

The Rise of the 'Missing Middle' in an Emerging Economy: The Case of South Africa

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I. Background

I: Background

Stylized Facts for South Africa

- South Africa possibly the most unequal society in the world:
 - Gini of 0.65 in 2014.
 - One of the highest unemployment rates in the world, reinforcing high Gini.
 - Labour Market income accounts for more than half of total inequality (Leibbrandt *et al.*, 2012).
 - Wage Gini has been increasing: 0.58 in 1995 and 0.69 in 2015.
- Changes in wage inequality in South Africa are non-monotonic:
 - U-shaped percentile-based wage growth between 1997 and 2015
- *Focus: Investigate the various explanations for wage polarization within a high-inequality developing country.*

I: Background

Wage Inequality and Education

- Tinbergen (1974, 1975) Model of skills-biased technical change
 - Changing wage structure explained by education premiums for high skilled workers.
 - Technology is skills-biased, or factor-augmenting in favour of high skilled workers.
 - Raises inequality by expanding level and variance of the wage distribution
- Compelling model for South Africa:
 - Dual education market where majority accumulate low quality schooling, unlikely to enter tertiary institutions vs. small wealthy elite with high quality schooling in preparation for higher education.
 - Can explain inequality driven by increasing premia at the top end, but not the “missing middle”

I: Background

Wage Inequality and Occupation & Task Content

- Technology can complement or substitute tasks, enhancing or depressing wage growth at different points in the distribution (Acemoglu & Autor, 2011; Firpo, Fortin & Lemieux, 2011; Goos & Manning, 2007; David, Katz & Kearney, 2006)
- Autor, Levy & Murnane's (2003) on impact of technological change on skill content.
- *Routine & Non-Routine and Interactive & Manual:*
 - Routine tasks (both interactive and manual) highly prone to substitution by computers (assembly line work)
 - Interactive non-routine tasks (e.g. Forensic accountant) are complemented by computer technology, increasing productivity and returns for these tasks. Normally high-skilled work.
 - Manual non-routine tasks (e.g. cooking, domestic work) have (currently) limited capacity for complementarity or substitution.
 - U-shaped earnings growth in US can partially be explained by medium skilled workers being substituted by technology (and trade) in the 80s and 90s, as well as low job growth for medium skill occupations
 - May hold explanatory power in South Africa

I: Background

Wage Inequality and Institutional Factors

- Onset of a series of sectoral minimum wage laws since 2000 in South Africa.
- Widening and depending of social security coverage
- Trade Union Dynamics
 - Weakened post-apartheid due to casualization and informalisation.
 - Decline of private sector union membership: *36% in 1997 to 24% in 2013.*
 - Growth in public sector union membership and the new labour elite:
 - Membership share of total union members increased from 56% in 1997 to 70 percent in 2013.
 - Increasing public sector wage premia since the end of apartheid
 - Growth in Temporary Employment Services: *9% annually over the last two decades*

II. Method and Data

II: Method and Data

- Investigate observation of wage polarization in South Africa using three drivers:
 1. *Skills-biased technological change (The education framework)*
 2. *Technology as modulated via task content of occupations*
 3. *Labour Market Institutional Factors*

II: Method and Data

Task Content Coding with LM Data

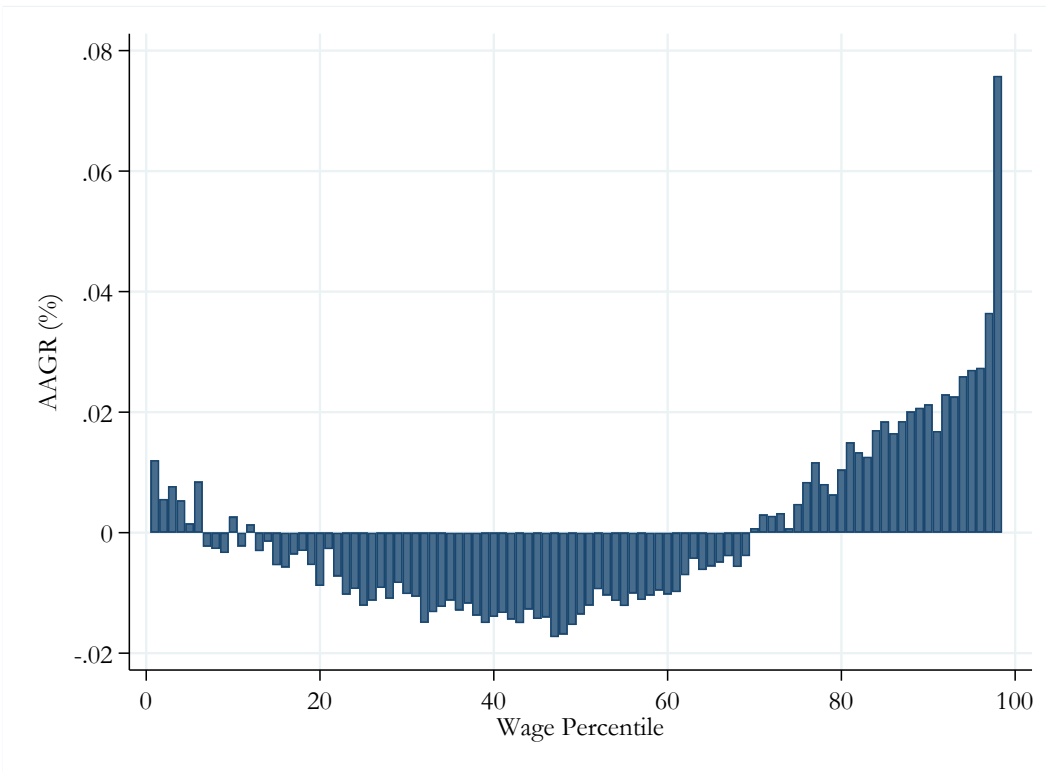
- Data is the Post-Apartheid Labour Market Series (PALMS), harmonized for 1995-2015.
- We code occupations into 5 non-mutually exclusive task content variables:
 1. **ICT** (e.g. typist, computer programmer): can be complemented or substituted by technology, risk of offshoring
 2. **Automated/Routine** (e.g. assemblers, machine operators): often involve repetitive work. Risk of substitution by technology and through import penetration
 3. **Face-to-Face** (e.g. food vendors, teachers): relies on face-to-face contact. Generally not easily offshorable or replaced by technology.
 4. **On-Site** (e.g. manual labourers, site supervisors): requires presence at place of work, not easily offshorable. Technology may complement or substitute these jobs, depending on the type of work involved.
 5. **Analytic** (e.g. artists, professionals): involve creative thought and problem solving. Cannot be easily automated, complemented by technology and not prone to offshoring.

III: Wage Inequality in South Africa

A Descriptive Overview

III: Wage Inequality in South Africa

Figure I. Annual Average Growth Rate of Real Wages in South Africa for the Period 1997-2015



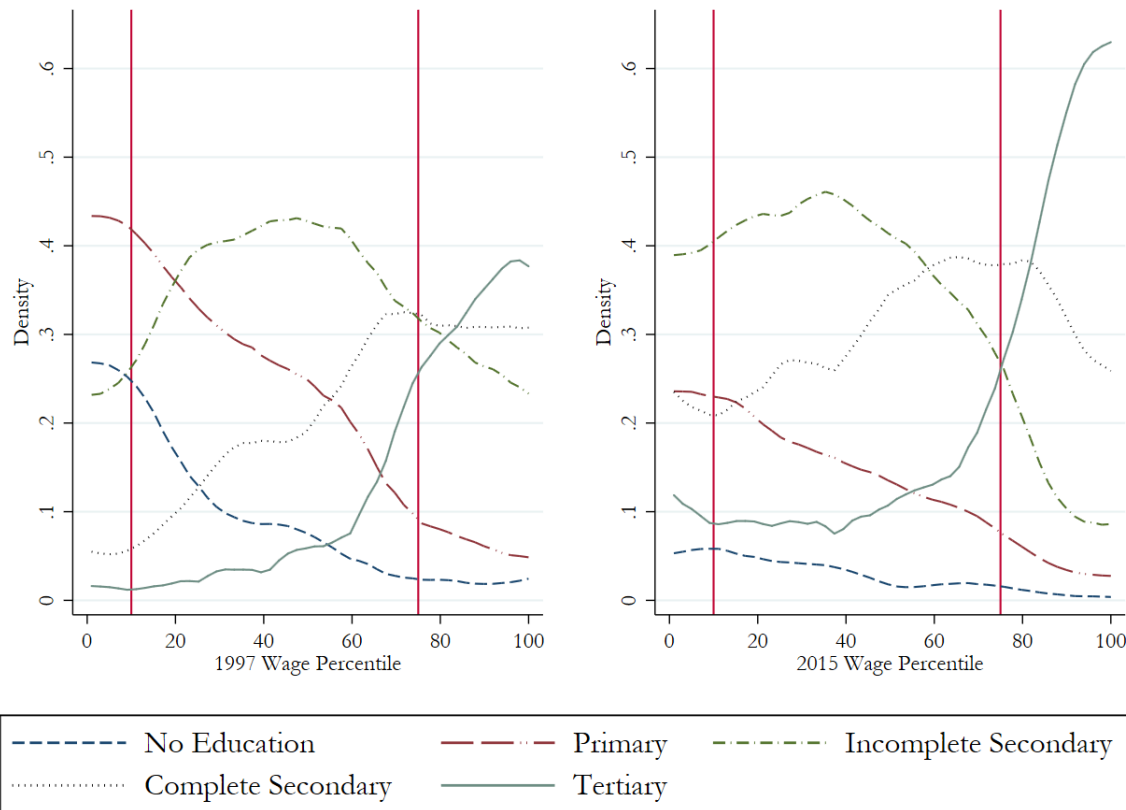
Notes: Own calculations using PALMS; adjusted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

- Negative slope of the 1st half of the distribution is inequality decreasing, positive slope in the 2nd half is inequality increasing
- Rapidly increasing inequality at the top end has increased overall inequality
- ‘Missing Middle’ - the middle of the distribution has experienced a fall in the AAGR of real wages over the period

III: Wage Inequality in South Africa

Driver I – Education and SBTC

Figure 2. Local Polynomial of Education Level per Wage Percentile in 1997 and 2015



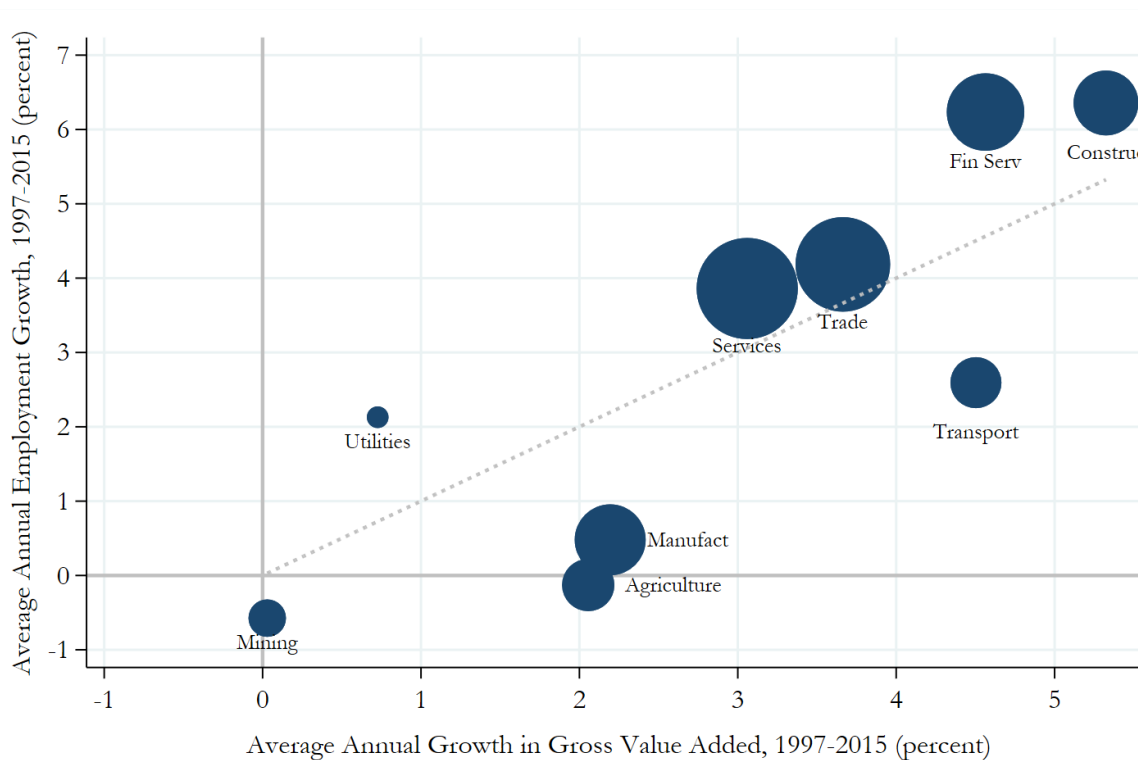
- *Bottom End of Wage Distribution:* Share of workers with primary education most prevalent in 1997, but by 2015- incomplete secondary education most prevalent.
- *Middle of distribution:* Share of incomplete and complete secondary education has grown.
- *Top-End:* Share of workers with tertiary education in >80th perc. increases sharply.
 - Across wage percentiles, the incidence of tertiary education increased.

Notes: Own calculations using PALMS, adjusted using sampling weights, sample consists of all employed adults of working age with non-missing wage and hours of work data, reference lines on the x-axis are at the 10th and 75th percentiles. Density interpreted as the proportion of jobs in that wage percentile classified as having the relevant education level.

III: Wage Inequality in South Africa

Driver 2: Technology and Task Content

Figure 3. Changes in Employment and Contribution to GDP by Sector, 1997-2015



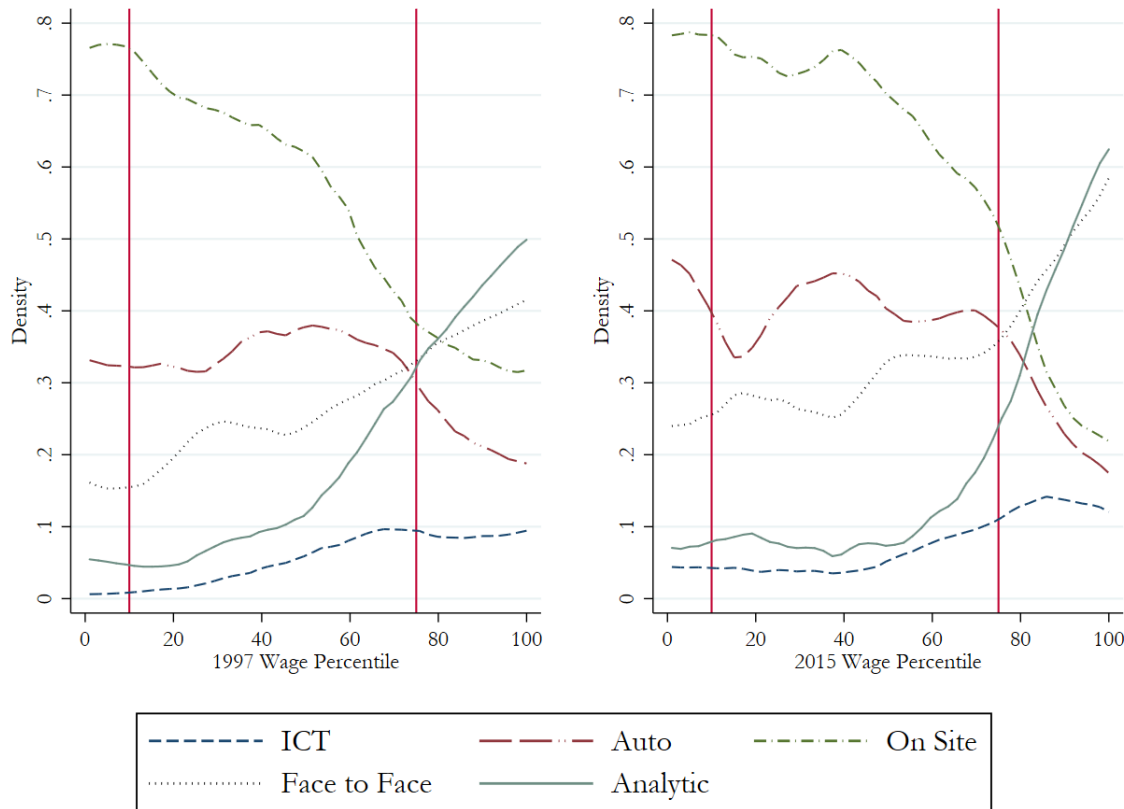
Notes: Own calculations using data from South African Reserve Bank and PALMS, adjusted using sampling weights; Bubbles weighted by the number of employed in 2015.

- Large sectoral shifts since the end of apartheid
- Shift in AD away from manufacturing towards a services-oriented economy.
- Financial services and services sectors experienced strong, labour-intensive growth (TES).
- Mining, agriculture and manufacturing have fared poorly, with mining and agriculture shedding jobs.
- Mining has become more capital-intensive given nature of mining in SA.
- Over 60% of manufacturing and agriculture jobs are automated - have these more routine jobs been displaced as use of technology soared?

III: Wage Inequality in South Africa

Driver 2: Technology and Task Content

Figure 4. Local Polynomial Regression of Task Content per Wage Percentile in 1997 and 2015



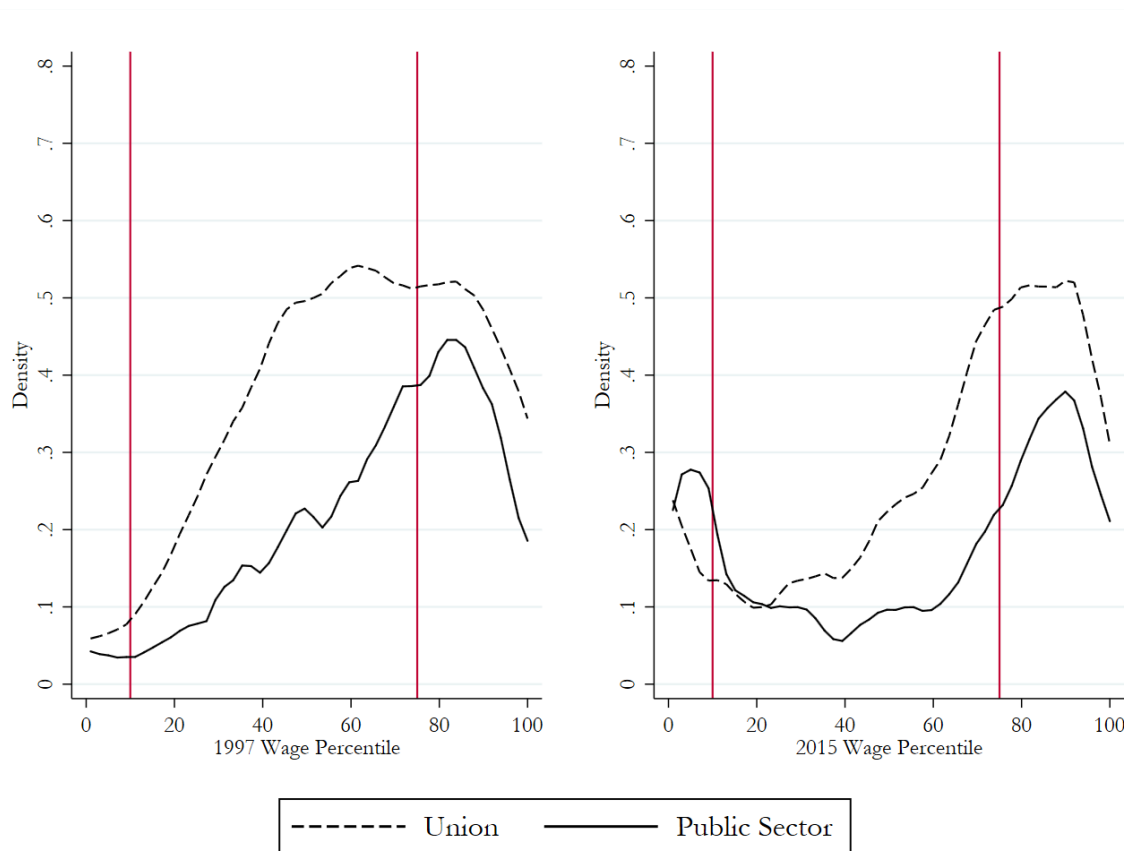
- *Bottom of Distribution:* Automated and on-site jobs most prevalent at the bottom of the distribution in both 1997 and 2015
 - Increase in incidence over period.
- *Middle of Distribution:* Increasing prominence of on-site, automated and face-to-face jobs.
 - Reflects expansion of financial services in particular and services industry in general.
- *Top of Distribution:* Analytic and face-to-face jobs are extremely concentrated at the top end in 2015.
 - On-site less prevalent, signaling decline of manufacturing and mining?
- Face-to-face jobs expanded most overall, reflecting the growing services sector

Notes: Own calculations using PALMS, adjusted using sampling weights, sample consists of all employed adults of working age with non-missing wage and hours of work data, reference lines on the x-axis are at the 10th and 75th percentiles, density interpreted as the proportion of jobs in that wage percentile classified as having the relevant task content.

III: Wage Inequality in South Africa

Driver 3: Labour Market Institutions

Figure 5. Local Polynomial of Union Membership and Public Sector Employment per Wage Percentile in 1997 and 2015



Notes: Own calculations using PALMS, adjusted using sampling weights, sample consists of all employed adults of working age with non-missing wage and hours of work data, reference lines on the x-axis are at the 10th and 75th percentiles, density interpreted as the proportion of jobs in that wage percentile classified as being union members or public sector employees.

- *Bottom-End:* Increase in private and public union representation up to 10th perc.
 - ‘Crowding in’ of sectoral Wm policies?
- *Middle of Distribution:* Very sharp hollowing out of union membership and public sector employment.
- *Top of Distribution:* Union membership and public sector employment most prevalent at the top end.
- Unions and government have played a role in supporting the most vulnerable but crucially have seen membership decline in middle of the distribution.

IV: Determinants of Wage Inequality: An Econometric Approach

IV: Determinants of Wage Inequality: An Econometric Approach

- Literature on wage inequality in advanced economies focused on theory and evidence behind task content framework.
- Consensus: This framework key to explaining wage polarization in developed world.
- However, Firpo, *et al.* (2011): Importance of task-content based explanations in accounting for *total* change in wage distribution over time is less well-understood.
 - Use Recentered Influence Function (RIF) regression on US wage data and reach more nuanced conclusion.
 - Task content and de-unionisation were central to wage changes in the 1980s and 1990s, but from the 2000s these factors were much less important compared to offshorability.
- The RIF-regression can differentiate between effects at different points of the distribution - an important strength when considering a range of explanations for the pattern of wage growth.

IV: Determinants of Wage Inequality: An Econometric Approach

- The RIF-regression is effectively and unconditional quantile regression.
- It uses recentered influence function of outcome variable instead of outcome variable itself on LHS. In case of quantiles, the Influence Function (IF) for the τ th quantile is given by:

$$IF(y; Q_\tau) = \frac{\tau - I\{y \leq q_\tau\}}{f_y(q_\tau)} \quad (1)$$

- Where f_y is the marginal density function of Y and $I\{\cdot\}$ is an indicator function. The RIF of the τ th quantile is:

$$RIF(y; Q_\tau) = q_\tau + IF(y; Q_\tau) \quad (2)$$

- We run a RIF-regression on *log of hourly wages for 1997 and 2015*. To control for our three competing explanations, we include:
 - *Five Education Dummies*
 - *Five Task Content Variables and*
 - *Two Institutional Variables (union membership and public sector employment).*
 - *Controls for age, age squared, marital status, gender and race*
- **Limitation:** Inability to control for minimum wage legislation since there were no sectoral minimum wages promulgated in 1997.

IV: Determinants of Wage Inequality: An Econometric Approach

- Oaxaca-Blinder Decomposition along quantiles of wage distribution.
- Decompose changes in real wages between 2015 and 1997 into total, compositional (Δx) and wage structure ($\Delta\beta$) effect for different percentiles of distribution. Begin with linear models of:

$$w^{1997} = x^{1997} \beta^{1997} + \varepsilon^{1997} \quad (3)$$

$$w^{2015} = x^{2015} \beta^{2015} + \varepsilon^{2015} \quad (4)$$

- Where w^i is outcome variable of wage in 1997 and 2015. If $E(\varepsilon^{2015})=E(\varepsilon^{1997})=0$, mean outcome difference between the two years decomposed as:

$$\Delta w = x^{2015} \beta^{2015} - x^{1997} \beta^{1997} \quad (5)$$

$$\Delta w = (x^{2015} - x^{1997}) \beta^{1997} + x^{1997} (\beta^{2015} - \beta^{1997}) + (x^{2015} - x^{1997}) (\beta^{2015} - \beta^{1997}) \quad (6)$$

$$\Delta w = E + C + EC \quad (7)$$

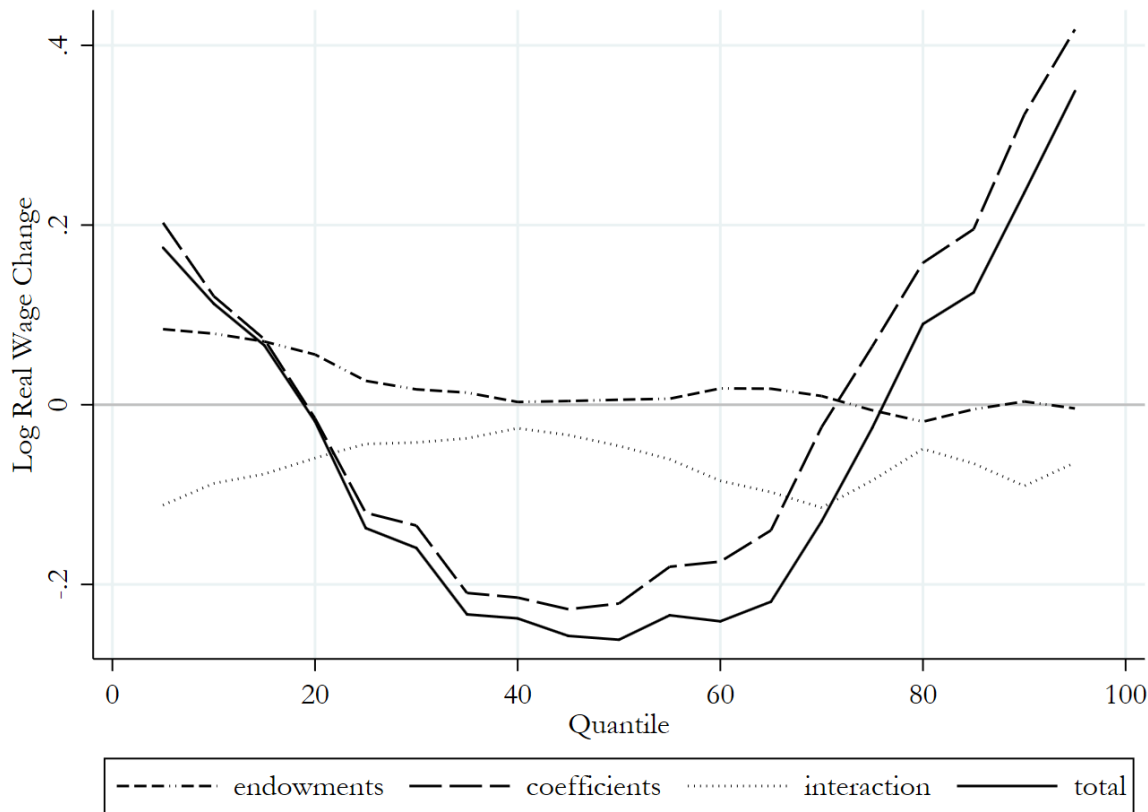
- where x^{1997} and x^{2015} are vectors of means of regressors (including the constants) for two years.
- Change in wages (1997-2015) decomposed into part due to differences in endowments (E), part due to differences in coefficients (C), and that due to interaction between coefficients and endowments (EC).

V: Determinants of Wage Inequality Results

V: Determinants of Wage Inequality

Results: Total Effects

Figure 6. Decomposition of Total Change into Endowment, Coefficient and Interaction Effects, 2015-1997



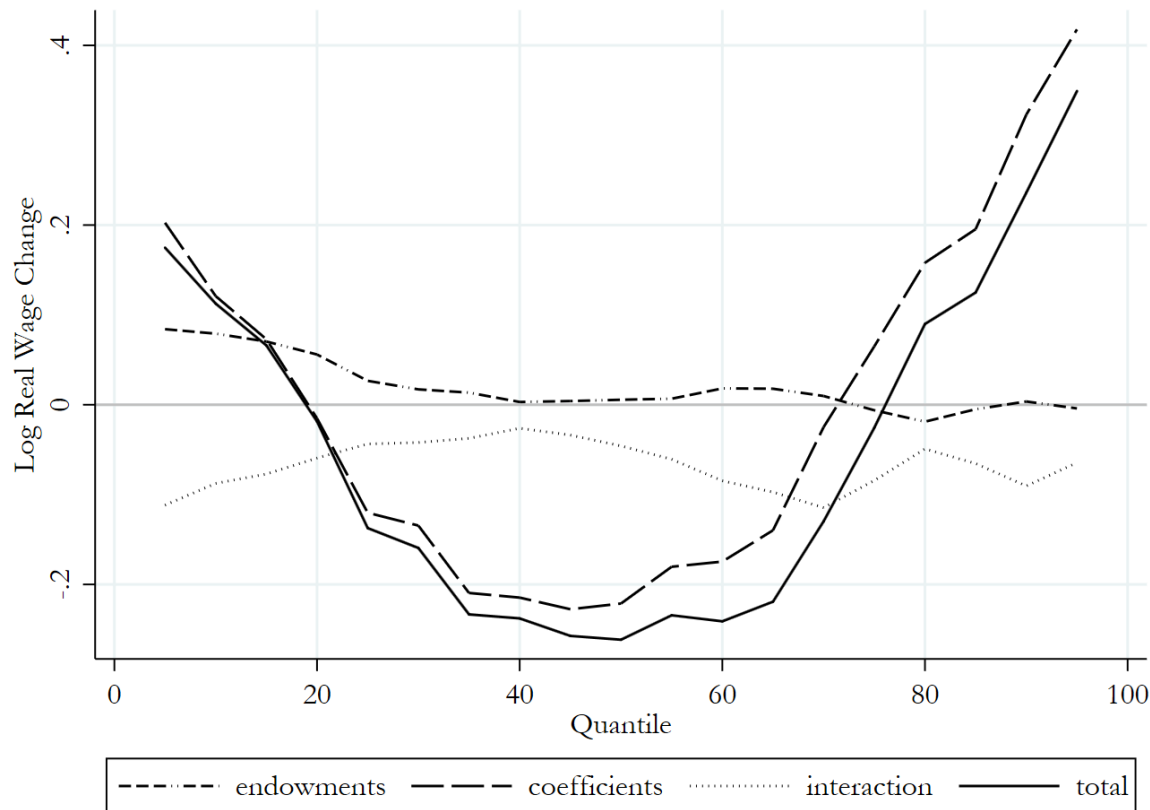
- Very clear U-shape in the total effect
- Consistent with the developed world, although the hollowing out appears deeper in South Africa than it is for advanced countries
- Most growth has accrued to earners at the top whilst those in the middle have experienced losses in real terms
- At the median, real wages in 2015 were 76 percent of what they were in 1997.
- Real wages at the 90th percentile were 27 percent higher in 2015 than 1997.

Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

V: Determinants of Wage Inequality

Results: Total Effects

Figure 6. Decomposition of Total Change into Endowment, Coefficient and Interaction Effects, 2015-1997



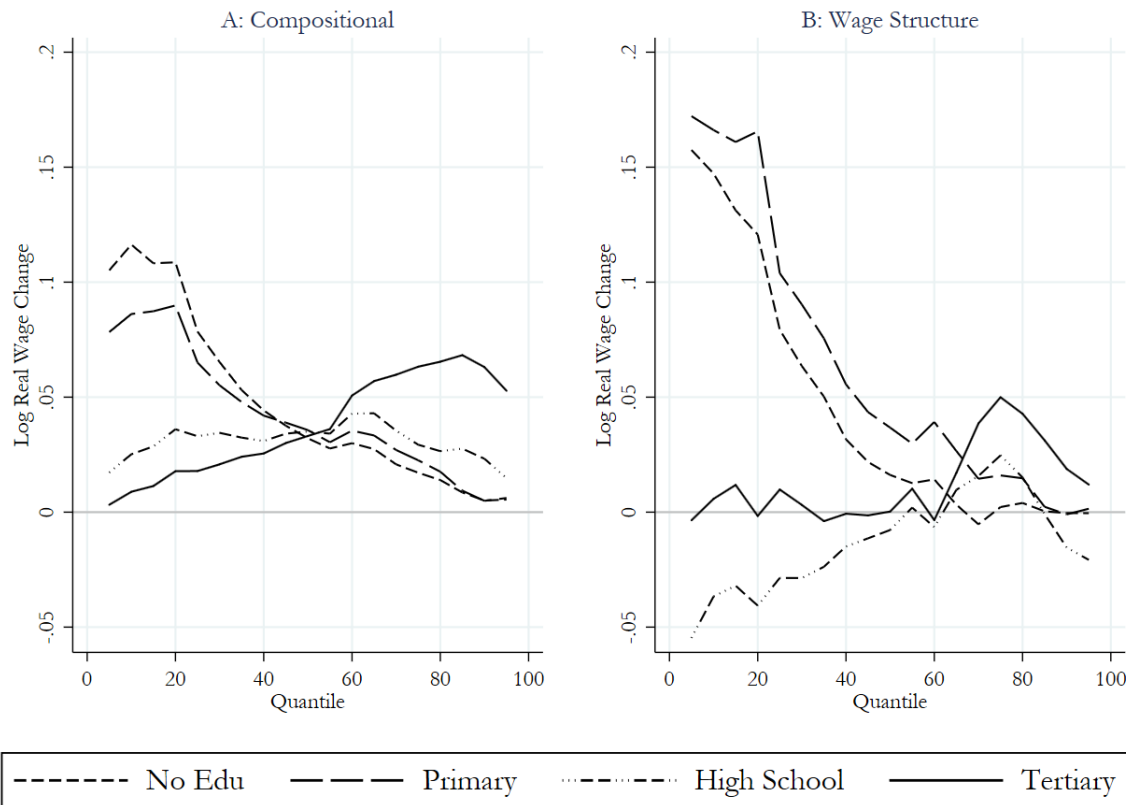
Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

- In the South African case the wage structure component (the coefficients) accounts almost entirely for the U-shaped nature of the wage change
- Compositional factors – such as increasing levels of education across the distribution – have had no significant impact on mitigating wage inequality in the economy.
- Rather, it is structural factors – Skills-biased technical change, the influence of technology on task content, and the role of labour market institutions – which are primarily contributing to the U-shaped pattern of wage growth in South Africa.

V: Determinants of Wage Inequality

Results: Education

Figure 7. Detailed Decomposition of the Compositional and Wage Structure Effects of Education Level, 2015-1997



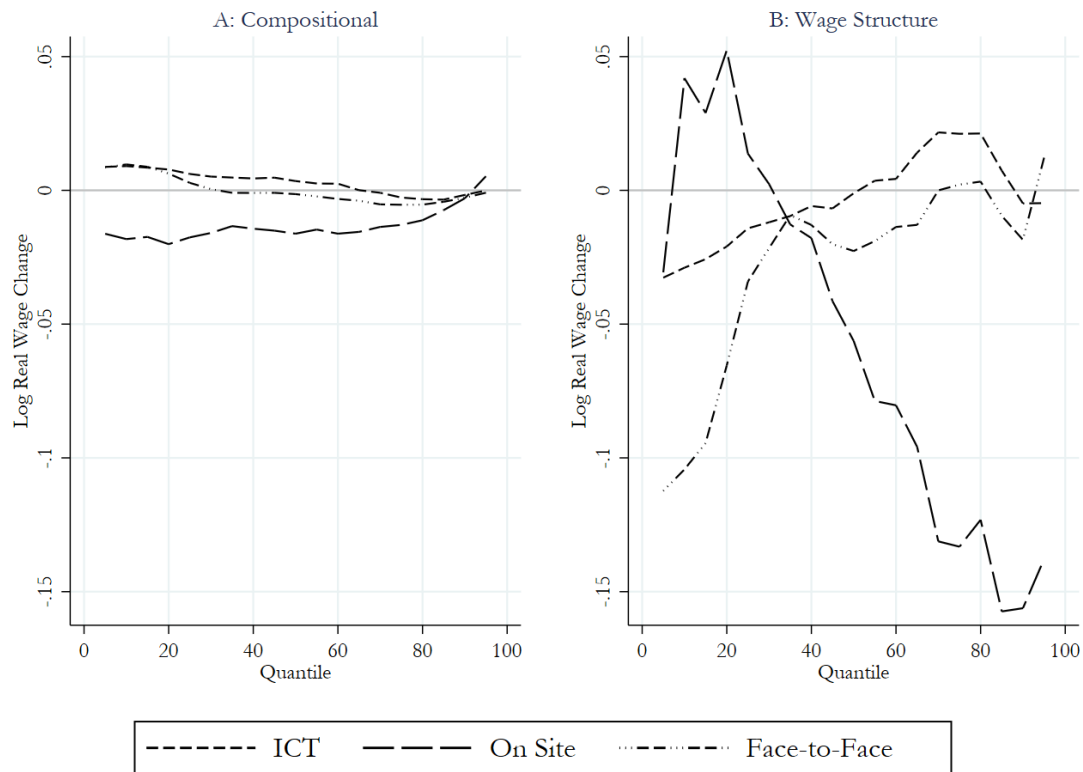
Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

- Compositional effects for no or primary education have decreased inequality at the bottom end, while large increases for those with tertiary education at the top end, have contributed to increasing inequality.
- Wage Effects (Panel B):
 - Those with no or primary education have enjoyed steeply increased returns, reflecting pro-poor policy and minimum wage legislation supporting wages at the bottom end of the distribution.
 - High school graduates have experienced a collapse in the returns to their level of education reinforcing the missing middle observation.
 - Tertiary educated have gained significantly.

V: Determinants of Wage Inequality

Results: Tasks (ICT; F-to-F; On Site)

Figure 8. Detailed Decomposition of the Compositional and Wage Structure Effects by Institutional and Task Variables, 2015-1997



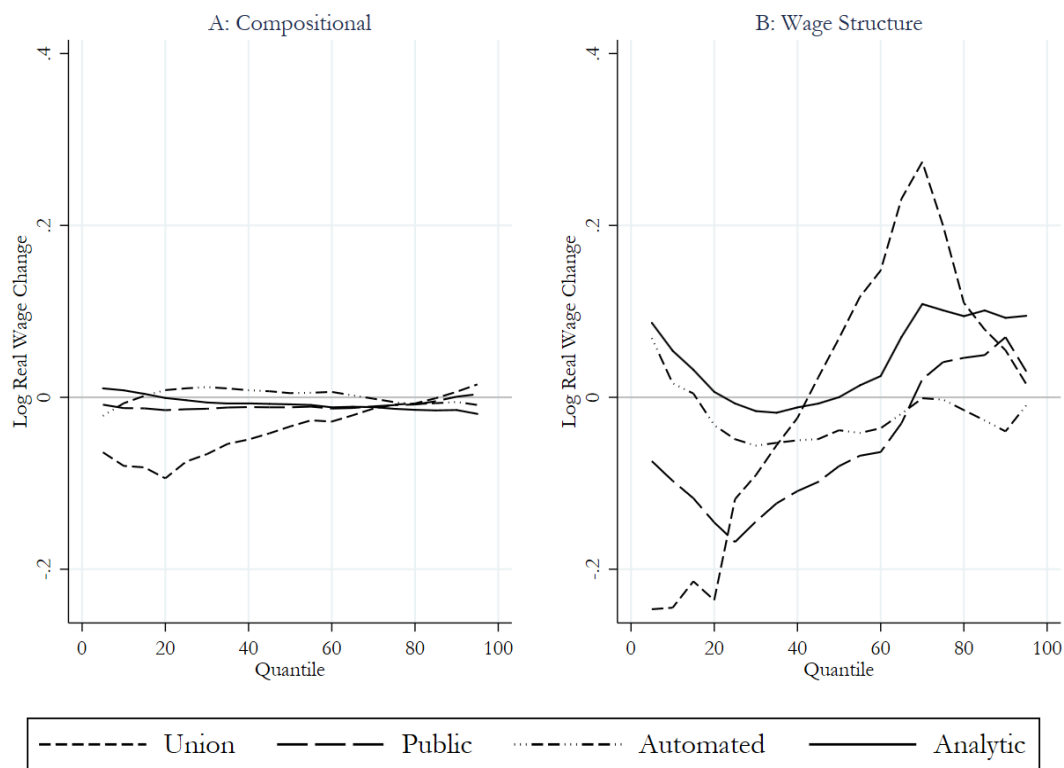
- **Wage structure effects more NB**
 - Negative compositional returns to on site at the bottom end could be a function of an oversupply of low skilled labour
- **Panel B:**
 - ICT and F-to-F: moderate gains for those at the top end
- **Panel B: On site**
 - Large heterogenous category (labourers to teachers to managers)
 - *Bottom*: likely minimum wage protection leads to positive returns (MW apply disproportionately to on site workers: agri; domestic; taxi; cleaning)
 - *Middle*: declining returns to manufacturing and substitutable work not protected by MW
 - *Top*: Substitution by technology/foreign labour. E.g. email replacing the need for in person meetings, software for project management and HR work.

Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

V: Determinants of Wage Inequality

Results: Tasks (Analytic;Auto)

Figure 9. Detailed Decomposition of the Compositional and Wage Structure Effects by Institutional and Task Variables, 2015-1997



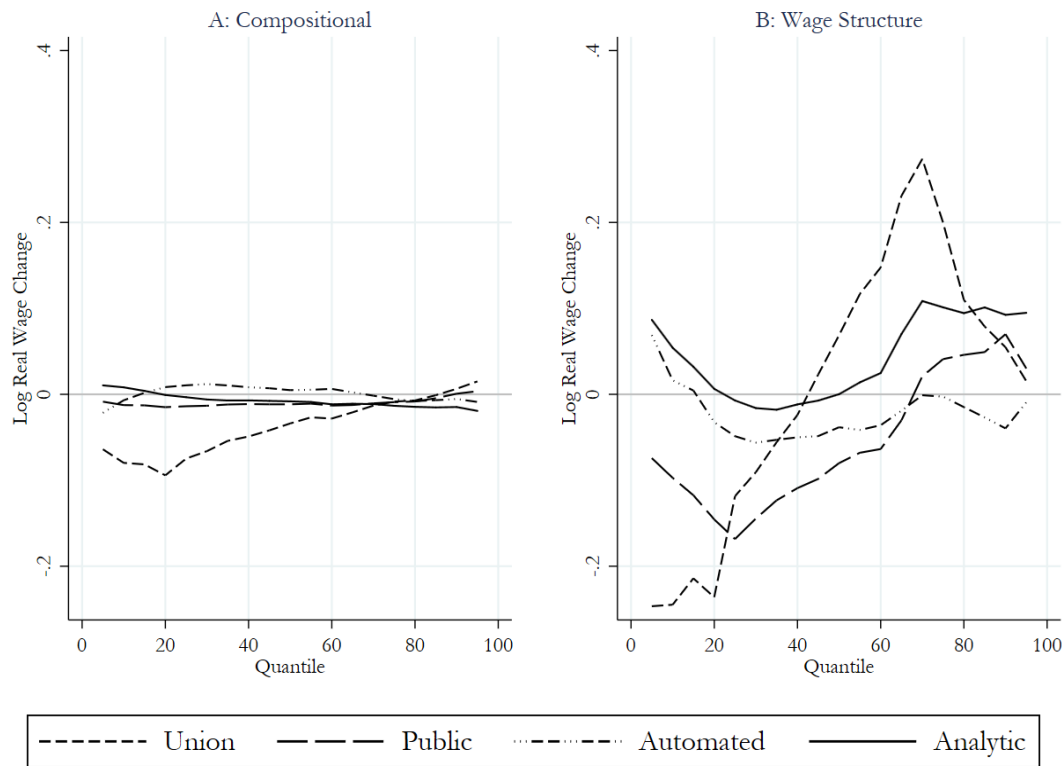
- Wage structure effects much more important than the compositional effects.
- Panel B:
 - Returns to analytic task content follow a distinct U-shape across the distribution
 - Premium on analytic due to difficulty of substitution with technology and sizeable growth experienced by sectors requiring these skills over the period (e.g. finance).
 - Pattern in automated task content is also that of a hollowing out of the middle of the middle of the distribution.
 - Auto tasks: some protection at the bottom end?
 - Reflects the erosion of the mining and manufacturing sectors in South Africa.

Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

V: Determinants of Wage Inequality

Results: Institutions

Figure 9. Detailed Decomposition of the Compositional and Wage Structure Effects by Institutional and Task Variables, 2015-1997



- Returns to union membership increased beyond 40th percentile in Panel B, in Panel A, the effect is below zero for the same section of the distribution. Means that although these union members are enjoying increased wages, there are substantially fewer workers joining unions.
 - it appears that unions are failing to protect the most vulnerable workers at the bottom of the distribution
- Returns to public sector employment in Panel B have benefitted those above the 60th percentile to the detriment of those below that point.
- Result arguably shows that elites have captured gains from public sector employment as all of the positive returns are clustered in the top third

Notes: own calculations using PALMS; data weighted using sampling weights; sample consists of all employed adults of working age with non-missing wage and hours of work data.

VI. Conclusion

VI: Summary of Results

Bottom	Middle	Top
<ul style="list-style-type: none">- Zero or primary schooling steep increased returns - minimum wage legislation?- Positive returns to automated jobs- minimum wage legislation?- Although proportion of unionised and public sector workers increased at bottom end - not relevant to positive wage growth in this section of the distribution.	<ul style="list-style-type: none">- High school graduates experienced collapse in returns.- Increasingly automated jobs with distinctly negative returns to this task type for the middle of the distribution, reflecting the decline in the manufacturing and mining sectors and capital substitution in these sectors- Hollowing out of public sector employment and de-unionisation in middle of distribution.	<ul style="list-style-type: none">- Increases in both level and returns to tertiary education, as well as increases in the returns to analytic jobs- A reflection of strong service-oriented growth- Important institutional factors include elite capture of unions and a swelling public sector wage premium at the top end of the distribution

VI: Conclusion

- Analysis Possibly one of first investigations of drivers of missing middle in wage growth in an emerging economy.
- Of three major explanations for wage polarization in South Africa : SBTC (education); Technology & tasks, and LM institutions.
 - All three important for different portions of wage distribution.
- First half of U-shape inequality decreasing, second half is inequality increasing
 - Latter effect dominating leading to increase in aggregate wage inequality in the post-apartheid period in South Africa.
- U-shape driven by U-shapes in both education and task content.
- Labour market institutions like unions that appear to be mostly inequality increasing.
- The schooling system, nature of the technology-employment relationship, sectoral patterns of growth and role of unions – all crucial then in predicting the future trajectory of wage inequality in South Africa.

Thank you