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SA's poser: Technology vs wages

The fourth industrial revolution and the minimum wage could put a damper on efforts to create a large number of jobs

COMMENT
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Although technology is making capital cheaper, policies such as the national minimum wage will make labour more expensive. What does this mean for the choices firms make in terms of labour and capital inputs?

Research shows that higher prices for labour will result in a lower demand for it, making job creation more difficult. Along with this, higher wages for low-skilled workers will encourage firms to employ more high-skilled workers and become more skill-intensive.

In South Africa (and globally), a number of trends are changing the relative price of labour. The coming implementation of a national minimum wage will substantially increase the cost of employment, particularly of lower-skilled workers. In parallel with this, the fourth industrial revolution is making technology cheaper and more widespread. The effect of both these factors on employment depends crucially on whether firms can move away from using people and towards using machines (capital), or can use them together.

The substitutability issue

While capital and labour substitutability should be central to the South African employment debate, this matter is often neglected.

At the extreme, if machines and people are perfect substitutes, they can be swapped to the point where only one is used for production. In such a situation, employment can be created without having to add any further capital.

If they are imperfect substitutes, or complements, then both are required and there is a limit to how much one can be substituted for the other. As a result, more capital will be needed if, to create employment, more people are to be hired. And if there are factors limiting capital accumulation, this could limit employment creation.

Likewise, the extent to which one type of labour can be substituted for another is critical. Can low-skilled workers be hired instead of high-skilled workers, or does one group need the other? And what about semi-skilled workers?

Understanding these relationships is important when crafting sensible policies for South Africa and dealing with its high rates of unemployment, particularly among those with lower skills.

The unemployment debate

The narrative often used to explain South Africa's high unemployment is that those who are unemployed lack the skills firms require. The policy solution is simple, even though implementation may be difficult: provide the requisite skills to those who are unemployed.

Various government initiatives attempt this solution. Sector Education and Training Authorities (Setas) train workers based on the needs of firms, and learnerships provide subsidised employment and training for new entrants into the job market.

A further constraint is the education system. Work by Stellenbosch University's Research on Socio-Economic Policy Group shows how the school system perpetuates inequality in the labour market. But educational reform requires political will and capital and, if it were implemented today, would probably take a generation to have a real effect.

Consistently missing from the skills narrative is any discussion about the substitutability of factors of production and different types of labour, as well as the role prices and wages play in encouraging firms to choose capital over labour or one type of worker over another.

Discussions on the effect that the relative price of labour has on demand are politically charged, as debates around the national minimum wage have shown. But avoiding the issue may constrain job creation.

A study by Alberto Behar, titled Would Cheaper Capital Replace Labour? in the *South African Journal for Economics*, considered how the demand for labour is related to wages and the price of other inputs. Using firm-level data from the late 1990s, it finds that capital is a substitute for all occupations and that, within labour, unskilled and semi-skilled labour are complements, whereas unskilled and skilled labour are substitutes.

Our research updates that study using data from the World Bank's Investment Climate Assessment of 2004, a firm-level survey of predominantly manufacturing firms across the major metropolitan areas of South Africa. The research estimates a "cost function", which is a representation of how the cost share of one input is related to the cost of other inputs and output across firms.

This approach estimates how the demand for a specific input, such as labour, changes with its price as well as the prices of other inputs such as capital. This is called the elasticity of substitution.

Our results indicate that capital and labour are imperfect substitutes: an increase in the cost of labour relative to capital is likely to lead to fewer jobs being created.

What does this mean?

In a broad sense, increases in the relative cost of labour — such as the implementation of the national minimum wage — will result in firms employing fewer people and replacing them with machines or other forms of technology. The continuing development of technology and computing is likely to make labour-saving options cheaper.

This will then make capital cheaper and more productive, and further encourage firms to substitute away from labour. In this environment, job creation will become more difficult.

The results also suggest another explanation for why job creation over the past 20 years has been difficult. Improvements in macroeconomic policy, especially monetary policy, have meant that real interest rates — and the price of capital — have fallen since 1994.

Job creation and the policy to facilitate it thus face at least two persistent challenges:

- Falling relative prices for capital, facilitated by macroeconomic policy but also by technological change, will make capital and technology cheaper; and
- Pressure to increase wages at the lower end will raise the cost of employing people.

Both of these are likely to encourage firms to choose machines over people. Policies for employment creation will need to work twice as hard to compensate for these changing relative prices.

Rise of the machines

If capital is expensive there's less demand for it, but the same applies to workers ...

TABLE 1: DEMAND FOR CAPITAL AND WORKERS

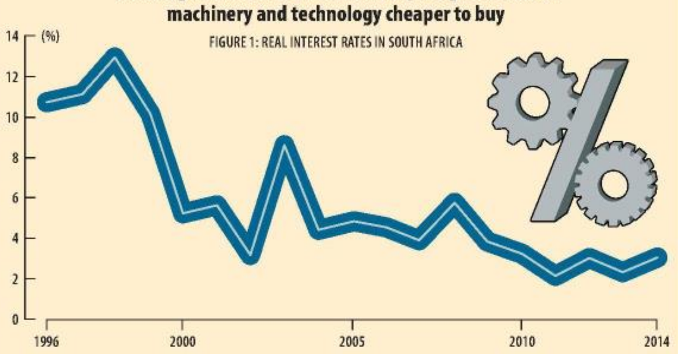
	CAPITAL	MANAGERIAL WORKERS	SKILLED PRODUCTION WORKERS	UNSKILLED PRODUCTION WORKERS
CAPITAL	−2.8%	0.39%	0.37%	0.28%
MANAGERIAL WORKERS		−0.3%	0.21%	−0.003%
SKILLED PRODUCTION WORKERS			−0.51%	0.11%
UNSKILLED PRODUCTION WORKERS				−0.3%

The first row shows that a 1% increase in cost of capital leads to a 2.8% fall in demand for capital and, for example, also leads to a rise in demand of 0.39% for managerial workers

The last row and column show that a 1% rise in the cost of unskilled labour will lead to a 0.3% fall in demand. Demand for skilled workers will rise 0.11% and for capital 0.28%

... falling real interest rates make capital goods such as machinery and technology cheaper to buy

FIGURE 1: REAL INTEREST RATES IN SOUTH AFRICA



Graphic: JOHN McCANN Data source: See Econ3x3.org

Where do workers stand?

As noted earlier, the research suggests there are different levels of substitutability:

- Unskilled and skilled workers are substitutes as wage increases for one type lead to firms using more of the other type;
- Managers and skilled workers are substitutes; and
- Unskilled workers and managers are not substitutes.

If wages for skilled production workers rise, demand for these workers will decrease and firms will hire managers and unskilled workers instead. Likewise, if the cost of hiring managers and unskilled workers rises, demand for skilled workers will increase.

This may help to explain why some parts of organised labour have strong stances on two policies that change the price of lower-skilled workers.

They have opposed the idea of a youth wage subsidy and the implementation of the youth employment tax incentive. This incentive reduces the cost of hiring young, low-paid mostly unskilled workers, encouraging firms to employ more of them. Consequently, there would be a reduced demand for skilled workers, the constituents of organised labour.

A national minimum wage, which will increase the price of unskilled labour, is likely to have the opposite effect and encourage substitution towards more skilled workers.

Job creation in the future

As technology evolves, job creation is likely to become more difficult, particularly for the unskilled workers. Based on the research results, there are at least two areas on which policy can focus.

- Change the price of labour. These results indicate that cheaper labour will result in more employment. Reducing wages is difficult practically, politically and ethically. But there are ways to cut a firm's employment costs without significantly reducing wages.

One way is through a scheme such as the youth employment tax incentive. The limitation of this scheme is that it targets only young workers and new jobs, which may discourage firms from preserving existing jobs.

An alternative approach would be for the government to "top up" the wages of low earners. The United States does this with its earned income tax credit. These top-ups would encourage people to accept work at a lower wage. In South Africa, where high-income earners make up the majority of taxpayers, this scheme would be highly redistributive.

- Change the skills composition of the workforce. The research suggests that higher wages for low-skilled workers encourages firms to employ higher-skilled workers. So: increase the number of skilled workers. Growing this pool of workers has the double benefit of reducing a potential constraint for firms and possibly improving the skills and earning potential of some of the unskilled.

Furthermore, the results suggest that policies to create jobs need to respond to the broader trends of the changing nature of work and technology, and the changes in relative costs that result.

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