The Evolution of Gender and Racial Occupational Segregation in Brazil - 1987 to 2006: Differences between Formal and non-Formal Labour markets

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Motivation and Aim

- Why Occupational Segregation and Informality?
- Studies of occupational segregation have been surprisingly rare in developing countries
- Lack of sufficiently detailed and complete data
- Disaggregating into the formal and non-formal labour markets: preliminary insights into the possible importance of formal labour market policies and institutions in shaping outcomes

**Aim** To provide a unique analysis of the evolution of gender and racial occupational segregation in Brazil from 1987 to 2006 across formal and non-formal labour markets, while also providing important new insights into the forces driving these changes
Contributions of the paper

- Introduction of a **harmonized reclassification** of occupations drawn from the Brazilian national household surveys (*the Pesquisa Nacional por Amostra do Domicílios* - PNAD) from 1987 to 2006
- Analysis of the Brazilian occupational **structure** and **segregation** over time
- Both by **gender** and **racial** segregation
- For the labour market as a whole, and by the **formal, informal** and **self-employed** labour markets
- Disaggregating by several **key characteristics** of the labour force (demographic, educational, sectoral and spatial patterns)
- **Decomposition** of changes in segregation over time (Deutsch et al 2009)
Main findings

- **Gender segregation** is considerably greater than racial segregation, but **racial segregation** has been more persistent over time and has several features that make it comparatively worrisome.

- While occupational segregation is declining by both gender and race, the decline has been greater in the **formal** labour market.

- Changes in the **internal gender and racial composition** of occupations have driven improvements over time among all sectors.

- Changes in the **occupational structure** have contributed to increasing levels of segregation, though this effect is concentrated entirely in the non-formal labour markets.
Structure of the presentation

1. Literature review
2. The Construction of the new harmonized Occupational Classification
3. Background: Brazilian Occupational Structure
4. Measuring Occupational Segregation over time
5. Decomposition of changes in segregation over time
6. Conclusions
Literature review on Occupational segregation

- 25 studies that measure occupational segregation in individual countries; the majority focus on **gender** occupational segregation and only three look at developing countries (Oliveira 2001, Calonico and Nopo 2007, Castro and Reilly 2011)

- Looking **jointly at gender and racial** segregation only on developed countries (Albelda 1986, King 1992 for U.S. and Neumann 1994, 1998 for Israel)

- Adopting a **cross-country perspective** (Blackburn et al 1993, Charles and Grusky 1995, Melkas and Anker 1997, Semyonov and Jones 1999, Anker et al 2003, Deutsch et al 2005 and Deutsch and Silber 2005); only two consider experiences in developing countries

- **For Brazil**: extensive research on wage discrimination (see among others, Arcand and Hombres 2004, Arias et al 2004, Carvalho et al 2006), but the only empirical study on gender occupational segregation is Oliveira (2001)
- in productive terms - micro-entrepreneurs, families engaged in small businesses, precarious and unskilled workers
- in legal terms - illegal and tax-avoiding activities

Measurement of informality:
- informal workers are those workers without signed work cards, the *carteira de trabalho* (Carneiro 1997, Soares 2004, Ulyssea 2006)
- the Brazilian informal market is large → 50% or more of the total labour force (Urani 1996, Carneiro 1997, Soares 2004, Bosch et al 2007, Ramos and Ferreira 2005)
- For some studies informality has increased over time, e.g. by 10% during the 1990s (Bosch et al 2007); however, Ramos and Ferreira (2005) argue that this increase of informality is confined to urban areas and the manufacturing sector
- Both formal and informal labour markets are highly pro-cyclical and strictly interrelated (*job-to-job dynamics*)
New Classification of Occupational Codes

- **Major break** in the data on occupations since 2001; previous studies focus on years prior to the change (Oliveira 2001, Machado et al 2003)

- Previous re-classification efforts:
  - The previous most detailed occupations’ re-classification using the PNAD is Osorio (2008): 46 2-digit occupational codes from 1986 to 2006

- **Our classification**: 80 codes at 3-digit, 26 at 2-digit, 10 at 1-digit

- It is harmonized to ISCO-08 (international classification); conversion of profession-based Brazilian classification system into the more skill-oriented international system (Muendler et al 2004)
### Occupational classification at 1-digit level

<table>
<thead>
<tr>
<th>Major Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Legislators, Senior Officials and Managers</td>
</tr>
<tr>
<td>2</td>
<td>Professionals</td>
</tr>
<tr>
<td>3</td>
<td>Technicians and Associate Professionals</td>
</tr>
<tr>
<td>5</td>
<td>Service Workers and Shop and Market Sales Workers</td>
</tr>
<tr>
<td>6</td>
<td>Skilled Agricultural and Fishery Workers</td>
</tr>
<tr>
<td>7</td>
<td>Craft and Related Trades Workers</td>
</tr>
<tr>
<td>8</td>
<td>Plant and Machine Operators and Assemblers</td>
</tr>
<tr>
<td>9</td>
<td>Elementary Occupations</td>
</tr>
<tr>
<td>0</td>
<td>Armed Forces</td>
</tr>
</tbody>
</table>
Background: the Brazilian Occupational Structure

Our sample

- Data: *the Pesquisa Nacional por Amostra do Domicílios* (PNAD) - 1987 to 2006
- Employed labour force in the entire national labour market (all five regions of Brazil and both rural/urban areas) aged 15-65 divided by:
  - formal sector: private sector employees with signed labour cards, domestic workers with signed labour cards and civil servants
  - informal sector: private sector employees and domestic workers without a signed labour card
  - self-employed sector: individuals working for themselves
- Drop military forces and employers; drop 'zero wage' observations
i) the informal and self-employed sectors cover more than half of the entire sample across all twenty years

ii) the distribution of workers across these three sectors has remained nearly constant over time
i) noticeable increase of women, although still underrepresented
ii) non-white workers' share exceed the share of white workers from 2003
Both women and non-whites continue to be overrepresented in the informal sector
⇒ particularly non-white women (roughly six p.p. of increase)
Distribution of female workers across occupations
Distribution of non-white workers across occupations

**Non-white workers - 1987**
- cod. 512 - Housekeeping and restaurant services workers
- cod. 612 - Agricultural workers – self-employed excluded
- cod. 613 - Crop and animal producers – self-employed
- cod. 712 - Building frame and related trades workers
- cod. 522 - Shop salespersons and demonstrators

**Non-white workers - 2006**
- cod. 512 - Housekeeping and restaurant services workers
- cod. 522 - Shop salespersons and demonstrators
- cod. 612 - Agricultural workers – self-employed excluded
- cod. 613 - Crop and animal producers – self-employed
- cod. 514 - Other personal services workers
Occupations in which each group is employed have remained relatively stable:
- female labour force participation directed at the same economic sectors (primarily in the tertiary sector)
- non-white workers move into all sectors, but mainly in tertiary
  ⇒ new female and non-white workers have largely been employed in the tertiary sector

Women tend to be more concentrated in a few occupations, while non-whites are more homogenously distributed

Non-formal employment concentrated in a smaller number of occupations, but the difference is less than expected → informality does not simply exist in marginal sectors

Both gender and racial concentration within occupations is declining over time
Measuring Occupational Segregation over Time

Indices of occupational segregation

- **Duncan and Duncan index**
  
  \[
  I_D = \frac{1}{2} \sum_{i=1}^{n} \left| \frac{F_i}{F} - \frac{M_i}{M} \right|
  \]

- **Karmel and Maclachlan index**
  
  \[
  I_{KM} = \frac{1}{2} \sum_{i=1}^{n} \left| \alpha \frac{F_i}{F} - (1 - \alpha) \frac{M_i}{M} \right| \quad \alpha = \frac{F}{T}
  \]

- **Gini concentration index**
  
  \[
  I_G = \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \left| \frac{F_i}{F} - \frac{F_j}{M} \right| \frac{M_i}{M} \frac{M_j}{M}
  \]

- The standard errors are computed using the bootstrapping technique based on 500 replications (Efron and Tibshirani 1991, 1993)
Measuring Occupational Segregation over Time
Segregation across Formal and Non-Formal Sectors

Duncan indices over time

Duncan index by gender

Duncan index by race
• Gender occupational segregation is greater than racial occupational segregation

• Gender segregation is generally more severe in non-formal sectors, while for racial segregation the trends are more mixed

• Overall levels of segregation are declining: this decline has been much more pronounced for gender segregation, and in the formal sector

• From the beginning of the 1990s racial segregation has increased in the informal sector
Decomposition of changes in Segregation over time

The decomposition methodology

- It decomposes changes of segregation measures between three sources of variation:

\[ \Delta I = C_{\Delta is} + C_{\Delta h} + C_{\Delta t} \]

- ’variation in the internal structure’: changes in the internal gender or racial composition within each occupation (also called ’net segregation’)
- ’variation in the margins’: changes in the relative weights of occupations or changes in the shares of sub-populations groups in the total labour force
- The standard errors of each component are computed using the bootstrapping technique based on 500 replications.
Decomposition of changes in Segregation over time
Empirical Findings across Formal and Non-formal labour markets

Contribution of different components in declining segregation (%)

- Segregation decline is driven by 'variations in the internal structure'
- Changes in occupations’ weights have contributed to increasing segregation only in the non-formal labour markets
Decomposition of changes in Segregation over time
Empirical Findings across Formal and Non-formal labour markets

- Segregation decline driven by 'variations in the internal structure'
  - Most female dominated occupations have experienced a decreasing female share over time, e.g. teachers and clerks
  - Growing share of non-whites in white dominated professions, e.g. life science and health professionals and teachers
- Negative contribution of the occupational structure concentrated in the non-formal labour markets
  - The most female dominated and largest occupations, led by housekeepers and restaurant workers, has grown mainly in the informal sector
  - Same for the most non-white dominated occupations, led by housekeepers and restaurant workers and non self-employed agricultural occupations
Conclusions

⇒ Does disaggregating the formal and non-formal sectors provide preliminary insights on the impact of labour market policies (ADL)?

- Segregation is declining more rapidly in the formal sector → it is only in the regulated market that we expect ADL to play a role

- Changes in occupational structure have contributed to increase segregation in non-formal sectors → ADL may reduce segregation when it is enforced, but segregated occupations may simply choose to function in the informal sector

- Further step: to estimate the impact of ADL on occupational segregation exploiting the variation over time and across states