# Occupational gender segregation in post-apartheid South Africa

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# Motivation

- South Africa: dysfunctional labor market with **low employment rates** among women and black Africans.

- Apartheid left South Africa with large **racial inequalities** with blacks facing:
  - Higher poverty and deprivation (Gradín, 2013)
  - Lower employment rates and wages (e.g. Rospabé, 2002)
  - Lower occupational attainment (e.g. Treiman et al., 1996)
  - Occupational segregation of blacks into low-paying occupations (Gradín, 2019)

- … but also affected **gender equality**, temporary migration of black men (Gelb, 2004):
  - Disruption of family life: Women had to fulfil the role of both breadwinner and care giver in challenging circumstances of high unemployment and HIV/AIDS prevalence, with very limited economic opportunities (Budlender and Lund, 2011).

# Previous literature on gender inequality

- Growing **feminization** of the labor force after apartheid, with **higher unemployment/self-employment** (Casale and Posel, 2002; Posel, 2014)

  – lower marriage rates, higher education, non-discriminatory legislation.

- **Compared with men**, South African women face:

  – lower employment rates (e.g. Leibbrandt et al., 2010)
  – lower earnings (e.g. Burger and Yu, 2007; Wittenberg, 2014)
  – and none of them is fully explained by their different endowments.
  – Women also tend to be over-represented at both, the **bottom** (e.g. domestic service) and **top** (e.g. professionals) of skills categories (Winter, 1999; Rospabé, 2001).

# Previous literature on gender inequality

- Much less about gender **occupational segregation** or **stratification**:

  – Occupational attainment (Rospabé, 2001); Occupational segregation (Parashar, 2008).

- Occupational **segregation** by **race**:

  – The labor market is still strongly stratified by race with blacks systematically overrepresented at the lowest-paying occupations,

  – … even after controlling for the differences by population group in education and other observed characteristics of workers (Gradín, 2019).

- **Aim:** To **extend the analysis** of **segregation and stratification** of occupations to **gender** in post-apartheid South Africa.

# Data

- **Census:** 1996 and 2001 Census, and 2007 Community Survey from **IPUMS-I** (MPC, U. Minnesota)

- **Labor force surveys:** South Africa - Post Apartheid Labour Market Series (**PALMS**, DataFirst-UCT) 1994-2015, combining different StatsSA surveys.
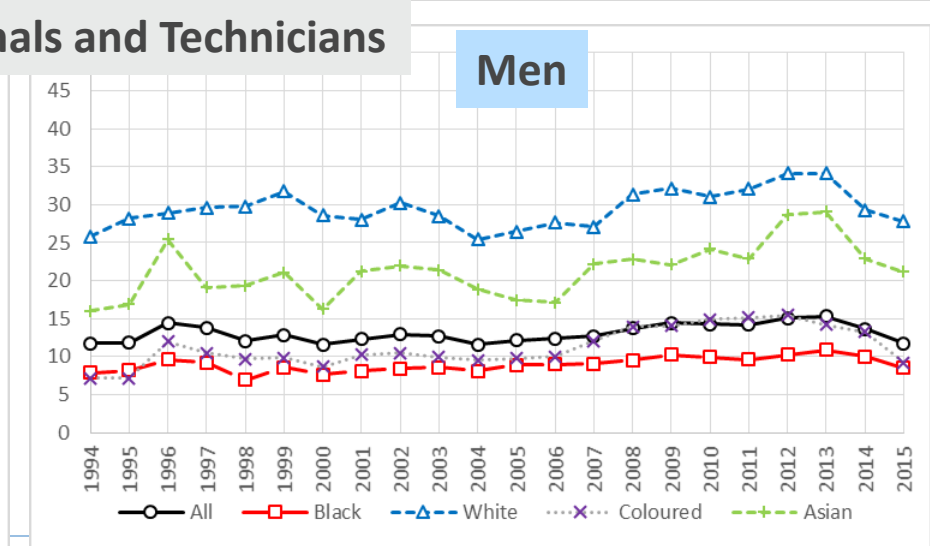
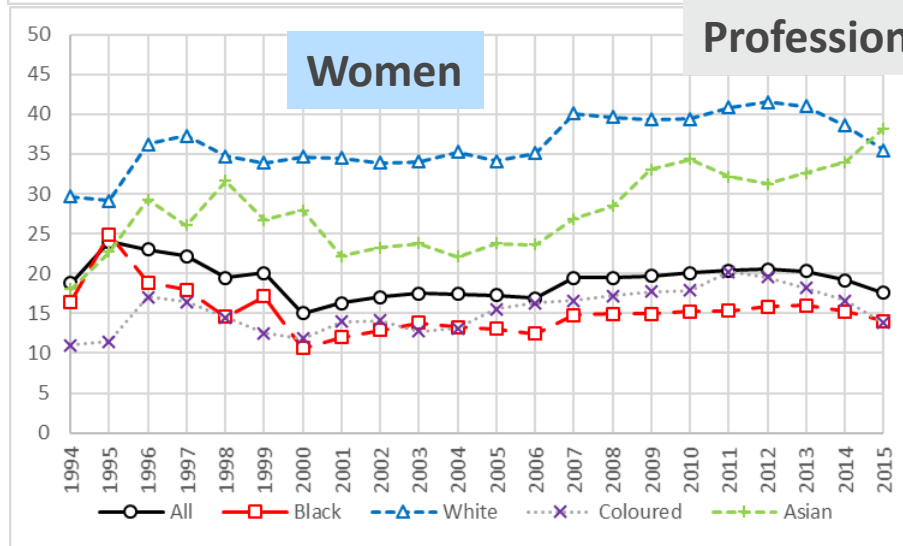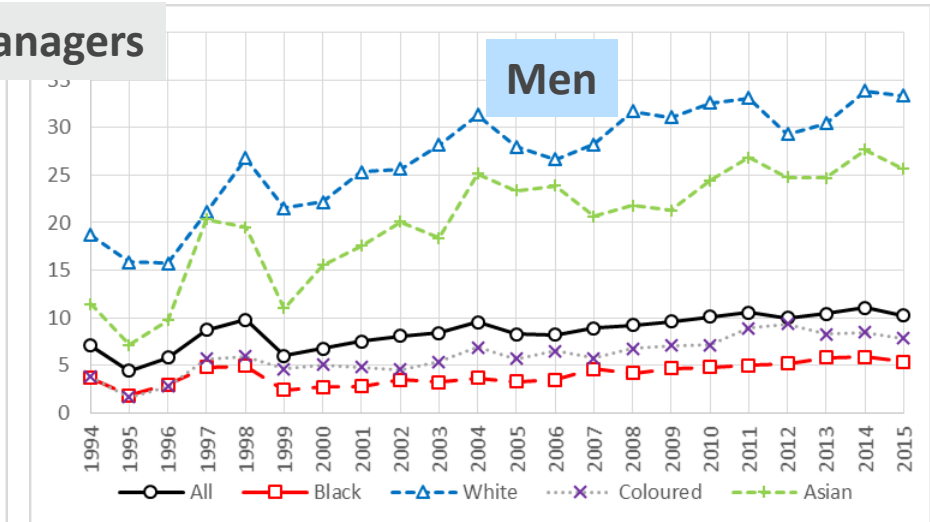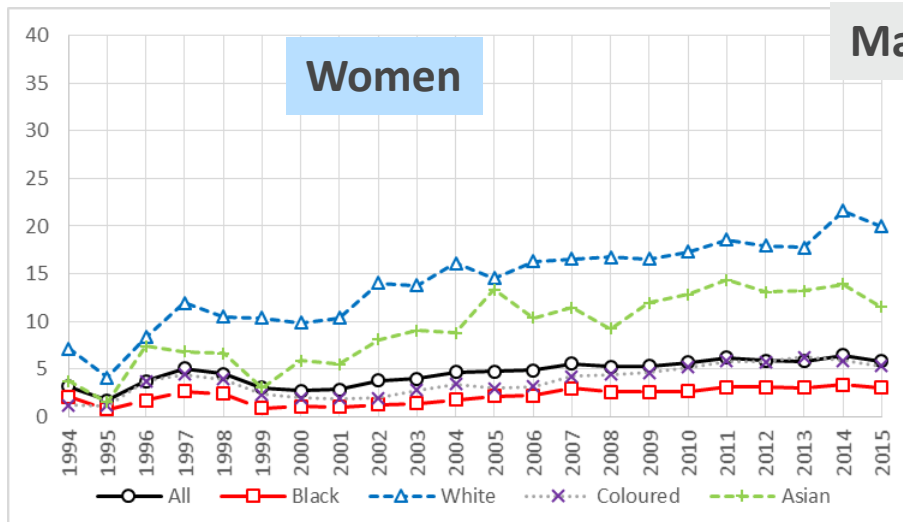**Sample:** 16-65 employed workers (not in the Armed Forces).
**Occupations:** 3-digit ISCO-1988 (In census: IPUMS version).
**Earnings:** income before taxes (midpoint interval) in census; real earnings in LFS.
**Worker characteristics**: province, area of residence, marital status, race, age, attained education, disability, immigration.
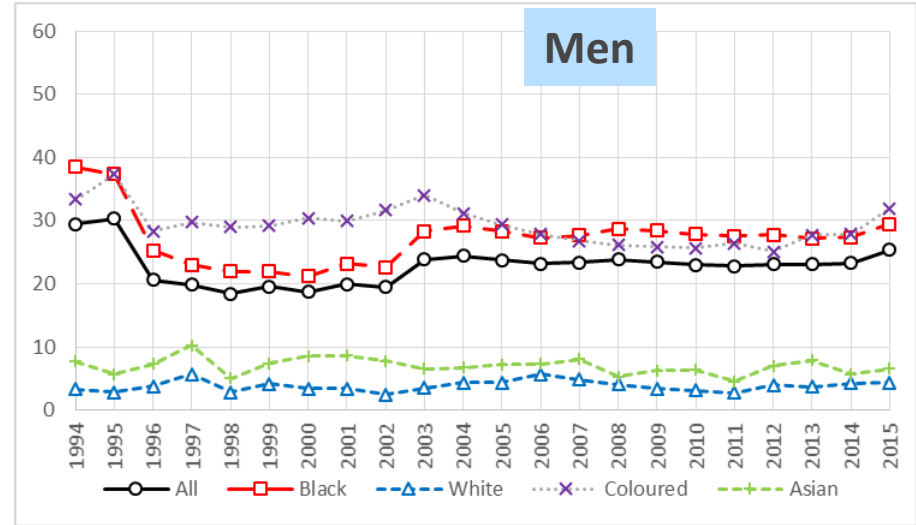
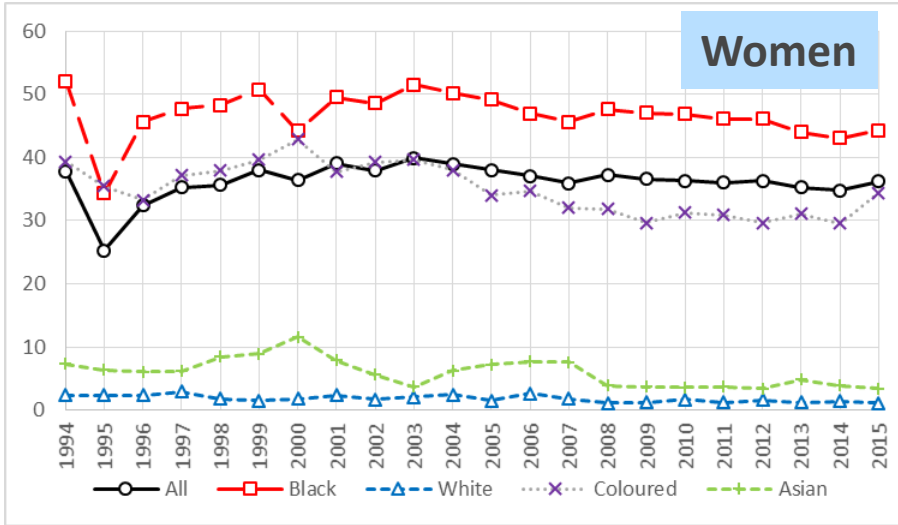Relevant issues regarding the codification of jobs by occupations, reporting of earnings, or the % of domestic help workers.

# Gender, race, and occupations

Managers

Women — Men

Professionals and Technicians

Women — Men

Legend (all four charts): All, Black, White, Coloured, Asian
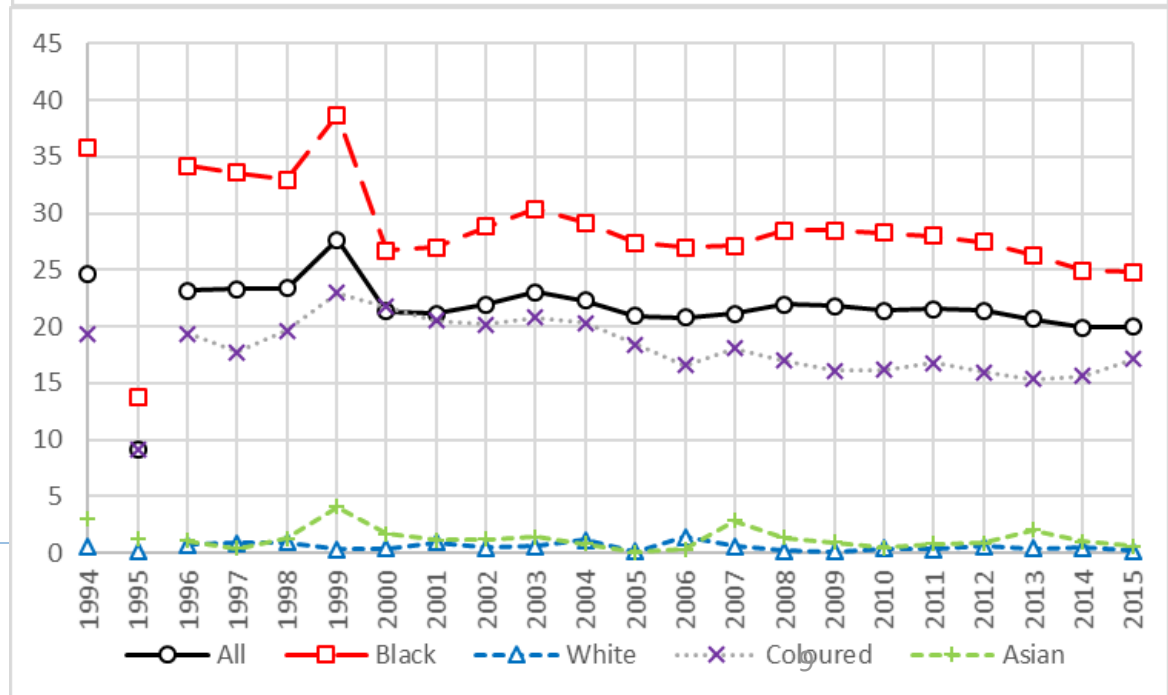
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# Elementary occupations

## Labor Force Surveys (PALMS)

**% women in domestic service**
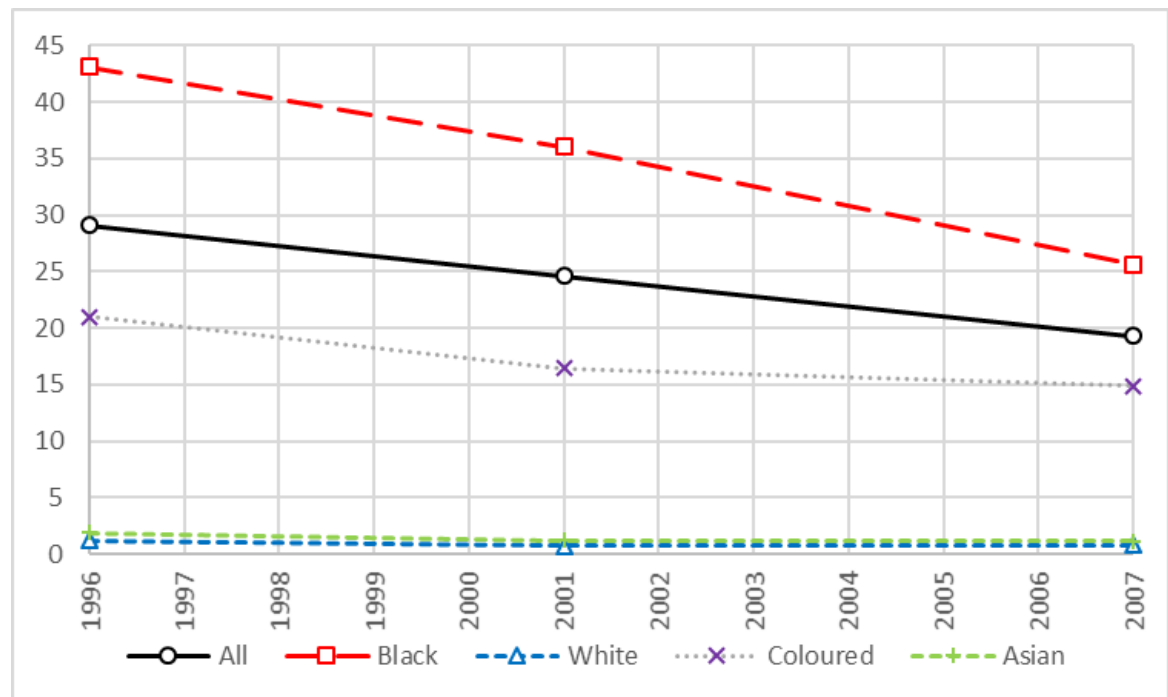
# Workers' characteristics by gender

Women working in 2007 tend to be less likely than men to be:
- married (49% versus 61%),
- Indian/Asian or black,

and have attained higher education (42% with secondary school and 9% with a university degree, compared with 38% and 7% of men).

More working women are in middle-aged groups and live in rural areas or in provinces such as Eastern and Western Cape or KwaZulu-Natal (and a lower proportion in Gauteng or North West).

# Occupational segregation by sex

# The approach

**Segregation curve**



$F_j^c$

$F_j^r$

$Gini = 2Area$

$D$

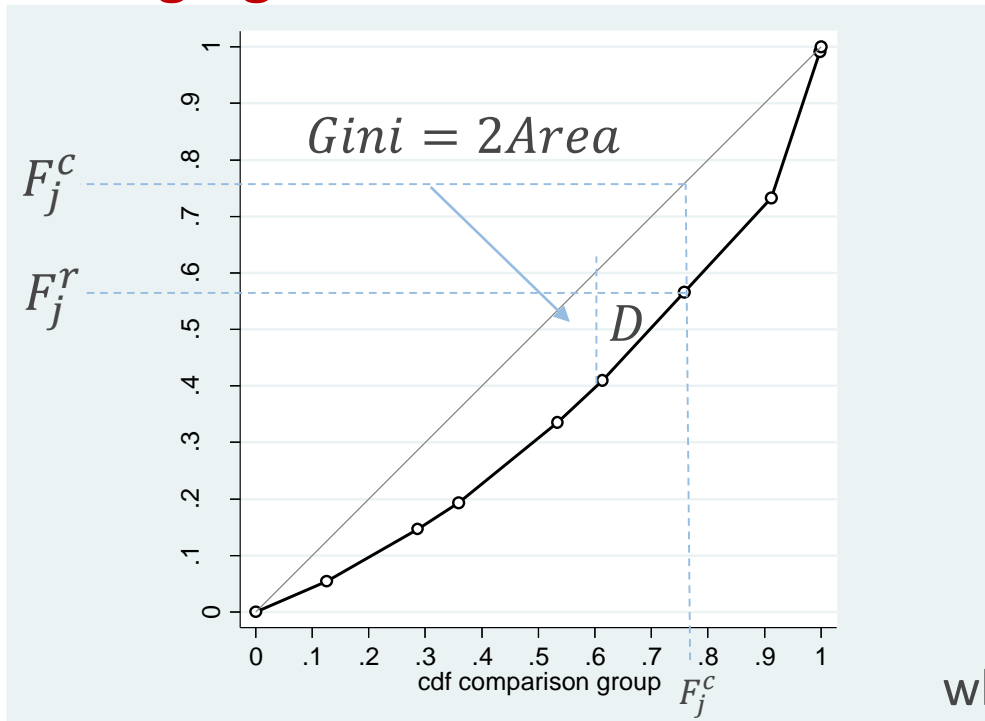cdf comparison group $F_j^c$

**Segregation indices S**$(f^c, f^r)$

*Dissimilarity*:

$$D(f^c, f^r) = \frac{1}{2} \sum_{j=1}^{T} |f_j^c - f_j^r|$$
$$= \max_{j \in [1,T]} \{F_j^c - F_j^r\}.$$

*Gini:*

$$Gini(f^c, f^r) = 2 \sum_{j=1}^{T} (\hat{F}_j^c - \hat{F}_j^r) f_j^c;$$

where $\quad \hat{F}_j^i = \frac{1}{2}(F_{j-1}^i + F_j^i) = F_{j-1}^i + \frac{1}{2} f_j^i$

Occupations sorted by male/female ratio

# Segregation conditional on worker characteristics

- **Aggregate decomposition** of segregation into explained and unexplained terms, Gradín (2013) (based on DiNardo et al., 1996 and Gradín, 2014).

$$S(f^c, f^r) = \underbrace{[S(f^c, f^r) - S(f^\gamma, f^r)]}_{\text{Explained}} + \underbrace{S(f^\gamma, f^r)}_{\text{Unexplained}}.$$

- $f^\gamma$ : **Counterfactual** with $c$ reweighted (propensity score) → distribution of characteristics ($X$) of $r$:

$$f_j^i(X) = \int_{X \in \Omega_X} f_j^i(X = x) f^i(x) dx$$

$$f_j^\gamma = \int_{X \in \Omega_X} f_j^c(X = x) f^r(x) dx = \int_{X \in \Omega_X} f_j^c(X = x) f^c(x) \Psi_x dx$$

$$\Psi_x = \frac{f^r(x)}{f^c(x)} = \frac{f^c}{f^r} \frac{Pr(i=r|x)}{Pr(i=c|x)}.$$

- **Detailed decomposition of the explained term** (Shapley).

# Gender segregation curves
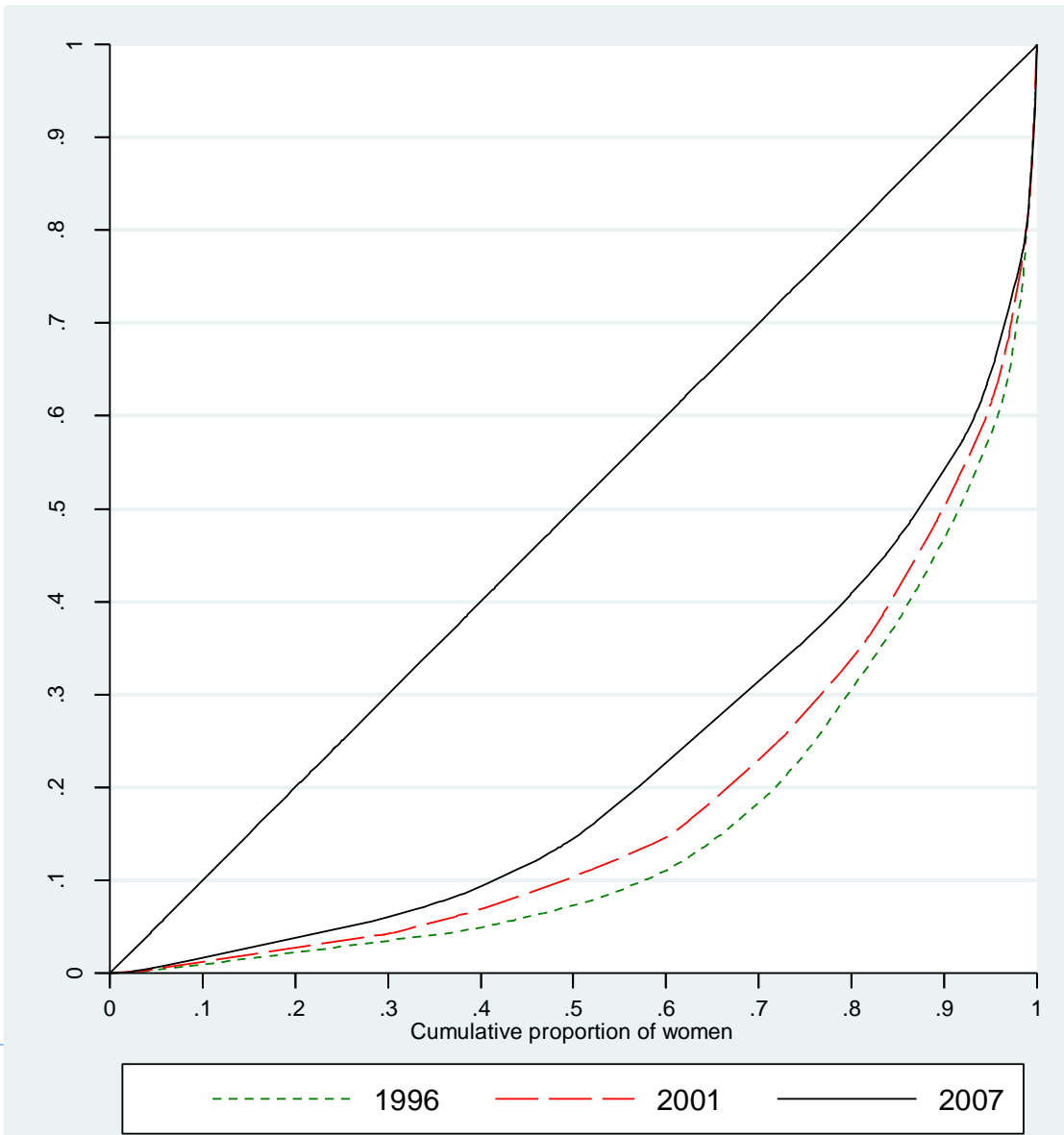


Decline in gender segregation in the census is robust to the choice of indices because it is corroborated by the segregation curves getting closer to the diagonal over time.

# Gender occupational segregation indices (Gini)



18% reduction with Gini (24% with D)

Segregation is not explained by gender diffs. in characteristics
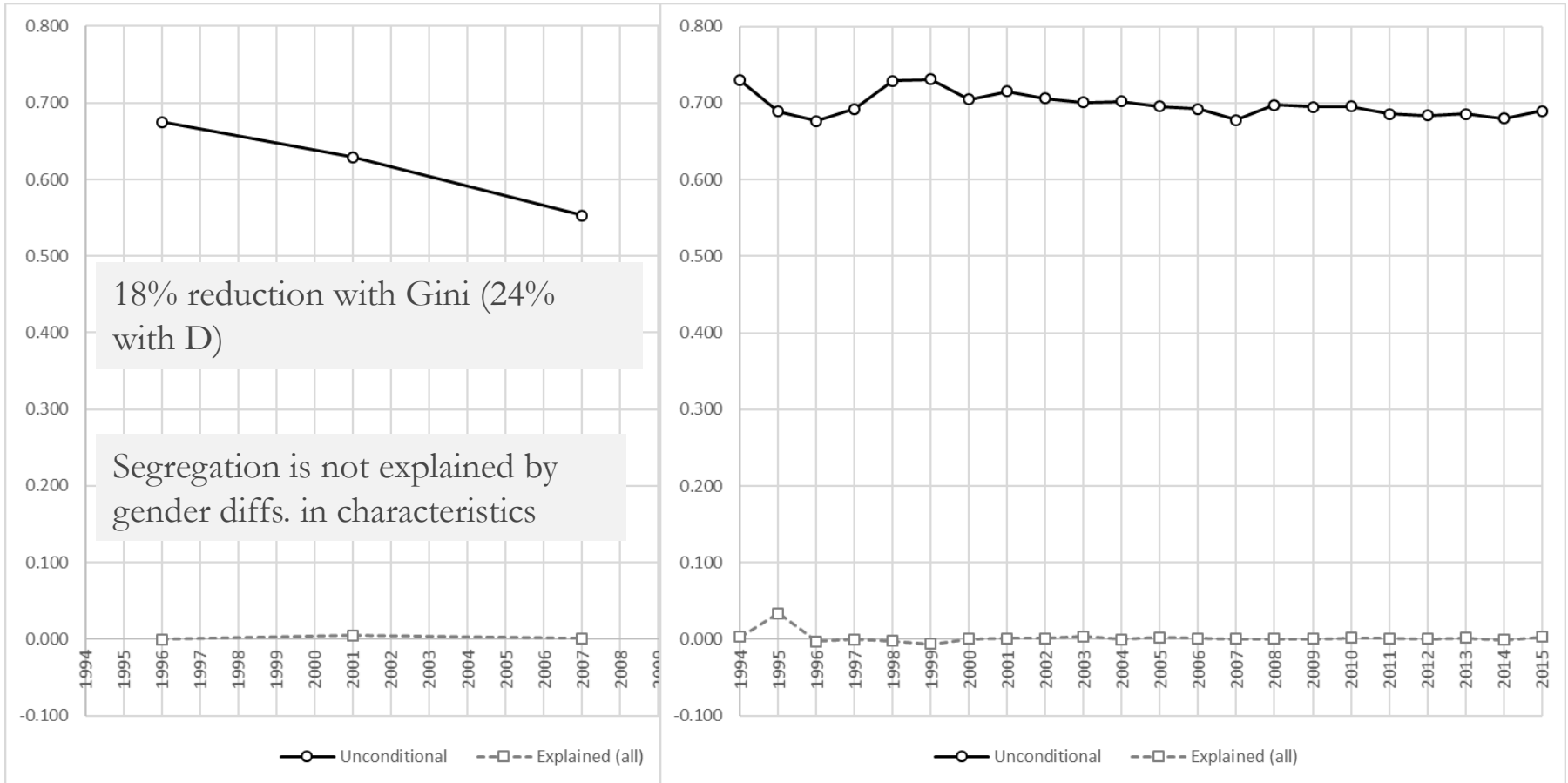
- Substantial increase in % women and men entering occupations initially dominated by the other gender (the unknown category excluded) between 1996 and 2001: from 22.7% to 25.6% (women) and from 19.7% to 23.8% (men).
- Modest increase for women (to 26.5%) and a decline for men (20.8%) between 2001 and 2007.
- No reduction over time in the Gini within the sets of occupations dominated by one gender (Gini - D).

15

# Table 4. Robustness in the evolution of segregation

Workers with unknown occupation …

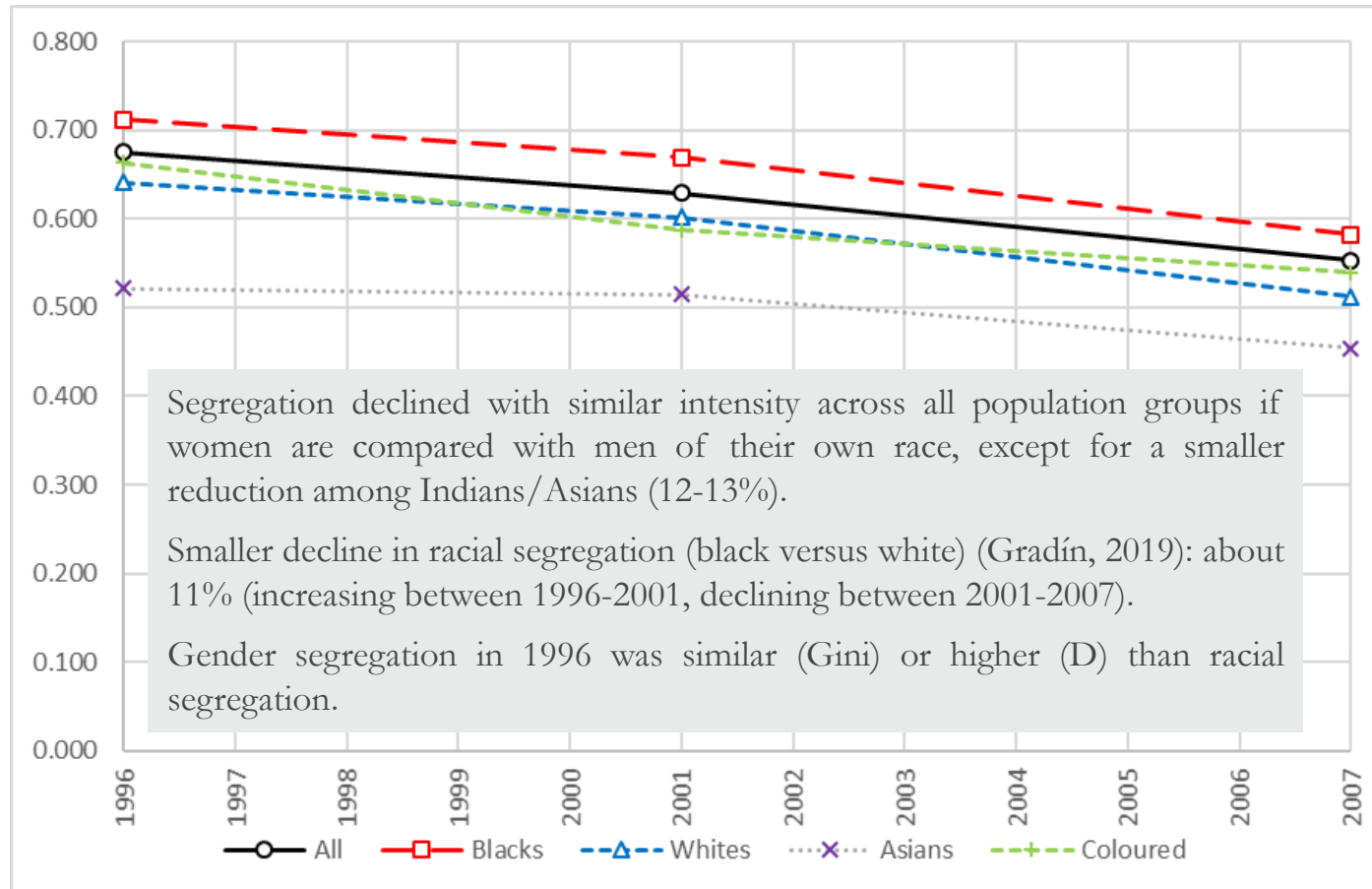| Scenarios | Gini | | | Dissimilarity | | |
|---|---|---|---|---|---|---|
| | 1996 | 2001 | 2007 | 1996 | 2001 | 2007 |
| **Base: one occupation** | **0.675** | **0.629** | **0.553** | **0.517** | **0.472** | **0.393** |
| **1: removed** | 0.698 | 0.650 | 0.609 | 0.544 | 0.501 | 0.454 |
| **2: 1996 %, rest removed** | 0.675 | 0.628 | 0.589 | 0.517 | 0.476 | 0.434 |
| **3: 2 segregated occ.** | 0.740 | 0.694 | 0.723 | 0.576 | 0.534 | 0.541 |
| **4: imputed (reweighting)** | **0.697** | **0.648** | **0.607** | **0.543** | **0.499** | **0.453** |

- The decline in segregation between 1996 and 2001 (or 2007) is robust.
- The decline between 2001 and 2007 is substantially smaller if the distribution of occupations in the unknown category (or its changes over time) did not differ much from the rest.
- If these occupations or changes over time are highly segregated, instead, it could be that segregation would have been constant or even increased between 2001 and 2007.

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# Gender occupational segregation indices by race (Gini)

## Census



The chart shows gender occupational segregation indices (Gini) by race from 1996 to 2007, with the y-axis ranging from 0.000 to 0.800. Lines plotted: All, Blacks, Whites, Asians, Coloured.

> Segregation declined with similar intensity across all population groups if women are compared with men of their own race, except for a smaller reduction among Indians/Asians (12-13%).
>
> Smaller decline in racial segregation (black versus white) (Gradín, 2019): about 11% (increasing between 1996-2001, declining between 2001-2007).
>
> Gender segregation in 1996 was similar (Gini) or higher (D) than racial segregation.

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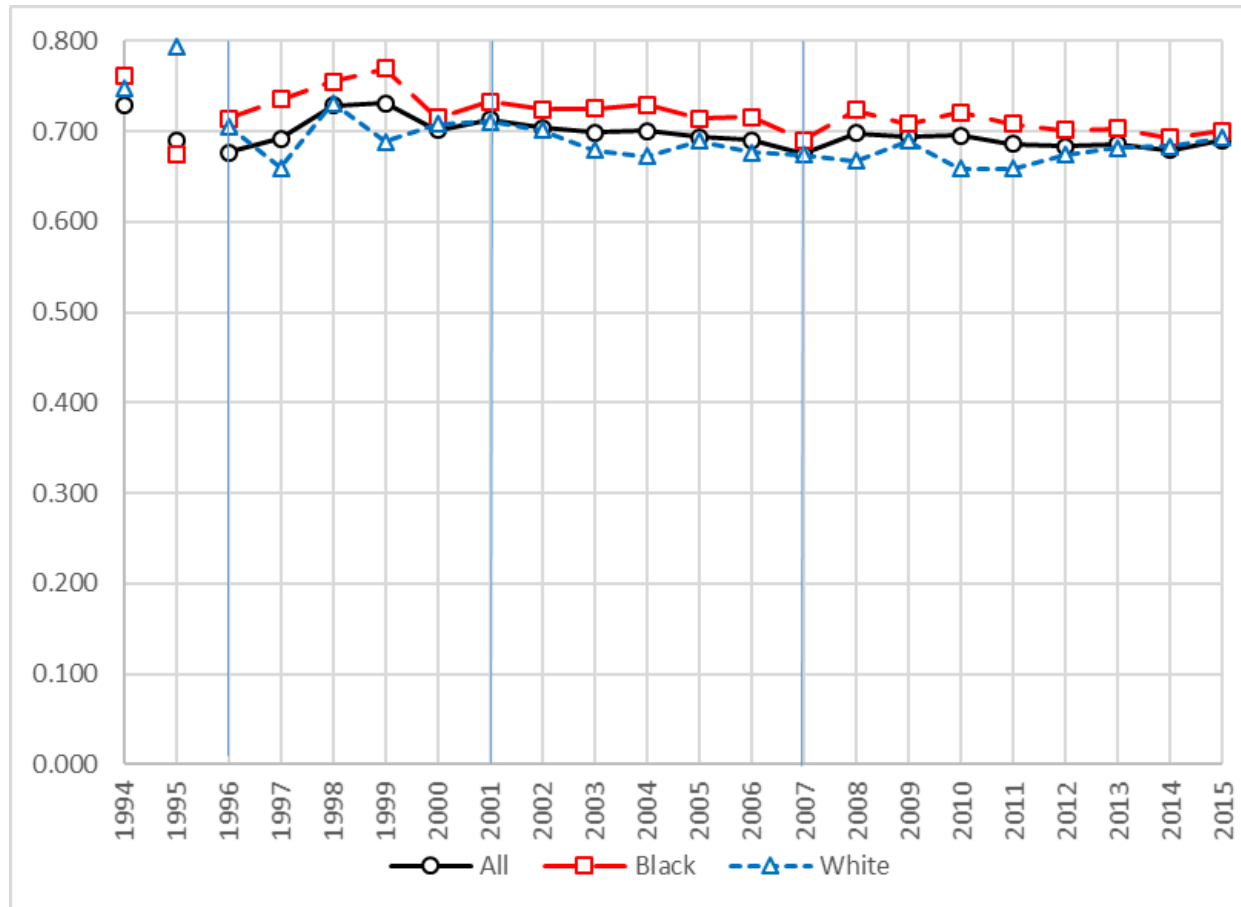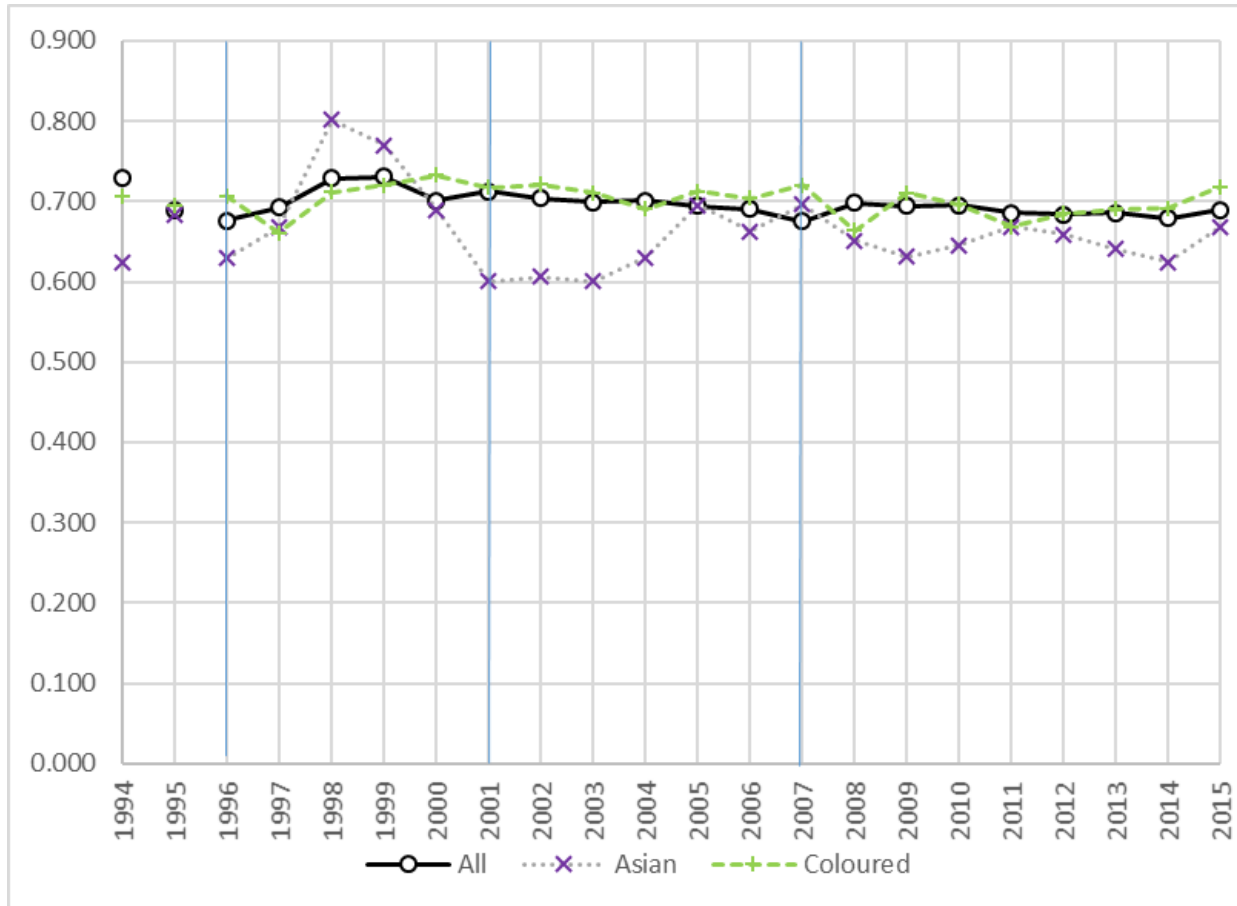
# Gender occupational segregation indices by race (Gini)
## LFS

# Gender occupational segregation indices by race (Gini)

## LFS

## Table 6. Segregation indices (Gini)

| | 1996 | | | 2001 | | | 2007 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Unc. | Unexp. | %E | Unc. | Unexp. | %E | Unc. | Unexp. | %E |
| **All** | 0.675 | 0.671 | 0.7 | 0.629 | 0.624 | 0.8 | 0.553 | 0.553 | 0.1 |
| | (0.001) | (0.001) | | (0.001) | (0.001) | | (0.002) | (0.002) | |
| **Black** | 0.712 | 0.704 | 1.1 | 0.669 | 0.660 | 1.4 | 0.582 | 0.581 | 0.2 |
| | (0.001) | (0.001) | | (0.001) | (0.001) | | (0.002) | (0.002) | |
| **White** | 0.641 | 0.636 | 0.8 | 0.602 | 0.596 | 0.9 | 0.512 | 0.509 | 0.5 |
| | (0.002) | (0.002) | | (0.002) | (0.002) | | (0.005) | (0.005) | |
| **Coloured** | 0.663 | 0.656 | 1.1 | 0.587 | 0.582 | 0.8 | 0.540 | 0.535 | 0.9 |
| | (0.003) | (0.003) | | (0.003) | (0.003) | | (0.006) | (0.006) | |
| **Indian/Asian** | 0.522 | 0.516 | 1.0 | 0.514 | 0.506 | 1.6 | 0.454 | 0.446 | 1.9 |
| | (0.005) | (0.005) | | (0.005) | (0.006) | | (0.011) | (0.012) | |

Differences in characteristics by gender explained virtually nothing of their occupational segregation in any year and population group (between 0-2%).

About 29% of black vs white racial segregation in 2007 in South Africa (Gradín, 2019a).

Explained gender segregation rose from 1.7 to 7.1% after including field of degree in the US (Gradín, 2019b).

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Table 4: Decline in gender Gini segregation index over time, decomposition

| | 1996-2001 | | 2001-2007 | |
|---|---|---|---|---|
| **Decline** | 0.046 | | 0.076 | |
| | (0.001) | | (0.002) | |
| | Cond. employment distribution | | | |
| **Explained** | Final | Initial | Final | Initial |
| **All** | 0.002 | 0.006 | 0.008 | 0.006 |
| **Area** | 0.000 | 0.000 | 0.002 | 0.002 |
| **Province** | 0.001 | 0.000 | 0.003 | 0.002 |
| **Education** | **0.014** | **0.014** | **0.015** | **0.014** |
| **Age** | -0.007 | -0.006 | -0.007 | -0.008 |
| **Race** | -0.005 | -0.004 | -0.009 | -0.010 |
| **Marital Status** | -0.001 | -0.001 | **0.005** | **0.006** |
| **Disability** | 0.000 | 0.001 | -0.001 | 0.000 |
| **Immigration** | 0.000 | 0.001 | 0.000 | 0.000 |

# Occupational stratification by sex

# Stratification (low-pay segregation)

## Concentration curve



Occupations sorted by earnings

## Concentration indices: $S(g^c, g^r)$
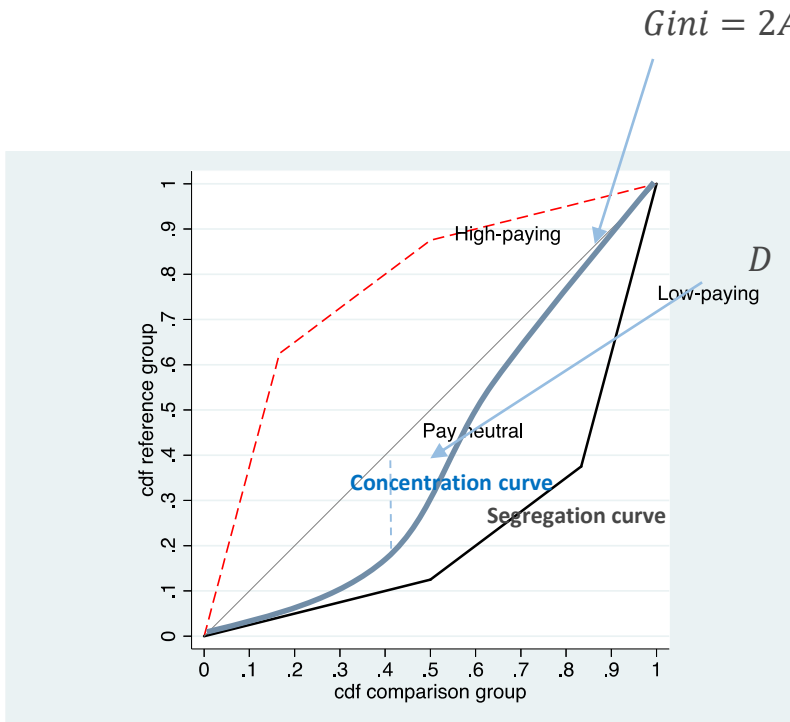
*Dissimilarity*:

$$D(g^c, g^r) = G_s^c - G_s^r,$$

where $|G_s^c - G_s^r| = \max_{j \in [1,J]} \{ |G_j^c - G_j^r| \}.$

*Gini:*

$$Gini(g^c, g^r) = 2 \sum_{j=1}^{T} (\hat{G}_j^c - \hat{G}_j^r) g_j^c$$
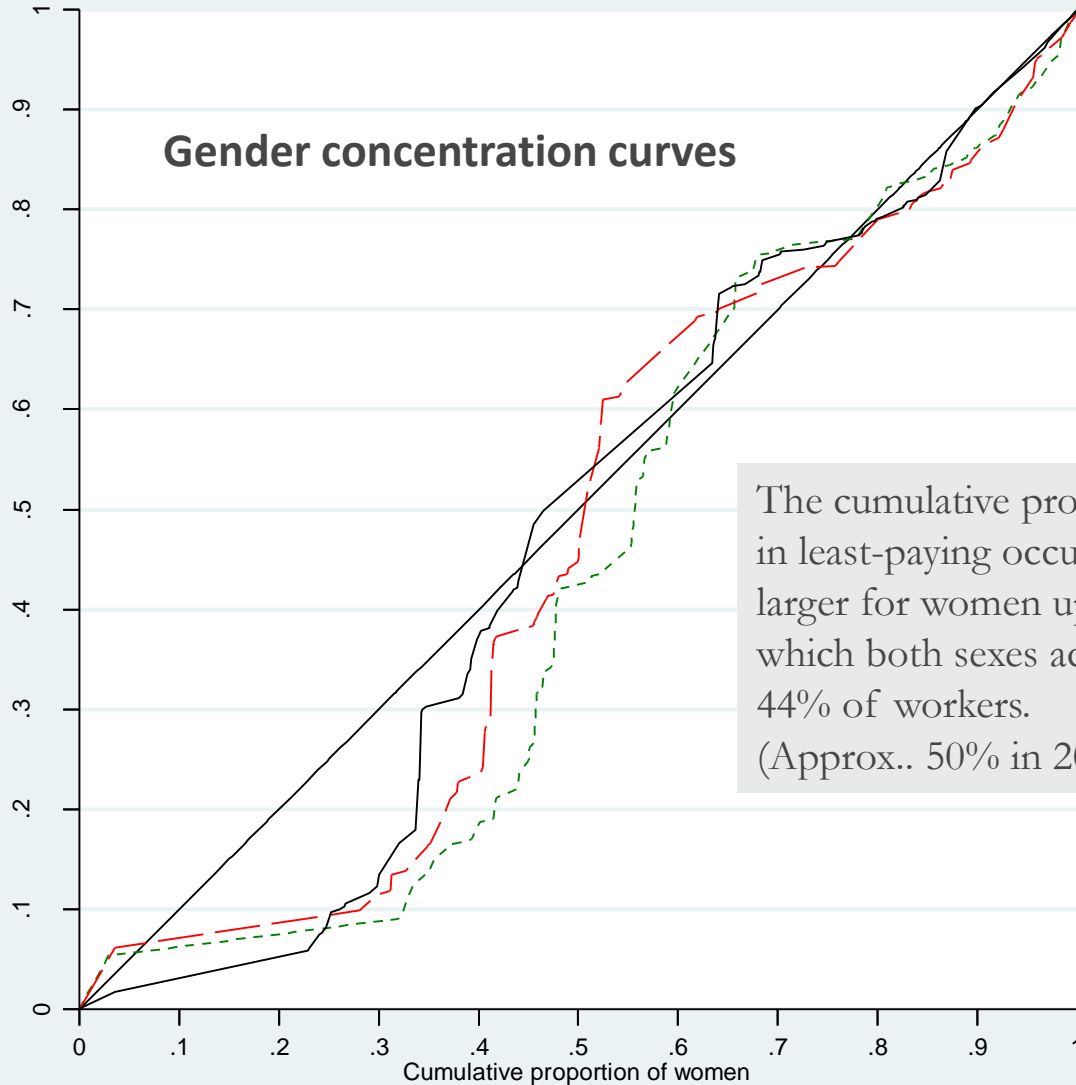
where $\hat{G}_j^i = \frac{1}{2}(G_{j-1}^i + G_j^i)$

## Concentration (low-pay ratio)
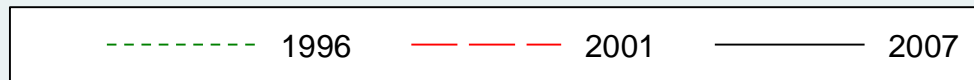
$$r_S = \frac{S(g^c, g^r)}{S(f^c, f^r)}$$

Same conditional analysis as with segregation

**Gender concentration curves**

The cumulative proportion of workers in least-paying occupations in 2007 is larger for women up to the level in which both sexes accumulate about 44% of workers.
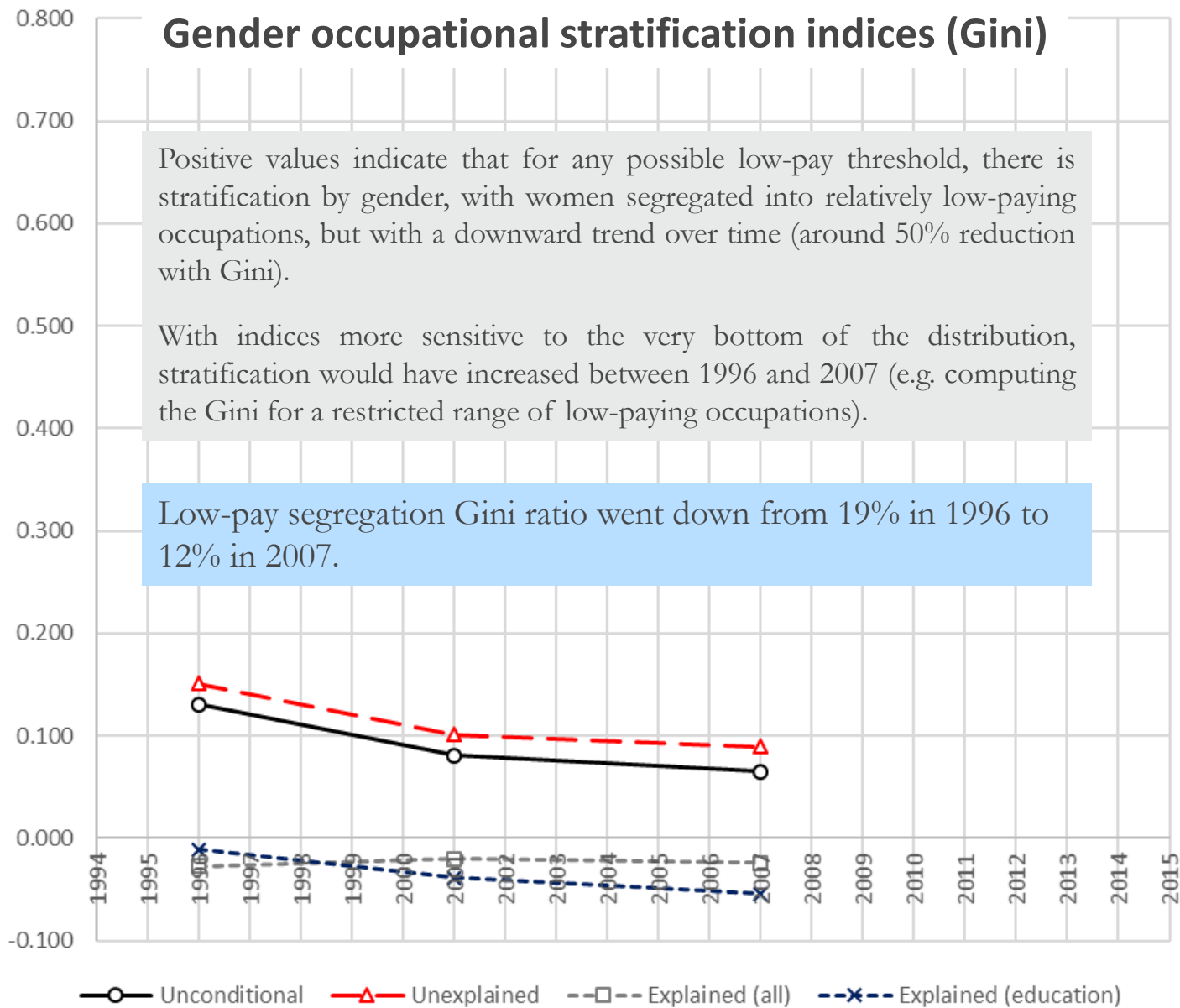(Approx.. 50% in 2001; 60% in 1996)

Cumulative proportion of women

------- 1996      — — — 2001      ——— 2007

# Gender occupational stratification indices (Gini)

Positive values indicate that for any possible low-pay threshold, there is stratification by gender, with women segregated into relatively low-paying occupations, but with a downward trend over time (around 50% reduction with Gini).

With indices more sensitive to the very bottom of the distribution, stratification would have increased between 1996 and 2007 (e.g. computing the Gini for a restricted range of low-paying occupations).

Low-pay segregation Gini ratio went down from 19% in 1996 to 12% in 2007.

Legend: —○— Unconditional   —△— Unexplained   --□-- Explained (all)   --✕-- Explained (education)

Much smaller stratification by sex than by race (Gradín, 2019)

# Table 7. Robustness in the evolution of low-pay segregation

Workers with unknown occupation …

| | Gini | | | D | | |
|---|---|---|---|---|---|---|
| | **1996** | **2001** | **2007** | **1996** | **2001** | **2007** |
| **Base Scenario. One occupation** | **0.131** | **0.081** | **0.065** | **0.229** | **0.193** | **0,175** |
| **Alternative 1. Removed** | 0.149 | 0.106 | 0.106 | 0.241 | 0.208 | 0.214 |
| **Alternative 3. 2 segregated occupations** | 0.174 | 0.117 | 0.103 | 0.229 | 0.193 | 0.175 |
| **Alternative 4: imputed (re-weighting)** | **0.147** | **0.106** | **0.115** | **0.239** | **0.208** | **0.218** |

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# Gender concentration curves by race: 2007

White and Indian/Asian men are overrepresented at the "bottom"

Only marginal proportions of whites and Indians/Asians of any gender in occupations with average income below 50% of the median.

Striking differences across population groups. Only black and Coloured women are overrepresented at the bottom.

(26% and 15% of women are domestic helpers)
(1% in the case of white and Indian/Asian women)

Cumulative proportion of women

———— Black ------ White —— Coloured ·········· Asian
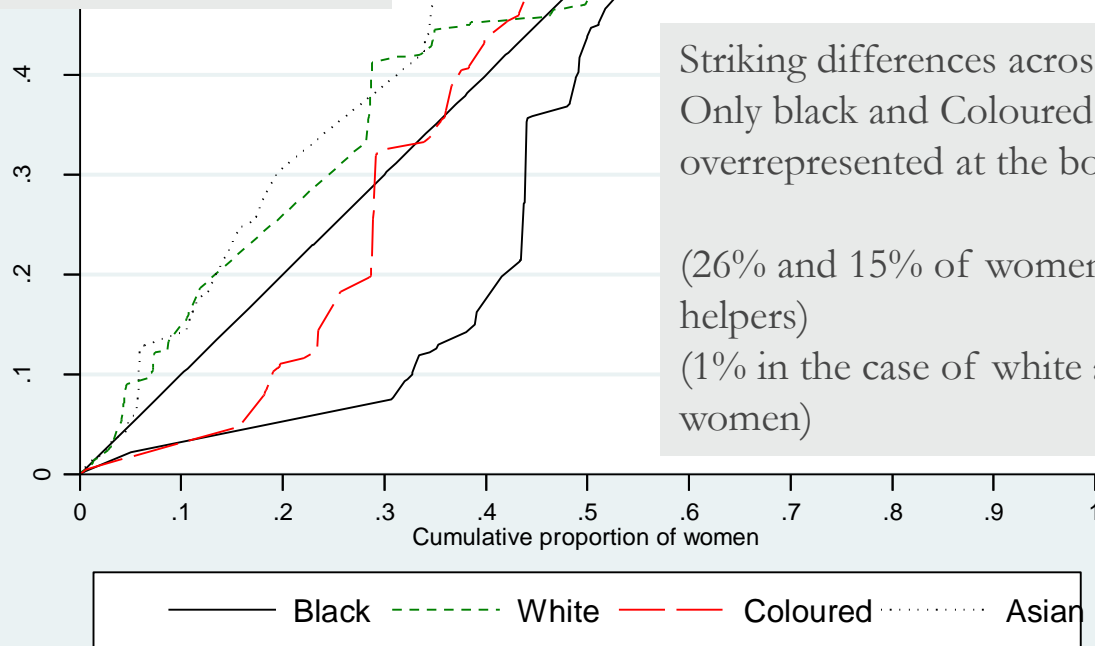
# Gini low-pay segregation of women (Census)

## a. Unconditional                    b. Conditional



Differences in levels and trends across population groups
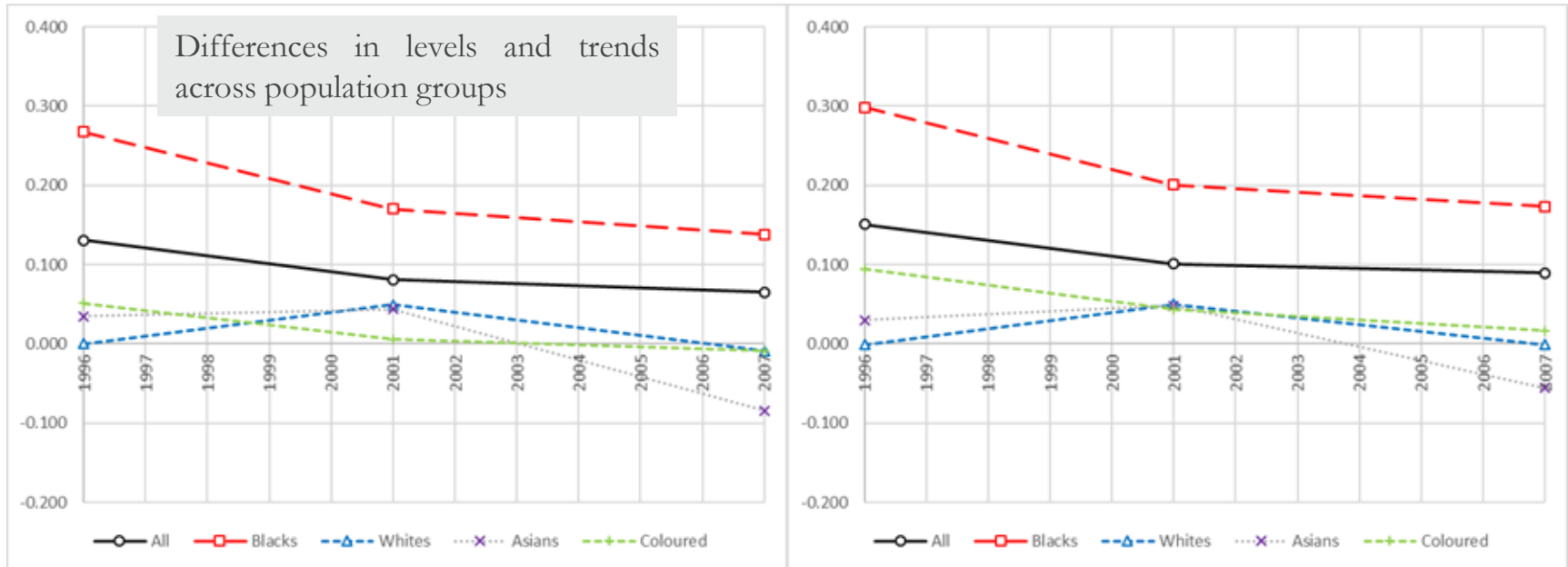
Concentration index is positive only for blacks.

Coloured women are segregated at low-paying occupations along black women if we restrict the measure to the bottom 30% of women in worst-paying occupations.

The value of Gini would be positive (0.041) although still below the corresponding value for blacks (0.066) and in contrast with the negative levels obtained for whites (-0.030) and Indians/Asians (-0.039) in that case.

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## Table 8. Low-pay Gini segregation index

| | 2007 | | | | |
|---|---|---|---|---|---|
| | **All** | **Black** | **White** | **Coloured** | **Indian/Asian** |
| **Unconditional** | 0.065 | 0.138 | -0.009 | -0.009 | -0.085 |
| **Ratio** | 11.8% | 23.6% | -1.8% | -1.7% | -18.6% |
| **Unexplained** | 0.090 | 0.173 | -0.001 | 0.017 | -0.056 |
| **Explained** | -0.024 | -0.036 | -0.008 | -0.026 | -0.029 |
| **Area** | 0.006 | 0.003 | -0.001 | -0.004 | -0.003 |
| **Province** | 0.000 | -0.001 | -0.001 | -0.002 | -0.002 |
| **Education** | **-0.054** | **-0.057** | -0.004 | **-0.028** | **-0.027** |
| **Age** | 0.002 | 0.008 | 0.001 | -0.001 | -0.008 |
| **Race** | -0.002 | | | | |
| **Marital** | 0.023 | 0.013 | -0.002 | 0.009 | 0.010 |
| **Disability** | 0.000 | 0.000 | 0.000 | 0.000 | -0.001 |
| **Immigration** | 0.002 | -0.001 | 0.000 | 0.001 | 0.002 |

The effect of education might be overestimated given the lack of information about field of college degree (Gradín, 2019b for the US), although only 9% of women and 7% of men had university degree in 2007. The advantage of women is larger in secondary education (42% versus 38%)

Concentration curves, 2007

Cumulative proportion of women

Unconditional          Conditional
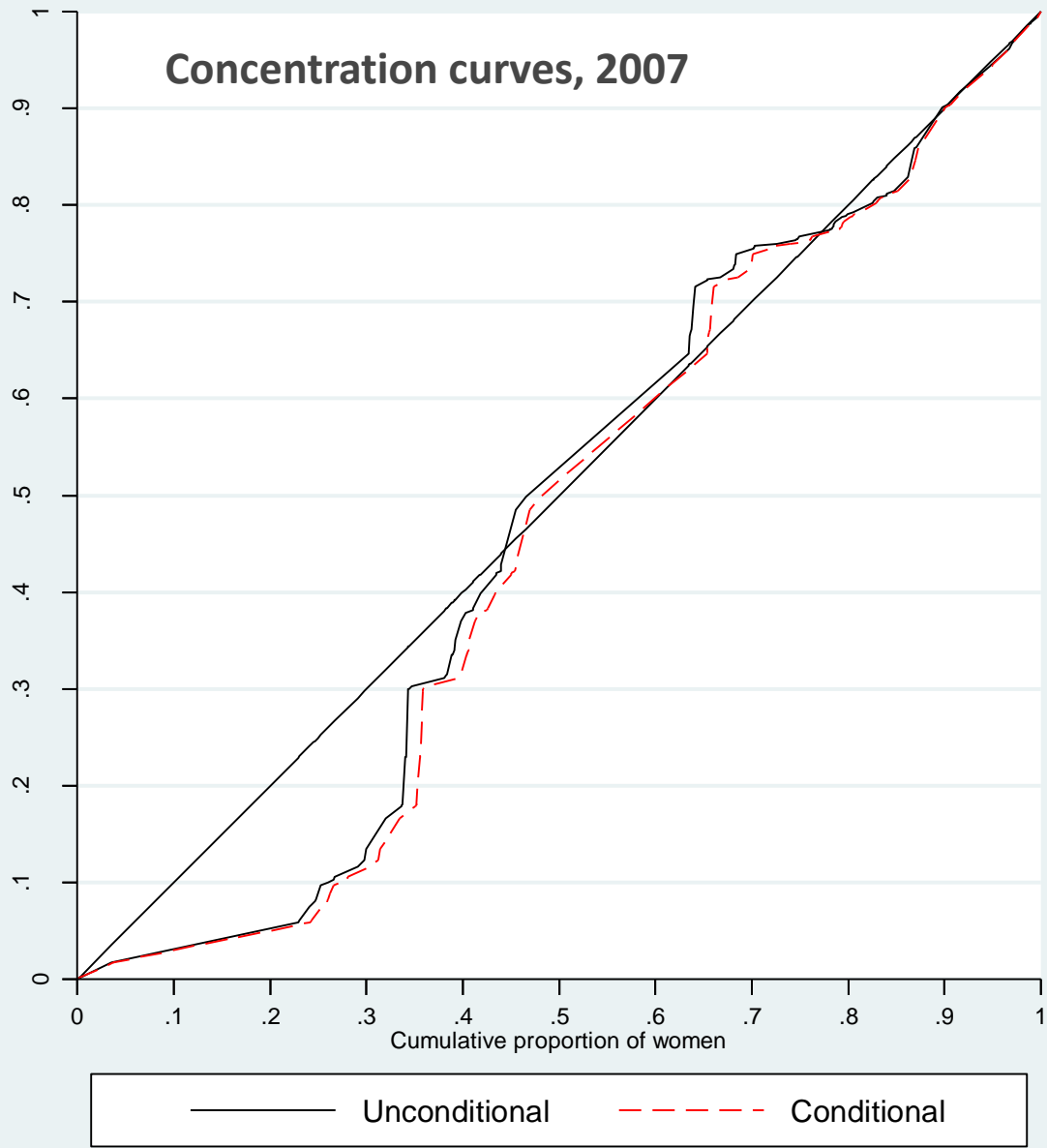
Gender occupational stratification indices (Gini)
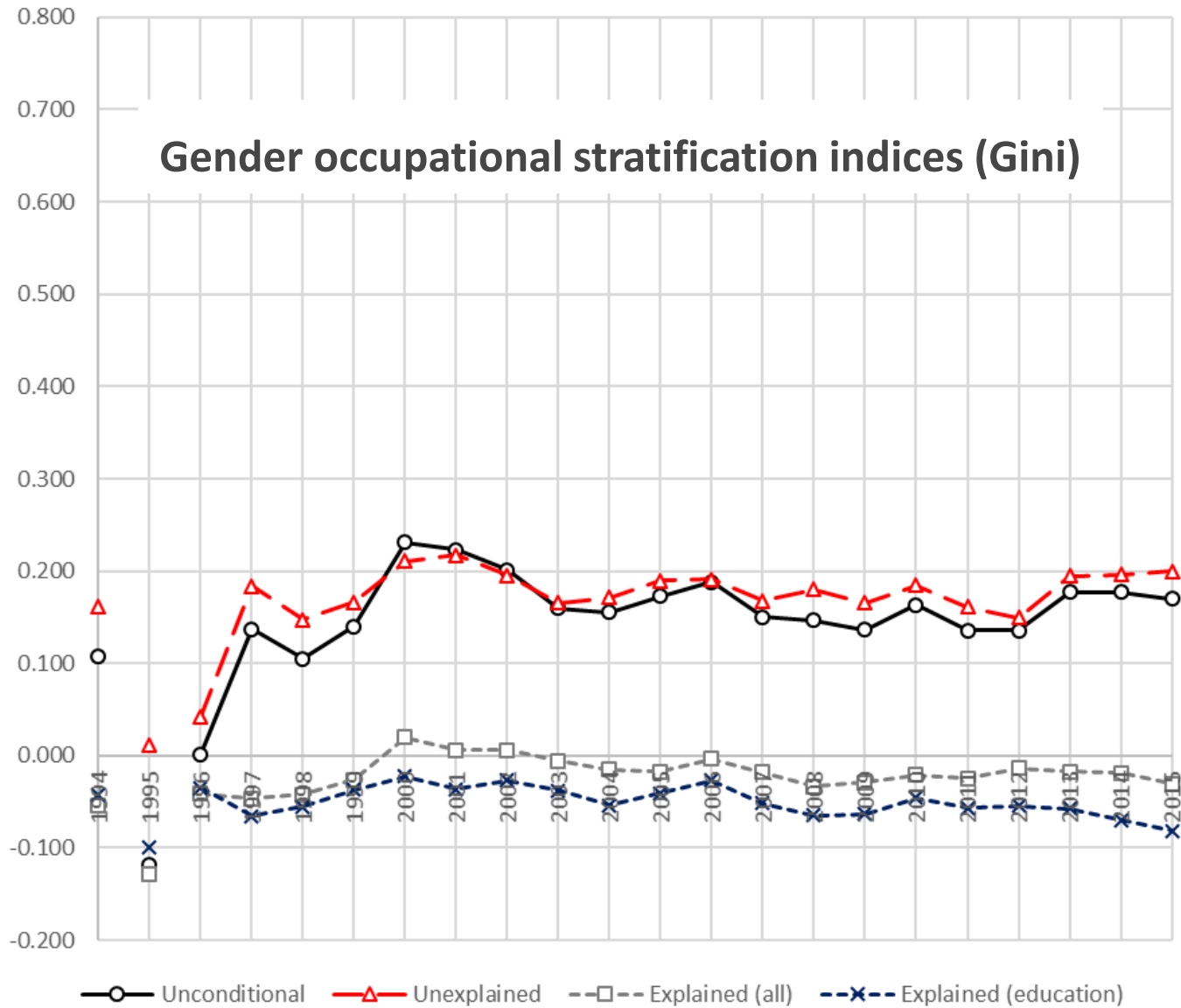
# Gender occupational stratification indices (Gini)
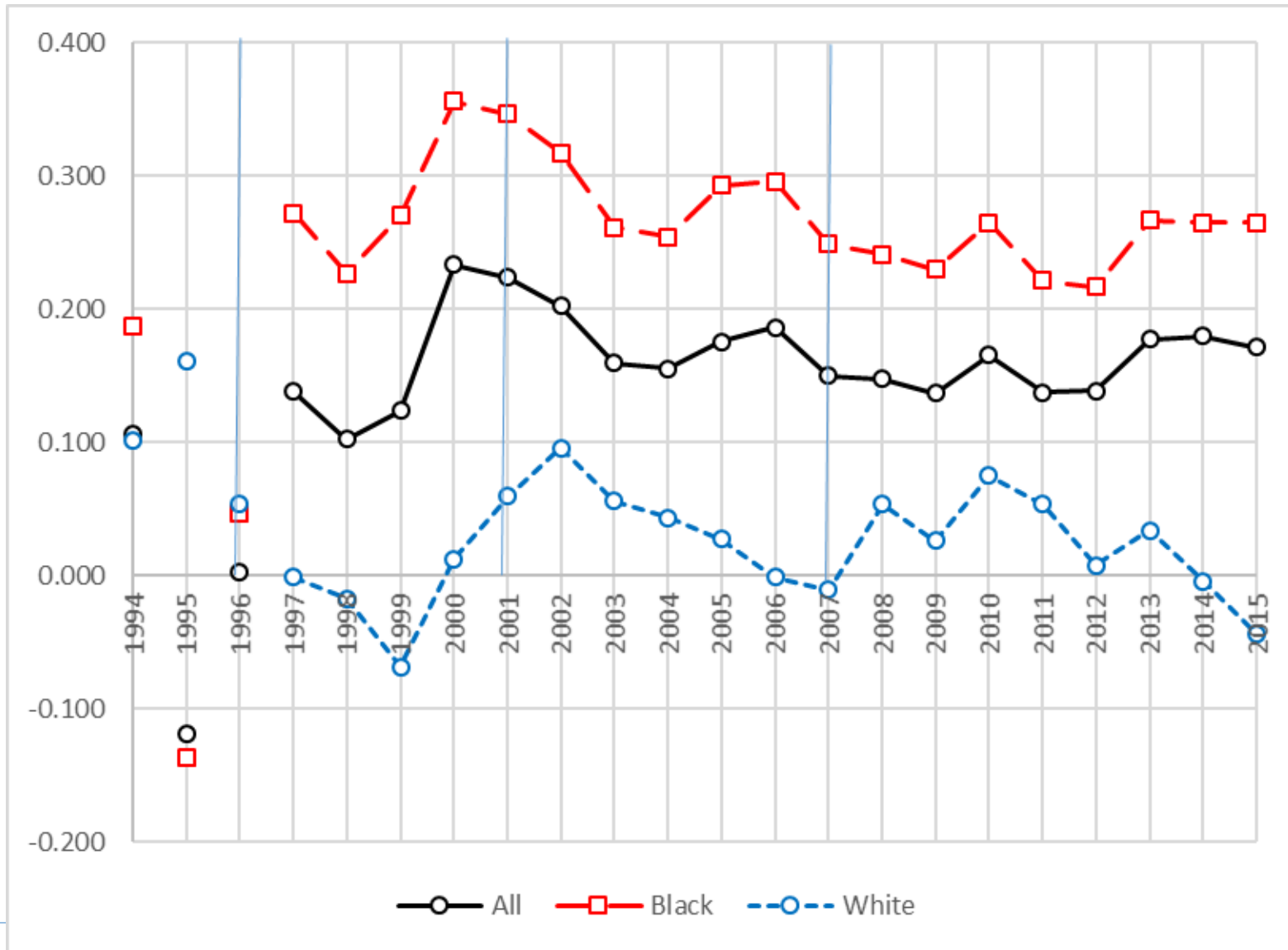
## Table 7: Decline in gender Gini concentration index over time, decomposition

|  | 1996-2001 | | 2001-2007 | |
|---|---|---|---|---|
| **Decline** | 0.050 | | 0.016 | |
|  | (0.002) | | (0.003) | |
|  | Cond. Employment Distributions | | | |
| **Explained** | Final | Initial | Final | Initial |
| **All** | **0.018** | **0.035** | **0.013** | **0.014** |
| **Area** | -0.001 | -0.001 | -0.016 | -0.018 |
| **Province** | 0.001 | 0.001 | **0.004** | **0.004** |
| **Education** | **0.046** | **0.065** | **0.054** | **0.051** |
| **Age** | -0.009 | -0.009 | -0.011 | -0.013 |
| **Race** | -0.018 | -0.023 | -0.022 | -0.015 |
| **Marital Status** | -0.004 | -0.004 | **0.005** | **0.004** |
| **Disability** | 0.003 | 0.004 | 0.001 | 0.001 |
| **Immigration** | 0.000 | 0.001 | -0.001 | 0.000 |

# Concluding remarks

- I have analyzed gender inequalities in the **distribution of occupations** in post-apartheid South Africa.

    - Limited available data, contributing to the understanding of segregation in developing countries.

- **Long-term** trend (census):

    - Substantial decline; women persistently holding lower-paying jobs (especially black and Coloured women), but at the same time increasingly filling higher paying positions (especially true for Indian/Asian and white women, also for Coloured).

- Most **recent** trend (LFS):

    - More persistent segregation and, to a lesser extent, stratification

# Concluding remarks (Cont.)

- This phenomena are not the result of the distinctive **characteristics** of male and female workers.

  - No segregation can be justified on these terms.

  - Only the over-representation of women in some higher-paying professional positions may be justified on their higher education and other attributes, but not their over-representation at the bottom of the pay scale.

- That is, **men and women with similar characteristics tend to work in different occupations, with a tendency for (black/Coloured) women to work in lower-paying jobs.**

  - Relatively higher education of women has mitigated this.