

**Gender inequality and its impact on economic growth:
a study of the relationship between gender inequality
in employment, education and growth in South Africa**

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For my Mother,
Edna Ruiters,
who expected academic achievement above everything else.
She would have been proud.

ABSTRACT

This thesis explores the impact that gender equality in employment and education in South Africa has on the country's Gross Domestic Product (GDP) growth on a quarterly basis from 2008 – 2017. The hypothesis is that gender equality in employment and education will impact economic growth in South Africa because the inclusion of women as economically active and educated equals will have a direct impact on the economy. The Autoregressive Distributive-Lag (ARDL) model is used to quantify the long run relationships between the dependent (economic growth) and independent (women's employment and education levels) with Granger causality tests used to examine short-run causal relationships between the variables. The study discovered that women's employment and the combined variable of women's education and employment have an impact on GDP growth. However, women's education does not have a significant impact on economic growth. It is also found that women's employment has an impact on women's education but the reverse does not hold. The results from this study inform employment and education policy in South Africa and ensure that women and men have equal access to labour markets and schooling. The objective is to facilitate the equal contribution of men and women to economic growth.

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1 Background to the study

1.1 Background

The 2018 African Economic Outlook Report from the African Development Bank (AfDB) estimated that real output growth in 2017 increased to 3.6 percent and is estimated to accelerate to 4.1 percent in 2018 and 2019. The International Monetary Fund (IMF) revised their projected growth rate upwards for sub-Saharan Africa (SSA) in 2017 to 2.6 percent due to the recovery in oil production in Nigeria and the easing of drought conditions in Southern Africa and projected 3.4 percent growth in 2018 (IMF, 2017:x). The notable argument in both institutions' projections is that Africa, especially Southern Africa, is on the upward trend, albeit a slow one. Southern Africa, excluding South Africa, will grow at an estimated rate of 3.3 percent and 4.1 percent in 2017 and 2018 respectively (AfDB, 2018:20). South Africa, however, continues to lag behind with projected growth rates of 1.8 and 2.6 percent in 2017 and 2018 respectively (IMF 2017). The AfDB's forecasted growth rates for South Africa are similar at 1.1 percent for 2018 (2018:170).

In the context of a slow recovery from the 2008 financial crisis and growing inequalities, countries are seeking ways to drive economic development, reduce poverty and improve equality. Many factors could drive growth, for example, economic diversification; infrastructure development; technological skills' development and education; migration; and inclusive growth. Ravallion and Chen (1997) show that a 1 percent increase in mean income or consumption expenditure reduced the proportion of people living below the poverty line by 3 percent.¹ The World Bank's *Attacking Poverty* (2000) found it more likely that a 1 percent reduction in poverty would lead to 2 percent growth. Adams (2003:21) argues that 'on average, a 10 percentage point increase in economic growth (measured by survey mean income) will produce a 25.9 percent decrease in the proportion of people living in poverty (\$1 a person a day)'. In their attempts to achieve growth, government policy makers then strive to replicate the ideal conditions for growth, based on other countries' experiences.

Development has become synonymous with economic growth and, conversely, increasing poverty and the marginalisation of vulnerable populations is linked to a lack of development.

¹ The World Bank's international poverty line was revised from \$1 a day to \$1.25 a day in 2008 and again to \$1.90 a day in 2015. In October 2017, the World Bank introduced additional poverty lines of \$3.21, \$5.48 and \$21.70 a day to depict poverty lines in lower middle-income, upper middle-income and high-income countries respectively. <http://blogs.worldbank.org/developmenttalk/richer-array-international-poverty-lines>

Amartya Sen's seminal work on *Development as Freedom* (1999) and his capability approach point to the importance of providing opportunities that allow people to 'exercise [their] reasoned agency' (Sen, 1999:xii). In this developmental framework, Sen's barriers to 'reasoned agency' include poverty, poor economic opportunities and gender inequalities, an argument that was taken up by the World Bank in their 2000 World Development Report on *Attacking Poverty*. By addressing the barriers, people will gain more agency and capacity to guide their own lives.

The World Bank (2000:v) connects the following systemic issues:

Increasing education leads to better health outcomes. Improving health increases income-earning potential. Providing safety nets allows poor people to engage in higher-risk, higher-return activities. And eliminating discrimination against women, ethnic minorities, and other disadvantaged groups both directly improves their well-being and enhances their ability to increase their incomes.

Since the World Bank's *Attacking Poverty* report (2000), the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs) in the post-2015 period, poverty reduction has become the central focus of all development programmes. The discourse on development has gone through different iterations where development outcomes include poverty reduction; the inclusion of marginalised groups; the inclusion of women in development; and then, the argument that women should not just be added into development discourses but should be an integral part of development discourses and programmes.

Following on from the World Bank's work on development outcomes and Sen's capability approach, this paper explores two main factors that could potentially drive economic growth, namely, education and employment. Research has identified quality education ('highbrow' education) and inclusive, decent work opportunities as the main sectors that generally drive economic development (AfDB 2016; Bandara; 2015; Page & Shimeles, 2014; Klasen & Lamanna, 2009). Education can improve job opportunities and better education will drive more technological developments that, in turn, will improve economic growth. However, gender gaps are proving to be the main reason behind continued social and economic inequality across the developing world (Hakura et al., 2016; Mitra et al., 2015; Berik et al., 2009; Seguino, 2000). A report from the McKinsey Global Institute (2015) argues that gender parity could add \$12 trillion to global growth and the IMF (2017) argues that gender inequality 'imposes a heavy economic cost because it hampers productivity and weighs on growth' (Kochhar et al., 2016:x).

Thus, the paper argues that parity in educational levels and employment opportunities could drive growth in countries where economies are lagging.

Chant (2006:101) argues that women's empowerment is seen through their 'capacity to make choices', but these should be considered within limited institutional and structural frameworks that constrain women's choices. 'Women's work', heterodox economic systems often underpay women's labour or render it invisible or undercounted in heterodox economic systems. By including women's work, economic data can improve numerically and inform policy more effectively. By improving women's access to equal work and education, countries could reduce poverty and engender sustainable development. The reality, however, is that data in developing countries on women's paid and unpaid work is limited for many reasons; one reason being that data generally is a weak area of bureaucratic management and another is that women's unpaid work is unquantified and therefore uncounted.

The 2016 African Economic Outlook posits that the highest levels of gendered inequality are in Africa (2016: 97). Women make up more than 50 percent of the population on the African continent, occupy jobs that are at the bottom of many production chains and do not receive equal access to education as compared to men (AfDB, 2016). Women's economic experiences vary across contexts, which is why government policies have to develop targeted programmes for those populations and contexts with the biggest development impact for those economies and groups.

Policy and legislation can go a long way to creating enabling environments for women, for example, by promoting (and perhaps more critically, monitoring and enforcing) the elimination of gender discrimination in schools and the workplace by introducing initiatives which encourage greater sharing of parental responsibilities and power within the home (or which endorse alternative family structures). (Chant, 2006:105)

Research provides the opportunity to create evidence-based policies by identifying the quick-wins for governments based on their development realities. By including women, researchers would provide a more comprehensive portrait of the status of an economy.

1.2 Problem statement

Gendered gaps in employment and education continue to hamper GDP growth in South Africa despite the country's middle-income status (Hakura et al., 2016). The Organisation of Economic Cooperation and Development (OECD) predicts that, in South Africa, 'unemployment and inequality will remain high, reflecting large skill gaps and low education

quality' (OECD, 2017). For this reason, it is important to explore how government policy can promote endogenous factors like quality education and employment to drive growth in South Africa. In addition, with a history of racial and gender discrimination, it would be critical to link employment and education to all women's participation in the economy.

South Africa's economic growth trajectory has moved from being one of the more successful African economies in the 1990s with a growth rate of to one of the slowest growing economies on the continent at 1.1% in 2018 (AfDB, 2018). The official data from Statistics South Africa (StatsSA, 2018) provide an interesting challenge to policy makers – how do they return South Africa to its former position as an economic powerhouse in Southern Africa and on the rest of the continent? What does government need to do to make sure that South Africa's growth returns to a positive trajectory?

In feminist writings, race and gender have been constant guides in determining the level of access women, broadly speaking, and black women, more specifically, have to the formal South African economy. In 2009, *Agenda* editors argued that 'given that economics is both about power and access to resources and the ownership of resources, a non-accounting of the unequal gender-related distribution of resources may not contribute to improving the position of women and may instead, continue to make them invisible' (Reddy and Moletsane, 2009:4). Again, if one uses Sen's capability approach, we could extrapolate that South African women who live in poverty will never access decent work or decent education, no matter which policy changes are effected; therefore, women will remain at a social and economic disadvantage.

Earlier studies have looked at the role of women's employment and economic growth from a global perspective (Oztunc, Oo and Serin, 2015; Klasen, 2002; Benavot 1989; Psacharopoulos and Tzannatos, 1989); in Nigeria (Obiorah, 2016); in apartheid South Africa (Ntuli and Wittenberg, 2013; Karlsson, 2009; Nolde, 1991); women's income and poverty in post-apartheid South Africa (Posel and Rogan, 2009); and, the informalisation of women's work in South Africa (Muller and Esselaar, 2004). De Vries (2015) research the link between schooling for girls and economic growth in a cross-country study, and Benos and Zotou (2014) explore the links between general education and economic growth.

Benavot's (1989) panel regression study of 96 countries from 1960 – 1985 shows that in less-developed countries girls' primary education has a higher return than boys' primary education

however, ‘conditions of highly dependent manufacturing production and marginal economic infrastructure ... [account] for the negative effects of tertiary education and the relatively weak impact of secondary education on economic growth’ (1989:28). In their 2009 study, Posel and Rogan (2009) argue that women-headed households are poorer than male-headed households therefore women have higher levels of poverty and have a lower capacity to contribute to GDP growth. The social grants in post-apartheid South Africa have done much to improve the lot of women-headed households but real economic growth would require women and men to be employed in income generating jobs that could lead to sustainable livelihoods.

Developments in feminist economics and the focus on gender equality in United Nations’ reports and international platforms such as the Beijing Action Plan have highlighted the potential role that gender equality has in driving economic growth. Seguino (2000:1211 – 12) argues that the gendered structure of export-led economies has favoured male workers over women as mining and manufacturing take centre-stage, which points to the importance of the kind of jobs that are created during periods of economic growth.

Under strategies purported to bring about inclusive growth, youth development, women’s economic empowerment and issues related to servicing ‘the poor’ have taken centre stage contributing to growth. However, under these circumstances, gender gaps continue to underpin social and economic inequality across the developing world (Hakura et al., 2016; Mitra et al., 2015; Berik et al., 2009; Seguino, 2000).

In 2008, Klasen and Lamanna (2009:91) updated their earlier work published in 2002 and proved that, in the Middle East and North Africa, education and employment gaps have a negative impact of 0.9 – 1.7 percentage points on economic growth compared to East Asia. They argue that gaps in employment create differences between regions. Barro (2000) and Castello (2010) argue that as countries develop, employment gaps between men and women will have a greater impact on growth because the kind of labour required by those countries relies on structural gender inequalities (see also Bandara; 2015; AfDB 2016; Page & Shimeles, 2014; Klasen & Lamanna, 2009). Mitra et al. (2015) argue that increased equality in ‘economic opportunity’ (equal employment) could lead to an average of 1.3 percentage points of growth while increased equality in ‘participatory equality’ (not necessarily equally) could result in a 1.2 percentage point improvement. As a result, the ‘business case’ for including women is quite clear.

1.3 Justification for the study

The purpose of this study is threefold. Firstly, it aims to identify if a relationship exists between gender equality in education and employment and economic growth in South Africa. Secondly, it aims to discern if the role of women in economic development adds an additional level of information for economic policies. Despite policy and legal advances in the fight against gender inequality, South Africa's gender gap in education and labour persists.

Finally, by extending gender-lens research on the relationship between education and employment and economic growth, policy makers will generate a complete picture that would benefit socioeconomic policies and programmes. In Table 1 below, the employment rates of males in South Africa between 2008, 2013 and 2017 (StatsSA) was higher than that of females but it is noted with concern that participation rates in both sexes have declined since 2001. The general decline in employment could be attributed to the slowdown in the economy since the global economic crisis but the specific decline in women's employment could point to the structural inequalities within the South African mining and manufacturing focused economy.

Table 1: Women's employment rates in South Africa by gender 2008, 2013 and 2017 (Q4)

Status	Male			Female		
	Q4 2008	Q4 2013	Q4 2017	Q4 2008	Q4 2013	Q4 2017
Employed	25,7	23,5	16,8	19,3	19,2	15,0

Source: StatsSA (author's compilation)

According to StatsSA, the real annual GDP increased by 3.1 percent in 2008; 1.9 percent in 2013 and 1.3 percent in 2017. The decline in economic growth, particularly in mining and manufacturing, could account for the decline in employment and it is important to note that women's unemployment remains higher than men's unemployment. In fact, the unemployment rate for women is higher than that of men where black women are the most vulnerable at 34.2 percent, coloured women at 23.5 percent and white women at 6.7 percent (StatsSA cited in Mhlanga, 2018). The declining global competitiveness rates of the South African economy could also explain the decline. In 2001, the World Economic Forum's Global Competitiveness Report ranked South Africa's competitiveness at 45th out of 134 countries in 2008 – 9; 53rd out of 148 countries in 2013 – 14; 61st out of 137 countries in 2017 – 18 (WEF, 2009, 2015, 2018).

The lower ranking points to evidence of the decline of South Africa's ability to compete internationally.

In order to counter South Africa's declining status, policy makers would need to play a bigger role in identifying the most appropriate programmes. Since the end of apartheid in 1994, South Africa's development programmes have highlighted the importance of education and employment in initiatives to drive growth and sustainable development. Policy makers try to find the magic wand to promote growth by tweaking policy to drive different sectors of the economy. For example, economic policy would look at ways to improve exports by driving local industrial development; or improve Foreign Direct Investment (FDI) to create more jobs. Alternatively, they would call for the promotion of infrastructure delivery to create more jobs and attract private sector investments. These policy initiatives all focus on economic growth as the ultimate prize.

This study explores the relationship between economic development, seen through the lens of real GDP growth, and women's employment and education levels. Studies on the impact of the inclusion of women in the formal economy and in traditional economic analyses have not been as prevalent as studies on the role of financial inclusion; strong institutions; energy capacity; and, infrastructure in economic development. This paper will thus add to a growing body of work that examines how gendered analyses could lead to different economic decisions, measurements and outcomes. This research will position feminist economics as a mainstream economic theory.

1.4 Statement of research objectives and hypotheses

The objective of this study is to determine the impact that gender inequality in employment and education has on economic development in a middle-income country. The study has three research questions:

- Q1. What impact has the gender gap in education had on economic growth rates within South Africa?

H_0 = There is no statistically significant impact between gender equality in education and economic growth.

H_1 = There is a statistically significant impact between gender equality in education and economic growth.

- Q2. What impact has employment equity had on economic growth rates within South Africa?

H_0 = There is no statistically significant impact between gender equality in employment and economic growth.

H_1 = There is a statistically significant impact between gender equality in employment and economic growth.

- Q3. Has there been a bidirectional relationship between gender equality in employment and education and economic growth?

H_0 = There is no bidirectional relationship between gender equality in employment and education and economic growth.

H_1 = There is a bidirectional relationship between gender equality in employment and education and economic growth.

The purpose is to identify the impact of gender equality in education and employment on economic growth in South Africa. Since the South African economy has slowed down in recent years, policy makers have explored various options to drive economic growth. This study aims to discern if the education and employment of women will add an additional lever for economic growth. Methodologically, when studying the impact of gender equality on economic growth, it is important to distinguish between short-run and long-run effects (Odhiambo, 2006).

1.5 Organisation of study

Chapter Two will position the study within broader debates about gender, education and economic development. The methodology, outlined in Chapter Three, will justify the use of the quantitative tools including unit root and co-integration tests and short run and long run analysis using the Autoregressive Distributed Lag (ARDL) model. The analysis and findings will be presented in Chapter Four. The thesis will conclude with Chapter Five presenting policy recommendations, the limitations of this study and recommendations for further research.

2 LITERATURE REVIEW

2.1 Introduction

Chapter 1 of this thesis outlined why a study on South Africa would further debate on the drivers of economic growth, particularly in light of its low growth trajectory and the high inequality levels. This paper aims to analyse the impact of women's employment, women's education on economic growth but it also engages with feminist economic perspectives that include the concept of women's work and other factors of production that are not normally included in mainstream analysis. Kabeer (2016:295) argues that 'using a feminist institutional framework' allows for exploration at 'lower levels of analysis for insights into the pathways likely to be driving ... relationships and possible explanation for their asymmetry'. In other words, feminist analysis highlights the stories in the margins of mainstream analysis.

2.2 Theories of economic growth

Before exploring feminist theories on growth, the paper highlights two traditional models of economic growth (De Vries, 2015:5). The neoclassical model, also known as the exogenous model, formulated by economists like Harrod (1939) and Domar (1946), argues that exogenous factors such as levels of savings and the productivity of capital promote economic growth. The Harrod-Domar model rests on the foundation that by increasing savings or the productivity of capital, the economy will have more money to spend on technological advancements and therefore increase the levels of economic growth. However, the Harrod-Domar model was criticised for focusing on fixed assets, and was succeeded by the Solow-Swan model (1956) that argues that capital and labour drive economic output and as such, an increase in investments (capital) or an increase in labour will lead to economic growth.

The second group of models, known as endogenous growth models, provide more specificity to determining what drives economic growth. Economists look at knowledge production (Romer, 1984; Romer 1986), human capital accumulation (Lucas, 1988) and government taxation policies (Rebelo, 1990). The endogenous models assume that growth will be accumulative as more factors are improved. These economic models provide the backdrop to an understanding of how to model economic growth by including a range of factors of production. This paper employs the endogenous model by exploring the contributions of education and employment generally as factors of knowledge production and human capital

accumulation, but more specifically it explores the contributions of women's education and employment to economic growth. The argument will return to this later.

2.3 Empirical evidence of the relationship between economic factors and economic growth

Theories of economic development, both exogenous and endogenous, posit that economic growth is influenced by variables ranging from democracy, financial inclusion, gross fixed capital formation (Altaee et al., 2016), labour, life expectancy, degree of openness and economic freedom (Djezou, 2014; Ajide, 2014). What is evident in this synopsis of studies is that there is no real agreement on which factors explain growth more adequately than others are.

Ullah et al. (2014) assess key determinants of economic growth in Pakistan and find that there is cointegration between economic growth and real domestic investment, foreign investment, exports, remittances and literacy rates. In short, the more money there is in a system and the higher the literacy, the more a country experiences economic development. A study on economic determinants of economic growth in Nigeria shows that labour, life expectancy, degree of openness and economic freedom affect the level of economic growth while the size of government and freedom to trade internationally introduce new variables to the debate (Ajide, 2014).

FDI is an accepted driver of economic development, while economic freedom provides detail in explanations about differences in economic performance (Haan et al., 2006, cited in Ajide, 2014:148). Pourshahabi et al. (2011) show that there is a relationship between FDI, economic freedom and economic growth in OECD countries but they develop their model further to include government consumption expenditure, public investment and human capital. An important policy recommendation Ajide makes is that 'excessive intervention by government in the economy should be drastically reduced to allow freedom to be enjoyed and exercised' (2014:166-167).

Morley (2006) found a unidirectional relationship between economic growth and immigration when using the ARDL bounds testing approach. The study found that growth affects immigration, but not the reverse. This finding rests on the argument that intra-state migration is driven by growth in economically viable nodes, such as large urban centres because of

increased demand for labour or ‘because immigrants are attracted to the host country by the prospect of higher wages and living standards produced by the greater economic growth’ (Morley, 2006:75).

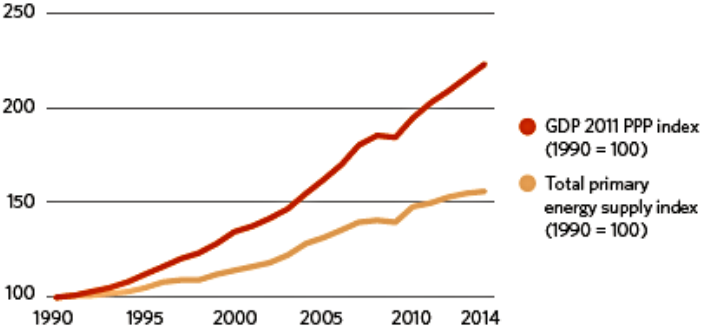
Ward et al. (2010) show that by improving gender equality, countries can improve economic performance. The authors (Ward et al., 2010) link gender equality with economic growth by including human capital, physical capital, the rule of law, competitive markets, macroeconomic stability, infrastructure, openness to trade and investment and increased agricultural productivity. Simply put, ‘better educated women can undertake higher-value economic activity’ (2010:1). The bidirectional relationship between economic growth and education could have prevented the 0.38 per cent loss per annum due to gender inequality in education and economic growth could have led to higher educational levels (Ward et al., 2010).

Ward et al. (2010) consolidate results from peer-reviewed quantitative evidence and a limited survey to show progress on Millennium Development Goal 3 (promote gender equality and empower women) and MDG 5 (improve maternal health). Klasen and Lamanna’s (2008) work features strongly as an empirical study that determines that gender inequality does not necessarily lead to economic growth but only in those countries where ‘social and cultural institutions are themselves conducive to growth and where employment equality also increases’ (Ward et al., 2010:10). The authors’ transmission mechanism (Ward et al., 2010:xi-xii) approach, which includes the stock of human capital, competitive markets, physical capital, rule of law, infrastructure, agricultural productivity, openness to trade and macroeconomic stability. Each of these factors could facilitate greater gender equality over time.

Other input factors into economic development are important, for example, the consumption of energy and its relationship to economic growth. Odhiambo (2009) argues that energy consumption drives economic growth. A study by Stern and Enflo (2013) argues that the causality was from energy to GDP between 1850 – 2000 but in more recent years, the causality runs from GDP to energy (cited in Bacon and Kojima, 2016) because as the economy grows, there is an increased demand for larger energy resources. A recent study by the International Energy Agency and the World Bank confirms the importance of the energy sector in economic growth paths of developing countries by referring to energy as the “golden thread” connecting economic growth, social equity and environmental sustainability’ (2017:vi). A unidirectional

relationship would imply that economic growth is reliant on energy consumption and that a decrease in energy consumption would lead to lower economic growth (Odhiambo, 2009:618).

Figure 1: Relative growth of GDP and energy supply, 1990 – 2014



Source: IEA and World Bank, 2017

Odhiambo (2006:619) provides an excellent discussion on four views of energy consumption and growth that have emerged in studies of developing and developed countries. Odhiambo cites studies on China, Brazil, India and other developing countries, which are of interest to this study because of their relationships with Africa, that show that energy causes growth (Altinay and Karagol for Turkey, 2005; Shui and Lam for China, 2004; Cheng, for Brazil, 1997; and Masih and Masih for India, 1986). Figure 1 above shows the similar but divergent relationship between GDP growth and energy supply where, as GDP grows, energy supply declines but the relationship remains positive. A second argument emerges that economic growth drives energy consumption (Cheng for India, 1999; Narayan for India, 2005). A third view shows that there is a bidirectional relationship between economic growth and energy consumption (Paul and Bhattacharya, 2004) and finally, there is a view that claims there is no link between the two variables (Cheng, 1997 on Mexico and Venezuela). Odhiambo concludes that, in Tanzania, policy makers could use energy consumption to drive economic growth. He used the Granger causality test and the ARDL bounds test in his work and showed that the ARDL provided more significant results than the former test.

Ozturk and Acaravci (2010), using the two-step Engle-Granger cointegration model and Granger causality tests, in a four-country study of Albania, Bulgaria, Hungary and Romania, conclude that a bidirectional relationship between energy and economic growth only exists for Hungary as the causal relationship between the two variables cannot be determined for the other

three countries. The study concludes that policy makers should consider the stage of development of the country, rather than uniformly apply an energy policy within a region. This is an important finding because in developing countries, energy is seen as a panacea for all faults, which might hold true as long as the energy deficit is significant. If the country is at a higher stage of development, innovation might be more important than supplying the market with more energy.

The democracy and economic growth nexus in Côte d'Ivoire is explored by Djezou (2014) furthering an old debate in political science that argued that peace would lead to development and institutions would provide the enabling framework (see North, 1990). The study, using the ARDL model and Granger causality tests, sets out the arguments that the level of economic development drives the consolidation of democracy (Djezou, 2014:252) and that as poor countries become wealthier, they are more likely to change institutions.

A similar argument is that democracy limits government to doing the 'right thing' therefore generating economic growth (see Acemoglu et al., 2001; Rodrik, 1999 and Scully, 1988). A counter argument states that democracy is bad for economic growth because governments suffer from 'short-termism' as they attempt to appease their electorate and do not provide the environment for long-term growth (Keefer, 2007 in Djezou, 2014:252). On the other hand, the Asian Tigers are authoritarian regimes idolised for their successful economic growth trajectories, despite their centralised decision-making models. Djezou concludes that 'the relationship between economic growth and democracy is nonlinear revealing the existence of a minimum level of GDP per capita required to positively impact democracy' and that 'economic growth can only occur in a particular environment that provides accountability, transparency, rule of law, and ethnic inclusiveness' (2014:262).

Financial inclusion has become an important area of study recently with calls to 'bank the poor' and to facilitate the entry of small businesses into the formal economy by providing access to affordable and suitable finance. Kargbo and Adamu (2009:30) use the ARDL approach in Sierra Leone and find a 'cointegrating relationship among real GDP, financial development, investment and real deposit rate' and conclude that financial development 'exerts a positive and statistically significant effect on economic growth and investment is an important channel through which financial development feeds economic growth'. Financial development and

inclusion are important factors in economic policy as they attract FDI and provide the environment that facilitates micro-, small- and medium-sized enterprises.

In a study on the Kingdom of Saudi Arabia, Altaee et al. (2016) use the ARDL model and find a positive relationship between gross fixed capital formation and exports and economic growth in the short- and long run. The authors also find a negative relationship between imports and economic growth where a reliance on imports leads to lower economic growth in the short- and long run; and, a negative short-run impact of financial development on economic growth but a long-term positive relationship between those variables.

Audi and Ali (2017) examine the effect of socio-economic and demographic changes on labour productivity in Pakistan through the ARDL model and Augmented Dickey-Fuller (ADF) tests to analyse the cointegration of the variables of the model. They include data from the human development index (HDI), dependency ratio², domestic investment, FDI, globalisation and inflation rates. Education is included as a determinant of labour productivity and economic growth. Their results show that total labour productivity has a bidirectional, positive and significant relationship with HDI, which ties in with Sen's capability approach. They conclude that 'better health, education and resources encourage labor to work hard and enhance the overall labor productivity' (2017:17/17).

This broad set of studies shows the diverse range of factors that could influence economic growth at various stages of development in a range of countries. Blackden et al. (2006) explain that 'many of the conventionally accepted factors which determine growth and poverty reduction outcomes do not fully explain Africa's poor growth and poverty reduction performance' (Blackden et al., 2006:17). These authors maintain that gender equality in education and formal sector employment are key determinants of economic growth that are often overlooked in mainstream economic analyses. This perspective is taken up in the remainder of this study. As such, feminist economic theory and the links between education and employment equality and economic growth both from a theoretical and empirical perspective are reviewed in the following sections.

² The dependency ratio is the age-population ratio is the number of dependents from 1 – 14 year olds and over 65 years olds in relation to the total population, 15 – 64 (www.investopedia.com)

2.4 Explaining feminist economic theory

Boserup's (1970) seminal work on women's role in economic development explains the role of women in developing countries in Africa, Asia and Latin America. Her argument was that women were unequally affected by global capitalism and economic development. Boserup's work also influenced the *Women in Development*, *Women and Development*, and *Gender and Development* discourses over the years (Okali, 2011). Orthodox macroeconomics and growth policies have 'gendered effects'; therefore, it becomes important for research to include inequalities, gendered work and structural constraints to equal participation. 'If a gender-lens is used to analyse issues of social equity and poverty, the economic proposals would emphasise the work – paid and unpaid – that women undertake and how it contributes to the Gross Domestic Product (GDP) the total value of goods and services produced by a country' (Taylor, 1997:10). The theory that frames the subsequent discussion is around inequalities, growth, gender and capabilities broadly but more specifically about the impact of gendered inequalities on wages, education and economic growth.

Elson's (2006) analysis of the 2006 World Development Report (WDR 2006) provides evidence of the difference between mainstream macroeconomics and feminist economics. The former argues for equality of opportunity, while the latter focusses on equality of outcomes, which take into account the social and economic differences between men and women that are influenced by access to resources. It can be argued that equal access is an economic factor that encompasses many other factors such as access to schooling, finance, employment, health, energy, economic opportunities, etcetera. The provision of equal opportunities (or access) for all contends that once the opportunity is provided, everyone, regardless of race, age, gender or geography would be able to access the opportunity. Feminist economists like Elson argue that a focus on equality of outcomes, an ideal world where everyone has equal access to factors of production, would produce the desired equality that development aims to achieve. By ensuring that the outcomes are equal, policy makers could create a differential approach to providing enabling environments. Policy makers would need to understand which factors would be more effective in bringing about equal outcomes.

Building on studies of the relationship between gender inequality and economic growth, Berik et al. (2009) argue that equality of opportunities and equality of outcomes should be considered. Their qualitative research concludes that the 'interaction of the macroeconomy and gender relations depends on the structure of the economy, the nature of job segregation, the particular

measure of gender inequality and the country's international relations' (2009:1). Berik et al. (2009:4) point out that an economist's view of modernisation includes past inequalities that persist in current economic structures, which, in turn, create 'inequality traps'. Furthermore, Berik et al. (2009:5) state that the WDR 2006 gives little attention to women's unpaid labour constraints on their labour market participation and labour market inequality (wages). 'Feminist economists' analyses of the interrelationship between inequality, development and growth underscore that the macroeconomy provides the structural conditions under which equality is sought' (Berik et al., 2009:5).

2.5 Gender inequality and growth

Berik et al. (2009:1) argue that 'inequalities based on gender, race, ethnicity, and class undermine the ability to provision and expand capabilities' and require 'macroeconomic policies that are likely to promote broadly shared development'. Amartya Sen's capabilities approach covers this argument and refers to the agency, or lack thereof, of people to live their best lives. Berik et al. (2009:2) define development as the 'expansion of capabilities', which means that people are provided with the tools and enabling frameworks to improve themselves and their lives. Feminist economists argue that the belief that men and women experience life and structural frameworks differently, underpins their understanding of inequalities and the differences between groups. This belief allows policies to take into consideration the added costs of equality, factor them into implementation plans and to consider the 'distributional conflict and resistance from groups who benefit from the status quo distribution' (Berik et al, 2009:3).

In order to explain the relationship between economic growth and gender inequality, scholars have used Kuznets's model (Acemoglu and Robinson, 2002; Kilinç 2015), referred to as the Gender Kuznets's Curve. In 1955, Kuznets (cited in Acemoglu and Robinson, 2002:184) found that 'as countries developed, income inequality first increased, peaked, and then decreased'. In their political economy analysis of the Kuznets Curve, Acemoglu and Robinson (2002) found that when inequality is very low initially, there would be development without social tensions; a second finding was that when civil society is 'unmobilized, even widening inequality may not be sufficient to force political reform' (2002: 200). This means that a society with endemic inequality will struggle to become equal, unless government policies make step-changes that address historic inequalities.

In furthering the discussion, in a study that covers seven developed countries, Kiliç et al. (2015) use the Gender Kuznets's Curve to show that economic development has a non-linear effect on the number of women working in the economy and that 'economic development does not guarantee gender equalization' (2015:54). The relationship in this case is characterised by growth having a potentially negative effect on inequality. These results show that the relationship between gender equality and economic growth is neither inevitable nor is it predictable. Policies addressing gender equality would need to constantly assess and adjust to ensure that positive benefits accruing to women continue and negative impacts are mitigated and addressed.

Ferreira (1999:13) provided an overview of the arguments in the growth and inequality debate and came to the following conclusion:

The inverted-U relationship between growth and inequality suggested by Kuznets has not survived recent empirical scrutiny terribly well. Instead, it is gradually being replaced by a perception that the main flow of causation may be in the other direction, with inequality hampering the rate and quality of economic growth.

Ferreira's argument links with Sen's capability theory that explores the relationship between growth, education and employment, for example, Barro (2000) who argues that inequality hampers growth but the extent to which it does depends on the levels of development in the country. If an economic system is based on unequal access to resources, for example, education and work (labour), it could be argued that those inequalities will result in low economic growth.

Seguino's study (2000) includes gender inequality as a driver of economic growth where the gendered structure of the economy affects the outcome of the economic policies. Seguino uses a growth accounting methodology to calculate the output of capital stock, skilled-adjusted female and male labour supply (human capital) and technological advancement (2000:1215). She finds that gender inequality stimulates economic growth. Seguino (2000) argues that export-led economies have succeeded in growing because of pre-existing gender inequalities between men and women workers; export-led sectors use women's cheaper labour to drive profit strategies; and that women's cheap labour attracts more FDI to countries that have gendered wage inequalities (2000:1211-12). Contrary to much of the earlier work, Seguino (2000) concludes that gender inequality has a positive relationship with economic growth; the more inequality there is, the better growth outcomes arise. She argues that gender inequality resulted in growth in export-led economies where women performed most of the work during

1975 – 1995 and, following from that wage inequality, investment increased because of the higher returns.

Contrary to Seguino (2000), Kabeer and Natali (2013) find ‘that gender equality contributed positively to economic growth [proved] to be fairly robust, holding across a range of different countries, time periods and model specifications’. Kabeer (2016:296) points out an asymmetry between mainstream economic analysis and feminist analysis that could be attributed to different methodologies between the two perspectives. She argues that neoclassical economics measures growth using simple measures of gender equality such as ‘education, employment and sometimes wages’ while feminist economics models gender equality using a ‘wide range of equality measures, including well-being, rights and political participation’ (Kabeer, 2016:296). Duflo (2012:1053) argues that there is a ‘bidirectional relationship between economic development and women’s empowerment defined as improving the ability of women to access the constituents of development – in particular health, education, earning opportunities, rights and political participation’.

Studies on women’s roles in economic development have remained peripheral to mainstream economic research but more and more studies are being conducted on the position of women in employment and their levels of education. Hakura et al. (2016) use dynamic panel regressions and new time series data that shows that gender inequalities are negatively associated with economic growth. They find that the structure of the economy influences the ability to address gendered economic inequalities.

Mitra-Khan and Mitra-Khan (2008) confirmed Seguino’s findings that wage inequality led to growth in a limited sample of semi-industrialised countries. Schober and Winter-Ebmer tested Seguino’s model and disputed that gender inequality is negative for growth by analysing micro-data using a Blinder-Oaxaca wage decomposition (2011:1477). Their conclusion was that they could not find evidence that discrimination would favour economic growth but determined that gender inequality was bad for the economy.

In 2009, Klasen and Lamanna updated their 2002 research and proved that, in the Middle East and North Africa, education and employment gaps have a negative impact on economic growth of between of 0.9 and 1.7 percent compared to East Asia (2009:91). They argue that gaps in employment create differences between regions. Barro (2000) and Castello (2010) argue that,

as countries develop, employment gaps between men and women will have a greater impact on growth than employment. Mitra et al. (2015) argue that increased equality in ‘economic opportunity’ (employment) could lead to an increase in growth on average of 1.3 percent while increased equality in ‘participatory equality’ could result in a 1.2 percent improvement. Gender equality is important because it provides the ‘economic opportunity’ (Mitra et al., 2015) for women to become economic equals. However, Berik et al. (2009:23) argue that gender gaps could be used to ‘stimulate growth’ but that context matters, and that sustainability and well-being should be the main impetus behind macroeconomic policies.

2.6 Women, work and economic growth

Mainstream economics failed to include ‘women’s work’ in earlier calculations of GDP. In fact, ‘little thought was given to gender differences within the variables, and this was reflected in the limited availability of gender-disaggregated data’ (Cloud and Garrett, 1997: 152). Women’s unpaid work was not included in GDP even though women’s care work removed them from the formal paid market. Examples exist where women spend 71 percent of their time collecting water compared to men (OECD, 2014).

Blackden et al. (2006:1), in an article that sets out seven arguments as to why gender equality is important, contend that gender inequality will have a direct impact on growth because ‘gender issues’ affect the development of institutional, physical, human and technological assets. Their work explores intra-household relations, resource control, quantity of children and the quality of children’s health, women’s time use and cultural and structural constraints (Blackden et al, 2006:3). Blackden et al. (2006:4) argue that gender inequality in employment also produces gaps in human asset development; therefore, has a negative impact on economic growth. In addition, the lack of women in leadership positions in the formal economy has a knock-on effect on businesses and economies by limiting their ability to grow to their full capacity (Bain & Company, 2017). Blackden et al. (2006:4) point out that gender inequality in employment and education result in gaps in wages, which could result in certain structural preferences for economies, for example, low paid labour (women) would lead to a service-related economy (call centres) or an export-related economy (sweat-shops).

Cloud and Garrett (1997:156) used Gross National Product (GNP) per capita as ‘the independent variable in addressing the pattern of women’s participation in the economy’ to determine if ‘the economic participation of men and women vary systematically by level of

GNP per capita'. The authors' study, which looks at the gendered differences in labour participation during periods of structural transformation over time across 132 countries, finds that women's economic activity is lower than men's rates because care work is not included in mainstream economics which results in 'female rates of economic activity [being] much lower than men's, and GDP per capita account[ing] for less than 16 percent of the variation in female rates' (Cloud and Garret, 1997:152).

Female participation rates tend to be higher when an economy is organized around family-based production in agriculture. With economic growth and increased urbanization, participation often declines, as women stay at home while men go out to work. At still higher levels of income per capita, female participation increases again as labor market options for women increase. Patterns of labor force participation also reflect cultural and ideological differences. (World Bank 1995:25)

In 2006, women's participation in the formal economy in SSA, at 67 percent, was higher than in other developing regions (Blackden, 2006:12). By 2014, the World Bank Indicators show that female labour force participation in SSA was at 66 percent compared to 76 percent of men (cited in Nchake and Koatsa, 2017:5). The structural nature of the economy perpetuates gender inequalities particularly when a country has moved from an agricultural base to a more industrialised base.

Baxter argues that 'despite being a small and open economy intricately woven into the "fabric" of the global economy, South Africa has initially weathered the global storm relatively well. Low levels of external debt, appropriate fiscal and monetary policies and a flexible exchange rate have helped "buffer" the economy against the global storm' (nd:112; for a later argument see Rena and Msoni, 2014). The period from the 1970s to the 1990s was marked by 'negative external shocks, with serious balance of payments and debt crises, forcing [developing countries] to adopt structural adjustment programs' (Klasen, 2002:370).

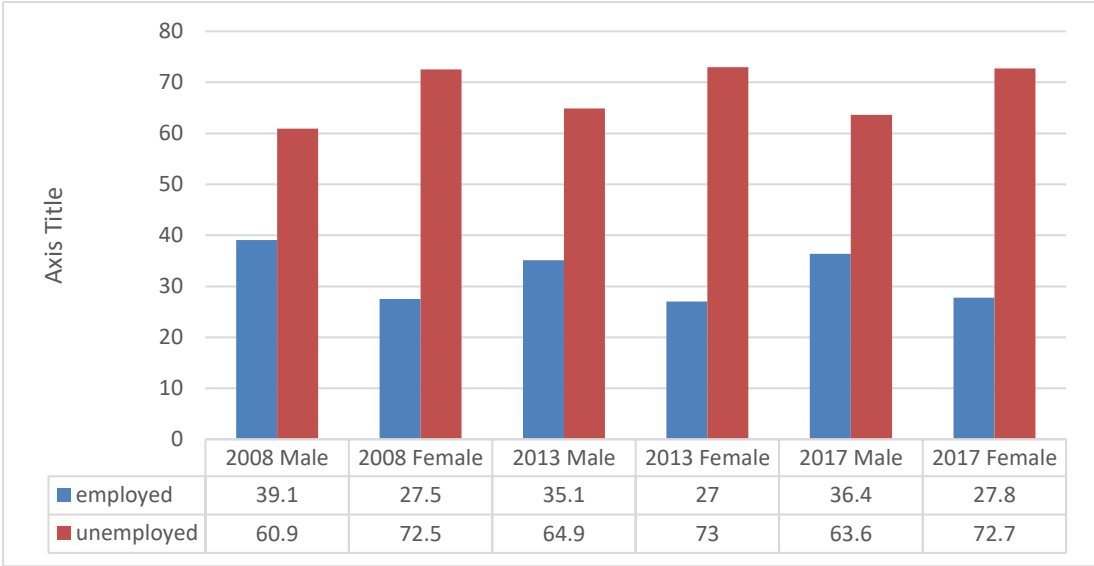
2.6.1 South African women, work and economic growth

Inequality in South Africa was founded on race, class, gender and geographical differences where, under apartheid, whiteness received more social and economic benefit than the gradations of blackness. In simpler terms, white citizens had more access to opportunities to work, decent education and training and decent wages. People who lived in rural areas were largely marginalised while urban dwellers received services based on their race. Class was also integrally tied to race, which meant that the working class constituted most black, urban men and women who occupied menial jobs within the economic structure. This differential

inequality played itself out for years as the apartheid government kept black men and women in the lowest paid jobs. ‘In South Africa, however, women end up in the lowest skilled, lowest paid and least protected jobs. Since World War II, more black women have been absorbed into the South African economy, notably in jobs, which are an extension of women’s traditional roles’ (Nolde, 1991:205). Nolde goes on to argue that ‘[w]omen must receive education and participate, along with men, in productive activity outside the home before they can plausibly assert claims to equality of status’ (1991:208).

In addition to the external constraints, South Africans were limited by the kind of work they could take up based on their raced identities and gender. Being a traditional and relatively conservative environment, South African women, black and white, were limited by their gendered roles as mothers and care workers within communities and families. Floro and Komatsu (2011) point to the racialized labour market that placed black women in low-earning, menial jobs that were vulnerable to economic shocks and policy changes. O’Regan and Thompson (1993:6) draw similar conclusions on women’s employment in their study on women and unionisation in South Africa in the 1990s where women made up 36.3 percent of employed workers in the country (see also Maconachie, 1993). By the end of Q4 of 2017, women constituted 27.8 percent of paid workers while men made up 36.4 percent of that group (StatsSA, 2018). What these figures point to is a pre-existing structural imbalance between male and female workers in South Africa that continued through to 2017. Figure 2 focuses on the rates of paid labour among men and women in 2008, 2013 and 2017 (Stats SA).

Figure 2: Employment rates by sex, 2008, 2013 and 2017

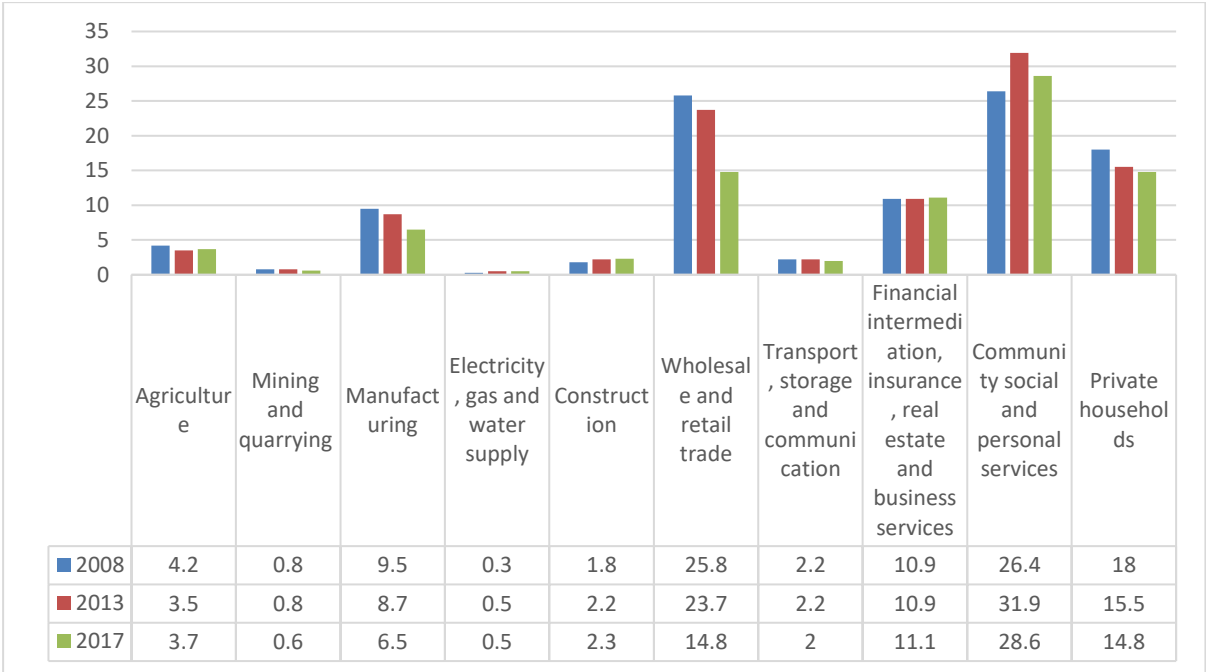


Source: StatsSA QLFS

Figure 2 depicts the employment rates among men and women in 2008, 2013 and 2017. In each of the years, men have higher employment rates than women, with the latter group experiencing almost static growth. There has been a decline in male employment rates too, which could be accounted for by the slowdown in the mining industry and the decrease in commodity prices in South Africa. Women were classified as ‘unemployed’ even though they might have been working in the informal market or as seasonal workers. In 2017, 49.4 percent of workers not economically active were women, while 34.5 percent were men (StatsSA 2018).

If a more thorough analysis of the South African economy is undertaken, data shows that women occupy certain industries more than others such as community, social and personal services at 28.6 percent in Q4 of 2017 and the wholesale and retail industry at 14.8 percent. In Figure 3 below, private household data could account for domestic workers at 14.8 percent, in Q4 2017. Surprisingly, agriculture does not employ a significant number of women specifically, and workers more generally, because agricultural households only account for 13.8 percent of all households surveyed in South Africa (StatsSA, 2018).

Figure 3: Women as a percentage of the labour force in each occupational category Q4 2008, Q4 2013, Q4 2017



Source: StatsSA QLFS

Figure 3 shows the predominance of women in the service sectors and in private households. Casale (2005) and Casale and Posel (2002) provide proof of the feminisation of the South African labour force since the mid-1990s. Both the narrow and broad female labour force increased by about 60 percent over the period, in contrast to the male labour force with an increase at around 35 percent. African females entering the labour market in greater numbers than before drove increased female labour force participation. The share of women in the South African labour force increased from 23 percent in 1960 to 39.4 in 1991 (O'Regan and Thompson, 1993:6) but decreased to 32.7 percent by Q4 of 2017. Most women are either employed in the informal market, working for family-owned businesses, or working in the home. Maconachie (1993:43) shows that in the 1990s, 'three quarters of all women in service occupations are listed as domestic workers (73.3) and nearly all domestic workers are women (95.5 percent)'. It is interesting to note that women in professional, semi-professional and technical occupations remain less than those employed in service industries. These 'feminised' labour positions are becoming more evident as service industries begin to grow in developing country economies (see Sen, 1999).

Women make up 51.9 percent of the population in South Africa in 2017 (StatsSA), which makes their participation integral to the formal economy. With a growth rate of less than 2 percent predicted for 2018 (AfDB), South Africa has to drive economic development through policies that include all workers, regardless of gender.

2.7 Education and growth

Education has played a prominent role in studies about economic growth. Benos and Zotou (2014) refer to the role that the development of human capital can play in promoting economic growth. They define human capital as the 'set of knowledge, skills, competencies and abilities embodied in individuals and acquired through education, training and experience' (Benos and Zotou, 2014:4). Their study uses meta-regression analysis (MRA) to survey literature that measures the effect of education on economic growth. Benos and Zotou (2014:24) conclude that their research shows bias towards evidence of 'positive growth effects on education', while there are 'few publications that point to the positive impact of education on growth'. Kreuger and Lindahl (2001) find, in their cross-country analysis, that education has a bigger impact on developing countries than on more advanced countries. For this study, the quality of education matters and deserves some discussion.

Afzal et al (2010) conducted a study on the short-run and long run relationship between general school education and GDP growth in Pakistan. Using the ARDL model, they find a significant bidirectional relationship between education and economic growth is found in the long run while an inverse relationship between education and economic growth is found in the short-run (2010:57).

Studies have also linked early stage education to economic growth (Barro 2013; Self and Gabrowski, 2004) and argue that primary and secondary education provide the foundation for future economic growth. It is argued that the level of education used in a study is important because “‘high brow” education fosters technological innovation while “low brow” education fosters technological imitation ... Our model posits that innovation makes intensive use of highly educated workers while imitation relies more on combining physical capital with less educated labor’ (Aghion et al., 2009).

Educational quality is important for economic growth rather than the improved provision of education (Hanushek and Wößmann, 2007; see also De Vries, 2015). ‘Quality’, in relation to education, could refer to the pupil teacher ratio as well as the ability of education to increase the measurable cognitive capacity of students (De Vries, 2015) The World Bank’s *Role of Education Quality and Economic Growth*, finds that for every year of schooling, economic growth is boosted by 0.58 percent and, that adding ‘educational quality (to a model that just includes initial income and years of schooling) increases the share of variation in economic growth explained from 25% to 73%’ (Hanushek and Wößmann, 2007:4, 7). Hanushek and Wößmann, (2007) identify two important drivers of quality education, namely incentives students and teachers receive as reward and a facilitative institutional structure.

De Vries (2015:12) argues that primary is the most important level of education and then secondary education and asks ‘whether there may be a threshold level of education or investment which is optimal’. De Vries (2015), using a regression analysis on panel data of 11 countries³ over 41 years, shows that education spending is positively related to economic growth in the short and long run but there are inconclusive results except that ‘the relationship between education spending and economic growth changes from negative to positive over the

³ Austria, Canada, Finland, France, Great Britain, Ireland, Israel, the Republic of Korea, the Netherlands, Norway and Portugal.

years' (2015:24). Aghion's (2009) agrees that four years of 'high brow' or quality tertiary education is preferred.

Becherair (2014) disaggregated educational levels (primary, secondary, high, high-technical schools and university) to determine which type of investment in education could lead to economic growth in Algeria from 1971 to 2011. Using the ARDL model, the results show that primary school and university are statistically significant in determining income per capita (2014:1224).

Following from this, Barro (1997, cited in Barro, 2000) argues that primary education has a greater impact on growth than secondary schooling. In his study, Barro lists Perotti (1996) and Benabou (1996) (both cited in Barro, 2000:8) as earlier proponents of the analysis between education and economic growth and concludes that educational inequalities retard growth in low-income countries but not in middle- or high-income countries. Later, Gyimah-Brempong et al. (2006) analyse the link between education inequality and economic growth and confirm the relationship between higher education and economic growth.

The study of Thévenon and Salvi Del Pero (2015) examines gender equality in education and the prospects for economic growth in 30 OECD countries over a 58-year period. They cite Barro and Sala-I-Martin (1995) that show that women's education has a negative impact and in fact additional education for women will have no further impact on economic growth (Thévenon and Salvi Del Pero, 2015:2). They argue that 'the relationship between education, female employment and growth changes over time and through the process of economic development' (Thévenon and Salvi Del Pero, 2015:2). This evidence points to structural changes in developing economies that might favour male employment over female employment or might employ women in lower-paid jobs. The authors also point to the possibility that developing countries might experience high growth rates without any real socioeconomic changes (ibid:3).

The authors (Thévenon and Salvi Del Pero, 2015:4) argue that 'gender inequality in education reduces the impact of male education on economic growth and raises the impact of female education (see also Dollar and Gatti (1999)). Dollar and Gatti (1999) also show that gender inequality in education is experienced more strongly in middle-income countries (cited in Ward et al., 2010:12). Thévenon and Salvi Del Pero (2015:4-5) show that an increase in years of

education accounts for more than 60 percent of output per capita growth, of which 34 points result from the increase in education of women: therefore, ‘years of education are more rewarding than for men’.

Obiorah (2016) employed the ARDL model to examine the impact of gender equality on education and pro poor development from 1970 - 2012 in Nigeria. Obiorah’s results show that women’s labour participation rates will increase GDP per capita by ‘over 214 per cent’, surprisingly argues that secondary education does not ‘impact positively’ on output per capita (Dollar and Gatti, 2009 cited in Obiorah, 2016:conclusion). In contrast, Klasen (2002:370) finds that ‘if Sub-Saharan Africa, South Asia, and the Middle East and North Africa had started with more balanced education achievements in 1960 and done more to promote gender-balanced education growth, their annual economic growth rates could have been up to 0.9 percentage points faster.’

Studies that explore the relationship between women, education and economic growth introduce a new perspective into the education and growth debate. To take the argument one-step further, this section explores the relationship between women’s levels of education and their relationship to economic growth. Dollar and Gatti (1999:3) show that ‘female secondary education ... is positively associated with growth, whereas male secondary education is negatively associated with growth’ but the impact of increasing girls’ education will only be felt in countries where school enrolment of girls is already high. Dollar and Gatti (1999) determine that gender inequality in education can be explained by cultural and religious practices and civil liberties. Ultimately, the study shows that there is relatively little improvement in GDP in developing countries and then a more marked improvement as countries become more developed because of higher and more equitable levels of education (Dollar and Gatti, 1999:21). Thus, there is no real incentive for countries to improve girls’ access to education until the economy is more developed.

Less developed countries could offer some learnings, for example, Blackden et al. (2006:9) show that gender inequalities in education could account for 1.3 percent of the growth differences between Botswana and Uganda. Using panel regressions, Klasen (2002) shows that a difference from 0.4 – 0.9 percent could result from the gendered differences in education levels between Africa, East Asia and the Pacific. These growth differences are not only in economic terms but in human development outcomes. Klasen argues that ‘promoting gender

equity in education may be among the few ‘win-win’ development strategies’ (2002:370). In the South African context, Nolde (1991:217) argues that when ‘women are not given the opportunity to fulfil educational goals and see jobs to use applicable skills and talents, they are denied a very significant part of themselves as well as what they have to offer society’.

Klasen and Lamanna’s (2009) study on women’s education and economic growth from 1960 – 2000 includes the Middle East and North Africa, Latin America and the Caribbean, East Asia and Pacific, the OECD, South Asia, SSA and Eastern Europe and Central Asia. Their study explores the role of employment and education in driving economic growth and concludes that gender inequalities in education and employment have a negative result on economic growth. However, Klasen and Lamanna (2009:118) point out that their results are limited by the shortage of comparable data on education and labour participation by women. The interesting outcome from Klasen and Lamanna’s (2009) work is that they draw attention to the linkages between education, health and well-being related to few childbirths and better health for the family and for better socioeconomic outcomes.

The World Bank argues that inequalities can only be addressed through targeted policies aimed at reversing the imbalance between girls’ and boys’ access to education.

Special efforts are often needed to offset the tendency for girls to receive less education than boys. Beyond the benefits it offers women in the labor market, education is linked to lower fertility, lower maternal mortality, and better health, nutrition, and education of children. These may not be fully realized without strong public intervention. (World Bank 1995:38)

Blackden et al. (2006:3) develop this argument further by asserting that if girls are included, they have a higher incidence of impacting economic growth than boys.

Oztunc, Oo and Serin (2015) confirm these links in their panel regression analysis of 11 Asia Pacific countries for the period from 1990 to 2010 and find that there is a significant relationship between annual per capita income growth and fertility rates, female labour force participation rates and female primary school enrolment. The Oztunc et al. study (2015) uses the capability framework or human capital theory that argues that by building the capacity of workers, the economy will grow proportionately. Özplak and Yildirim (2009, cited in Oztunc et al., 2015:350) conclude that women’s employment has an impact on economic growth per capita and higher levels of female education will lead to increased employment rates (Oztunc et al.

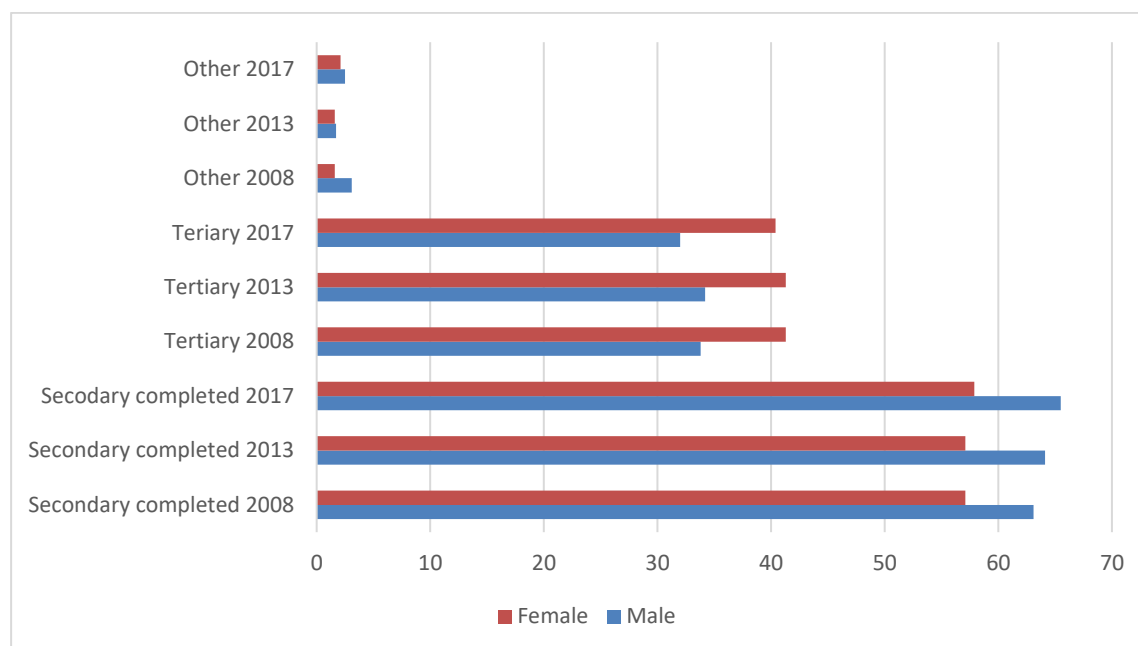
2015:355). The education of women has a positive effect on economic growth and that female primary and secondary school enrolment and fertility rates are significant for their study and explain 60 percent of variation in GDP per capita for their select Asia Pacific countries. Interestingly, their results show that women's tertiary education has a negative effect of 10 percent on annual GDP per capita (ibid:356).

2.7.1 South African women, education and economic growth

While racial access to education remained unequal under apartheid, it continued after 1994 but with black students gaining access to former white institutions by virtue of their class rather than raced identity. However, the bottom of the pyramid, namely, poor, black students continued to get sub-standard education. Van den Berg (2007:877) cites numerous studies in his article, concluding that the improved quality of education would 'permit continued upward mobility of the largest part of the workforce as well as to support sustained economic growth'.

Despite education being more equitable after apartheid, 'segregation and centralisation' of education led to women still suffering from 'gender inequality in education' (Unterhalter, 1990:66). Karlsson's (2009:74) work on the nexus between gender, inequality and poverty points to the structural inequality in the economy. Comparatively speaking, the data, in the figure below, shows that women are almost on par with men when it comes to formal education until the level of the bachelor's degree and post-graduate degrees. O'Regan and Thompson conclude that the 'disproportionate number of unemployed educated women cannot, therefore, primarily be explained in terms of differences in levels of education... The explanation must be more complex' (1993:14). This analysis continues to hold water today (see Figure 4).

Figure 4: Comparative levels of education of males and females (2008, 2013, 2017)

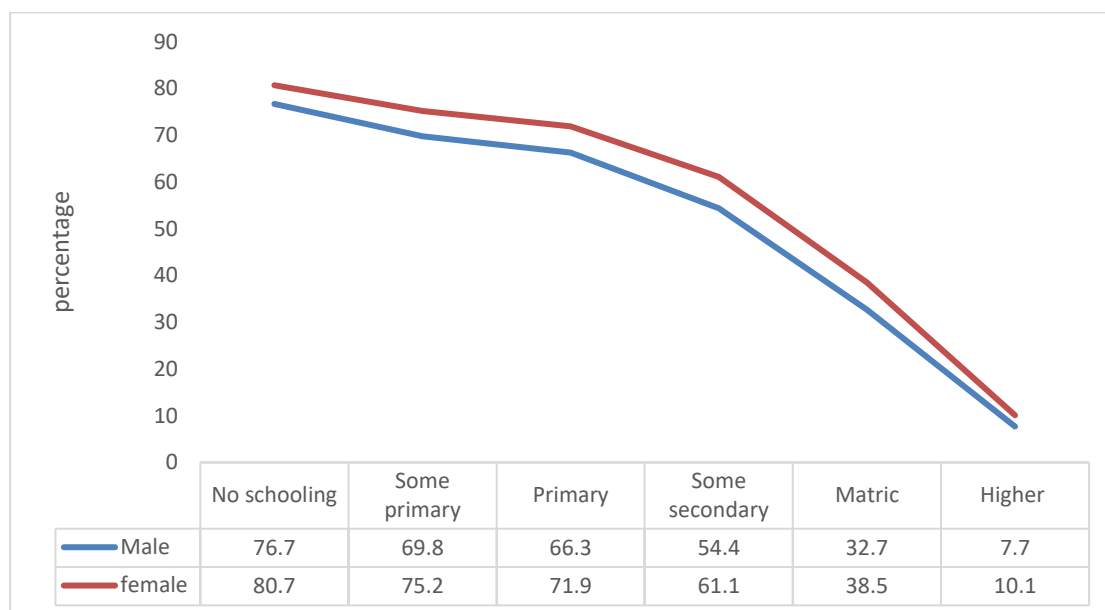


Source: StatsSA (2008, 2013, 2017)

As stated earlier, girls and boys in South Africa have similar primary school education level because of government policy to offer free education at that level. Secondary school sees more boys than girls completing school with a slight increase from 2008 to 2017. The biggest difference between the sexes is the tertiary education levels where women outperform men. This could mean that more men go into employment after secondary education because there are more job opportunities for them in the economy. Women then opt to continue their education in the hope that they would get better jobs at a later date. The trend in developing economies shows that men have higher participation rates in education than women (see King and Winthrop, 2015 and World Bank Gender Dataportal), often because of cultural and social demands on women as wives, carers and mothers.

If women are more educated than men are in South Africa, women's poverty levels should be lower than that of their male counterparts. However, if employment is a proxy for the well-being of an individual, then it could be said that women are worse off than men in South Africa. A recent StatsSA study on Men, Women and Children (2018) in South Africa shows that poverty is tied to levels of education and gender. Figure 5 below shows the upper-bound poverty line (UBPL) that is measured at R992 per person per month.

Figure 5: Poverty headcount by sex and education (UBPL)⁴, 2015



Source: StatsSA (2018b)

Figure 5 depicts women being worse off than men despite having the same exposure to educational opportunities. Interestingly, women appear to reduce the poverty gender gap the more education they received. This supports the argument that education could reduce poverty and could drive economic development. The policy that introduced free education for all children has provided almost equal education for boys and girls at primary and secondary school. It is however, concerning that women still outnumber men in the ‘no schooling’ category.

Ntuli and Wittenberg (2013), building on Casale’s earlier work (2003), argue that higher education and urban location were associated with higher labour force participation, particularly in 1995, 1999 and 2004. Their research focused on black women in the labour market rather than an overall study on South African women and used ‘decomposition analysis’ (Ntuli and Wittenberg, 2013:348) that identified key determinants of black women’s labour force participation. The authors found that an improvement in education outcomes increased the number of black women participants in the labour market due to the market becoming more open to them rather than as a result of structural changes in the market itself (Ntuli and Wittenberg, 2013).

⁴ UPBL is one of three poverty lines in South Africa. The lower-bound poverty line (LBPL) is set at R647 per month and the food poverty line (FPL) is R441 per person per month.

Malangeni and Phiri (2017) estimate short- and long run cointegration tests for South African education and economic growth based on the ARDL model using annual data for the period 1994 – 2014. Their results show an insignificant relationship between education and economic growth for the period, which goes against other studies but points to questions of quality rather than quantity. They concur with Glewwe et al. (2012) argue that ‘an insignificant relationship between educational attainment and economic growth is plausible for less developed countries whose main concern is quality as opposed to quantity of educated persons’. This argument ties in with Aghion et al. (2009) who refers to ‘high brow’ education. Malangeni and Phiri (2017:107) conclude that the government should be concerned with the quality of education rather than the quantity.

2.8 Conclusion

The literature review has provided an overview of South Africa’s gender relations in the context of education and employment and linked those variables to economic growth, represented by GDP growth. The discussions have shown that South Africa has gender inequality in employment, particularly related to more technical and professional levels, and it has very little gender inequality in education except at the tertiary level where women outnumber men.

This research paper builds on Malangeni and Phiri’s (2017) methodology for GDP growth but adds gender inequality in employment and education to determining their relationship to economic growth. Feminist economics has begun to disaggregate the statistics to discern the difference between women and men’s access to employment and education, among other variables. Research exploring the role of women in economic development adds an additional level of information for economic policies.

Chapter Three will develop the methodology to explore the relationship between GDP growth and women’s employment and education levels.

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology underpinning the research in the paper and establishes the impact of the independent variable on the dependent variable that form the basis for this study. The chapter has six sections. The second section outlines the research assumptions, while the third section restates the research questions and objectives. The fourth section describes the approach and analytical model used and the fifth section describes the dataset used in this study. The final section concludes the chapter.

3.2 Research approach and assumptions

The research approach adopted is of a quantitative nature that employs a statistical approach to answer the research questions. The qualitative method was not suitable for this study as the research question required a statistical methodology. The study employs an econometric model to show evidence of a relationship between the variables and the direction of that relationship. The data used was obtained from the central statistical department in South Africa and spanned a period of forty quarters from 2008 to 2017. The details of the dataset are provided in Section 3.5.

The main assumption of the study is that gender parity in education and employment in a country will contribute to greater economic growth. If a country institutes policies that increase the number of women who finish ‘quality’ education, meaning that they have at least completed high school and where some have gone on to complete certificates, diplomas or degrees, the more an economy will grow. In essence, this means that with more women educated sufficiently to contribute to the economy, the more the economy will grow. In turn, the more educated women eligible for the labour market, the more women employed. For this reason, the study uses number of years of education based on educational milestones achieved, for example, secondary schooling, tertiary schooling and other schooling and training.

In the first instance, this paper aims to determine whether there is a statistically significant relationship between women’s education levels and economic growth. The second assumption is that if more women are provided jobs within an economy, their increased employment would result in improved GDP growth because the labour pool would be increased with workers who have the skills to contribute to economic growth. This study uses real GDP as an indicator of

economic growth and not at other factors that affect economic growth, for example, FDI, which is necessary in panel data for multiple countries (Malangeni and Phiri, 2018; Djezou, 2014; Odhiambo, 2009; Morley, 2005). This study is limited to a time-series analysis of a single country where the focus is exclusively to examine the relationships in question.

The paper sets out to prove a significant statistical relationship between increased women's labour participation rates and economic growth.

Finally, the paper aims to determine the direction of the relationship between women's education and employment levels and economic growth. The assumption is that there is a positive relationship between increased women's participation in education and labour and economic growth, but it is necessary to determine if there is a bidirectional relationship between the dependent and independent variables. In other words, if a bidirectional relationship exists, women's labour and education will increase economic growth and, in turn, that economic growth will also improve women's participation in the workplace and improve education levels as companies grow and individuals have more money to spend on social development, such as education.

3.3 Research questions, hypotheses and objectives

The research questions and hypotheses for this paper are stated below. The independent variables, namely, women's education levels and women's employment levels are statistically measured against economic growth, represented by GDP.

- Q1. What impact will a reduction in the gender gap in education have on economic growth rates within South Africa?
H₀: There is no statistically significant impact of gender equality in education on economic growth.
H₁: There is a statistically significant impact of gender equality in education on economic growth.
- Q2. What impact will greater employment equity have on economic growth rates within South Africa?
- H₀: There is no statistically significant impact of gender equality in employment on economic growth.

H₁: There is a statistically significant impact of gender equality in employment on economic growth.

- Q3. Is there a bidirectional relationship between gender equality in employment and education and economic growth?

H₀: There is no bidirectional relationship between gender equality in employment and education and economic growth.

H₁: There is a bidirectional relationship between gender equality in employment and education and economic growth.

The objective of the study is to provide statistical evidence the impact of the independent on the dependent variables to direct policy makers to operationalise effectively targeted policies that would improve women's education and employment levels to drive economic growth. By introducing empirically based policies, policy makers could be assured that their attempts to drive growth through gender equity are being directed to the most appropriate lever they can find.

3.4 Research method

3.4.1 Theoretical model

Drawing from the literature, the long-run relationship between real GDP and women's education and employment can be expressed as:

$$LRGDPA_t = \alpha + \beta_1 LEW_t + \beta_2 LTWE_t + \varepsilon_t \quad (1)$$

where *LRGDPA* is the natural log of real GDP, *LEW* is the natural log of women's employment and *LTWE* is the natural log of total women's education.

To determine the appropriate method to analyse this relationship, knowledge of the characteristics of the series is necessary, in particular, whether the series are stationary. Elder and Kennedy (2001:138) explain why stationarity is important in econometrics: '[I]f two variables with unit roots are regressed on each other, spurious results are obtained – t-statistics are misleadingly high, as are *R* squares, and Durbin-Watson statistics are very low'. The authors advise that if unit roots (the data is non-stationary) are present, alternative estimation tests than the traditional Ordinary Least Squares (OLS) should be undertaken. Thus, the starting point for

the analysis is to test the stationarity of the data as this will then inform the choice of modelling technique.

3.4.2 Unit root tests

The most commonly employed test in the literature for determining the stationarity of the data is the Augmented Dickey-Fuller (ADF) test. This test augments the original Dickey and Fuller (1979) equation with lags of the dependent variable to remove the effects of autocorrelation in the series (Enders, 2015). Brooks (2014) argues that the optimal number of lags needs to be determined because too few lags ‘will not remove all the autocorrelation’ while too many lags will decrease the power of the test. Information criteria such as the Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC) and Schwartz Information Criterion (SIC) are typically used for this purpose. The former is efficient but not consistent while the latter two are consistent but not efficient (Zucchini et al., 2016). Consistency implies that asymptotically the criterion will select the true model order from the candidates but, given the small sample of 40 observations used in this study, consistency is thus not relevant (Zucchini et al., 2016). AIC thus offers the advantage of efficiency for the small sample of this study. This means that the ratio of the expected prediction error of the chosen model converges to the expected prediction error of the theoretical minimizer (Zucchini et al., 2016). Thus this criterion was used to determine the optimal number of lags of the differenced dependent variable to include in the ADF test equation.

The ADF test equation can take one of three forms:

- i) Random walk (no intercept or trend)

$$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^p \Delta y_{t-i} + u_t \quad (2)$$

- ii) Random walk with drift (otherwise known as an intercept)

$$\Delta y_t = \mu + \psi y_{t-1} + \sum_{i=1}^p \Delta y_{t-i} + u_t \quad (3)$$

- iii) Random walk with a trend and drift

$$\Delta y_t = \mu + \psi y_{t-1} + \lambda t + \sum_{i=1}^p \Delta y_{t-i} + u_t \quad (4)$$

(Enders, 2015)

The hypothesis of this test is expressed mathematically as follows:

$$H_0: \psi = 0$$

$$H_1: \psi \neq 0$$

The null hypothesis tests that the series has a unit root/ is non-stationary. Another way of stating this is that the series is integrated of order one, $I(1)$. The alternative hypothesis is that the series is stationary or integrated of order zero, $I(0)$. The test statistic is computed as per a normal t-test on the coefficient but follows a unique distribution because under the null hypothesis the series is non-stationary. The critical values were originally put forward by Dickey and Fuller (1981) but revised by MacKinnon (1996). If the test statistic is more negative than the critical value at the chosen significance level, then the null hypothesis is rejected in favour of the alternative hypothesis that the series is stationary. If the test statistic is not more negative than the critical value, then the null hypothesis cannot be rejected and the series is deemed to contain a unit root (non-stationary) (Brooks, 2014).

Often in empirical studies, a single form of the ADF test equation is chosen (with no justification for the selection thereof) or, two or all three are used to ensure that the conclusions are robust to the specification of the unit root equation. The specification of the equation is an important consideration as, according to Campbell and Peron (1991, cited in Enders 2015) if unit root tests include regressors that are not in the data the power of the unit root test decreases as additional deterministic regressors are added. Alternatively, studies should not omit regressors that are in the research. Enders (2015) and Elder and Kennedy (2001) thus highlight the need for a ‘testing strategy’ to avoid these problems. There are a few approaches suggested in the literature for this purpose (see for example, Enders, 2015; Heymans et al., 2014; Elder and Kennedy 2001; Perron 1988; Nelson and Plosser 1982), with some overlap in their strategies. Typically, these strategies either adopt a ‘specific-to general’ approach or a ‘general-to-specific’ approach. For the purposes of this study, the general-to-specific approach of Enders (2015) was followed as it reduces the number of equations to be estimated as the variable does not need to be double- or triple tested (Elder and Kennedy, 2001).

The ‘general’ approach means that no conditions are imposed on the intercept or trend term so eq. (4) is tested first (in eq.’s (2) and (3), the drift and the drift and trend terms respectively are forced to zero) (Enders, 2015). However, it is also worth noting that all sources say that it is important to start by studying the variables graphically over time and gauging whether a trend is indeed apparent. Macroeconomic variables tend to have a trend over time (a growth rate) and this is certainly likely to be the case with GDP (Elder and Kennedy, 2001; Enders, 2015); a

critical input in this empirical analysis. Hence, this further supports the choice to begin the testing process with eq. (4). It is important to note that this process does not supersede the traditional ADF test of $\psi = 0$, but rather acts as a precursor to determine the appropriate form of the test (Enders, 2015).

To determine whether eq. (4) is indeed the correct specification or not, Dickey and Fuller's (1981) method is employed. This test uses a joint F-test with the hypothesis as follows:

$$H_0: \mu = \lambda = \psi = 0$$

$$H_1: \mu \neq 0 \text{ and/or } \lambda \neq 0 \text{ and/or } \psi \neq 0.$$

This is called the Φ_2^5 test where the null hypothesis is equivalent to saying that the time series is a random walk while the alternative is that the time series is a random walk with a drift and a trend. This test, while implemented like a traditional F-test, does not follow the F-distribution under the null hypothesis of non-stationarity, with Dickey and Fuller (1981) thus generating appropriate critical values for this purpose. The null hypothesis cannot be rejected if the F-statistic is less than the critical value suggesting that the series is a random walk (with no drift or trend). Given this conclusion, the appropriate step is to confirm whether the series has a unit root using the t-test of Dickey and Fuller (1979) by testing eq. (2) (Elder and Kennedy, 2001). The null hypothesis is rejected if the F-statistic is greater than the critical value. With this conclusion, Dickey and Fuller (1981) then suggest running a second test.

This second test is known as Φ_3 , also based on eq. (4), with the null hypothesis that the series is a random walk with drift against the alternative that the time series is a random walk with drift and trend. Mathematically this is expressed as:

$$H_0: \psi = \lambda = 0$$

$$H_1: \psi \neq 0 \text{ and/or } \lambda \neq 0$$

(Seddighi, 2012)

The F-test is also computed for this test and compared to the Dickey and Fuller (1981) critical values at the chosen significance level. If the null hypothesis cannot be rejected, it can be

⁵ The Φ_1 test is used as the starting point when only a drift term is considered with no trend term.

concluded that the series is a random walk with drift (and eq. (3) can then be estimated to test for the stationarity of the series) while if the null hypothesis is rejected, eq. (4) is used to test for the stationarity of the series.

The unit root testing strategy, however, not only entails assessing the appropriate test equation to use for the ADF test but also the testing method itself. Two other commonly employed tests for the presence of a unit root include the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Phillips-Peron (PP) tests. The latter follows the ADF test closely but uses an alternative procedure to handle the autocorrelated residuals. It typically yields the same conclusions as the ADF test. The KPSS test, in contrast, is a stationarity test and thus reverses the null and alternative hypotheses) which thus offsets the weakness of the ADF test (Audi and Ali, 2017; Afzal et al., 2010, Liew, 2004). Table 1 provides a brief summary of the advantages and disadvantages of the three tests. As is evident, none of the tests provide a superior test than the others and, as such, are often used in conjunction with each other to ensure the robustness of the conclusions drawn regarding the stationarity of the series being tested. Thus, for the purposes of this study, all three tests were used. The appropriate form of the unit root equation, as determined in the ADF test, was utilised in the PP and KPSS tests (Heymans et al., 2014).

Table 2: Advantages and disadvantages of the ADF, PP and KPSS tests

	Advantages
ADF	If the model is correctly specified, the ADF test has higher power than the PP test.
PP	The PP test is more powerful than the ADF test. It does not require the selection of the number of lags but automatically corrects the statistic for autocorrelation and heteroscedasticity.
KPSS	The KPSS test is more powerful in small samples.
	Disadvantages
ADF	The ADF test is sensitive to structural breaks and has poor small sample properties.
PP	The PP test is based on asymptotic theory and therefore only works well in large samples. It also is sensitive to structural breaks. It is more sensitive to model misspecification.

KPSS	If too large a bandwidth is chosen then the KPSS test has low power, while if a bandwidth parameter is chosen that is too small then the test is oversized.
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Sources: Liew (2004), Cross Validated (no date), McCarthy (2015)

For those variables that are found to be $I(1)$, the final stage of the unit root testing procedure is to determine whether the series are integrated of order two ($I(2)$) (or higher) meaning that the first differences are not stationary (the series has two unit roots). To this end, the first differences of the series are subjected to the same testing procedure to ascertain whether they are stationary, as described for the series in levels, following the general-to-specific approach and using all three testing methods.

3.4.3 The Autoregressive Distributed Lag (ARDL) model

As the results in the following chapter show in more detail, the variables used in this study were found to be $I(1)$. As mentioned in section 3.4.1, if the variables are found to be non-stationary then OLS cannot be used as it will result in a spurious regression. Instead, in this scenario, a cointegration testing procedure is usually employed. Statistically, if two or more series are individually $I(1)$, meaning that they are non-stationary, but some linear combination of them is $I(0)$, meaning the combination is stationary, then the variables are said to be cointegrated (Brooks, 2014). Practically, if two or more series are cointegrated, a long-run relationship is said to exist between the variables.

This study uses the Autoregressive Distributed Lag (ARDL) model developed by Pesaran and Shin (1997) for the analysis of a long-run relationship when the underlying variables are integrated of order one. They build on the earlier work developed for the analysis of $I(1)$ variables by Engle and Granger (1987), Johansen (1991), Phillips (1991), Phillips and Hansen (1990) and Phillips and Loretan (1991, cited in Pesaran and Shin, 1997). This model has two main advantages over other methods of testing for cointegration such as the Engle and Granger (1987) and Johansen (1991) methods. Firstly, the ARDL model yields consistent estimates of the long run coefficients irrespective of whether the underlying regressors are $I(1)$ or $I(0)$ whereas for the other testing approaches, all variables must be $I(1)$ (Pesarin and Shin, 1997). However, the variables cannot be integrated of any higher order (e.g. $I(2)$) and thus it is still necessary to pre-test the series to determine their order of integration before estimating the ARDL model (Altaee, 2016). Secondly, and with particular importance to this study, the ARDL

model has good small sample properties which is not true for the other approaches (Ozturk and Acaravci, 2010; Ullah et al., 2014).

The use of this model in this study is consistent with similar research that has examined the effects of different variables on economic growth, as discussed in section 2.3. For example, Ullah et al. (2014) use the ARDL model to test the relationship between real GDP per capita and various economic variables including real gross fixed capital formation, the literacy rate, remittances, real FDI, and real exports in Pakistan. Altaee et al. (2016) also employ the ARDL model to explore the determinants of economic growth in the Kingdom of Saudi Arabia with the focus on real gross fixed capital formation, real imports, real exports and financial development. Similarly, Ozturk and Acaravci (2010) use the ARDL model to determine the causal relationship between energy consumption and real GDP in Albania, Bulgaria, Hungary and Romania.

Eq. (1), depicting the long-run relationship between the variables in the model, can be presented in an ARDL specification given by:

$$\begin{aligned} \Delta LRGDPA_t = & \alpha + \sum_{i=1}^K \phi_i \Delta LRGDPA_{t-i} + \sum_{j=1}^L \theta_j \Delta LEW_{t-j} + \sum_{m=1}^N \lambda_m \Delta LTWE_{t-m} \\ & + \delta_1 LRGDPA_{t-1} + \delta_2 LEW_{t-1} + \delta_3 LTWE_{t-1} + v_t \end{aligned} \quad (5)$$

where Δ is the first difference operator and v_t is the white noise error term (Ozturk and Acaravci, 2010).

The first step in estimating this equation is to determine the optimal number of lags of the first differenced variables. As with the unit root tests, the AIC was used for this purpose. Thereafter, the bounds cointegration test is applied to eq. (5) to determine if there is a long run relationship among the variables (Pesaran and Shin, 1999; Pesaran et al., 2001). This test is based on an F-test (or Wald test) with the joint hypothesis as follows:

$$H_0: \delta_1 = \delta_2 = \delta_3 = 0$$

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq 0$$

The null hypothesis equates to the test of no long-run cointegrating relationship between the variables against the alternative that there is a long-run cointegrating relationship. Importantly,

however, the test statistic does not follow the traditional F-distribution with Pesaran et al. (2001) presenting two sets of critical values for a given significance level that should be used for this purpose. The first, the upper bound critical values, assume that all variables are I(1) while the second, the lower bound critical values, assume that all variables are I(0). Odhiambo (2009) explains that if the computed F-statistic exceeds the upper critical values at the chosen significance levels, then the null hypothesis of no cointegration is rejected suggesting that a long-run relationship does exist between the variables. If the test statistic falls within the two critical values, then the bounds test is inconclusive, while if the test statistic is below the bounds lower critical value, then the null hypothesis of no cointegration cannot be rejected.

If cointegration is found between the variables, then eq. (1) represents the long-run relationship between real GDP per capita and women's employment and women's education with the coefficients examined to assess the signs and magnitude of the relationships. Short-run deviations in the long-run relationship will occur. The corrections for these deviations are captured in the short-run model known as the Error Correction Model (ECM) depicted in the ARDL framework as

$$\begin{aligned} \Delta LRGDPA_t = & \alpha + \sum_{i=1}^K \phi_i \Delta LRGDPA_{t-i} + \sum_{j=1}^L \theta_j \Delta LEW_{t-j} + \sum_{m=1}^N \lambda_m \Delta LTWE_{t-m} \\ & + \varphi ECT_{t-1} + v_t \end{aligned} \quad (6)$$

where ECT_{t-1} is the error correction term obtained from the long-run cointegrating relationship (eq. (1)). The coefficient, φ , should be negative such that when the long-run relationship is above equilibrium (ECT_{t-1} is positive), GDP will adjust downwards in the following period while if the long-run relationship is below equilibrium (ECT_{t-1} is negative), GDP will adjust upwards in the following period to correct for the disequilibrium (Brooks, 2014).

3.4.4 Granger causality test

In addition to examining the long-run relationships between the variables, short-run causality between economic growth and women's education and employment will be tested. This can be done irrespective of whether a long-run cointegrating relationship is found to exist. Moreover, Granger causality can be used in small samples, as is the case in this study. The null hypothesis of the test is that lags of X_t do not Granger cause Y_t against the alternative that lags of X_t do Granger cause Y_t . This can be tested by estimating a Vector Autoregressive (VAR) model with the following two equations (to test pairwise causality):

$$Y_t = a_o + \sum_{i=1}^n a_{1i}Y_{t-i} + \sum_{i=1}^n b_{1i}X_{t-i} + u_t \quad (7)$$

$$X_t = b_o + \sum_{i=1}^n a_{2i}Y_{t-i} + \sum_{i=1}^n b_{2i}X_{t-i} + \varepsilon_t \quad (8)$$

and testing the hypothesis

$$H_0: b_{1i} = 0$$

$$H_1: b_{1i} \neq 0$$

for $i = 1, 2, 3 \dots n$ and where $\Delta LRGDPA_t$, ΔLEW_t and $\Delta LTWE_t$ will represent Y_t and X_t .

This test can be performed using either the F-statistic (Wald test) or a chi-squared test and if the test statistic is found to exceed the critical value at the chosen significance level, then the null hypothesis that the coefficients are jointly equal to zero can be rejected in favour of the alternative that they are jointly significant meaning that lags of X_t do Granger cause Y_t (Brooks, 2014). The same set of equations can be used to test whether lags of Y_t Granger cause X_t by examining the joint significance of a_{2i} . If the null hypothesis of these two tests are rejected, then it can be concluded that there is bidirectional causality between Y_t and X_t while if the hypothesis is only rejected for one of the tests, then it can be concluded that there is only unidirectional causality between the variables in question.

An important consideration in performing this test is the optimal number of lags for the VAR (denoted i). For this purpose, the AIC was relied upon, consistent with the explanation provided previously. This was also supplemented with the Final Prediction Error (FPE) criterion, with an examination of these two criteria sufficient in the context of a small sample, (Liew (2009)).

3.4.5 Diagnostic tests

Three diagnostic tests were run to determine the validity and reliability of the data, namely, the Breusch-Godfrey Serial Correlation Lagrange Multiplier (LM) test; the Breusch-Pagan-Godfrey heteroscedasticity test and the Cumulative Sum of Squares test (CUSUMSQ) for stability.

Autocorrelation refers to the correlation of the residuals of the regression model over time. Such patterns in the residuals violates the assumption of OLS of no serial correlation and gives rise to inefficient coefficient estimates. The Breusch- Godfrey LM test is used to test for autocorrelation with the null hypothesis of no serial correlation against the alternative hypothesis of serial correlation of the tested order' (Box-Steffensmeier et al., 2014:76; see also Lyon and Tsai, 1996). The test is often preferred over the Durbin-Watson (DW) test because it tests for higher orders of autocorrelation than only the first order of autocorrelation of the DW test and is therefore more comprehensive while it also does not require various restrictive conditions to be met as is the case with the DW test (Brooks, 2014).

The variance of the error terms must be constant under OLS, a condition known as homoscedasticity. If this condition is violated, known as the heteroscedasticity, then, similarly, to the presence of autocorrelation, the coefficient estimates will be inefficient. The Breusch-Pagan-Godfrey heteroscedasticity test was used to test for the violation of this assumption in this study, with the test statistic computed by multiplying the R^2 of the estimated variance function (auxiliary regression) by the number of the observations N (see also Kaufman, 2013; Verbeek, 2008).

An implicit assumption of a regression analysis is that the coefficient estimates are stable over time. To determine the veracity of this assumption, the CUSUMSQ test was used. The null hypothesis is of parameter stability. The statistic enables the researcher to detect a drift of the mean outside two boundaries (Brooks, 2014:188 - 189). If the results of the test fall within the CUSUMSQ boundaries, the model parameters are considered stable.

3.5 Data and data selection

The data used in this paper was sourced from the StatsSA Quarterly Labour Force Surveys (QLFS) that provide information on the employment, unemployment and inactivity statistics in South Africa. The employment data is also gender disaggregated, which makes it suitable for the purposes of this study. The QLFS have been produced regularly since 2008, however, prior to this, between 2000 and 2007, the surveys were only produced biannually. The QLFS is a household-based sample survey that collects the labour market activity data on individuals aged 15 – 64 and provides information on the demographics of the employed population, namely, education level, hours of work, etcetera (StatsSA website).

Initially the study was going to use data for the period 2000 to 2017, with the 2000 to 2007 data from the Labour Force Surveys but the data was sourced biannually for that period and the data was different when compared to that in the QLFS for the 2008 to 2017 period. In particular, the fields related to education and employment differed too much to use the data from the semi-annual surveys; therefore, the study only uses the 2008 to 2017 quarterly data providing 40 data points for analysis. In 2014, the QLFS data from 2008 was revised to lift the weighting that was first introduced in 2008. This study thus uses the revised 2008 to 2017 QLFS data.

To measure women's education data was selected from the QLFS from the final year of high school to the highest qualification post-high school, as follows:

- Final year high school (matriculation)
- Tertiary education
- Other

The reason for measuring education at this level (as opposed to only primary or secondary education) relates to the need for 'high-brow' education' (AfDB, 2016; Bandara, 2015; Page & Shimeles, 2014; Klasen & Lamanna, 2009), and the International Labour Organisation's (ILO) argument for 'decent jobs'⁶. The employment data collected represents women in formal employment in South Africa. The study has not included informal employment because it is difficult to quantify and often only occupies lower skilled jobs.

The proxy for economic growth, namely, real GDP, was sourced from the South African Reserve Bank's Quarterly Bulletin Macroeconomic Time Series and was seasonally adjusted. Real GDP was used because 'for comparisons between one time period and the next, it is necessary to convert nominal GDP to real GDP. That process requires dividing the rise in nominal quantities into a real component and an inflation component', which is then removed (Feldstein, 2017:148; see also Ozturk & Acaravci, 2010). Real GDP 'shows how the economy's overall production of goods and services changes over time (Mankiw, 2008:100).

The three sets of data are therefore at the same level of frequency and can be compared and correlated effectively. The natural logarithm of all variables was used in the analysis as it aids

⁶ According to the ILO, decent work is productive work for women and men in conditions of freedom, equality, security and human dignity.

in reducing the problem of heteroscedasticity while also enabling the model coefficients to be interpreted as percentages.

3.6 Conclusion

This chapter has set out the theoretical model used in this study, namely the ARDL model and provided justification for the use thereof. The ADF test was initially run on the variables including a trend and intercept at levels, with the optimal lag length chosen using the AIC because it offers the advantage of efficiency for the small sample of this study. Thus this criterion was used to determine the optimal number of lags of the differenced dependent variable to include in the ADF test equation. The chapter has also explained how the data was determined to be stationary through the use of the ADF, KPSS and PP models. The Granger Causality test was also run to assess the direction of causality between the variables. Finally, three diagnostic tests, were explained to show the validity and reliability of the data. Chapter four explains the findings of the tests on the data in this study.

4 FINDINGS

4.1 Introduction

This chapter presents the results of the study and forms the foundation for the conclusions and recommendations in Chapter 5. The empirical analysis, as outlined in section 4.3 covers the unit root tests, the bounds cointegration test, ECM and the Granger causality test. Section 4.4 provides the results from the diagnostic tests and the chapter concludes with 4.5. This chapter also includes links to previous studies on the determinants of economic growth.

4.2 Initial observations

Following the recommendations of Elder and Kennedy (2001) and Enders (2015), Figures 6, 7 and 8 graphically depict the natural logarithm numbers of the data for real GDP (LRGDPA), women’s employment (LEW) and women’s education at the secondary, tertiary and other levels (LTWE) variables over time respectively. Figure 10 below shows the three series together.

Figure 6: Graphic depiction of real GDP

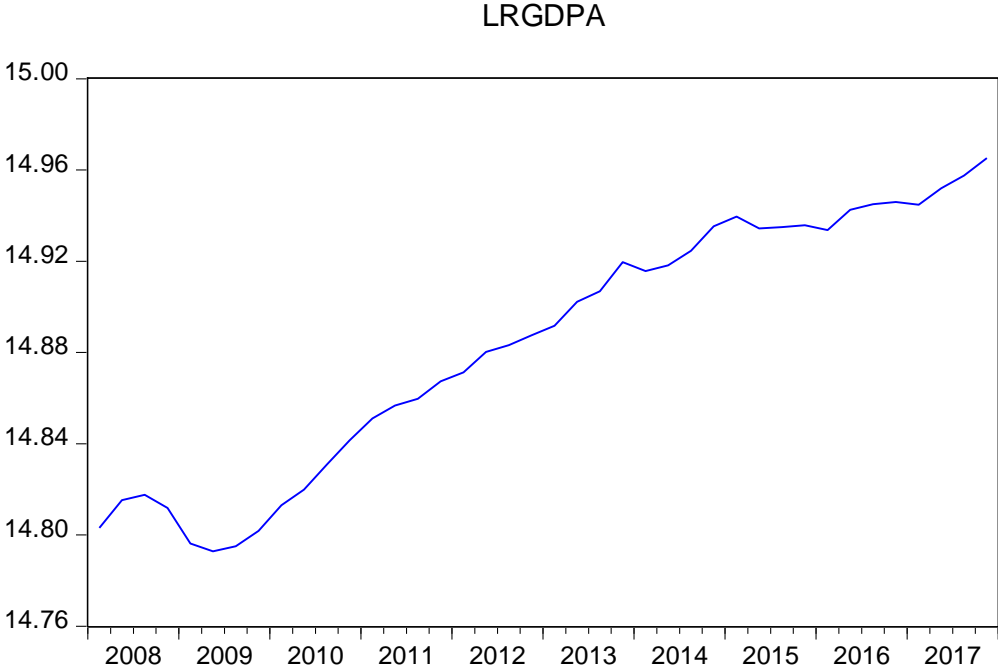


Figure 7: Graphic depiction of women's employment data

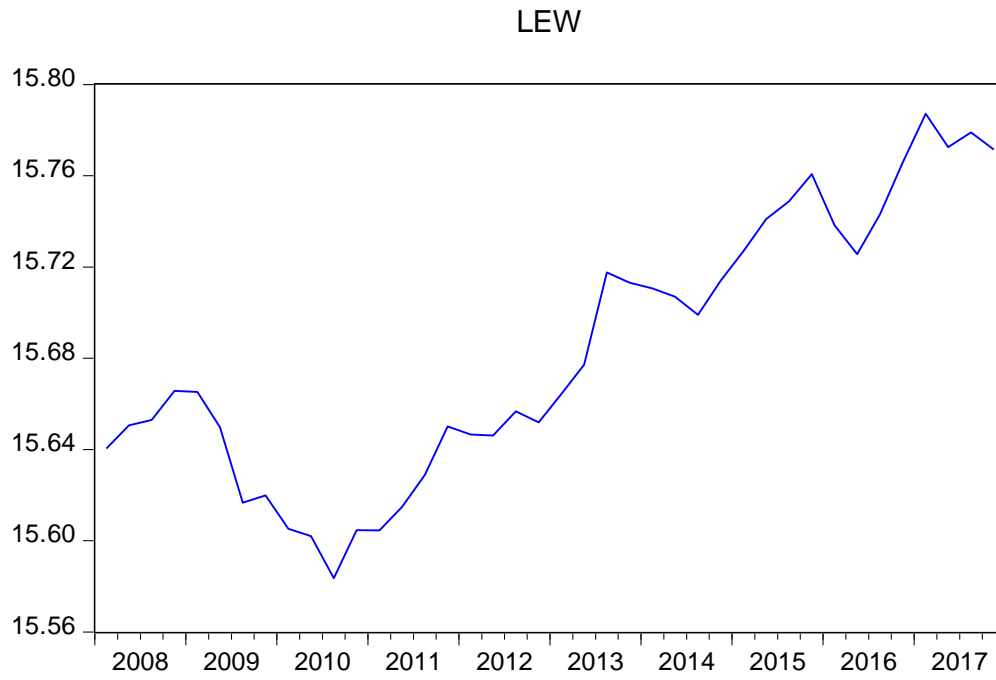


Figure 8: Graphic depiction of women's education data

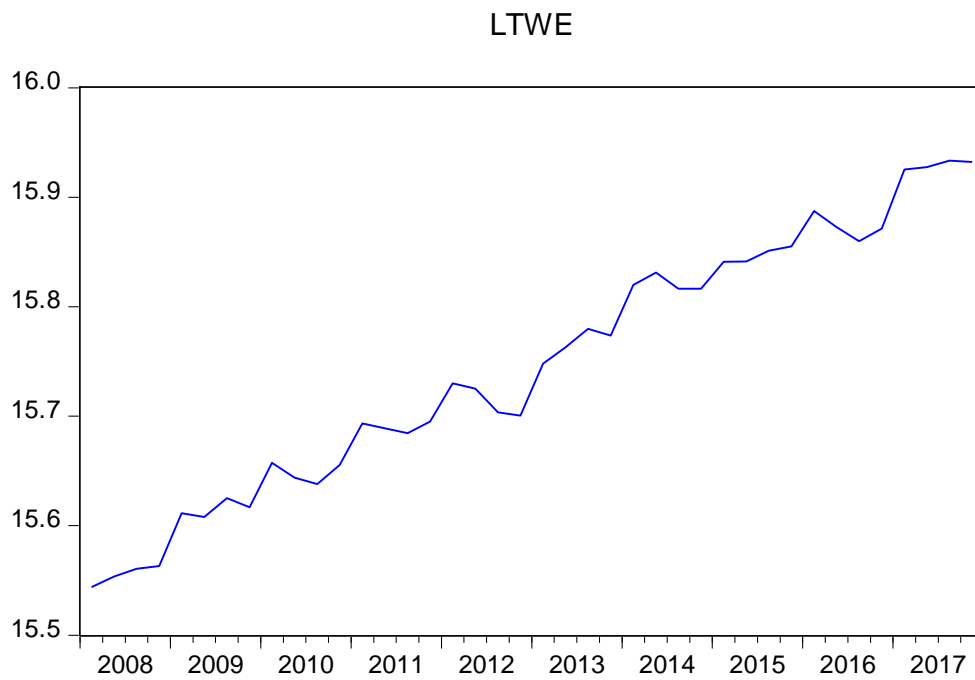
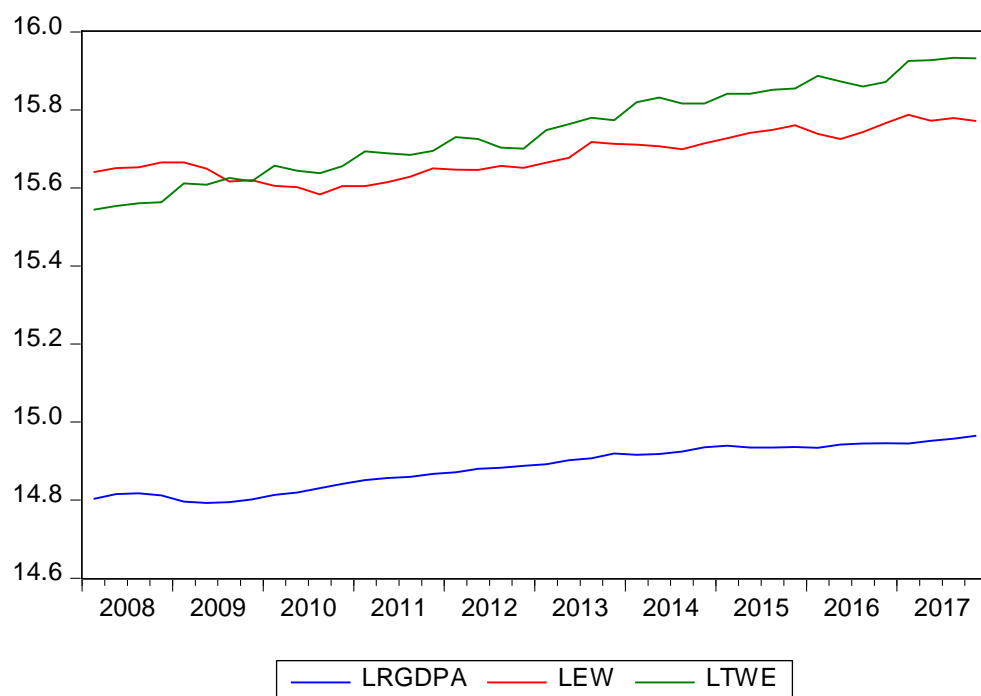


Figure 9: Graphic depiction of a possible relationship between the variables



LRGDPA and LTWE look like they are trending upwards over time, which may suggest that they are non-stationary. LEW, also looks like it is trending in the same direction from about 2010 onwards but prior to that it was heading on a downward trajectory, so may be stationary. Formal tests for stationarity are conducted, with the results presented in the next section. The fact that women's employment actually declined over the first two years of the study is an interesting observation and consistent with the evidence presented in section 2.6.

Visually, in Figure 9, there appears to be a relationship between the variables over the period of the study as the variables appear to be moving together over time hence the hypothesis that there could be some relationship. The analysis of the statistical tests that follows will show the actual relationship between the data and there is a whether a long-run cointegrating relationship as the graphical analysis suggests.

4.3 Empirical analysis

4.3.1 Unit root tests in levels and first differences

Prior to testing for cointegration using the ARDL bounds test, this study applied the ADF, KPSS and PP unit root tests to test the order of integration. A key assumption of the ARDL

bounds testing requires that all variables should be integrated of either order 0 or order 1. As explained in Chapter 3, the ADF test was initially run on the variables including a trend and intercept at levels, with the optimal lag length chosen using the AIC. To determine whether this specification is indeed correct or not, Dickey and Fuller's (1981) method is employed.

Table 3: Joint tests in the random walk with trend equations

	Levels		First differences	
	Φ_2	Φ_3	Φ_2	Φ_3
LRGDPA	7.2952***	1.1131	5.0191*	7.4212**
LEW	8.3942***	11.1446***	0.9294	-
LTWE	5.1585**	4.0182	2.2815	-
	Critical values		Critical values	
10%	4.31	5.61	4.31	5.61
5%	5.13	6.73	5.13	6.73
1%	7.02	9.31	7.02	9.31

Note: *, **, *** mean rejection at 10%, 5% and 1% respectively, the critical values are based on a sample of 50 from Dickey and Fuller (1981).

The results from the joint F-test that the coefficients in this ADF test equation are jointly equal to zero are shown in Table 3 in the column Φ_2 . For LRGDPA, the F-statistic of 7.2952 is greater than the critical values and therefore the null hypothesis that all the coefficients in this regression are zero can be rejected, i.e. the series is not generated by the random walk. The same conclusion can also be drawn for LEW and LTWE (although for the latter this is only at 5 percent and not 1 percent).

For the second test (Φ_3), that the coefficients on the trend and lagged dependent variable are jointly equal to zero, the null hypothesis cannot be rejected for either LRGDPA or LTWE suggesting that the trend and unit root coefficients are not significantly different from zero. Thus the null hypothesis that the series follows a random walk with drift cannot be rejected. As such, using the model with an intercept was deemed appropriate and thus the ADF test with an intercept was examined. The results for these tests are shown in Table 4 and reveal that, for both these variables, the null hypothesis of a unit root could not be rejected thus indicating that LRGDPA and LTWE are non-stationary. As explained previously, the KPSS and PP tests were then implemented including an intercept only, with the results of these shown alongside the ADF tests in Table 4. The null hypothesis of the KPSS test that the series is stationary can be rejected while the null hypothesis of the presence of a unit root in the PP test cannot be rejected.

Thus these two tests confirm the conclusions drawn from the ADF test that LRDP and LTWE are non-stationary in levels.

Table 4: ADF, KPSS and PP test results

	Levels			First Differences		
	ADF	KPSS	PP	ADF	KPSS	PP
LRGDPA	-0.6448	0.7446***	-0.2754	-3.8365***	0.1447*	-4.1002**
LEW	-4.7134***	0.1534**	-1.9121	-5.0493***	0.1665	-5.0320***
LTWE	-0.2551	0.7831**	-0.7454	-0.7871	0.1800	-5.7584***

*Note: *, **, *** mean rejection at 10%, 5% and 1% respectively; the tests use either equations (1), (2) or (3) depending on the results of the joint hypothesis tests resented in Table 1. The critical values are from MacKinnon (1996) for the ADF and PP tests and from Kwiatkowski et al. (1992) for the KPSS test.*

As can be seen in Table 4, for LEW, the null hypothesis that the time-series followed a random walk with drift was rejected. Thus, the ADF test was analysed on the model with drift and the trend term. This statistic of -4.7143, shown in Table 4, suggests that the null hypothesis can be rejected, i.e. the series LEW is stationary. The results of the KPSS and the PP tests, however, reveal the opposite conclusion as both tests point to LEW being non-stationary in levels. With respect to this difference, it is important to consider the properties of the three tests as highlighted in Chapter3. It is surprising that the ADF and PP tests reveal different conclusions given their similarity. The latter however, is consistent with the KPSS test, which overcomes the weakness of the ADF and PP tests that they have low power (meaning that the test does not reject the null hypothesis even when it is false, which appears to be true for the ADF test for LEW). As explained previously, the KPSS test circumvents this problem by reversing the null and alternative hypothesis. Thus given that the KPSS test points to LEW being non-stationary; a result confirmed by the PP test and the fact that the ADF finding is consistent with the observation of low power, the conclusion was drawn that LEW, as with LTWE and LRDP is non-stationary in levels.

Given that the series were found to be non-stationary in levels, it was necessary to determine if their first differences were stationary. The same procedure was adopted as with the level tests and the results displayed in the second panels of Tables 3 and 4. For all three variables, the joint test that the coefficients in the ADF test equation with drift and trend could not be rejected at the 5 percent significance level suggesting that the null hypothesis that the series follow a random walk could not be rejected. Thus, the ADF tests were performed without an intercept

or trend to enable the unit root/stationarity hypothesis to be tested for the ADF approach and then the PP and KPSS tests. However, given that the KPSS test cannot be estimated without an intercept, the intercept only was used as opposed to the intercept and trend option. For the first differences of LEW, all three tests confirm that the series is stationary as shown in Table 4. For LTWE, the KPSS and PP tests both suggest the first differences are stationary whereas the ADF suggests the opposite. This contradiction between the ADF and KPSS/PP tests is similar to what was observed for LEW in levels. Thus, consistent with the argument presented previously, the latter two tests were relied upon given this disagreement and it was therefore concluded that LEW was stationary in first differences.

Finally, for LRGDPA in first differences, there was evidence that the null hypothesis could be rejected for the joint test. As such, the second of Dickey and Fuller's (1981) tests was performed and, as shown in Table 2, this null hypothesis was also rejected. As such, the drift and intercept terms were included in the testing equation. As shown in Table 4, the tests under this format for ADF and PP rejected the null hypothesis that the first differences are non-stationary at 5 percent, while for the KPSS test, the null hypothesis of stationarity could not be rejected at a 5 percent.

In conclusion, therefore, all three variables were found to be stationary in first differences. Taken together with the results from the levels equation, the final conclusion is that all variables are integrated of order one and thus satisfy the criterion for use in the ARDL model.

4.3.2 Long run bounds test with ARDL

The relationship between women's employment (LEW) and women's education (LTWE) and GDP were tested separately and then jointly using the ARDL long run bounds test to determine cointegration among the variables as per eq. (5). The results are presented in Table 5 below. The null hypothesis for this test is that there is no long run relationship between the variables. Table 5 shows that the null hypothesis for women's employment (LEW) was rejected at the 5 percent significance level because the F-statistic was higher than the I(1) bounds critical value. Women's education (LTWE) was found to have no cointegrating or long run relationship with real GDP at all significance levels because the F-statistic value was lower than the I(0) bounds critical values. The test statistic from the combined test on women's employment and women's education and their relationship with real GDP lies above the upper bounds critical values at the 1 percent significance level; therefore, the null hypothesis that there is no cointegration

between the variables was rejected. In other words, there is a long run relationship between the variables LEW and GDP, and LEW and LTWE and GDP but not between LTWE and real GDP.

Table 5: Long run bounds test approach to cointegration

With LRGDPA		LEW		LTWE		LEW and LWTE	
Bounds		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F-statistic		7.5984		4.2148		9.9103	
Critical Values	10%	5.59	6.26	5.59	6.26	4.19	5.06
	5%	6.56	7.3	6.56	7.3	4.87	5.85
	1%	8.74	9.63	8.74	9.63	6.34	7.52

The results confirm that women’s employment and GDP are linked as are women’s employment, women’s education and GDP, which reinforces the idea that women’s employment individually and women’s education and employment collectively are inextricably linked to economic growth, thus policies focused on improving growth need to consider both together rather than only one in isolation. Chapter 5 will return to this policy recommendation. This study shows that there is an insignificant relationship between women’s education and GDP growth, which confirms the results of Malengeni and Phiri (2017) and Glewwe et al. (2009) and builds on the work of Benavot (1989) by examining the quality of education rather than the quantity of education. This study measures quality by the level of education achieved, namely, secondary school, tertiary education and ‘other’, which refers to post-high school training. This study also confirms Klasen’s (2002) results, which show association but not ‘causality’ in relation to economic growth.

Given that the bounds test provides significant proof that the dependent and independent variables are cointegrated for two of the three specifications tested, the long-run coefficients can be examined in the ARDL model and thereafter the ECMs are analysed.

4.3.3 Long run coefficients in the ARDL model

Table 6 below presents the results of the ARDL model for the long-run coefficients. For the first relationship, the results reveal that a 1 percent increase in women’s employment will lead to a 3.17 percent decline in real GDP over the long-run. For the second cointegrating relationship which also includes women’s education, a 1 percent increase in women’s employment will also lead to a decline in real GDP to the amount of 5.83 percent. In contrast, for a 1 percent increase in women’s education, real GDP will increase by 0.57 percent.

However, as the t-statistics indicate, none of these coefficients is significant. Although these coefficients are not significant, analysing the signs relative to theory and previous empirical findings is of value. The finding of a negative relationship between women’s employment and real GDP contrasts with the result of Oztunc et al. (2015) that, in Asia, women’s employment increases GDP. The structural composition of the economy is important in this case. The coefficient for women’s employment shows a negative result that could be explained by a number of socioeconomic factors that lie behind the data, for example, the feminisation of labour that takes place in service-oriented economy and the structural inequalities that place women in lower paid jobs could result in slower growth if more women are employed. The relationship between women’s education is positive in the long-run model because education initiatives take time to take effect on economic growth. When employment is also included in the specification, the impact is not very large in magnitude. Benavot (1989:28) argues that ‘women’s employment in the service sector will have a negative effect on economic growth’ and that secondary and tertiary education do not impact economic growth as much as primary schooling. Malangeni and Phiri (2018) argue that education insignificantly affects economic growth.

Table 6: Long-run coefficients for the cointegrating relationships

Panel A: LRGDPA and LEW				
Variable	Coefficient	Std. Error	t-Statistic	Probability
LEW	-3.1734	6.8466	-0.4635	0.6459
Panel B: LRGDPA, LEW and LTWE				
Variable	Coefficient	Std. Error	t-Statistic	Probability
LEW	-5.8262	9.7997	-0.5945	0.5582
LTWE	0.5730	1.9833	0.2888	0.7754

4.3.4 Error correction models

As mentioned, for the two relationships where cointegration was found, the ECMs were estimated, with the results shown in Table 7 below. The error correction term in both models is negative and significant at 1 percent signalling that the relationship between the variables will converge to long run equilibrium, which means that the results can be used to forecast in the future as the model is stable. The error correction term in the model including both women’s education and employment shows that any disequilibrium in the long-run relationship between these variables in the previous quarter will be corrected at an adjustment speed of 0.05 percent for any 1 percent disequilibrium. This is a relatively slow adjustment process. For the model with only women’s employment, the adjustment term is even slower at 0.03 percent.

The R^2 for the GDP and women's employment ECM is 30 percent suggesting that the correction for disequilibrium in the long-run relationship does account for a substantial proportion of the short-run variation in GDP. The explanatory power of the ECM that includes both women's employment and education is substantially higher at approximately 75%, where several of the contemporaneous and intertemporal coefficients are also significant in explaining changes in GDP along with the error correction term. In particular, the current and one period lag of women's employment are significant. Thus, for a 1 percent increase in $D(LEW)$ will lead to a 0.15 percent reduction in economic growth in the same quarter but a 1 percent increase in $D(LTWE)$ in the previous quarter will result in 0.15 percent growth in GDP in the following quarter. As such, the initial negative effect of women's employment on economic growth appears to be offset in the second quarter. Turning to women's education, the short-run relationships show that although an increase in women's education has no immediate impact on GDP growth, there is a significant and positive effect from increases in education in the preceding one, two and three quarters. For example, a 1 percent increase in women's education in the previous quarter has a 0.11 percent increase in the current quarter.

Table 7: Error Correction Models

Panel A: LRGDPA and LEW				
Variable	Coefficient	Std. Error	t-Statistic	Probability
C	2.2160	0.5595	3.9609	0.0003
@TREND	0.0007	0.0002	3.6577	0.0008
CointEq(-1)*	-0.0344	0.0087	-3.9536	0.0004
$R^2 = 0.3028$		DW 1.4351	F-statistic 7.8178	
Panel B: LRGDPA, LEW and LTWE				
Variable	Coefficient	Std. Error	t-Statistic	Probability
C	4.4766	0.7853	5.7003	0.0000
@TREND	0.0013	0.000	5.4034	0.0000
D(LRGDPA(-1))	-0.0422	0.1649	-0.2562	0.8002
D(LRGDPA(-2))	-0.2512	0.1571	-1.5991	0.1241
D(LRGDPA(-3))	-0.2114	0.1237	-1.7093	0.1015
D(LEW)	-0.1487	0.0495	-3.0070	0.0065
D(LEW(-1))	0.1525	0.0545	2.7982	0.0105
D(LTWE)	0.0555	0.0485	1.1447	0.2646
D(LTWE(-1))	0.1157	0.0413	2.8039	0.0103
D(LTWE(-2))	0.0824	0.0439	1.8795	0.0735
D(LTWE(-3))	0.1337	0.0452	2.9573	0.0073
CointEq(-1)*	-0.0463	0.0081	-5.695048	0.0000
$R^2 = 0.7467$		DW 1.8956	F-statistic 6.4319	

4.3.5 Granger causality test

For the purposes of the Granger causality tests where stationary data is required, the series were all differenced once. To determine the optimal lags, the lag order selection criteria were examined. As explained in Chapter 3, for this purpose the AIC and FPE were relied upon. Table 8 demonstrates that one lag is optimal for the VAR, with the remaining measures (the likelihood ratio test (LR), SIC and HQIC) also confirming this conclusion. The VAR with one lag was thus estimated and the Granger causality tests run, with the results shown in Table 9.

Table 8: Lag order selection criterion

Lag	LR	FPE	AIC	SC	HQ
0	NA	1.81e-09	-11.6183	-11.4877	-11.5723
1	260.0288*	1.11e-12*	-19.0115*	-18.4890*	-18.8273*
2	6.0894	1.50e-12	-18.7280	-17.8137	-18.4056
3	8.2179	1.85e-12	-18.5459	-17.2397	-18.0854

* indicates lag order selected by the criterion

Table 9: Granger Causality Tests

Null hypothesis	F-statistic	Probability
D(LEW) does not Granger Cause D(LRGDPA)	0.5372	0.4685
D(LRGDPA) does not Granger Cause D(LEW)	5.7218	0.0223
D(LTWE) does not Granger Cause D(LRGDPA)	1.4840	0.2313
D(LRGDPA) does not Granger Cause D(LTWE)	0.0312	0.8608
LTWE) does not Granger Cause D(LEW)	1.1262	0.2959
D(LEW) does not Granger Cause D(LTWE)	4.4093	0.0430

The first two panels of Table 9 show that neither women's employment nor women's education have a causal effect on GDP in the short run but real GDP does have a causal effect on women's employment as the p-value of 2.23% indicates that the null hypothesis that DLRGDPA does not Granger cause DLEW can be rejected at the 5% significance level. The last panel indicates that women's employment has an effect on women's education in the short-run. These results make sense because women's employment and education will not have an effect on GDP in an economy where services, manufacturing and mining dominate, as is the case in South Africa. Male workers dominate the latter two industries while the services sector employs women in low paid jobs. These results can also be analysed as follows: in the short-run, as GDP increases, it will affect women's employment but it is not clear in which direction it will increase. The

second event is that as women’s employment increases, it is possible that their education levels could increase due to more disposable income for socioeconomic development.

Examining the cointegration and Granger causality test results together, it is evident that women’s employment and GDP have a long-run relationship and women’s employment, women’s education and GDP are also cointegrated while in the short-run, causality runs principally from GDP to employment although the ECM did show some effect of women’s education and employment on GDP. Moreover, in the short-run there is also a relationship between employment and education.

4.4 Diagnostic Tests

In this section, the results of the tests of the validity and stability of the model are presented. These tests include the Breusch-Godfrey LM test for serial correlation, the Breusch-Pagan-Godfrey test for heteroscedasticity and the CUSUMSQ test for stability. The results for the serial correlation test, documented in Table 10, show that the p-values are higher than the significance levels of 0.1, 0.05 and 0.01 and therefore the null hypothesis is that there is no serial correlation up to two lags cannot be rejected. That is, the model does not suffer from autocorrelation.

Table 10: Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.1244	Prob. F(2,20)	0.8837
Obs*R-squared	0.4423	Prob. Chi-Square(2)	0.8016

For the Breusch-Pagan-Godfrey test of heteroscedasticity, the results, shown in Table 11, revealed that the null hypothesis of homoscedasticity could not be rejected as the test statistics were all below critical values, based on the various forms of the test. This conclusion is expected given that all the variables were transformed into log form, which assists in the eliminating the problem of heteroscedasticity naturally. Thus, similarly, to the conclusion regarding autocorrelation, this model does not suffer from heteroscedasticity, meaning that the coefficients are efficient.

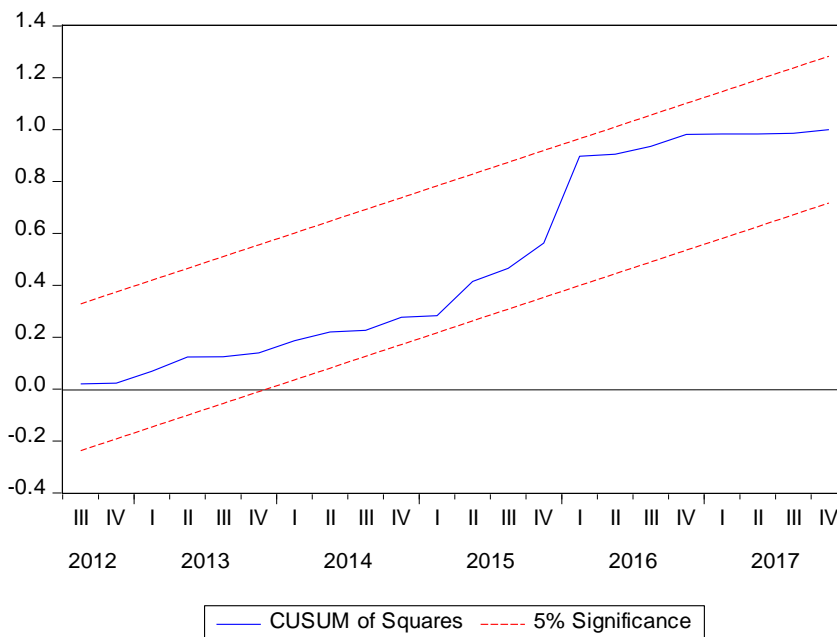
Table 11: Heteroscedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoscedasticity			
F-statistic	1.1164	Prob. F(13,22)	0.3963

Obs*R-squared	14.3089	Prob. Chi-Square(13)	0.3525
Scaled explained SS	5.4116	Prob. Chi-Square(13)	0.9650

As explained previously, to test the stability of the model, the CUSUM squares test was estimated. If the CUSUM line lies within the 5% significance level boundaries then the model can be considered stable. Figure 10 below shows the line lying within the 5% significance level boundary, which shows that the model is stable.

Figure 10: The CUSUMSQ line



The diagnostic tests thus show that the model is stable and has no serial correlation and the residuals are homoscedastic. As such, it can be concluded that the model can be relied on for econometric forecasting and inferences.

4.5 Conclusion

Chapter 4 provided the empirical results obtained by running the ARDL bounds testing model. The data was determined to be non-stationary in levels but stationary in first differences by running unit root tests and stationarity tests, namely, the ADF, KPSS and PP tests. Thereafter, the ARDL model was used to test for cointegration between the variables with GDP and LEW cointegrated and GDP and LEW and LTWE cointegrated but not GDP and LTWE. The ECM determined that there was convergence between the variables in the long-run for both models. The Granger causality test was conducted at lag order 1 to determine the relationship between

the variables and the direction of that relationship. The Granger test showed that neither women's employment nor women's education have a causal effect on GDP in the short run but real GDP does have a causal effect on women's employment. Finally, the Breusch-Godfrey LM, Breusch-Pagan-Godfrey and the CUMSUMSQ tests were run and revealed that the model did not suffer from serial correlation or heteroscedasticity, confirming its suitability for inferences while the coefficients were also found to be stable over time.

Chapter 5 will provide the conclusion to the study based on the findings presented in this chapter including policy recommendations for governments and proposals for future research studies.

5 CONCLUSION

5.1 Introduction

After completing the analysis of the statistical tests and discussing the findings in Chapter 4, this chapter provides the policy discussion and conclusion of the study.

5.2 Research conclusion

This study's objective was to determine if there was a long-run relationship between GDP and women's education and women's employment in South Africa over a period starting in Q1 2008 and ending in Q4 2017. The economic vulnerability of women makes it imperative for studies to guide policy makers in their determination of targeted policies for gender equality in the work place and in education.

The study showed that women's employment and GDP do move together in the long-run and such, women's employment is inextricably linked to GDP. On the other hand, women's education is only linked to GDP when combined with employment and not on its own, as shown in the cointegration findings. However, further analysis of the cointegration results showed a surprising result that in the long-run, an increase in women's employment will lead to a decline in economic growth, which points to the structural inequalities in the economy that women's employment is effected in lower paying sectors or jobs. Even more surprising is the finding that women's employment combined with education will also lead to a decline in economic growth in the long-run and that women's education combined with employment will only lead to a slight increase in economic growth.

The results from the Granger causality tests show that GDP growth will lead to more employment opportunities for women rather than women's employment leading to GDP growth in the short-run. The study shows that in South Africa, for the period under study, GDP Granger caused women's employment. As the economy grew, jobs were generated in sectors that employed more women. This finding goes against the more common analysis that women's employment contributes to GDP growth. The study confirms arguments on the feminisation of labour in service-oriented sectors. The findings are in line with Casale and Posel (2002).

An additional finding is that women's employment Granger causes women's education. Considering that the education variable included the final year of high school, tertiary education

and other educational certificates, it would make sense that as more women are employed, they are able improve their educational status. It is interesting to note that education does not Granger cause employment in this study because studies have shown that as women are educated, their employment prospects improve. This could possibly be explained in terms of the nature of jobs that women occupy in service-oriented economies, where their remuneration and contribution to the economy is limited by the structural inequalities in the economy.

In light of the above, the study concludes that the first null hypothesis specified that there is no statistically significant relationship between gender equality in education and economic growth cannot be rejected. Secondly, the null hypothesis that there is no statistically significant relationship between gender equality in employment and economic growth can be rejected in favour of the alternative hypothesis that there is a relationship. Finally, the study concludes by failing to reject the null hypothesis that there is no bidirectional relationship between women's employment and education and GDP growth.

5.3 Policy recommendations

Based on the findings of this study, the South African government has a number of options to consider in relation to increasing economic growth through women's employment and women's education levels. The Department of Higher Education and Training; Department of Labour; Department of Science and Technology; and, the Department of Trade and Industry would be the key contact departments for the findings of this study.

This study shows that the combined variable of women's employment *and* women's education has a positive relationship with GDP growth. If jobs are created in the more technical areas of the economy that could employ more women, the economy will grow through the inclusion of trained and educated women. These technical jobs should not only be in the services sector where the majority of the workers are women but should be in the sectors of science and technology too.

South Africa will need to increase its intake of 'high brow' educated women to ensure that the skills required by an economy that needs to industrialise to keep up with global trends are met. The Department of Labour might need to reserve jobs for women with suitable levels of education to ensure that women applicants are not overlooked during the application process. This requires that targets and policies are directed to attracting and retaining skilled women applicants for specific job categories.

The Department of Trade and Industry (the dti) could create an investment environment in which companies are rewarded for investing in majority-women industries such as specialised factories in the clothing industry or science. Women-focused investments could be attracted to the relevant sectors through social impact bonds, highlighting investment opportunities in those sectors and through tax-incentives to investors who wish to invest in industries that support women's parity in the economy.

In relation to education, South African women do not need assistance in completing high school but there one group of girls do require policy assistance to ensure that they do complete. The South African constitution and law protect pregnant schoolgirls but in reality schools and governing bodies have the power to refuse them entry or the girls drop out of their own volition thinking that they are expected to do so. Pregnant learners should be informed of their right to continue and be supported in ways that ensure that they complete high school. By increasing the numbers of girls who complete high school, South Africa will have more women who can be employed in 'decent jobs' once entering the labour force.

Secondly, universities need to ensure that more women complete tertiary certificate and degree programmes. In South Africa, female graduates outnumber male graduates but fewer women enrol for higher degrees meaning that the majority of enrolled women students leave with the basic degree and do not go on to achieve 'highbrow' education. Explanations for this phenomenon could range from sociocultural expectations that women get married after their first degree and start families or socioeconomic where women enter the labour force to support families or to become financially independent. Either way, women with basic degrees will remain in jobs that do not offer good promotion prospects or in sectors that are predominantly staffed by women, such as the hospitality and services industries. Policies should target initiatives that would address the needs of women with basic degrees, for example, bursaries for higher degrees such as masters and doctorates, childcare facilities at universities for students with children. Additional initiatives should consider providing secure environments for women students to remain on campus safely and free from fear of attack and violence, and flexible programmes for working women who wish to return to school to improve their qualifications.

Educational programmes are long-term in nature; therefore, a 3 – 5 year incubation period would be acceptable for policies to show improvements in women's educational levels. Statistically though, this output cannot be measured with ARDL.

Finally, workplace policies should consider programmes that provide continued employment and education for women especially those who are eligible for maternity leave. Efforts should be made to provide opportunities for women in the workplace to improve their roles and responsibilities and to advance women as workers. This would be a private and public sector initiative, as institutions would need to comply with employment equity requirements but also introduce tailored programmes for women in their employ.

5.4 Limitations of study and recommendations for future studies

This study is based on a limited sample period due to a lack of robust data prior to 2000 in South Africa. The StatsSA quarterly data on women's employment is robust and verifiable from 2000 onwards. The limited nature of the data makes it difficult to extrapolate the study's results to other contexts. The study does not explore the relationship between men's employment and education and that of women, which results in a focus of only one sector of the population. Future studies could explore that relationship over a longer period and achieve results that are more significant.

5.5 Conclusion

This study aims to contribute to feminist economics debates on the contribution that women could make in the economy through their improved employment and education levels. It has also examined the contributions women make in a developing middle-income country and returns surprising results that go against earlier studies. The study has also confirmed the potential to replicate this study in other locations and over longer periods.

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