



Transformations in Technology, Transformations in Work

October 2016

TECHNOLOGY, SKILLS AND WAGES IN SOUTH AFRICA

Tackling labor market polarization

Aalia Cassim, Guest Contributor

This was a guest contribution by Aalia Cassim, a Senior Economist at the National Treasury, South Africa. Her focus is on competition, regulation and firm dynamics. Previously Aalia was a Senior Researcher at the Development Policy Research Unit (DPRU) at the University of Cape Town. While at the DPRU, Aalia's research looked at labor market dynamics, social protection, youth employment, minimum wages and higher education.



SOUTH AFRICA



44,422

GDP per person
employed
(constant 1990 PPP \$)



49

Internet users
(per 100 people)



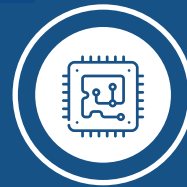
149

Mobile cellular
subscriptions
(per 100 people)



0.73

Research and development
expenditure
(% of GDP)



6

High-technology exports
(% of manufactured exports)

TECHNOLOGY, SKILLS AND WAGES IN SOUTH AFRICA

Tackling labor market polarization

Aalia Cassim, Guest Contributor

In the past two decades of the post-Apartheid era, South Africa has faced persistently high levels of inequality and unemployment. While poverty in the country has declined, income inequality has risen.¹ The Gini Index – a measure of income inequality – worsened from 59.3 to 63.4 between 1994 and 2011.¹ And unemployment has averaged approximately 25 percent since 1994.

Uneven access to economic opportunity, differences in the quality of education and varied settlement patterns between those at the upper and lower end of the income distribution are among the reasons for the rise in wage inequality. Many in South Africa's labor force remain unskilled and have limited access to internet connectivity and social networks. This is partly related to the post-Apartheid era's poor quality of education. In addition, spatial and settlement

patterns in which poorer households are situated outside of urban centers make it harder for residents of these communities to access good jobs. These factors have essentially resulted in the development of a divided economy.

South Africa is caught in a vicious cycle in which existing income inequality fuels low skill accumulation that further exacerbates inequity.²

The country's structural context does not allow for certain cohorts of the population, such as poor individuals, to access higher skills in part due to limited access to economic opportunities and quality services. For example, children from the poorest households in South Africa are seven times more likely than those from the richest households to rank in the lowest 10 percent of students.³ This lack of access is partly due to poor social networks and low-quality schooling. However,

South Africa is caught in a vicious cycle in which existing income inequality fuels low skill accumulation that further exacerbates inequity.

¹ The Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal income distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

the widening gaps in opportunity are explained by the increasing diffusion of technology in the economy, whereby certain skills and jobs have been rendered less valuable. In general, these are the low- and medium- skilled jobs that firms can easily substitute using automation or technology. At the same time, more advanced skills – such as research and analysis – suited to technologies used in global markets, earn a higher wage premium, which is the differential in wages for a given set of skills relative to unskilled workers.⁴ There is evidence of a growing wage premium for skilled labor in South Africa whereas wages for low-skilled work have declined in real terms.⁵

The shift in the nature of skills that a 21st-century economy demands is not unique to South Africa. It is also prevalent in a number of emerging and developed markets. But South Africa's exceptionally high unemployment rate makes

The South African economy is becoming increasingly capital-intensive, which also means it is becoming more technology- and skill-intensive.

its situation unique. In part, this is related to the fact that South Africa's informal sector is small. Therefore, if one is not employed in the formal sector, her/his odds of finding employment outside are limited. This is in sharp contrast with other African countries where the bulk of jobs are informal and so people find some form of work – however productive or unproductive it may be.

This chapter first considers the global context and the falling share of income afforded to labor, and then goes on to focus on the sectoral investment trends in South Africa. Investment

has a very clear relationship with the country's labor demand trajectory, which is presented thereafter. Finally, the chapter proposes practical policy recommendations that are required in South Africa to overcome the resulting earnings gap and to reduce inequality, with a focus on education, industrial policy and Information and Communication Technologies (ICT).

Labor share and sectoral investment in South Africa

The South African economy is becoming increasingly capital-intensive, which also means it is becoming more technology- and skill-intensive.

Expansion of capital-intensive as opposed to labor-intensive sectors means that there are fewer jobs. Moreover, as economies become

more technological and therefore skill-intensive, those without the requisite qualifications are left behind. These factors are fueling a decline in labor's share of income.

Globally, the share of income secured by labor – as opposed to capital income such as profits – has declined over the past three decades.⁶⁷ The median labor share in 26 out of 30 Organisation for Economic Co-operation and Development (OECD) countries for which data were available fell from 66.1 percent in 1990 to 61.7 percent in 2009.⁸ The International

Technological change, specifically information technology, has increased the productivity of physical capital relative to labor and is partly responsible for the decline in labor's share of income.

Labour Organization suggests that globalization, financialization and technological shifts are the primary drivers behind labor's falling income share in both developed and developing countries.⁹ Technological change, specifically information technology, has increased the productivity of physical capital relative to labor and is partly responsible for the decline in labor's share of income.¹⁰ This has resulted in the substitution of labor for physical capital in some cases.¹¹ For example, firms may view physical capital, such

Table 1
Investment growth against capital-labor (K-L) ratios by sector, 1997-2013

	K-L	Investment Growth (%)
Manufacturing	5.15	4.14
Transport, Storage and Communication	1.57	8.07
Construction	1.53	10.22
Wholesale and Retail Trade	0.83	5.78
Community, Social and Personal Services	0.77	5.96
Financial and Business Services	0.32	2.56
Agriculture, Forestry and Fishing	-0.38	0.00
Mining and Quarrying	-1.80	7.13
Electricity, Gas and Water	-4.18	7.69

Source: Borat, Cassim & Hirsch (2014).

as machines, as a better investment than human capital. Rather than hire additional labor, firms increasingly invest in physical capital.

Moreover, the increasing size and market for financial services has also fueled a decline in labor's share of income.¹² In South Africa, the financial services sector contributed 22 percent to GDP in 2012, an increase from 12 percent in 1994.¹³ This sector tends to demand workers that have a middle to a high level of skills. Yet South Africa's labor force remains largely low-skilled.¹⁴ The increasing market share of a sector that does not require low-skilled workers is part of declining demand for labor in general.

Previous research on South Africa has found that capital-intensive industries have attracted far more investment, even though these sectors were less likely to generate employment.¹⁵ **Table 1** presents annual investment growth in South Africa between 1997 and 2013 against the Capital-Labor (K-L) ratioⁱⁱ by sector.

Previous research on South Africa has found that capital-intensive industries have attracted far more investment, even though these sectors were less likely to generate employment.

The capital-intensive sectors such as construction and transport, witnessed the highest rates of annual investment growth. These sectors saw investment growth between 7 and 10 percent between 1997 and 2013.

Sectors such as agriculture that could drive rural employment, particularly for lower skilled workers and residents of less developed areas have had subdued levels of investment from the private sector. Currently, the sector employs only 5 percent of the country's total workforce.¹⁶

Among all the sectors, the K-L ratio was highest for manufacturing, highlighting that there are high levels of investment in heavy manufacturing and mechanization rather than in labor. Sectors such as wholesale and retail trade, finance and business, and community services had K-L ratios of less than one, reflecting that employment is growing faster than capital in these sectors. While these sectors have been the key employment drivers in services, investment was driven primarily by capital-intensive sectors such as construction and transport.¹⁷

ⁱⁱ The capital-labor ratio (K-L) captures a firm's degree of capital intensity. For a given firm or sector, if this ratio is greater than one, i.e. the amount of capital utilized by a firm (K) is greater than the amount of labor (L), it means that the firm or sector is capital-intensive. Further, higher the ratio, then more capital-intensive is the sector or firm. Conversely, a K-L ratio of less than one implies that the firm or sector is labor-intensive.

Impact of investment patterns on skill demand and wage premiums

The skill-biased technical change (SBTC) theory suggests that technological change has resulted in a downward shift in the demand for low-skill workers and a rise in demand for highly skilled workers, leading to income inequality. A series of studies highlight that technological change is one of the explanations for the rise in wage inequality in the United States.^{18,19} There is also growing global evidence from developing countries of how SBTC can exacerbate wage inequality, especially in the presence of increased foreign trade.²⁰ Greater foreign trade leads to technology spillovers. Trading partners are likely to adopt foreign technology developed in skill-intensive advanced economies and end up with skill biases.²¹ Using data from South Africa, Rattso and Stokke's model predicts an increase in technological skill bias as the economy becomes more dependent on foreign technology.²²

The increasing investment in capital (noted in the previous section) has shifted the nature of skills demanded in the South African economy over the past two decades. Rodrik found that, between 1980 and 2005, capital deepening – an increase

in the capital intensity of firms – in South Africa resulted in a higher demand for skilled workers as opposed to low-skilled workers, which is among the reasons for a higher wage premium for skilled workers relative to low-skilled workers.^{iii, 23}

A study undertaken by the Development Policy Research Unit on the South African labor market considers the changing nature of skills and the impact of the change on wage premiums. The study considers different skill types, including

The increasing investment in capital (noted in the previous section) has shifted the nature of skills demanded in the South African economy over the past two decades.

ICT skills, analytic or strategic decision-making skills, and skills that can be automated because of their routine nature, including construction or the operation of machinery.²⁴ It shows that between 2001 and 2011,

employment where ICT skills are used increased by 64 percent. During the same period, employment of those using analytic or problem-solving skills rose by 53 percent. Analytic jobs are dominated by high-skilled persons such as managers and professionals, including those in the legal field; consultants; and other desk-based jobs that are not solely administrative. However, employment of those using automated or routinized jobs has

ⁱⁱⁱ Rodrik decomposed sectoral real remuneration into skill composition and skill adjusted (residual) or wage push components.

increased by just 5 percent.^{iv} A quantile wage regression follows in which the results show that, after controlling for demographic characteristics including age/experience, race and education, ICT-related jobs and those in the analytic category earn higher wages throughout the income distribution relative to workers in the other categories. The increasing demand for skilled work is thus matched by higher wage premiums.

For automated jobs as well as those involving high levels of physical exertion – such as operating machines, vehicles or mechanical equipment – wage premiums have seen a decline over time. These jobs can be automated and easily replaced by technology competing against workers in the labor market. South Africa also has an over-supply of labor to do less-skilled work.²⁵ Therefore, job profiles with no analytic or decision-making components are associated with low wage premiums that have been declining over time.²⁶

This study essentially shows that wages in South Africa appear to be influenced by global demand for technical and analytic skills.

Wages in South Africa appear to be influenced by global demand for technical and analytic skills. While investment in technology is necessary to compete globally, its skill biased nature excludes a huge cohort of South Africa's labor force.

While investment in technology is necessary to compete globally, its skill biased nature excludes a huge cohort of South Africa's labor force. The expected gains from investments in technology are therefore potentially offset by the adverse impact they have on many workers that lack the requisite skills and are seeing their share of national income decline.

A country cannot grow prosperously when a quarter of its working age population is unemployed. At present, South Africa's poor labor force participation - 56.6 percent in 2014²⁷- is exacerbating wage inequality. Improving upon this situation requires more balanced investment in terms of industrial policy as well up-skilling individuals.

^{iv} They include occupations such as textile weavers, engravers, machine operators and assemblers.

Moving forward

This chapter proposes four recommendations to reduce wage inequality in South Africa.

1. *Improve quality of education*

One of South Africa's primary challenges is that the quality of education that the public system provides is of low quality and is not aligned with labor market demand. The skill set of young graduates does not match the requirements of growing industries. In order to rectify this mismatch, there needs to be more coordination between government agencies working on education, including national departments such as the Department of Basic Education and Department of Higher Education, as well as provincial departments; and employers, both in the private and public sector. A dialogue between the organizations responsible for education and employers would help align education to market demand.²⁸

Further, education must be supplemented by skills training. Unemployment rates for college graduates are greater than 15 percent.²⁹ But the current landscape of skills training is not adequate either. More needs to be done to improve the quality of skills training, align it to labor market needs and boost enrollment in Technical

Vocational Education and Training (TVET) in South Africa. In 2013, only 794,250 individuals were enrolled in Further Education and Training and TVET, while the country's youth population – individuals between the ages of 15 and 24 – was 10.6 million.^{30,31}

A review of the curriculum and the skills demanded by the labor market is necessary to produce graduates with relevant qualifications

The country needs a long-term strategy to address the demands of those eligible for tertiary education but who are unable to afford it.

can improve their personal welfare as well as contribute productively to economic growth. Updating the curriculum involves examining methods of global production that can be

adopted in South Africa to enhance the potential of the labor force.

2. *Increase access to education*

In 2011, nearly 17 percent of South Africa's population lived on less than US\$ 1.90 per day.³² With such a high proportion of its population living in poverty, financial constraints are a significant barrier to accessing education. While the government offers free schooling to those who cannot afford it, there are a number of eligible people who do not access these benefits because of lack of information.

Tertiary or higher education at the college and university levels has also become expensive and inaccessible for the majority of the population.

Over the last decade, the government subsidy as a share of total university fees has declined from 49 to 40 percent while the student contribution has risen from 24 to 31 percent.³³ While funding is available for poor students, there is a gap in

the funding system for those who are not quite “poor enough” and are commonly referred to as the “missing middle.”

The lack of access to higher education has led to a wave of protests around the country since 2015.³⁴ While the government agreed to not increase the fees for tertiary institutions in 2016, the country needs a long-term strategy to address the demands of those eligible for tertiary education but unable to afford it.

3. Link industrial policy to the labor force

Industrial policy that supports capital-intensive production that relies on physical capital or technology will not enable creation of large-scale employment. Yet, there is evidence that industrial policy in South Africa has focused on heavy rather

than light manufacturing over the past two decades.³⁵ Support for heavy industry that utilizes more productivity-enhancing technologies

rather than labor comes through various means, including favorable tariffs as well as the availability of cheap energy. But incentives for certain labor-intensive, light manufacturing sectors are, to some extent, nullified by

regulatory barriers plus enhanced global competition and lower wages in other countries. This has an adverse impact on the potential of manufacturing to generate employment.

Policymakers should promote employment creation in industries that make use of the labor force in its current form and also take into account the levels of technology adoption in different sectors. While improving the education system is key, it will take some time to implement a new curriculum and integrate it into the current system. Therefore, in the short term, supporting light manufacturing or less technology-intensive industries that make use of low-skilled workers, who constitute a majority of the labor force, is critical to providing productive employment. While light manufacturing may not up-skill

Supporting light manufacturing or less technology-intensive industries that make use of low-skilled workers, who constitute a majority of the labor force, is critical to providing productive employment

workers to the point that their salaries can compete with wage premiums in, for instance, the ICT field, it is still critical to ensure that this group is employed productively. Reducing the number of unemployed individuals will also ease the burden on the state, which currently has an extensive social security budget. Industrial policy should be accompanied by on-the-job training to enhance employee productivity and acquaint employees with new technologies.

4. Enhance connectivity

A fundamental step toward up-skilling individuals is improving access to ICT, not only to enhance efficiency, but also as a tool for sharing information. Connectivity, particularly internet roll-out in both rural and urban areas, should be broader so that poorer segments of the population have access. Internet connectivity is a vital means of sharing information on government assistance and information on available jobs.

In 2015, 48.7 percent of households in South Africa had an internet connection, including

connections on a mobile phone. The largest share of South Africans with access to the internet use it at the workplace, 15.1 percent, followed by their home, 9.7 percent, and at school/university/college, 5.1 percent.³⁶ Internet connectivity also varies by province. Wealthier provinces, such as Gauteng, host the highest number of connected households, 65.7 percent, while poorer provinces, such as Limpopo, have the lowest share of household internet connections, at 39.3 percent.³⁷

Those excluded from access to internet lack information and have limited social and professional networks, perpetuating the already high levels of inequality. A possible solution is to create internet hubs around cities as well as in peri-urban areas where individuals can access computers, use online portals and forums, and possibly undertake computer literacy courses at subsidized rates.

Conclusion

Increasing technology adoption in South Africa has shifted the demand for labor toward more skilled workers and has had a direct impact on wage premiums across sectors. Skill-biased technical change has also exacerbated income inequality.

South Africa's growth has been higher in capital-intensive sectors such as construction and transport. These investment patterns have

had significant implications for employment and wages. This chapter presents evidence of increasing wage premiums for higher skills linked to technology-intensive sectors such as ICT and analytical skills and a growing wage gap between high- and low-skilled workers. Policy options to reduce the resulting wage inequality include enhancing the quality of and access to education, linking industrial policy to the labor force and increasing focus on ICT.

Endnotes

- ¹ Bhorat, H., Naidoo, K., & Yu, D. (2014). *Trade unions in an emerging economy: The case of South Africa*. Working Paper Series No. 2014/055. South Africa. World Institute for Development Economic Research (UNU-WIDER).
- ² M. Pellicer, V. Ranchod, M. Sarr, E. Wegner. (2011). *Inequality Traps in South Africa: An Overview and Research Agenda*. Working Paper 57. SALDRU.
- ³ Watkins K. (2013, January 16). Too Little Access, Not Enough Learning: Africa's Twin Deficit in Education. Brookings Op-ed. Retrieved from <https://www.brookings.edu/opinions/too-little-access-not-enough-learning-africas-twin-deficit-in-education/>
- ⁴ Acemoglu, D. & Autor D. (2011). Skills, tasks and technologies: Implications for employment and earnings. In O. Ashenfelter & D. Card (Eds.), *Handbook of Labor Economics, Vol. 4, Part B* (1043–1171). Amsterdam: Elsevier.
- ⁵ Bhorat, H., Goga, S., & Stanwix, B. (2013). LMIP Report 1: Occupational Shifts and Shortages: Skills Challenges Facing the South African Economy.
- ⁶ ILO. (2013). *Global Wage Report 2012/13. Wages and Equitable Growth*. Geneva: ILO.
- ⁷ OECD. (2012). *Employment Outlook 2012*. Paris.
- ⁸ Ibid
- ⁹ Stockhammer, E. (2013). *Why have wage shares fallen? A panel analysis of the determinants of functional income distribution*. ILO Working Paper, Conditions of Work and Employment Series No. 35. Geneva: ILO.
- ¹⁰ Burger, P. (2015). Technology, labour power and labour's declining income share in post-apartheid South Africa.
- ¹¹ OECD. 2012. *Employment Outlook 2012*. Paris.
- ¹² ILO. 2013. *Global Wage Report 2012/13. Wages and Equitable Growth*. Geneva: ILO.
- ¹³ IDC/R&I. (2013). *South African economy: An overview of key trends since 1994*. Department of Research and Information. South Africa: Industrial Development Corporation.
- ¹⁴ Lawrence, E. (2006). Trade Liberalization and Labour Demand in South Africa During the 1990s. In H. Bhorat and R. Kanbur (eds), *Poverty and Policy in the Post-Apartheid South Africa*, Cape Town (232–61). South Africa: HSRC Press.
- ¹⁵ Bhorat, H. Cassim, A. and Hirsch, A. (2014). *Policy Co-ordination and Growth Traps in a Middle-income Country Setting*. UNU-WIDER Working Paper 155/2014. UNU-WIDER.
- ¹⁶ Quarterly Labor Force Survey, 2016. Retrieved from <http://www.statssa.gov.za/publications/P0211/P02111stQuarter2016.pdf>
- ¹⁷ Bhorat, H. Cassim, A. and Hirsch, A. (2014). *Policy Co-ordination and Growth Traps in a Middle-income Country Setting*. UNU-WIDER Working Paper 155/2014. UNU-WIDER.
- ¹⁸ Bound, J. & Johnson, G. (1992). Changes in the structure of wages in the 1980s: An evaluation of alternative explanations. *American Economic Review*, 83, 371–92.
- ¹⁹ Katz, L. & Murphy, K. M. (1992). Changes in relative wages, 1963–1987: Supply and demand factors. *Quarterly Journal of Economics*, 107, 35–78.
- ²⁰ Rattso, J. & Stokke H.E. (2013). Trade, skill biased technical change and wage inequality in South Africa. *Review of International Economics*, 21(3), 419-431.
- ²¹ Acemoglu, D. (1998). Why do new technologies complement skills? Directed technical change and wage inequality. *Quarterly Journal of Economics*, 113, 1055-89.
- ²² Rattso, J. & Stokke H.E. (2013). Trade, skill biased technical change and wage inequality in South Africa. *Review of International Economics*, 21(3), 419-431.

- ²³ Rodrik, D. (2006). Understanding South Africa's Economic Puzzles. CEPR Discussion Papers 5907. C.E.P.R. Discussion Papers.
- ²⁴ Bhorat, H., Goga, S., & Stanwix, B. (2013). LMIP Report 1: Occupational Shifts and Shortages: Skills Challenges Facing the South African Economy.
- ²⁵ Edwards, L. (2006). Trade Liberalization and Labour Demand in South Africa During the 1990s, in Haroon Bhorat and Ravi Kanbur (Eds.), *Poverty and Policy in the Post-Apartheid South Africa*, Cape Town: HSRC Press: 232–61.
- ²⁶ Bhorat, H., Goga, S., & Stanwix, B. (2013). LMIP Report 1: Occupational Shifts and Shortages: Skills Challenges Facing the South African Economy.
- ²⁷ The World Bank, World Development Indicators (2014). Labor force participation rate, total. Retrieved from <http://data.worldbank.org/indicator/SL.TLF.ACTI.ZS?locations=ZA>.
- ²⁸ Bhorat, H. Cassim, A. and Oosthuizen, M. (2014). Occupational Shifts and Skills Challenges Facing the South African Labour Market. HSRC: Pretoria.
- ²⁹ Broekhuizen, H. (2016). *Graduate Unemployment and Higher Education Institutions in South Africa*. Stellenbosch Economic Working Papers: 08/16. Matieland, South Africa: Department of Economics, University of Stellenbosch.
- ³⁰ Post-Education School and Training in South Africa. Retrieved from <http://www.dhet.gov.za/DHET%20Statistics%20Publication/Statistics%20on%20Post-School%20Education%20and%20Training%20in%20South%20Africa%202013.pdf>
- ³¹ United Nations Population Division. World Population Prospects: The 2015 Revision. Population by age groups (both sexes). Retrieved from <https://esa.un.org/unpd/wpp/Download/Standard/Population/>
- ³² World Development Indicators. World Bank. Retrieved from <http://data.worldbank.org/indicator/SI.POV.DDAY?locations=ZA>
- ³³ News24Wire. (2015, October 23). What you need to know about university fees in South Africa. Business Tech. Retrieved from <http://businesstech.co.za/news/general/102010/what-you-need-to-know-about-university-fees-in-south-africa/>
- ³⁴ Business Day Live. (2015, October 21). Students storm gates of parliament in fees must fall protest against budget. National. Retrieved from <http://www.bdlive.co.za/national/2015/10/21/students-storm-gates-of-parliament-in-fees-must-fall-protest-against-budget>
- ³⁵ Bhorat, H. Cassim, A. and Hirsch, A. (2014). *Policy Co-ordination and Growth Traps in a Middle-income Country Setting*. UNU-WIDER Working Paper 155/2014. UNU-WIDER.
- ³⁶ Stats SA. (2016). General Household Survey 2015. Statistical Release P0318, forthcoming. South Africa: Statistics South Africa.
- ³⁷ *ibid.*

JustJobs

WORKING FOR SHARED PROSPERITY

JustJobs Network is a private, nonpartisan organization finding evidence-based solutions to one of the most pressing challenges of our time: How to create more and better jobs worldwide. We produce empirical research on good job creation, focusing our work on the critical knowledge gaps in the global employment landscape.

JustJobs convenes a global network of diverse stakeholders—including policy shapers, academics, and grassroots leaders — to deepen the practical implications of our research endeavors and amplify their impact. Through the combination of cutting-edge research and global knowledge sharing, we aim to forge a fresh, dynamic channel for policy dialogue on employment at national, regional and international levels. Our team members are based in New Delhi and Washington, D.C.

For more information visit
www.justjobsnetwork.org or
write to us at info@justjobsnetwork.org

Report design by



Whitespace35

www.whitespace35.com
venkatesh@whitespace35.com
+91 97414 51309