976)
35-49 years; 0-4 years of schooling	6.372*** (1.714)	-2.118 (1.839)
35-49 years; 5-8 years of schooling	4.406** (2.171)	2.476 (2.063)
35-49 years; 9+ years of schooling	4.274** (1.899)	-0.498 (1.985)
50-64 years; 0-4 years of schooling	5.184*** (1.870)	1.088 (1.762)
50-64 years; 5-8 years of schooling	7.473*** (2.521)	3.302 (2.707)
50-64 years; 9+ years of schooling	-6.572*** (2.236)	0.0900 (2.308)
Number of observations	35,740	
Number of groups	502	
Fraction of variance due to area fixed effects	0.6510	
F-test (49, 35189): all coefficients=0	3,499.21***	
F-test (501, 35189): area fixed effects=0	11.47***	

\* Significant at p<0.1; \*\* Significant at p<0.05; \*\*\* Significant at p<0.01.

Source: 1991, 2000, and 2010 Brazilian Demographic Censuses.