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**Employer characteristics and youth
employment outcomes in the formal sector
in South Africa**

Assessment using administrative tax data

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Abstract: Through the use of administrative tax data, this study attempts to identify the characteristics of firms that employ relatively large numbers of young people. The policy objective of this exercise is to use these insights to inform policy and programming in the context of youth unemployment, particularly regarding where efforts to intensify youth absorption into employment should be focused to ensure maximum impact in addressing the problem of low youth employment in South Africa. Given the nature of this new data set, we adopt an explorative approach and make use of various econometric models to conduct the analysis within the limitations of the variables in different tax data sets. The novelty of this paper is that it uses unique administrative tax micro-data sets, which allows us to explore the relationship between firm characteristics and youth employment in South Africa with a significantly large sample size.

Keywords: Administrative data, tax, firm level, firm behaviour, employment, unemployment

JEL classification: C55, C80, D22, E24

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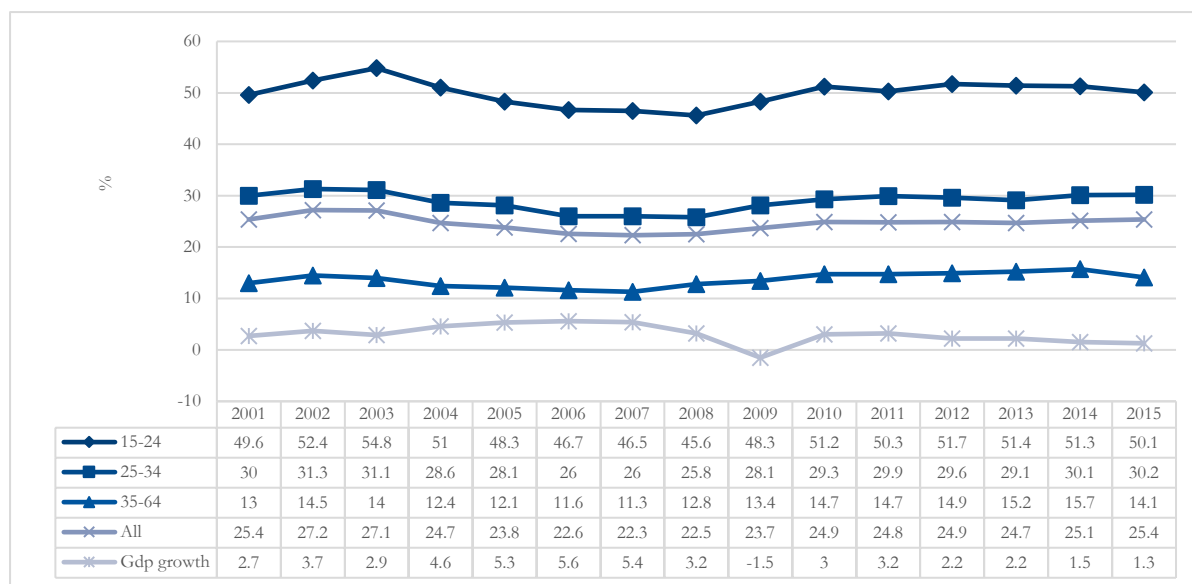
1 Introduction

Rising levels of frustration and impatience suggest that time is of the essence: failure to act will threaten democratic gains. In particular, South Africa must find ways to urgently reduce alarming levels of youth unemployment and to provide young people with broader opportunities. (National Planning Commission 2012: 30)

According to South Africa’s National Development Plan Vision 2030 (NDP), serious inroads have to be made to reduce poverty and encourage economic growth. One of the main challenges involves reducing the unemployment rates in South Africa, particularly among youth.¹ Evidence indicates that youth unemployment is a costly burden to society that contributes to lower productivity, which has the potential of having a negative impact on growth. In turn, low economic growth can result in loss of jobs in the labour market, perpetuating the unemployment problem. With youth unemployment rates averaging 51.39 per cent in South Africa in 2013–16, and with the presence of a youth bulge in the current demographic structure, policymakers are justified in paying special attention to the sluggish recovery in youth employment rates.

Figure 1 shows the annual unemployment rates for the disaggregated working-age population, as well as the annual percentage change in gross domestic product (GDP) at constant prices between 2001 and 2015. Prior to 2008, the youth unemployment rate had been declining. The financial crisis in 2008 saw an increase in unemployment across all age groups, but more so in the youth group (age 15–34), with a corresponding decrease in economic growth. This is further supported in Figure 2 with an overall negative relationship between youth unemployment and economic growth.

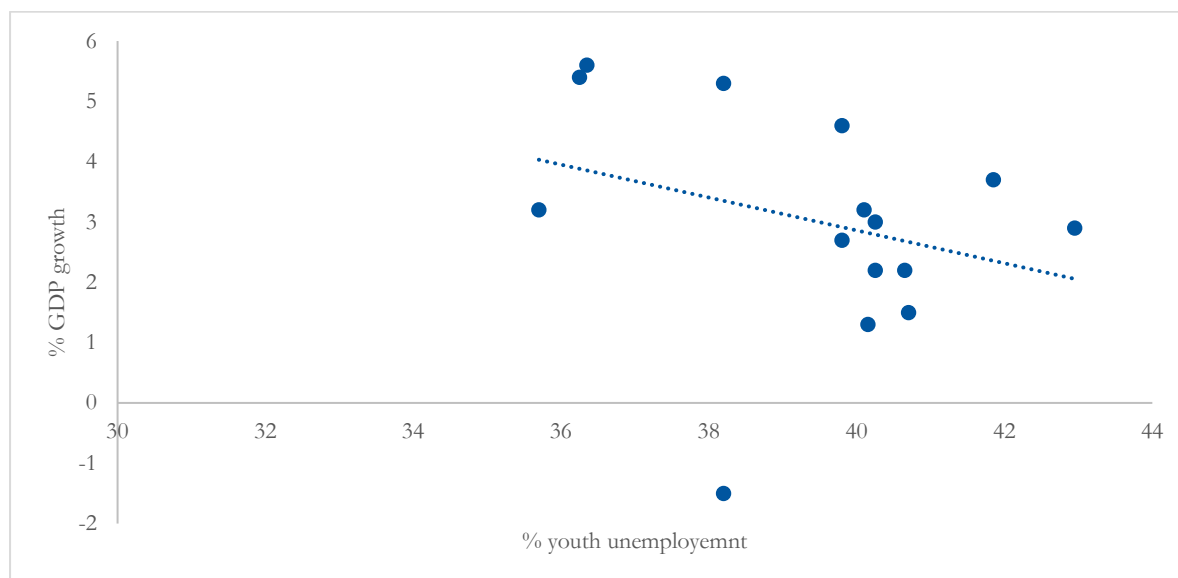
Figure 1: Unemployment rates by age group and economic growth



Source: Authors’ calculations based on data from Labour Force Survey 2001–07, Quarterly Labour Force Survey 2008–15, and Statistics South Africa.

¹ Youth unemployment has increased since 2008 partly due to the global recession, rising from 32.7% in 2008 to 36.1% in 2011, and remained between 35% and 37% in subsequent years, according to Stats SA’ (Business Live 2015).

Figure 2: Youth unemployment and economic growth in South Africa



Source: Authors' calculations based on data from Labour Force Survey 2001–07, Quarterly Labour Force Survey 2008–15, and Statistics South Africa.

The evidence suggests that during the economic downturn the country experienced lower productivity, which may have resulted in loss of jobs.

The slow rise in the share of employed youth is a concern for policymakers, as youth unemployment means:

- There is a proportion of young workers that could contribute to the productivity of the country but are either failing to find employment (Levinsohn 2008) or are discouraged jobseekers, which can result in intergenerational poverty and social exclusion.
- Young people are not gaining the skills and experience necessary to improve the productivity of the country.
- There is a high risk of social conflict, such as juvenile delinquency, which can incur high social costs to the country.
- Unemployed youth represent a social welfare challenge to the country.

Oosthuizen's (2013) demographic-dividend estimates reveal that South Africans under the age of 30 and those over the age of 59 consume more than they earn in the labour market, that is, they have lifecycle deficits. The deficit among young people is financed through public and private transfers, while older people are financed through asset reallocation such as asset income. The implication of this is that youth unemployment in South Africa delays the rise in labour income, and as a result young people remain dependent on their household members or the state to finance their consumption for a longer period than is the norm in other countries.

The above reasons make this study relevant, as it aims to explore, with the aid of company tax data, the characteristics of employers that are more likely to employ young people. Based on this analysis, the study then identifies possible policy interventions which may be helpful in addressing youth unemployment. The ultimate aim of the study is to obtain insights as to where efforts to intensify youth absorption into employment should be focused, and in so doing to create avenues where youth employment can benefit economic growth in South Africa.

This study's uniqueness lies in the application of econometric techniques to tax micro-data to investigate how firm or employer characteristics impact on youth employment outcomes in South

Africa. Previous studies have investigated how firm characteristics affect outcomes such as export activity (Cieslik et al. 2014; Peyman et al. 2013), corporate social responsibility expenditure (Chauhan 2014), employment subsidy effects (Krug et al. 2008), accessibility of finance (Makoni 2014), gender earnings gaps (Heinze and Wolf 2006), firm relocation (Brouwer 2010), and participation of firms in production networks (Harvie et al. 2010), among other outcomes. However, to our knowledge, no study has considered how firm or employer characteristics impact on youth employment outcomes in South Africa (see Rankin et al. 2012).

The use of national company tax data will also enable us to provide results which are nationally representative of firms in the formal sector—something that would not be possible using Labour Force Survey data, which focus on employees rather than employers.

Youth employment concerns are of particular significance, not only in South Africa but in the whole Southern African region, since they determine the outcomes of economic and social development through poverty reduction and decreasing costs to society. Studies such as this one can be extended to the region and open up opportunities for insightful research with similar tax data. In return, the findings unique to each country may assist policymakers in identifying areas where they can concentrate their focus to encourage youth employment and in turn economic growth.

2 Literature review

2.1 Youth unemployment in South Africa

Policymakers recognize the need to improve the performance of the labour market to reduce tension and ease access to young, unskilled jobseekers.² Accordingly, the NDP highlights the following policy proposals with respect to youth and the labour market in this regard:

- creation of a tax incentive for employers to reduce the initial cost of hiring young labour market entrants;
- provision of a subsidy to the placement sector to identify, prepare, and place matric graduates (i.e. secondary-school leavers) into work;
- expansion of learnerships (i.e. vocational training) and making training vouchers directly available to jobseekers;
- introduction of a formalized graduate recruitment scheme for the public service to attract highly skilled people;
- expansion of the role of state-owned enterprises in training artisans and technical professionals.

The government's commitment to prioritizing youth in terms of job creation objectives has been noted in several strategy frameworks and policies, including the National Youth Policy for 2015–20 (Presidency of the Republic of South Africa 2015), the New Growth Path (Department of Economic Development 2011), the Department of Trade and Industry's (2015) Industrial Policy Action Plan, the 2011 Skills Accord, and the 2013 Youth Employment Accord, with an emphasis

² Studies cited by Duff and Fryer (2005) provide evidence that unemployment has been found to be strongly correlated with: physical effects (ill health); psychosocial effects such as depression and low self-esteem; substance abuse; family effects including domestic violence and decrease in family cohesion; poverty; poor educational attainment and the related low skills levels.

on the need for targeted subsidies, support for labour-absorbing activities, and concentration of resources in areas that will ensure the greatest impact to address the country's unemployment problem.

We briefly highlight below some of the causes contributing to youth unemployment in South Africa and some of the interventions that have been introduced to tackle the problem.

Causes

Several challenges face young people entering the labour market. At the individual level, young people are generally inexperienced and less skilled. This experience gap between adults and young people acts as a significant constraint on job creation. According to the National Treasury (2011), skills deficiencies contribute to this gap and make education and skills development a priority for the government.

Freeman and Wise (1982) contend that youth unemployment is concentrated in particular groups of youth in low-educated poor families who lack work for extended periods of time. This is confirmed using the 1999 October Household Survey by Mlatsheni and Rospabe (2002), who find that differences in the employment of young people (aged 15–30) and adults are attributable to disparities in observable characteristics such as experience, education, access to credit, and family characteristics in the case of self-employment. In addition, Lam et al. (2007) find further evidence for the Cape Area Panel Study that differences of race and gender contribute to youth unemployment.

At firm level, employers seek to minimize their costs and maximize their productivity. Therefore inexperienced young workers are regarded as a risky investment. Given the uncertainty of the productivity of young people, firms then regard entry-level wages, the administrative costs of hiring and firing, and training costs as too high in relation to the risk of hiring young workers. As such they tend to hire fewer young people compared with older workers than they should. This has a ripple effect, as young people end up not gaining work experience, and firms in turn rely on observable characteristics for productivity: a prolonged unemployment period signals low productivity and inexperience, which generates a potential for statistical discrimination.

Policies

The mismatch between labour supply and demand has generated various policy initiatives to deal with the rising unemployment problem. In South Africa this has taken two forms: one aims at supply-side interventions to assist in the education and training of workers, improving the quality of workers; the other strategy, which is similar in spirit to the approach used in this paper, aims at demand-side interventions that lower the costs of hiring inexperienced young workers.

Learnerships and apprenticeships offered by both the public and private sectors have been established as supply-side initiatives to improve the development of current and potential workers. These include vocational and educational training programmes such as Further Education and Training (FET) schools, Sector Education and Training Authority (SETA) programmes, Second Chance programmes (where school dropouts are given an opportunity to complete their schooling), and the Training of Unemployed Persons programme run by the Department of Labour (National Treasury 2011). These programmes subsidize firms to provide approved training to employees combined with possible extensions to work contracts on completion of the programme.

While these programmes have been relatively successful in job creation for the young, findings from the National Treasury (2011) show that unemployed youth end up being absorbed by large firms, suggesting that the administrative burdens of the programmes exclude small firms, who are then forced to depend on the approval of the SETA board for skills development programme funding. The report also finds that learnerships benefit medium-skilled workers, who earn relatively higher salaries, and exclude the majority of low-skilled unemployed workers. Burns et al. (2010) further suggest that the subsidy given to firms may be too low to cover the related training costs.

A further rationale for the need to understand demand-side factors that influence youth employment outcomes arises from possible limitations to supply-side interventions. Since labour supply is already high in South Africa, these interventions may have a limited effect in reducing youth unemployment. As such there have been two main initiatives from the demand side: the Expanded Public Works Programme (EPWP) and the Employment Tax Incentive (ETI).

The EPWP aims to provide short-term jobs and training for the unemployed through various short- to medium-term programmes covering all spheres of government and state-owned enterprises. In its first phase this programme created 1.6 million short-term jobs. However, the success of the programme is weakened by limited periods of employment and low labour intensity, which increase the cost per job created (National Treasury 2011). As such it remains only a short-term measure to alleviate unemployment, and is a predominantly public-sector initiative.

The ETI was proposed as an incentive for firms to employ more youth aged 18–29. The incentive acts as a wage subsidy and is activated by lowering the firm's amount of Pay As You Earn (PAYE) tax payable to the South African Revenue Services (SARS) each month. In so doing, the ETI compensates firms for the risks involved in hiring and training inexperienced youth with uncertain productivity levels. Again there are disadvantages to the tax incentive, such as the loss to firms that have already hired young people in the absence of the programme, and the possibility that firms may replace current employees with those that qualify for the subsidy, or else may fire workers after the subsidy expires and employ new ones who qualify for it. However, the programme has a built-in disincentive for displacing existing employees: it levies a penalty on the employer of R30,000 for each worker that is found to have been displaced in order to take advantage of the ETI. Despite these challenges, the programme has managed to exceed its initial 2011 projections to support 423,000 jobs of which 178,000 would be new jobs or jobs saved from loss (Chatterjee and MacLeod 2016).

Other programmes to address youth unemployment are offered by the National Youth Development Agency, which provides a number of services aimed at assisting graduates and matriculants to find work placements and prepare for the employment environment. These include various initiatives such as the Graduate Development Programme, the Job Preparation Programme, the National Youth Service, Jobs and Opportunity Seekers (a graduate database which links registered unemployed young people to job opportunities), and Youth Advisory Centres.

Wage or employment subsidies are incentives that aim to accelerate job creation and raise employment. They form a central feature of labour market policies in many countries by lowering the cost of labour to an employer or raising the wage a worker receives. This stimulates job creation and higher employment. By assisting the unemployed into formal, well-regulated employment, employment subsidies also contribute towards the creation of decent jobs.

There are various forms of wage subsidy. They can be provided to employers to raise labour demand by reducing the cost of labour (employer-side subsidies) or given to employees to promote labour supply by increasing the returns to employment and hence improving the incentives to

work (employee-side subsidies). The subsidy can be a direct transfer, a reduction of or exemption from social security contributions, or an income tax credit. It can be provided to those already employed or to new hires.

Many micro-level studies at the individual (labour supply-side) level find evidence that wage subsidies are successful in increasing the employment or re-employment prospects of the unemployed. The World Bank's Youth Employment Inventory suggests that 'wage subsidies have contributed to improving short-term employment outcomes in transition economies, while having mixed outcomes in industrialized countries' (Puerto 2007a). There is also evidence that wage or employment subsidies have long-term dynamic effects by improving the permanent employability of participants. In Australia it was estimated that the youth subsidy improved employment prospects by at least 20 per cent up to 26 months after the subsidy expired (Puerto 2007a).

Employment subsidies are appealing because they target job creation directly, unlike indirect measures to improve the quality of workers entering the labour market. This is important, since deficient labour demand is one of the main problems facing the young. The high rate of youth unemployment in South Africa suggests that demand for young workers is insufficient and cannot absorb the rising number of jobseekers entering the labour market. These features of the labour market indicate that an incentive scheme such as an employment subsidy that encourages firms to hire young workers is appropriate for South Africa and has a high potential to create decent jobs. Employment subsidies operating through the tax system can also rapidly reach a scale that cannot be achieved by targeted administrative schemes, generating much greater potential for employment growth.

2.2 Evidence on youth employment incentives

Evidence from South Africa and international evaluations of employment subsidies indicate that some interventions do generate positive returns. Although literature on youth employment outcomes in South Africa is limited, we do find some evidence-based research by Rankin et al. (2011). They investigate demand-side incentives by asking firms how they would react to the implementation of a youth employment incentive. Of the firms in their study, 38 per cent indicated that they would on average hire an additional 7.5 young workers, while 62 per cent indicated that they would favour young people for new job openings in response to a wage subsidy, but not necessarily to add to their existing workforce. This lends some support to the hypothesis that older workers will be replaced in favour of younger workers who are eligible for the incentive. At the same time, 77 per cent of firms indicate that they are unlikely to replace any older workers as a result of the subsidy, if only because of high redundancy costs and loss of experience.

Rankin et al. (2012) consider the dynamics of youth unemployment by using Statistics South Africa Labour Force Survey data for 2008–11. They find that nearly 80 per cent of employed youth (20–24 years old) are in formal private-sector jobs, only eight per cent are in formal public-sector jobs, and just over one per cent of youth are self-employed in the formal sector. These rates are significantly lower than those in the 35–64 age group. Rankin et al. (2012) also find that youth employment in firms that employ 10–49 people fell from 46 per cent in 2008 to 38 per cent in 2011. Firms with a workforce size of over 50 employees are more likely to employ young workers aged 20–24. However, Rankin et al. (2012) do not use firm-specific data, and they do not make use of an econometric model to produce their findings.

Levinsohn et al. (2014) measure the effectiveness of a wage subsidy in South Africa by conducting a controlled experiment whereby a voucher (to be presented to a prospective employer) is given to unemployed individuals in a treatment group. They find that employment is higher by 25 per cent in the treatment group compared with the control group who did not receive the voucher

(7.4 percentage points higher than the 31 per cent probability of employment in the comparison group), and this persisted for 18 months after the expiry of the voucher.

We can also draw evidence on youth employment initiatives from international comparisons. Betcherman et al. (2007) examine labour market policies in 84 countries. The interventions they examine include those that increase labour opportunities for young people, such as counselling, job search skills, promoting youth entrepreneurship, wage subsidies, public works programmes, and interventions that remove discrimination and mobility barriers. The results indicate no differences across the different interventions in terms of impact or cost-effectiveness. While most of the programmes examined have a positive effect on youth employment, less than half of them are efficient. They also find a greater impact of the programmes on youth employment outcomes in developing countries, but a lower impact in countries with less flexible labour markets. Betcherman et al. (2007) conclude that the highest returns for disadvantaged young people come from early and sustained interventions, finance is important in determining success, interventions work better in countries with flexible labour markets, and context—not type of programme—determines the success of an initiative.

Puerto (2007b), using Latin American and Caribbean countries, finds that while supply-driven vocational training programmes dominated during the 1970s, by the 1990s more demand-side incentives had been put in place, such as the Chilean Jovenes programme, which integrated classroom training and work experience in basic and specific trades. He finds that demand-driven programmes that involve the private sector are more successful than supply-side incentives; this supports the point raised earlier with respect to limitations to supply-side interventions.

However, Smith (2006) argues against demand-side programmes in an analysis of global youth employment initiatives. He compares a number of unsuccessful programmes with successful international supply-side subsidies and argues that any benefits of demand-side subsidies are found through the supply-side, while the former incurs more administrative costs for firms. Smith (2006) highlights demand-side programmes implemented in Australia, where the administrative costs of establishing eligibility limited outcomes, and Poland's Intervention Works programme, which had a negative effect on employment due to biased state administration. This is in contrast to supply-side programmes such as the United States' Earned Income Tax Credit scheme, which increased employment by six per cent, while programmes in Canada and the United Kingdom recorded positive effects on employment outcomes. A limiting factor in Smith's findings is his sample of countries, which are developed economies from the OECD. The impact of either the demand side or the supply side and of targeted subsidies may be very different in a developing economy such as South Africa.

2.3 Firm characteristics and employment

Given the paucity of studies that explicitly assess firm characteristics and youth employment, this section reviews evidence that looks at firm characteristics and employment in general. According to Rankin et al. (2011), the matching process is determined by the firm in an environment where unemployment is high. As such, studies that address issues of employment outcomes also need to consider the characteristics of firms that absorb potential jobseekers. To this end, studies that look at firm-level characteristics find that the age, size, earnings, type (family business, corporate,

exporter, importer, or other), location, and sector play a contributory role in several employment outcomes.³

Firm trade status

Cieslik et al. (2014) consider the firm-level determinants of export performance in a number of European countries. Drawing on trade theory, they focus on the relationship between firm productivity and exporting as postulated by the Melitz (2003) model. They include other firm characteristics such as age, size, use of human capital, and degree of internationalization. Cieslik et al. (2014) find that the probability of exporting increases with higher levels of productivity, human capital, and firm size for both the pooled sample and individual countries.

Edwards et al. (2016) find evidence that trading firms differ significantly from non-trading firms. Using firm-level data from 2008–13 to analyse the relationship between trading firms and manufacturing firm performance in South Africa, they find that firms that directly engage in international trade demonstrate increases in productivity and employment outcomes, are more capital-intensive, pay higher wages, and have a higher value added per worker than non-traders. The results are stronger with importers compared with exporting firms. The evidence also supports the hypothesis that firms learn by importing technologies. These results lend credence to recent evidence on trading firms showing consistently higher premiums than non-trading firms, as well as a slight advantage for importing firms over exporters (Bernard et al. 2018; Wagner 2012).

Were (2007) investigates the impact of export-oriented trade on employment outcomes in Kenya's manufacturing sector in 1990–2003. Using panel data analysis and firm-level variables, she finds that export-oriented firms generally employed more workers on average, relative to non-exporting firms, with a shift of firm employment towards a more skilled labour force during the period of trade liberalization. However, in 1990–2003 the share of employees in exporting firms declined by over 20 per cent. In addition, Were (2007) finds that 36 per cent of all workers in the manufacturing firms were casual or part-time workers in 2003.

Firm productivity

Analysis by Haltiwanger et al. (1999) provides evidence, from the United States Census Bureau and firm-level data for 1985–97, that differences in workforce characteristics are significantly related to differences in productivity levels. Firms which employ more young and prime-age workers, a more educated workforce, fewer females, and fewer foreign-born individuals are more productive. However, there is little evidence of a relationship between changes in productivity and changes in the mix of workforce characteristics.

Moreover, Haltiwanger et al. (2013) find that the significant inverse relationship between firm size and net job growth rates found in most literature is removed when they control for firm age. The results indicate that although start-ups and young firms are volatile with a high exit rate, they also contribute significantly to job creation. The implication of this finding is that policies that target firm size while ignoring age may have limited success in encouraging job creation. As such, policy

³ We list some studies on firm characteristics and firm outcomes in Table A1 in the Appendix, and briefly explain the variables and methodologies used in these studies. While these studies may not have a direct link to the research question we are attempting to shed light on, they help direct our approach to the tax data that we have at our disposal with the explicit aim of considering the relationship between firm-level characteristics and youth employment outcomes.

intervention is needed to assist start-ups and young firms with the challenges they face in the initial stages of the business.

Firm age

Further evidence from Ouimet and Zarutskie (2014), controlling for firm size, industry, geography, and time, shows that young firms employ more young workers. They also find that young employees in young firms earn higher wages than young employees in older firms; young employees tend to join young firms with innovation potential and higher growth conditional on the survival of the firm. In addition, Ouimet and Zarutskie (2014) provide evidence of a positive relationship between the regional supply of young employees and new firm creation, particularly in high-tech industries.

Decker et al. (2015) confirm the findings from Ouimet and Zarutskie (2014). They find that the pattern for high output-growth firms is similar to that for high employment-growth firms. Their analysis provides evidence that high output-growth firms tend to be young and create more job opportunities in general. They find that in the post-2000 period, the share of productivity and employment activities by high growth firms is significantly higher in high-tech and energy-related industries.

Firm size

Page and Soderbom (2015) find that in Ethiopia, small and large formal-sector firms create similar numbers of net jobs, with small firms having a much higher turnover of employment and paying lower wages. From a policy perspective, in order to create more jobs, aid should therefore target the constraints on the growth of firms of all sizes by increasing firms' capabilities through new programmes that aim to improve the investment climate, for example management training.

Firm labour costs

Analysis by Abowd et al. (1994) finds that high-wage-earning workers and high-wage-paying firms explain inter-industry wage differentials, with the characteristics of high-wage workers being more significant than firm-level characteristics. They study a longitudinal sample of over one million French workers and over 20,000 employing firms. They decompose real total annual compensation per worker into components related to observable characteristics, worker heterogeneity, firm heterogeneity, and residual variation. They find that individual effects, especially those not related to observables such as age, sex, and education, are a very important source of wage variation in France compared with firm-level effects. They find that firms that hire high-wage workers are more productive but not more profitable, and are more capital- and high-skilled labour-intensive. When one controls for individual effects, firms that pay higher wages are more productive, more profitable, and more capital-intensive, but are not more high-skilled or labour-intensive.

Holzer and Ihlanfeldt (1998) investigate the effects of customer discrimination on the employment and earnings of minorities, particularly black people. Using survey employer data from four large metropolitan areas in the United States, they find that the racial composition of a firm's customers has significant effects on the race of who gets hired, particularly in jobs that involve direct contact with customers and in sales or service occupations. They also find evidence that the wages of the workers are affected by the race of the customers. Workers in firms that have predominantly black customers earn less than those in firms with mostly white customers.

The reviewed literature serves as a guide to our subsequent empirical analysis.

3 Empirical analysis

3.1 Data description and descriptive analysis

This section gives a description of the data used in the firm characteristics/youth employment panel that we created using tax records. It then conducts a descriptive analysis before presenting the results of the econometric analysis. The data used to measure firm characteristics and composition of youth are taken from the National Treasury South African Revenue Service employee income-tax returns (NT-SARS IRP5) and company income tax (CIT) administrative data for 2010–14. This is a relatively new data set which contains employee-related information such as income or age, as well as firm-level information such as labour costs, industry sector, firm age, productivity, and size of firm (Pieterse et al. 2016). The tax data are unique in that, given the amount of information gathered from the administrative records, they offer a wider scope of investigative research on South African firms in comparison with other survey data (for example, the Quarterly Labour Force Survey). Furthermore, the use of administrative tax data is becoming widespread in developed regions such as the United States and Europe (Cieslik et al. 2014; Ouimet and Zarutskie 2014); therefore innovative research such as this study is a breakthrough for an emerging country like South Africa, and the expectation is that it can be extended to other developing countries in Africa.

We generate variables that measure the proportion of youth aged 15–34 (South Africa’s national definition of youth) in firms from the IRP5 panel. The firm characteristics are collected from the CIT panel. These two data sets are merged by PAYE reference number and tax year. Firms without PAYE reference numbers and duplicates are dropped from the panel, and we are left with a sample of 222,000 firms. Table 1 describes the variables used in the analysis.⁴

The following analysis gives a brief overview of the data, with some interesting patterns emerging between firm characteristics and youth employment in South Africa. Figure 3 shows the distribution of youth aged 15–34 in firms. It shows that 58 per cent of firms have 50 per cent or fewer of their employees falling within this age cohort.

The figure also shows that there is a presence of firms (11 per cent) who employ more than 90 per cent youth. Figure 4 shows the proportion of youth in firms relative to the cohort aged 35–64 employed by firms that filed tax returns in 2010–14. While it may appear that the number of firms with youth is on the rise, in relation to the number of firms that reported during the period, the increase is not significant enough to relieve the burden on the economy.

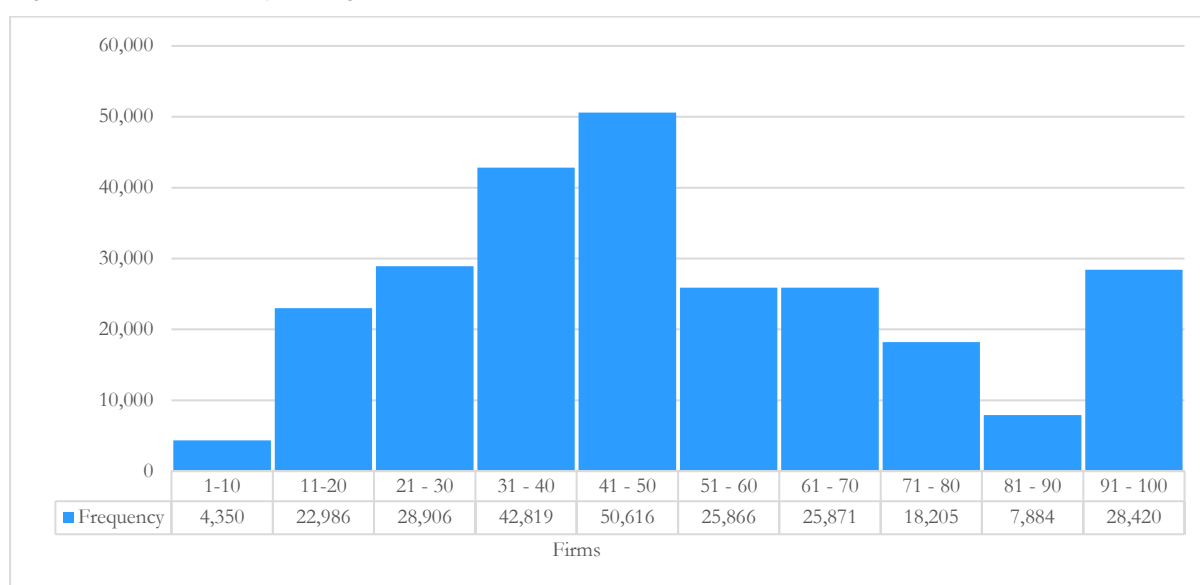
⁴ Summary statistics of variables can be found in Table A2 in the appendix.

Table 1: Variables list

Variable	CIT/IRP5 input name	Description
Proportion of youth aged 15–34	Authors' calculations from IRP5 data	Percentage expressed as ratio of youth to workforce (number of youth/total workers)*100
Proportion of workers aged 15–34 in firms (generated for 10%, 50%, and 70%)	Authors' calculations from IRP5 data	Binary variable: 1 = firms with (10%), (50%), (70%) or more aged 15–34, 0 = otherwise
Firm age	taxyear-birth_year	Logarithm of number of years since birth year Firm age cohorts
Firm size	g_sales	Number of employees (categorized), gross sales (categorized)
Productivity	g_sales/total workers	Logarithm of productivity expressed as annual gross sales per employee
Capital intensity	(k_ppe+k_faother)/total workers	Logarithm of capital intensity expressed as ratio of fixed assets per employee
Profitability	g_grossprofit	Logarithm of gross profits Binary variable: 1 = firm made profits, 0 = otherwise
Trade status	cust_impexpind	Indicator for whether firm is importer only, exporter only, both, or non-trading
Labour costs	x_wages	Logarithm of employee wage expenses only Wage expenses (categorized)
Foreign ownership	ITR14_c_fgnhold	Binary variable: 1 = firm belongs to foreign holding company, 0 = otherwise
Industry sector	c_isic4_profcode	Indicator for industry sector of firm (recoded from 4–1-digit ISIC codes)
R&D spending	x_rd	Binary variable: 1 = firm spends on R&D, 0 = otherwise
Training spending	ITR14_x_training	Binary variable: 1 = firm spends on training, 0 = otherwise
Learnerships spending	ITR14_t_deb_lrncomp, t_deb_lrna	Binary variable: 1 = firm spends on learnerships, 0 = otherwise
Days worked	periodemployedfrom, periodemployedto	Logarithm of number of days worked Days worked (categorized)

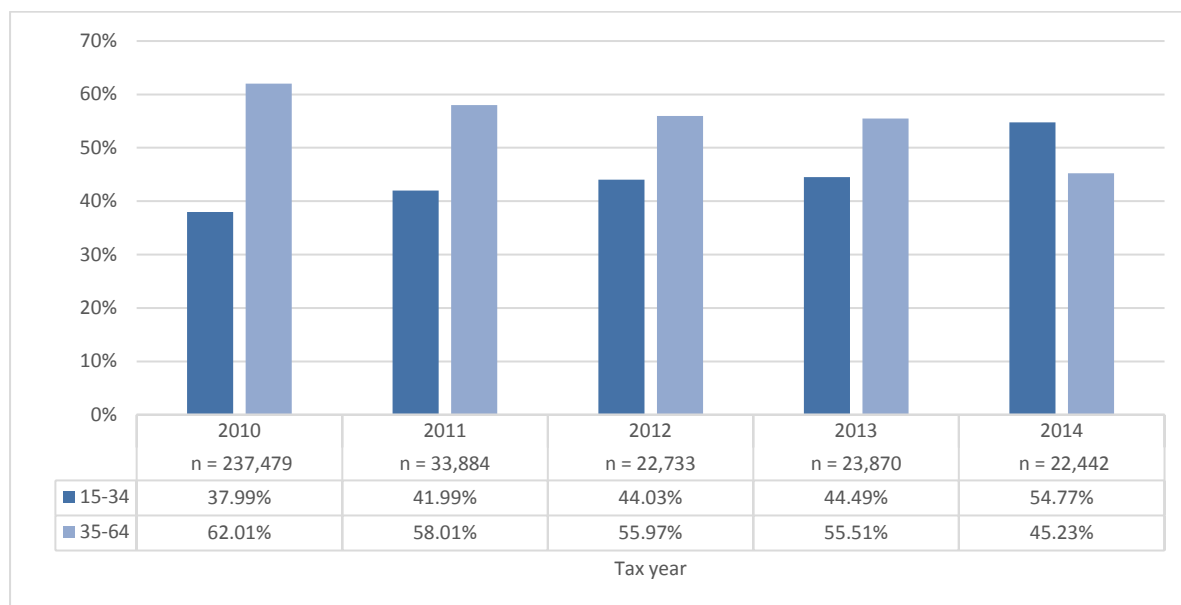
Source: Authors' own.

Figure 3: Distribution of youth aged 15–34 in firms



Source: Authors' calculations based on tax records.

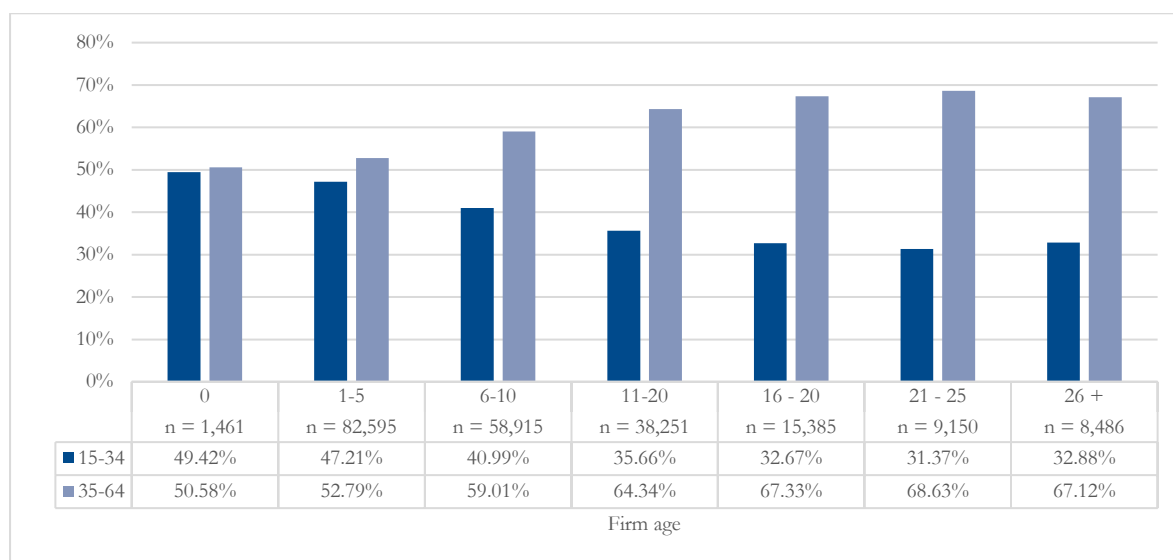
Figure 4: Proportion of youth aged 15–34 in firms



Source: Authors' calculations based on tax records.

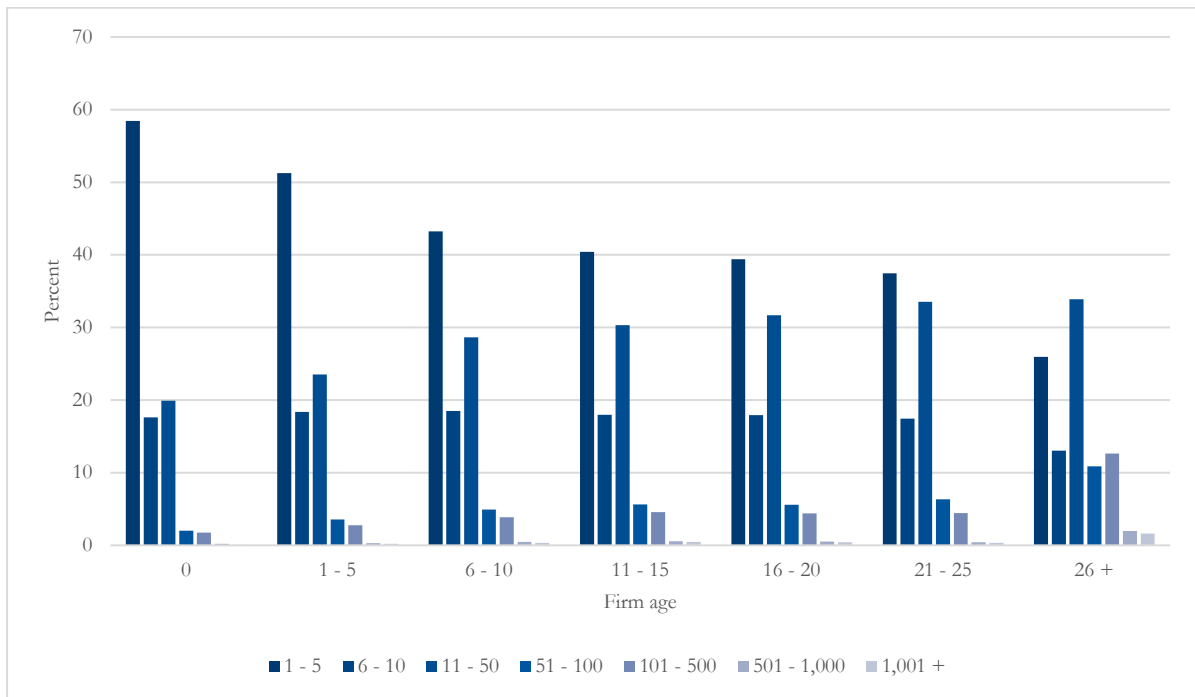
Figure 5 indicates that older firms in South Africa do not employ as many youth compared with start-ups and young firms. However, the young firms are also the most vulnerable to exiting the market (Haltiwanger et al. 2013). Moreover, they are typically small in size, employing a workforce of between one and five employees (Figure 6), which suggests that while young firms create employment for young people, they may not have capacity to absorb significant proportions of unemployed youth. As such, potential policies that can target the sustainability of start-up firms in the labour market may assist in reducing youth unemployment.

Figure 5: Firm age and youth employment



Source: Authors' calculations based on tax records.

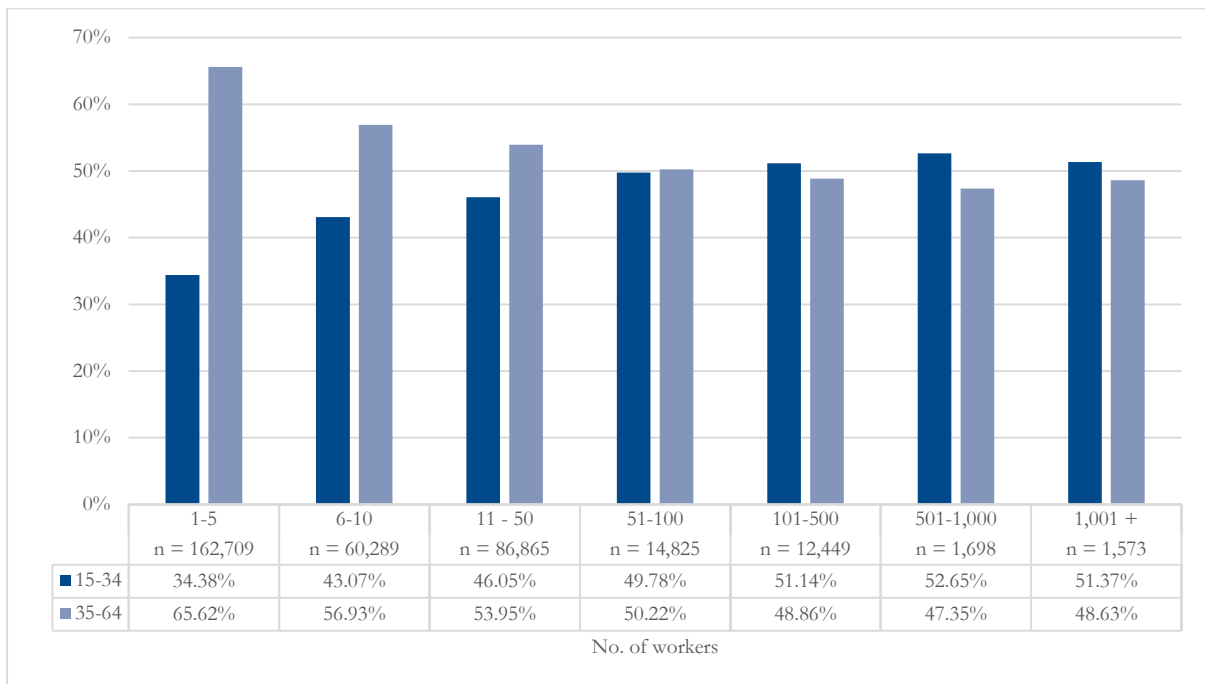
Figure 6: Firm age and firm size



Source: Authors' calculations based on tax records.

Figure 7 indicates that medium to large firms have relatively more youth than micro to small firms, which supports our earlier assumption that large firms have the capacity to absorb more workers, youth included. Large firms may also be capable of bearing the administrative costs of youth training programmes in comparison with small firms that want to keep their running costs low.

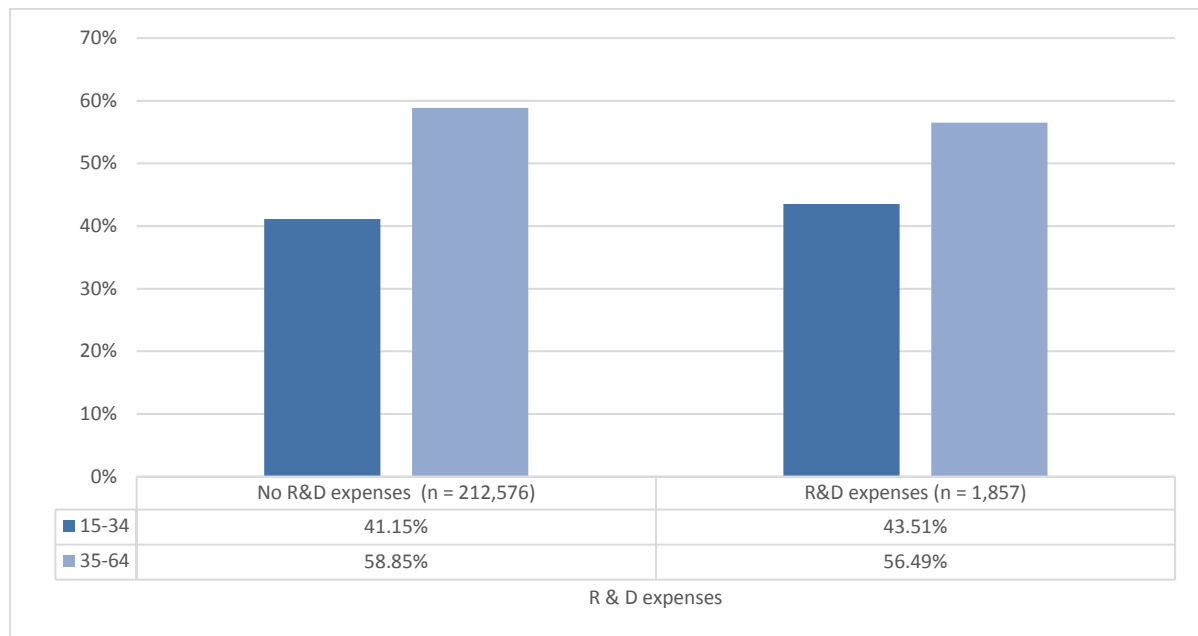
Figure 7: Firm size and youth employment



Source: Authors' calculations based on tax records.

Although the NT-SARS data do not record the skill or education levels of individuals, the low percentage of youth found in firms that spend on research and development (R&D), shown in Figure 8, suggests that the lack of training and experience may act as a deterrent to absorbing youth in the labour market. This is plausible given the observed positive relationship between skills intensity and R&D activities at firm level (Piva and Vivarelli 2009). This is further supported by evidence presented in the industry sector.

Figure 8: Firms with R&D expenses and youth employment

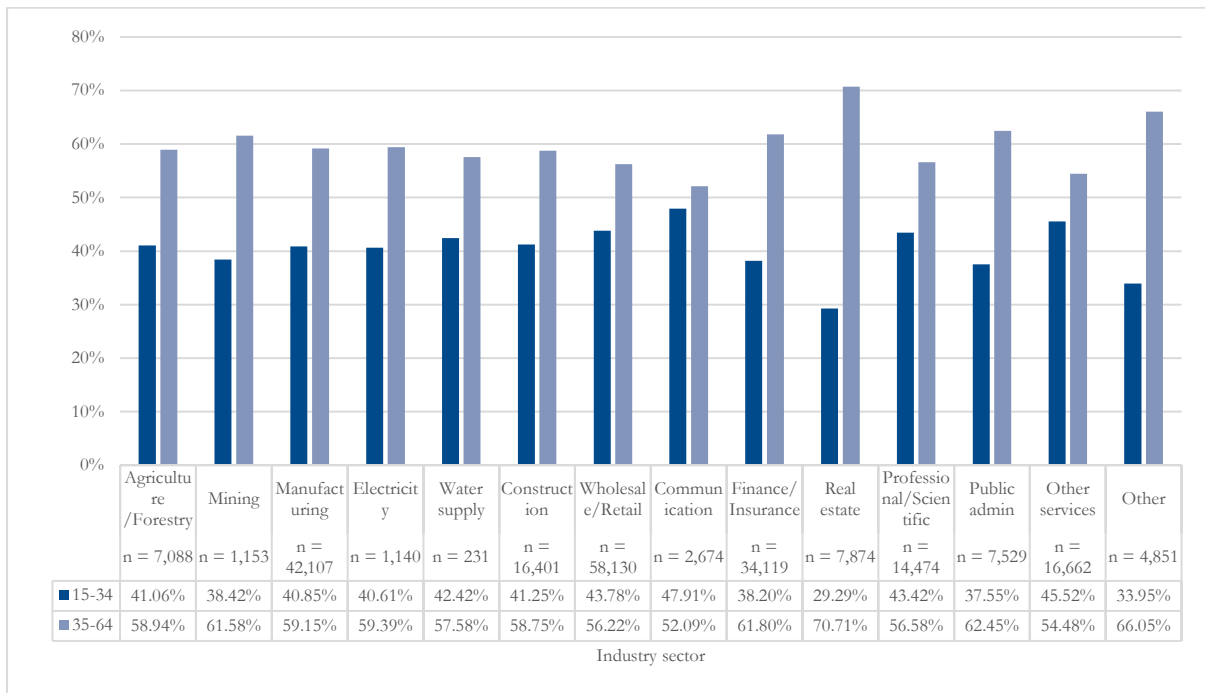


Source: Authors' calculations based on tax records.

In Figure 9, youth employment by industry sector indicates that the wholesale, retail, and communication sectors employ higher proportions of youth. These sectors tend to be low-skilled with minimum experience required, for example in call centres, retail shops, catering, and hotel staffing. They usually train employees on the job. This is in contrast to firms that invest in R&D, as shown in Figure 10. Firms such as car manufacturers tend to be involved in R&D, as does the professional and scientific sector with firms such as the Council for Scientific and Industrial Research. They have lower proportions of youth, suggesting that these firms may require a more skilled labour force and may therefore be reluctant to hire inexperienced young workers.

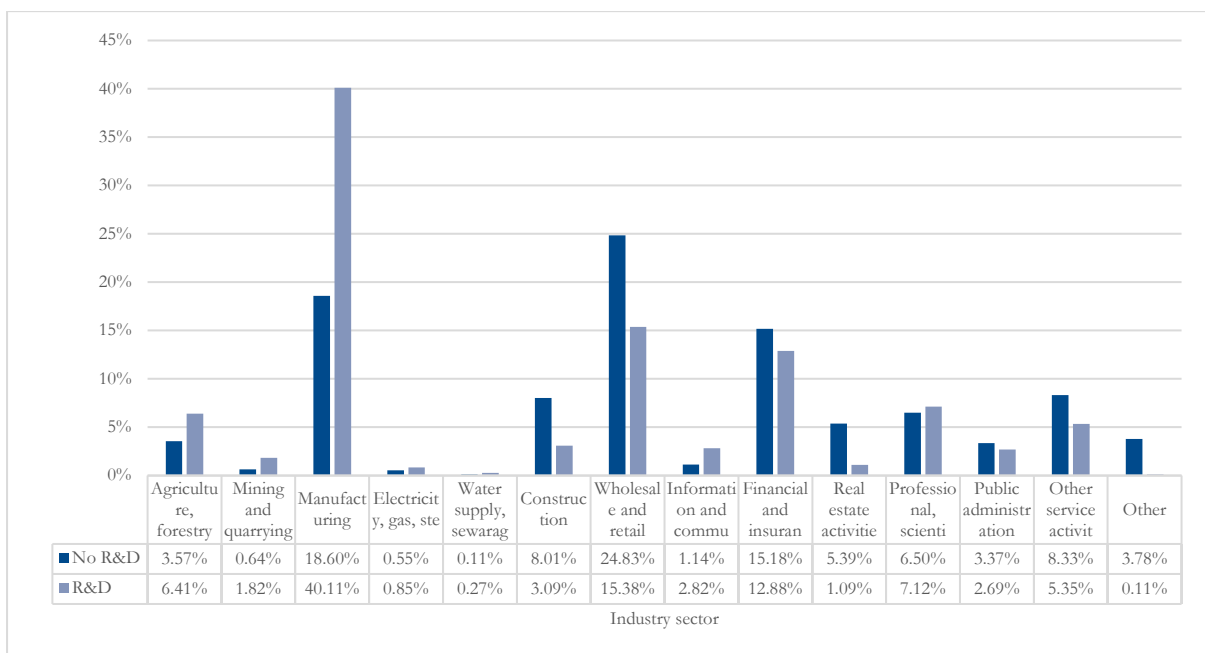
With economies becoming more technology-driven (for example, green technologies), policy interventions through SETA programmes and FET colleges also need to change focus and concentrate on equipping youth with the necessary skills to use the latest technologies and increase their chances of employment across the various sectors.

Figure 9: Industry sector and youth employment



Source: Authors' calculations based on tax records.

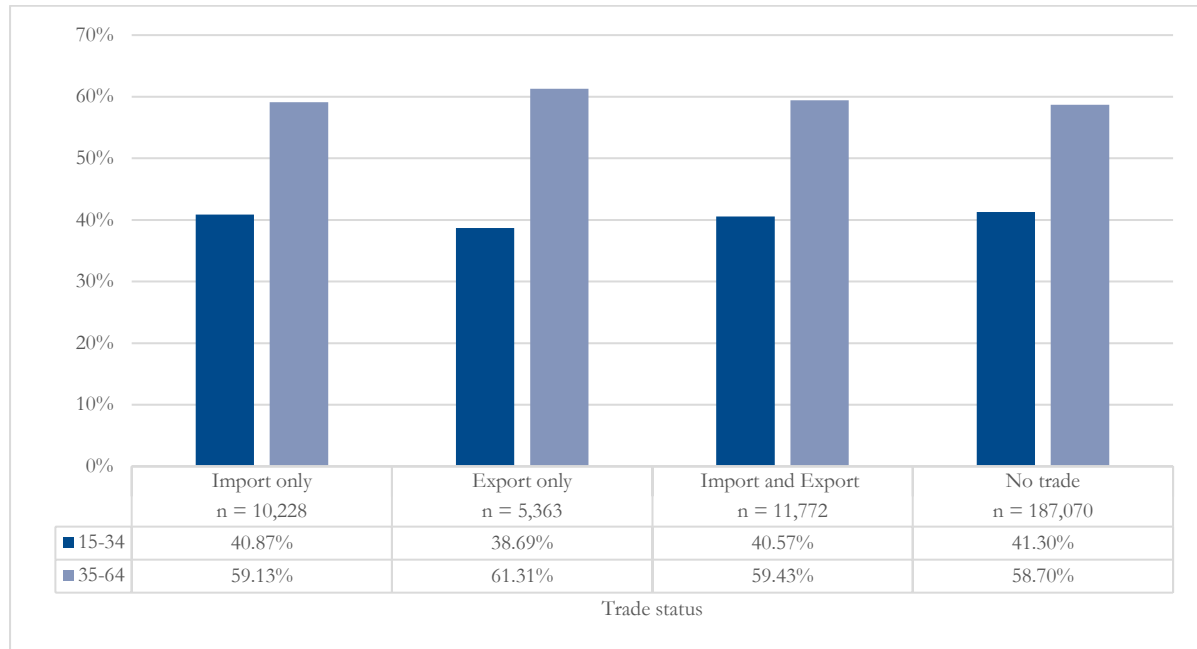
Figure 10: Industry sector and R&D expenses



Source: Authors' calculations based on tax records.

Figure 11 shows slight differences in the proportion of youth employed by firms that participate in the international market versus firms that do not. The statistics indicate that importing firms hire relatively more youth. Firms involved in international trade may be more skill-intensive, as they tend to import technologies or export products which require the use of technologies (Edwards et al. 2016). This can disadvantage young unskilled workers seeking employment.

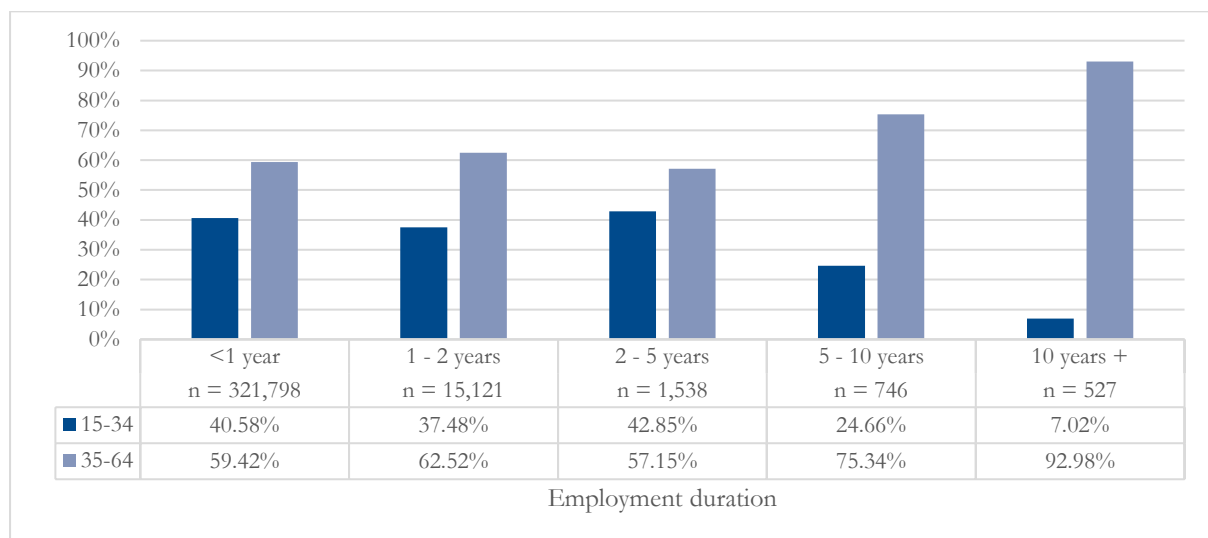
Figure 11: Firms' trade status and youth employment



Source: Authors' calculations based on tax records.

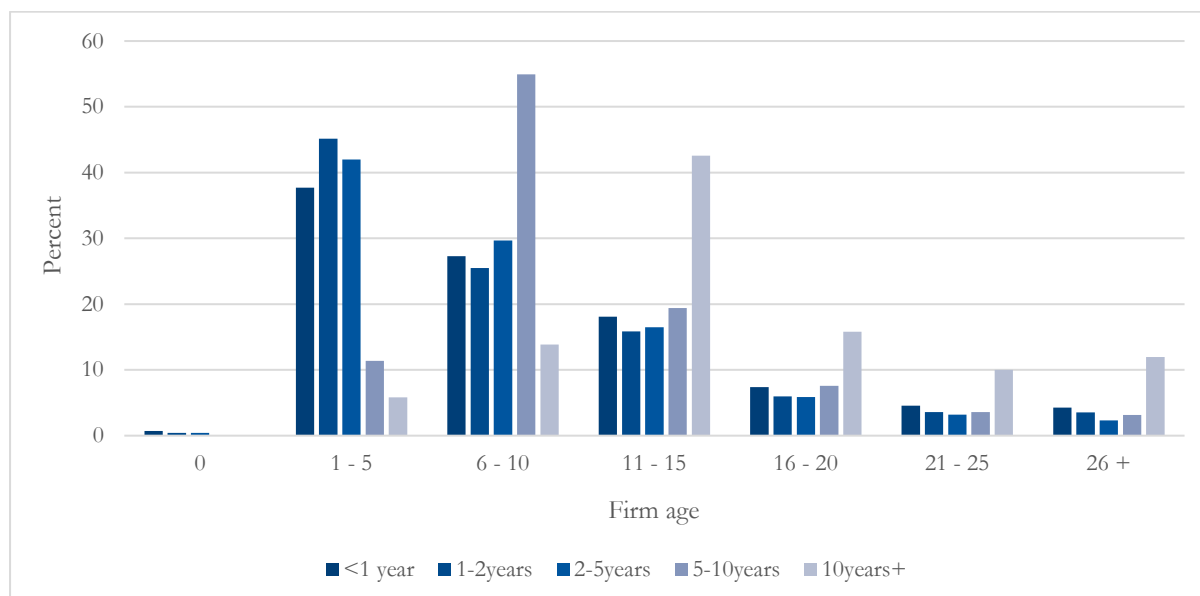
A final descriptive that may be important for the analysis is the duration of workers' employment. Figure 12 indicates that among the young, employment is concentrated at five years' duration or less. Moreover, the evidence regarding firm age in Figure 13 is consistent with Ouimet and Zarutskie (2014). Young firms in South Africa have relatively more young workers.

Figure 12: Employment duration and youth employment



Source: Authors' calculations based on tax records.

Figure 13: Employment duration and firm age



Source: Authors' calculations based on tax records.

3.2 Methodology

While this study concentrates more on the descriptive analysis of the data set, we also include some estimations to support the results above. Given that we are working with new data sets, we adopt an explorative approach guided by the above-discussed literature to make use of econometric models that are suitable for conducting the exercise within the limitations of the variables available in the different tax data sets. In this sense, we are not prescriptive about the exact model that we use to estimate the results. However, while we take an explorative data approach, we view our task through the lens of previous work which has been done investigating the link between firm characteristics and employment outcomes in general.⁵

A commonly used method in the literature is the probit model (Cieslik et al. 2014; Ouimet and Zarutskie 2014) to determine the effects of explanatory variables on dichotomous or binary outcome variables. Another alternative would be to fit a linear probability model (LPM); however, this model has a number of deficiencies that are well documented in the literature (see Greene 2012: 687; Wooldridge 2012: 251). Even if some of its shortcomings, such as heteroscedasticity of the error term or the generally lower coefficient of determination, can be resolved, according to Gujarati and Porter (2009: 552) 'the fundamental problem with the LPM is that it is not logically a very attractive model because it assumes that $P_i = E(Y = 1 / X)$ increases linearly with X ' We therefore develop an empirical probit model with the following specification:

$$Y_i^* = \beta X_i + \mu_i \quad (1)$$

where the binary dependent variable is indicated by $Y_i^* = 1$ if firms employ at least 50 per cent youth, and $Y_i^* = 0$ if firms do not employ youth. The percentage choice is determined by the distribution in Figure 3. There is a significant drop in the proportion of youth after the category

⁵ See Table A1 in the appendix for the various methodologies used in the literature reviewed.

41–50. However for comparison we also include results for firms that employ at least 10 per cent and 70 per cent youth.

We also include results from a pooled ordinary least squares (POLS) model, which allows us to use a continuous dependent variable as an alternative method to the binary outcomes. POLS has also been suggested in the literature for estimating similar pooled cross-sectional time series data. We estimate the following equation:

$$Y_t = \beta X_t + \mu_t \tag{2}$$

where Y is the proportion of youth aged 15–34 in firms expressed as a percentage, and X is a vector of the firm characteristics measured as continuous variables. The only drawback with the POLS is the assumption of homogeneity across the firms, that is, they share common intercepts and slopes, and the regressors are not correlated with the error term. This can lead to downwardly biased results if correlation is present. We include year fixed effects to allow for any changes over the five years in the firm characteristics such as firm size, firm age, labour costs, productivity, profitability, and value of trade.

4 Results

Table 2 reports the results for the probit regressions and shows that more established firms are less likely to employ young people compared with young firms. This is in line with conclusions drawn by Ouimet and Zarutskie (2014) and Haltiwanger et al. (2013). The probit results show that firms that are less than 26 years old are more likely to hire young people, with firms between the ages of one and five years contributing the most to creating youth employment, as indicated by the higher marginal effects of 18–35 per cent. However, we are cognizant of the fact that younger firms are also dynamic and exit the market at a higher rate than older firms; therefore this result may indicate churn in the labour market (Kerr 2016).

Large firms employ more young people. Firms with bigger workforces are more likely to have at least 10 per cent youth in their employment. This proportion increases to at least 50 per cent as the firms increase to over 1,000 employees.

Firms with lower labour costs are more likely to employ young people. As highlighted in the literature, one of the disadvantages to firms of hiring youth is the additional costs of training them and the lost productivity per employee during the training period. If the firms already have high labour costs, they may be unwilling to employ young people without some form of compensation. Wage subsidies and the ETI programme are targeted towards such cases.

Firms with registered learnerships employ more young people compared with firms with completed learnerships. The data are not able to pick up whether firms with completed learnerships retain these young people or replace them with other young workers in order for the firm to claim wage subsidies.

Table 2: Probit results

	10% or more youth		50% or more youth		70% or more youth	
	Marginal effects	Std errors	Marginal effects	Std errors	Marginal effects	Std errors
Firms with youth aged 15–34						
Productivity	-0.064***	0.001	-0.036***	0.002	-0.001	0.001
Profitability	0.007	0.006	-0.041***	0.008	-0.022***	0.005
R&D expenses	0.008	0.010	0.011	0.012	0.008	0.009
Training expenses	0.042**	0.017	0.000	0.018	-0.011	0.012
Learnerships completed	-0.229***	0.086	-0.021	0.130	-0.103	0.104
Learnerships registered	0.105***	0.022	0.075***	0.015	0.067***	0.010
Foreign-owned	0.018	0.031	-0.033	0.036	-0.003	0.025
Firm age (26+)						
0	0.166***	0.018	0.322***	0.028	0.144***	0.021
1–5	0.187***	0.007	0.348***	0.005	0.184***	0.003
6–10	0.151***	0.007	0.253***	0.005	0.104***	0.003
11–15	0.097***	0.007	0.152***	0.005	0.046***	0.003
16–20	0.069***	0.008	0.085***	0.006	0.018***	0.003
21–25	0.034***	0.009	0.030***	0.007	0.001	0.004
No. of workers (1–5)						
6–10	0.246***	0.003	0.061***	0.004	0.000	0.003
11–50	0.260***	0.004	0.098***	0.005	0.020***	0.003
51–100	0.282***	0.005	0.203***	0.008	0.083***	0.007
101–500	0.292***	0.005	0.307***	0.010	0.146***	0.009
501–1,000	0.219***	0.025	0.393***	0.018	0.217***	0.022
1,001+	0.191***	0.039	0.465***	0.020	0.303***	0.027
Gross sales (R1–1,000,000)						
R1,000,001–10,000,000	0.181***	0.005	0.046***	0.004	-0.014***	0.003
R10,000,001–100,000,000	0.265***	0.006	0.076***	0.007	-0.042***	0.005
R100,000,001–1,000,000,000	0.291***	0.006	0.060***	0.013	-0.067***	0.008
R1,000,000,001+	0.300***	0.005	0.094***	0.035	-0.069***	0.020
Labour costs (wages R1–1,000,000)						
R1,000,001–10,000,000	0.022***	0.003	-0.042***	0.004	-0.035***	0.003
R10,000,001–100,000,000	0.029***	0.011	-0.135***	0.009	-0.071***	0.005
R100,000,001–1,000,000,000	-0.039	0.048	-0.285***	0.020	-0.119***	0.009
R1,000,000,001+	-0.020	0.123	-0.333***	0.051	-0.095**	0.045
Industry sector (manufacturing)						
Agriculture, forestry, and fishing	-0.022***	0.006	-0.061***	0.007	-0.024***	0.004
Mining and quarrying	-0.025	0.017	-0.070***	0.019	-0.051***	0.010
Electricity and gas	0.026***	0.010	0.052***	0.018	-0.009	0.011
Water supply	0.039**	0.018	0.038	0.039	0.009	0.025
Construction	-0.007**	0.004	-0.003	0.005	-0.012***	0.003
Wholesale, retail, transport, and accommodation	0.009***	0.002	0.066***	0.004	0.051***	0.003
Communication	0.008	0.007	0.144***	0.013	0.112***	0.010
Finance and insurance	-0.028***	0.003	0.004	0.004	0.018***	0.003
Real estate	-0.100***	0.007	-0.109***	0.008	-0.036***	0.004

Professional, scientific, and technical activities	0.001	0.004	0.056***	0.006	0.021***	0.004
Public services	-0.055***	0.006	-0.075***	0.007	-0.009**	0.005
Recreational and cultural activities	0.006	0.004	0.069***	0.006	0.063***	0.004
Not specified	-0.036	0.039	-0.066	0.049	-0.023	0.029
Trade status (exports only)						
Imports only	-0.001	0.006	0.056***	0.009	0.037***	0.006
Imports and exports	0.007	0.006	-0.001	0.009	0.009	0.006
No trade	0.000	0.005	0.057***	0.008	0.046***	0.005
Observations	153,131		153,131		153,131	
Chi-square	47909.71***		14409.45** *		9077.89***	

Notes: Dy/dx for factor levels is the discrete change from the base level. *** p<0.01, ** p<0.05, * p<0.1.

Source: authors' calculations based on tax records.

The probit model allows us to identify the industry sectors that employ young workers. The results indicate that the wholesale and retail, communication, and recreational sectors are the most likely to employ young people compared with manufacturing. These industries generally require inexperienced, low-skilled labour that they train on the job; therefore we would expect youth employment to be high in these sectors. Firms that do not participate in the international market are also more likely to employ young people compared with those that do. This may also suggest a skills constraint faced by the young, as trading firms in South Africa tend to be involved in technological inputs.

The results do not show any significant relationship between firms involved in R&D and youth employment.

Table 3 reports the ordinary least square (OLS) results. The results are consistent with the probit model in showing negative relationships between firm age and youth employment, productivity and youth employment, and labour costs and youth employment. A one per cent increase in the firm age reduces the proportion of youth in firms by 0.1 per cent, while a one per cent increase in productivity decreases youth employment by 0.03–0.1 per cent.

There is a positive relationship between gross sales and youth employment in line with the probit model, while increased value of imports reduces the percentage of youth employed by 0.01 per cent. The inferences drawn from the POLS results remain similar to the probit model.

Table 3: Pooled OLS results

	1	2	3	4	5	6
Proportion of youth aged 15–34	OLS	OLS	OLS	OLS	OLS	OLS
Productivity	-0.027*** (0.002)	-0.031*** (0.003)	-0.099*** (0.010)	-0.028*** (0.002)	-0.033*** (0.003)	-0.101*** (0.010)
Firm age	-0.154*** (0.002)	-0.146*** (0.003)	-0.142*** (0.010)	-0.148*** (0.002)	-0.137*** (0.003)	-0.136*** (0.010)
Gross sales	0.037*** (0.003)	0.032*** (0.004)	0.099*** (0.014)	0.037*** (0.003)	0.034*** (0.004)	0.101*** (0.014)
Wage expenses	-0.034*** (0.002)	-0.037*** (0.003)	-0.054*** (0.011)	-0.033*** (0.002)	-0.036*** (0.003)	-0.054*** (0.011)
Profitability	-0.018*** (0.003)	-0.007* (0.004)	0.001 (0.014)	-0.017*** (0.003)	-0.007 (0.004)	0.002 (0.014)
K-L ratio		0.001 (0.001)	0.012** (0.006)		0.002 (0.001)	0.013** (0.006)
Exports			-0.004 (0.003)			-0.004 (0.003)
Imports			-0.009*** (0.003)			-0.009*** (0.003)
Observations	118,214	43,211	4,220	118,214	43,211	4,220
R-squared	0.072	0.073	0.078	0.073	0.076	0.079
F test	1784***	552.7***	38.02***	1141***	385***	31.65***
Year FE	No	No	No	Yes	Yes	Yes

Notes: Coefficients reported. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' calculations based on tax records.

5 Conclusion and recommendations

The relevance of the study is in relation to identifying firms for the design and targeting of interventions such as the youth wage subsidy and the ETI. Using tax administrative panel data from NT-SARS for 2010–14, we find that older firms, high output-growth firms, high profit-making firms, and exporters are less likely to employ young people compared with firms with low labour costs, importers, and those registered with SETA for learnerships. We also identified that the wholesale and retail, communication, and recreational sectors are more likely to employ young people than agriculture, mining, manufacturing, and public service sectors.

The relationship between labour costs and the likelihood of a firm employing more young people lends support to policy interventions through youth wage subsidies. However, for the incentive to be successful, the subsidy needs to be high enough to cover the training costs, so as to encourage even small firms—which would otherwise be excluded by the programmes' administrative burden—to absorb more young people. The performance of the ETI thus far also suggests that targeting firms with a greater propensity to employ younger people might enhance outcomes. With

respect to firm age, younger firms need support in the initial stages of start-up (i.e. small, medium, and micro enterprise development) as they employ more young people. Firms also need incentives to retain young people once learnerships have been completed. Consistent with available evidence, the link between learnerships and the propensity to employ young people is affirmed, further highlighting the importance of SETA reforms.

Information on the locations of firms, and on the gender, race, education, and skills level of employees in the data set, might assist a more detailed analysis; however, it is not made available, which is one of the drawbacks of the NT-SARS data set.

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Appendix

Table A1 lists some of the variables and methodologies used in similar analyses.

Table A1: Literature review

Authors	Data	Methodology	Sample
Schoer and Rankin (2011)	<p><i>Dependent:</i> ratio of youth to total workforce, hiring wage voucher holders into workforce, firm provides SETA training, monthly starting wages for unskilled labour</p> <p><i>Explanatory:</i> firm age, firm size, firm type, firm sector, presence of union, type of referrals (Holzer 1987)</p>	Survey questionnaire to sample of firms in South Africa for wage subsidy OLS; probit	South Africa
Cieslik et al. (2014)	<p><i>Dependent:</i> export activity (binary = 1 if firm exports)</p> <p><i>Explanatory:</i> labour productivity (sales per employee), firm age, firm size, level of innovation (R&D spending), education (employees with university degrees), foreign ownership, use of foreign technology</p>	Probit	Central and Eastern Europe: Armenia, Azerbaijan, Czech Republic, Estonia, Georgia, Hungary, Latvia, Lithuania, Poland, Slovakia
Edwards et al. (2016)	<p><i>Dependent:</i> firm characteristics (firm size, capital-labour ratio, wage per worker, labour productivity)</p> <p><i>Explanatory:</i> dummy variables for exporter only, importer only, exporter and importer, importation of intermediate goods</p>	OLS with fixed and time effects	South Africa
Were (2007)	<p><i>Dependent:</i> proportion of casual to permanent workers in workforce</p> <p><i>Explanatory:</i> real output, wages of casual workers to total wages, exporting status of firm, productive capacity (number of shifts), number of competitors, institutions (firm has unionized employees), share of skilled labour, industry type, location</p>	OLS with fixed and random effects; seemingly unrelated regression	Kenya
Haltiwanger et al. (1999)	<p><i>Dependent:</i> productivity (log of firm sales divided by employment)</p> <p><i>Explanatory:</i> individual characteristics (age, gender, education, foreign-born); firm characteristics (firm age, firm size, ownership structure)</p>	OLS	United States
Haltiwanger et al. (2013)	<p><i>Dependent:</i> employment (changes in number of workers)</p> <p><i>Explanatory:</i> firm size, firm age, number of firm's establishments</p>	OLS	United States

Ouimet and Zarutskie (2014)	<i>Dependent:</i> fraction of employees in age categories, fraction of new hires in age categories, log wage per worker in age categories <i>Explanatory:</i> industry, firm age, firm size, private vs public firms, location, receives venture capital financing	OLS with fixed and time effects; probit	United States
Page and Soderbom (2015)	<i>Dependent:</i> total employment <i>Explanatory:</i> firm age, firm size, region, productivity, wages		Ethiopia
Abowd et al. (1994)	<i>Dependent:</i> total compensation costs per employee <i>Explanatory:</i> education, employee age, gender, location, firm performance (value added per employee), operating income (total assets and sales per employee), share of skilled employees	Generalized least squares	France
Holzer and Ihlanfeldt (1998)	<i>Dependent:</i> race of last hired worker, log of starting hourly wage of newly hired worker <i>Explanatory:</i> firm size, presence of union, percentage of firm's customers who are black or Hispanic, occupation of worker, location, industry, education	Difference-in-differences-in-differences	United States

Source: Authors' own.

Table A2 shows the statistics of the variables used in the analysis.

Table A2: Summary of variables

Variable	Obs	Mean	Std Dev.	Min.	Max.
Proportion of youth aged 15–34	355,257	37.89975	31.09062	0	100
Productivity	207,869	1562784	1.97E+08	0	8.99E+10
K-L ratio	71,851	948641.5	4.01E+07	0	7.92E+09
Firm age	1,177,840	11.74704	29.43331	0	2014
Gross sales	1,062,102	2.79E+07	7.45E+08	0	3.10E+11
Labour costs	644,452	4449694	9.55E+07	0	1.98E+10
Profitability	558,582	7859444	2.26E+08	0	6.72E+10
Total exports	93,490	2.97E+07	5.68E+08	1	5.58E+10
Total imports	112,415	2.52E+07	4.36E+08	1	5.08E+10
Training expenses	98,487	155734	4346706	0	8.46E+08
R&D expenses	481,903	25427.85	1526743	0	3.87E+08
Foreign-owned	1,177,840	0.004465	0.066671	0	1
Learnerships completed	1,177,840	0.0012421	0.0352216	0	1
Learnerships registered	1,177,840	0.0069279	0.0829454	0	1

Source: Authors' own.