

An analysis of employment intensity of sectoral output growth in Botswana

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ABSTRACT

Despite an impressive macroeconomic growth record in Botswana over the past four decades, high unemployment and poverty incidences remain persistent and an intractable challenge of macroeconomic management in the country. The study explores the employment intensity of sectoral output growth in Botswana with a view to identifying key sectors of the Botswana economy that are employment intensive. To achieve this objective, the study used both simple elasticities and econometric procedures to provide empirical evidence concerning the extent to which economic growth that has occurred in Botswana is employment intensive and in which sectors. The findings confirmed the low labour absorptive capacity of the Botswana economy at the aggregate and at sectoral decompositions, suggesting the notion that growth performance in the country is, after all, 'jobless growth'. With respect to policy, the study recommends a successful mineral-led economy that is able to diversify into sectors and activities that are by nature relatively more labour-intensive.

Key words: employment intensity, sectoral output growth, Botswana

Introduction

The principal link through which economic growth is transmitted to the poor is the amount of employment it generates. This derives from the fact that labour is about the only resource in which the poor are relatively abundant. Thus, for the poor, the productive use of their plentiful factor, labour, is the principal way to overcome

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poverty. As the population of a country grows, people need work in order to support their families and themselves. Economic growth is necessary to employ all those who seek work. Without sufficient economic growth, people looking for work will be unable to find it. However, in a jobless growth economy, unemployment remains stubbornly high even as the economy grows. This tends to happen when a relatively large number of people have lost their jobs and the ensuing recovery is insufficient to absorb the unemployed, under-employed and new members entering the work force.

There is now consensus among the rich literature exploring the relationship between economic growth and poverty that output growth alone is necessary, but not sufficient, for a country to improve the standards of living of its inhabitants (Ravallion & Chen 1997; Ravallion 2001; Dollar & Kraay 2002; Hull 2009). What is necessary for poverty reduction is a pro-poor growth strategy that ensures reductions in inequality and poverty incidence accompanied by economic growth. The entry point of the relevance of employment in the linkage between pro-poor growth performance and poverty outcomes is that poor people derive their income from work. Thus, employment intermediates the growth–poverty reduction nexus by ensuring that economic growth generates employment, because labour is the main asset for the majority of the poor. Hence, the level of employment and the access of the poor to decent earnings opportunities will be crucial determinants of poverty reduction.

Thus, the intuition that the creation of jobs matters for development underlies the design of a vast majority of national development strategies that look to employment generation as a major channel for poverty reduction. For economic growth to generate the kind of employment that contributes directly to poverty alleviation, it must be in sectors that have relatively high elasticities of employment. While extant literature is unanimous that sectoral patterns of growth will affect the extent of poverty reduction, there remains a lack of consensus as to which sectors are most important for poverty reduction. For instance, while Loayza and Raddatz (2006) find that growth in unskilled-intensive sectors contributes to poverty reduction, Satchi and Temple (2006) contradict this by documenting that growth in agriculture may increase poverty, while growth in the urban sectors may cause it to fall.

This issue becomes very important for Botswana. Prudent management of Botswana's diamond export earnings has been responsible for the country's impressive macroeconomic record since independence in 1966. Botswana transformed itself from one of the poorest countries in the world to a middle-income country with a per capita GDP of \$14 100 in 2009. GDP growth rates have averaged 7% per annum, and per capita incomes have posted some of the highest rates of growth in the world. Notwithstanding this impressive growth record, high unemployment and poverty incidences remain persistent and an intractable challenge of macroeconomic

management. Unemployment is estimated at about 24.6%, compared to an average of 12% among other countries with similar income levels. While changes in methodology and coverage make intertemporal comparisons difficult, unemployment roughly doubled from the early 1980s to exceed 20% by the early 1990s through to the present. Unemployment is highest among unskilled youth, at 60.8% for 15- to 19-year olds and 45.6% for those aged 20–24. Yet significant shortages persist in more skilled occupations. Unemployment is higher in urban than rural areas, and female unemployment exceeds male by about 30% (see CSO, various issues).

Siphambe (2007) highlighted and provided explanations for the growth without employment experience in Botswana. According to him, although growth in GDP has been impressive, such growth has not been able to create enough employment for the economy. This is because the mining sector has been a major source of the growth, whereas its nature of work is capital-intensive and, thus, it has limited opportunities for employment creation. The foregoing underscores the need to further expound on the role of the labour market in linking macroeconomic growth in Botswana to poverty reduction by examining the possibility that the spree of growth generated in Botswana is after all ‘jobless growth’.

To achieve this, this study aims to investigate the extent to which economic growth in Botswana is pro-poor, by assessing employment elasticity of growth so as to uncover whether growth is most readily associated with increased employment-intensity in key growth-generating sectors of the Botswana economy.

Theoretical perspectives and literature review

The relationship between output growth and employment has been widely studied based on what is known as Okun’s law. In his seminal paper, Okun (1962) defines a coefficient that gives the rate of change of real output for a given change in the unemployment rate. This coefficient postulates a specific empirical relationship between economic growth and the change in the rate of unemployment. More specifically, an increase in the economic growth rate by 3% (above the normal rate) was expected to reduce the unemployment rate by 1% point. This implies that the rate of GDP growth must be equal to its potential growth just to keep the unemployment rate constant. To reduce unemployment, therefore, the rate of GDP growth must be above the growth rate of potential output.

Okun’s law has attracted overwhelming attention from subsequent literature for a number of reasons. The first reason is its robust empirical regularity. Adanu (2005) asserts that in the last two decades, a large number of empirical studies have investigated the validity of this law with findings that, on the whole, tend to support

it. Secondly, it is important as a macroeconomic building block. Okun's law (which is rooted in old and new Keynesian economics), when combined with the Phillips curve, produces the aggregate supply curve. For instance, Prachowny (1993) derives the usual Okun relationship starting from a production function using several restrictive assumptions. His empirical evidence for the United States supports the view that the Okun equation is a useful proxy in macroeconomics. Thirdly and more importantly, Okun's law has implications for macroeconomic policy, particularly in determining the optimal or desirable growth rate, and as a prescription for reducing unemployment. As aptly captured by Harris and Silverstone (2001), "Okun's coefficient is a useful 'rule of thumb' in forecasting and policy-making".

In spite of the foregoing, a growing body of literature has emphasised the importance of the theoretical foundations of Okun's relationship over and above its empirical regularity, and thus attempts at recovering its theoretical basis have been the focus of a rich body of literature. Indeed, this area of research has been motivated by the fact that Okun himself (1970) stated that his 1:3 relationship hid changes in other factors and inputs that accompany employment growth and foster output growth.

Courtney (1991) and Palley (1993) introduced the idea of the possible asymmetry of the relationship between output and unemployment. That is, output expansion and contraction are accompanied by a different change in unemployment. In this stream of research, Harris and Silverstone (2001) showed how the assumption of a symmetrical relationship would lead to the rejection of the hypothesised existence of a long-term relationship between unemployment and output in the US and New Zealand. Further theoretical grounds and empirical evidence of non-linearity were also reported by Virén (2001) and Lee (2000) with reference to OECD countries, Silvapulle, Moosa & Silvapulle (2004) and Cuaresma (2003) for the US, and Mayes and Virén (2002) and Dopke (2001) for European countries.

Other authors have investigated the stability of Okun's relationship across time and space. Dokpe (2001) posits several reasons why the link between employment and growth might change over time. The rate of technical progress might speed up or slow down; the institutional settings regarding the labour market might change; or wage policies might be more or less aggressive. Hence, it is necessary to analyse whether or not the link between employment and growth has been stable over time. In this vein, Pini (1997) estimated that employment elasticities in Germany and Japan rose during the period 1979–1995 compared to 1960–1979, while declining in France and Sweden and showing little change in Italy, the UK and US. He also detected negative employment elasticities in Italy and Sweden for the period 1990–1995. Baker and Schmitt (1999) estimate Okun coefficients for a panel of OECD

countries. They point out that the employment intensity of growth today is higher than, for example, in the 1960s. They stress the importance of foreign growth as a determinant of domestic employment. Moreover, they contrast the interpretation of unemployment given by Okun's law as a macroeconomic explanation for the view that microeconomic factors are the main source of at least European unemployment. They claim that the relatively good empirical performance of Okun equations is a strong hint that macroeconomic forces play a greater role in the development of unemployment than is generally believed.

A major concern of economic policy is to improve the employment intensity of growth. Hence, empirical evidence on the sources of cross-country differences on the Okun relationship is particularly relevant for policy. Revenga and Bentolila (1995) discuss the reasons for a different employment intensity of growth across countries. They use a panel estimation method to evaluate the Okun coefficients in a group of OECD countries and add dummy variables to capture different labour market institutions. In a similar approach, Nickell (1999) explains differences in the level of unemployment rates by variables capturing the main labour market institutions.

Other authors criticised the simplest versions of the relationship for neglecting the role of prices (for example, Flaig & Rottman 2000), institutional factors (for example, Revenga & Bentolila 1995) or exchange rate volatility (for example, Buscher & Müller 1999; Stirböck & Buscher 2000). Flaig and Rottman (2000) criticise the Okun coefficient literature for neglecting the influence of relative prices. They argue that the employment intensity of growth is strongly related to real labour cost and, hence, estimating a simple Okun equation is not appropriate since it would be not correctly specified. Buscher and Müller (1999) and Stirböck and Buscher (2000) argue that the Okun relationship in Germany is affected by exchange rate volatility. In particular, they argue that higher exchange rate volatility will cause a lower employment intensity of growth. Revenga and Bentolila (1995) discuss the reasons for a different employment intensity of growth across countries. They use a panel estimation method to evaluate the Okun coefficients in a group of OECD countries and add dummy variables to capture different labour market institutions.

Lastly, authors including Khan (2001), Islam (2006) and Kapsos (2005) caution that employment elasticity has overtly overemphasised employment growth over productivity growth. Whereas the employment intensity of growth is a purely quantitative aspect of job rich growth, productivity growth speaks more to the qualitative aspects of growth in the number of 'decent' jobs. In this vein, the authors emphasise that both the employment and productivity-intensive growth are desirable in order to produce economic development objectives such as poverty reduction and reduction of social exclusion.

While the phenomenon of jobless growth is a major challenge to economic management in developing countries, existing studies such as those reviewed seem to focus on European Union countries, leaving the developing economies in Latin America, sub-Saharan Africa and the transition economies in a research quandary on this phenomenon. Several studies that focus on these countries deserve special mention.

The International Labour Organisation (ILO) has focused strongly on the role of employment linking growth and poverty reduction in its recent analytical and empirical work. A number of its studies during the last five years have documented that slow employment growth has been a major correlate of slow or negative poverty reduction in the entire developing world. Slow employment growth has been due to both slow growths of the economy and to low employment intensity of growth. While in Latin America, sub-Saharan Africa and the transition economies, the principal problem was slow growth, even in rapidly growing countries such as Thailand prior to the Asian crisis, the poverty-alleviation effect of growth was reduced by the premature decline in the employment intensity of growth.

Islam (2006), incorporating seven country case studies on the growth-employment-poverty linkage, concludes that slow employment growth was an obstacle to poverty reduction that might otherwise have been achieved. Almost without exception, slow employment growth was associated with low employment intensity of growth.

Osmani (2006) showed that the elasticity of manufacturing employment, with respect to manufacturing output in Asia, has sharply declined or remains dismally low. Asia as a whole experienced negative growth in manufacturing employment during the 1990s, an outcome driven largely by the negative growth of manufacturing employment in China during the decade of its extraordinarily rapid growth. In most of the other Asian countries, growth in manufacturing employment was positive though lower than during the preceding decade. India was a rare case of increased elasticity of employment with respect to output in the 1990s compared with the preceding decade, but the absolute level of elasticity was very low.

N'Zué (2001) investigated how economic growth and employment in the Ivorian modern private sector evolved over time, and the employment elasticities of selected variables. The empirical results suggest that employment and economic growth in Côte d'Ivoire do not move together in the long run (they are not cointegrated), that is, jobless growth can occur and had occurred in the country. It also results from the econometric estimation that economic growth and employment were negatively correlated in Côte d'Ivoire during the period of analysis. The same negative correlation existed between employment and development aid. However, investment is positively

correlated with employment. Investment is therefore the key to tackling the crisis of unemployment and poverty.

Research method

This section presents the methodology of the study. We first present the model specification, followed by the types and sources of data.

Model and analytical techniques

Two basic methods have been used to estimate employment elasticity of output in the literature. The first is the simple arithmetic method of finding the most convenient measure of the employment intensity of growth provided by the elasticity of employment with respect to output growth. This is obtained by dividing the proportionate change in employment by the proportionate change in output during a given period, usually a year, as given below:

$$\varepsilon = \frac{\left[\frac{L_t - L_{t-1}}{L_t} \right]}{\left[\frac{Q_t - Q_{t-1}}{Q_t} \right]} \quad (1)$$

The numerator gives the percentage change in employment L , between periods t and $t-1$, while the denominator gives the corresponding percentage change in output, Q_t .

While this methodology is computationally very simple, the weaknesses inherent in simple two-point calculations are such as to call into question the usefulness of the elasticity obtained for forecasting purposes. The base year or the terminal year may, for example, be abnormal, so that the elasticity obtained may not reflect the 'normal' technological relationship between L and Q for a sector. This problem may be especially severe for a developing country such as Botswana, where the industrial sector is small and the investment incentive programme is predominantly capital centred. The base year will be represented by a large number of traditional low-productivity, labour-intensive activities that will not be representative of subsequent activities set up under an investment incentive programme that favours capital-intensive industries and techniques of production. The abnormality of the base year will be accentuated by the smallness of the industrial base, because the establishment

of, say, a highly capital-intensive plant could significantly alter the factor intensity of an entire sector. The problems are multiplied when the calculation is for a group of industries, because a normal year for one industry may not be normal for another.

The second method involves applying the econometric method of regression analysis where a functional relationship between employment and output is postulated and estimated. This becomes appropriate when lengthy and reliable time-series data on L and Q are available; the regression method should be preferred since it avoids the problem of finding normal base and terminal years (Lim 1976). For robustness check, this study employed the two approaches in estimating the sectoral and aggregate employment elasticities over the study period.

Following Okun (1962) as applied by Bruno, Falzoni and Helg (2005) and others, we suppose that the firm technology exhibits constant returns to scale with external economies generated by sectoral international exposure, g . Hence, we estimated a labour demand function of the double-log linear specification of the form:

$$\ln L = \beta_0 + \beta_1 \ln W_t + \beta_2 \ln r_t + \beta_3 Q_t + \beta_4 \ln g_t + \varepsilon_t \quad (2).$$

where L is the number of employees (employment), W is the wage rate, r is the user cost of capital, Q is sectoral value added in real terms, g is a measure of sectoral international exposure and ε_t is the error term. β_i are constant parameters. The logarithmic specification of equation 1 ensures that the β_i can be interpreted as elasticities, since regression results using logged variables are always interpreted as elasticities (Koop 2005).

The parameter of primary interest in this study is β_3 , the output elasticity of employment parameter that enables an identification of which of the Botswana growth sectors is employment intensive. Thus, an elasticity value of 1 implies that every 1 percentage point of GDP growth is associated with a 1 percentage point increase in employment. As previously mentioned, the estimates of employment elasticity are, however, based on the assumption that employment is primarily a function of output. That is, the elasticities generated from the procedures described are indicative of the response of employment in terms of quantity of employed persons to GDP growth. However, Islam (2006) has argued that both the quantity of labour input and labour productivity contribute to output growth. Depending on the policies pursued, a country may be able to achieve a balanced contribution of both these elements towards output growth. It thus becomes necessary to exercise caution in clarifying and interpreting the relationship between employment elasticities, ε , and actual employment growth and productivity growth.

In this vein, Kapsos (2005) provides an arithmetic identity to show the proportionality of the economy's total output, Q , to the product of the labour force employed and labour productivity, as follows:

$$Q_t = L_t \times P_t \quad (3)$$

where Q_t and L_t are, as before, output and employment, while P_t is equal to labour productivity (output per worker). Equation 3 implies that for small changes in output, the following holds:

$$\Delta Q_t = \Delta L_t + \Delta P_t \quad (4)$$

That is, for a given amount of output growth, ΔQ , any increase in the rate of employment growth must be met by an equal and opposite decrease in labour productivity growth. Given that the estimated employment elasticity coefficients leave out the influence of productivity growth on output growth as previously discussed, then in formulating conclusions about employment elasticities, one must necessarily consider the productivity side of the relationship. This relationship becomes explicit in the context of the following:

If equation 4 is divided by output growth, ΔQ , it gives:

$$\varepsilon = 1 - \frac{\Delta P}{\Delta Q}, \text{ where } \varepsilon = \frac{\Delta L}{\Delta Q} \quad (5)$$

Kaspos (2005) used equation 5 to clarify the relationship between employment elasticities, ε , and actual employment growth and productivity growth. Given a positive GDP growth scenario in Botswana, the relationship is summarised as follows. Negative employment elasticities correspond with negative employment growth and positive productivity growth. Employment elasticities between 0 and 1 correspond with positive employment and productivity growth, and higher elasticities within this range correspond to more employment-intensive (lower productivity) growth. This typically represents the ideal, whereby job growth occurs together with gains in productivity. Lastly, elasticities greater than 1 correspond with positive employment growth and negative productivity growth.

Type, sources and description of data

The study utilised secondary data sourced from Bank of Botswana Annual Reports (various issues) based on the Botswana Central Statistics Office (CSO) to construct all the variables. The variables used in the empirical work are aggregate and sectoral GDP,

wages as the price of labour, market interest rates as the price of capital, employment (number of employees) and measure of international exposure or openness index. Our dependent variable, L , is measured as number of employees (L). The output variable, Q , is proxied by value added in constant 1993/94 prices (TVA). The wage variable is measured as employee average monthly earnings by sector in Pula. As a proxy for international integration, g , we utilise the share of import over value added. The choice of this proxy to measure international integration is motivated by our focus on the substitution effect's component of the labour demand elasticity. In fact, import penetration might well represent measure of substitution possibilities in production due to the availability of a larger variety of inputs and a measure of the competitive pressure coming from the international markets.

Results and discussion

A preliminary step in the econometric analyses of time series data entails testing for the order of integration of variables making up the aggregate and sectoral labour demand function in equation 2. The Augmented Dickey-Fuller and Philips-Perron test were adopted. These tests indicate that the model variables are of unit roots in levels and generally differenced stationary of order one, i.e. $I(1)$. (Details are available from the authors.)

A usual response in modelling integrated variables was to independently take the first differences of each of the $I(1)$ variables and then to use these first differences in any subsequent modelling process. In the context of univariate modelling, this is entirely the correct approach. While this approach is statistically valid, it does have the problem that pure first difference models have no long-run solution. Fortunately, there is a class of models that can overcome this problem by using combinations of first differenced and lagged levels of cointegrated variables.

Consequently, we tested for cointegration to determine the existence of long-run relationship among the model variables by using the the Engle-Granger two-step method involving estimating the cointegrating regression using OLS (Ordinary Least Squares) in the first step and using the step 1 residuals as one variable in the error correction model in the second step, provided cointegration is established in the first step. Results of the Augmented Dickey-Fuller (ADF) tests on residuals of cointegrating regressions of the sectoral and aggregate models are reported in Table 1.

The results in Table 1 indicate that the the residuals from the cointegrating regression can be considered stationary, which implies the existence of at least one cointegrating equation in all the estimated models, and thus long-run relationships

Table 1: Test for cointegration on the residual of estimated potentially cointegrating equation for aggregate and sectoral labour demand models

Model	Test statistics (ADF test on residual)	Decision*
Agriculture	-12.23	Cointegrated
Banking and business services	-7.44	Cointegrated
Commerce	-8.12	Cointegrated
Construction	-6.55	Cointegrated
General government	-5.32	Cointegrated
Manufacturing	-11.68	Cointegrated
Mining and quarrying	-10.34	Cointegrated
Transport and communications	-4.89	Cointegrated
Electricity, gas and water	-7.11	Cointegrated
Aggregate economy	-7.24	Cointegrated

* Critical values for the Engle–Granger cointegration test on regression residuals with no constant in test regression at 1%, 5% and 10% are respectively -5.41, -4.76 and -4.42.

Source: Engle & Yoo (1987)

exist among modelled variables. Our empirical model in equation 2 was therefore estimated in error correction form. The final stage in building an error correction model using the Engle–Granger two-step approach is to use a lag of the first-stage residuals as the equilibrium correction term in the error correction model's equation. The coefficient estimates for this model are presented in Table 2.

The coefficients attached to the output variable in Table 2 correspond with the employment elasticity of output growth in the Botswana case. The interpretation of these coefficients follows the interrelationships between employment elasticities, ϵ , and actual employment growth and productivity growth as espoused in the section on the model and analytical techniques.

The employment intensity of output growth in Botswana over the study period was 0.01, with statistical significance at the 5% level. The extremely small employment intensity of growth coefficient corresponds with the fact that the growth process in Botswana has been driven mainly by productivity improvements, rather than by employment or labour demand growth. This outcome finds plausible explanation in the nature of structural changes that accompanied growth performances of the Botswana economy. Value added in virtually all the sectors of the economy grew rapidly in the Botswana post-independence economy. This rapid growth of the eco-

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Table 2: Econometrics model results of employment intensity of aggregate and sectoral outputs growth in Botswana (1990–2008)

Dependent variable: (L = Labour demand)	All	Agriculture	Banks	Commerce	Construction	Government	Manufacturing	Mining	Transport	Electricity, gas and water
Constant	-0.05 (-2.71)	1.04 (9.67)	-0.08 (-4.55)	-0.26 (-8.57)	-0.22 (-3.90)	0.12 (8.21)	-0.17 (-7.76)	-0.06 (-2.80)	0.48 (4.95)	0.05 (2.39)
Cost of labour (Wages)	-0.07* (-1.96)	-0.05* (-1.89)	-0.06* (-7.82)	-0.08* (-3.39)	-0.31* (-7.99)	0.30* (8.74)	-0.25* (-3.4)	0.21* (9.20)	0.44* (4.40)	-0.08* (-2.89)
National output proxy by (TVA)	0.01* (3.00)	-0.17* (-9.63)	0.01* (5.01)	0.04* (8.73)	0.03* (4.00)	-0.02* (-8.39)	0.03* (7.76)	0.01* (2.60)	-0.08* (-4.97)	-0.01* (-2.26)
Cost of capital (int)	0.32* (10.33)	0.31* (5.06)	0.45* (12.41)	1.05* (10.13)	0.63* (8.57)	-0.05* (-1.48)	0.13* (3.18)	-0.05 (-1.07)	-0.99* (-4.34)	0.29* (5.11)
Measure of international exposure (g)	-0.04* (-2.27)	-0.28* (-9.18)	-0.05* (-2.54)	-0.25* (-8.08)	-0.33* (-7.19)	0.15* (8.02)	-0.05* (-2.59)	0.16* (6.19)	-0.17 (-1.24)	0.05* (1.80)
Error Correction Term (ECM_all sectors(-1))	-0.14* (-5.02)									
Error Correction Term (ECM_agric(-1))		-0.92* (-1.86)								
Error Correction Term (ECM_banking(-1))			0.89* (4.87)							
Error Correction Term (ECM_commerce(-1))				0.98* (5.79)						
Error Correction Term (ECM_construction(-1))					0.92* (2.05)					
Error Correction Term (ECM_govt(-1))						0.88* (3.10)				
Error Correction Term (ECM_manufacturing(-1))							0.93* (2.10)			
Error Correction Term (ECM_mining(-1))								0.91* (3.14)		
Error Correction Term (ECM_transport(-1))									0.69* (2.25)	
Error Correction Term (ECM_water(-1))										0.78* (3.57)
Summary Statistics										
Adj. R-Square	0.63	0.89	0.86	0.84	0.84	0.83	0.88	0.87	0.83	0.81
F-Statistic	25.04	113.20	88.34	76.74	72.92	68.70	101.82	92.83	67.77	60.69
Prob (F-statistic)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	72	72	72	72	72	72	72	72	72	72
Estimation method	OLS	OLS	OLS	OLS						

t-statistics are in brackets

* Indicates significance at the 10%, 5% or 1% level

nomony was accompanied by important structural changes, the most significant of which was the dramatic decline in the relative size and contribution of the agricultural sector, and phenomenal upsurge of the relative size and contribution of the mining sector. Noting that the agricultural sector is a labour-intensive sector, and the mining sector an obviously capital-intensive one, these structural changes clearly account for the greater impact of technological and productivity improvements in the mining sector-driven economy, to the detriment of labour absorption in the declining agricultural and other labour-absorptive sectors of the economy. In all, this finding serves to confirm the low labour absorptive capacity of the growing economy in Botswana with high levels of unemployment.

At the sectoral level, employment elasticity of sectoral output growth in banking, commerce, construction, manufacturing and mining are positive, but also weak although significant at the 1% levels. These indicate that growth experiences in these sectors are more productivity driven than labour employment driven. These find explanations in the context that these sectors consist of organisations in the so-called 'modern industries' where processes are permeated by applications of technology and technological tools that promote labour productivity and labour substitutability. While this outcome may be inimical to the employment and poverty alleviation objectives of economic management in Botswana, it conforms to the assertion by Kahn (2001) that employment elasticities gradually fall as a country attains upper middle-income status and becomes more developed and more labour scarce.

The agriculture, government, transport, and electricity, gas and water sectors produce negative employment elasticities. In a country with positive GDP growth, negative employment elasticities correspond with negative employment growth and positive productivity growth. The negative level of employment elasticities in the agricultural sector in Botswana result partly from the diffusion of labour-saving technologies in the sector, indicating that this sector will not be able to create enough jobs for the growing rural labour force in the future. The policy priorities for the agricultural sector in most developing countries including Botswana are to increase both productivity per hectare and the productivity per worker of those who remain in agriculture, while simultaneously seeking to shift as many workers out of agriculture as possible. Given the stage of development, the enormity of the challenges in shifting people out of agriculture, and the seasonality of unemployment in agriculture, Botswana may not be in a position to achieve all these objectives simultaneously. Appropriate skills imparted to the people involved in agriculture to facilitate their shift to rural non-farm employment may contribute significantly to the reduction of poverty in rural areas. The electricity, gas and water sector accounts for a very small share of total employment of around 0.94%. Employment in this sector is largely

formal, since it is dominated by the public sector. Since the electricity, gas and water sector is capital-intensive, increasing employment in this sector will depend mainly on the expansion of installed capacity.

The foregoing findings bring to the fore the possibility of a trade-off between productivity and employment in Botswana's unemployment amidst impressive growth performance. The apparent contradiction could probably be explained by the employment-creating effect of labour productivity growth exceeding the employment-displacing effect of the same across the sectors of the Botswana economy.

The coefficients attached to the wages variable in Table 2 correspond with the wages elasticity of employment growth. Changes in wage rates should mirror changes in labour productivity if workers are receiving a fair share of the returns to production. To what extent has this been the case in Botswana? Firstly, coefficients of wages for the aggregate economy model prove to be negative and significant at the 5% level. This means that a 1% increase in wages in the economy reduces employment by about 7%. The same pattern is found for the agriculture, banking, construction, electricity, gas and water, commerce and manufacturing sectors, where a 1% increase in wages tends to reduce employment in the sectors by 5%, 6%, 31%, 8%, 8% and 20% respectively. This means that wage increases that are not backed up with increased productivity in these sectors will harm employment in the economy.

Lastly, the signs on the coefficients of international exposure are generally negative except in general government, mining, and electricity, gas and water. This means that international exposure in these sectors will have a negative impact on domestic employment. For example, international exposure in the construction, agriculture and commerce sectors tends to reduce domestic employment by about 33%, 28% and 25% respectively. We can therefore conclude that the practice whereby foreign contractors in the economy import workers for which there might be local substitutes may not be healthy for the economy.

To serve as robustness checks on the econometric approach to estimating a formal labour demand function to generate the respective elasticities, simple point employment and wage elasticities of total and sectoral value-added growths were computed. The results are mostly in tandem with the econometric results.

The summary statistics are generally satisfactory, with adjusted R^2 ranging from 0.63 to 0.89. This shows that the explanatory variables explain over 63% of the variations in the dependent variables in our models. The F-statistics, which test the overall goodness of fit of the models, are equally satisfactory at the 1% confidence level. The error correction terms are generally significant in all the models, and they correct between 14% and 98% of the errors in the model after the short-run disturbances, which is quite robust.

Residual tests, including normality, serial correlation and heteroskedasticity tests were performed to confirm all the assumptions relating to the classical linear regression model. The results indicate that the estimated model is well specified and generally conforms with statistical assumptions underlying our modelling procedures.

Summary and policy recommendations

Botswana's macroeconomic and growth performance in the last couple of decades is highly applauded; however, high levels of unemployment and poverty remain intractable challenges of macroeconomic management. The study explores these issues by investigating how employment intensive the main growth-generating sectors of the Botswana economy are. The findings confirm the low labour-absorptive capacity of the Botswana economy at the aggregate and at sectoral decompositions, suggesting the notion that growth performance in the country is, after all, 'jobless growth'.

The inference drawn from the low employment-intensity of growth performances across the sectors is that the observed growth performance has been more labour-productivity driven than labour-employment driven. This speaks more to the undiversified structure of the economy that depends overwhelmingly on the mining sector. Given the capital-intensive and labour-replacing process in the mining sector, over-reliance on this sector to the detriment of other labour-intensive sectors will ultimately compromise the employment objectives of the country.

With respect to policy, the study recommends a successful mineral-led economy that is able to diversify into sectors and activities that are by nature relatively more labour-intensive, such as manufacturing, and examine ways and means of creating (or improving) incentives for their growth in the long run. Noting the rural prevalence of most unemployment and poverty incidences, sectors where the rural poor are concentrated (such as agriculture, rural non-farm activities and the urban informal sector) should come to the fore of policy priority, whether in terms of pricing (of inputs as well as outputs), taxation, regulatory measures or any other means.

References

- Adanu, K. 2005. 'A cross-province comparison of Okun's coefficient for Canada', *Applied Economics*, 37: 561–570.

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- Baker, D. & Schmitt, J. 1999. 'The macroeconomic roots of high unemployment: The impact of foreign growth', *Economic Policy Institute*. [Online] Available at <http://www.epinet.org>. Accessed: 3 July 2011.
- Bruno, G.S.F., Falzoni, A.M. & Helg, R. 2005. 'Estimating a dynamic labour demand equation using small, unbalanced panels: An application to Italian manufacturing sectors'. [Online] Available at: <http://www.stata.com/meeting/2italian/Bruno.pdf>. Accessed: 22 March 2010.
- Buscher, H.S. & Müller, C. 1999. Exchange rate volatility effects on the German labor market: A survey of recent results and extensions, IZA Working Paper No. 37. Bonn.
- Courtney, H.G. 1991. The Beveridge curve and Okun's law: A re-examination of fundamental relationships in the United States. PhD thesis, Massachusetts Institute of Technology.
- CSO (Central Statistics Office). *National Accounts* (various issues). Gaborone, Botswana: Central Statistics Office.
- Cuaresma, J.C., 2003. 'Okun's law revisited', *Oxford Bulletin of Economics and Statistics*, 65: 439–451.
- Dollar, D. & Kraay, A. 2002. 'Growth is good for the poor,' *Journal of Economic Growth*, 7(3): 195–225.
- Dopke, J. 2001. The employment intensity of growth in Europe, Kiel Working Paper, No. 1021. Kiel Institute of World Economics, Germany.
- Engle, R.F. & Yoo, B.S. 1987. 'Forecasting and testing in co-integrated systems', *Journal of Econometrics*, 35(May): 143–159.
- Flaig, G. & Rottmann, H. 2000. Input demand and the short- and the long-run employment thresholds: An empirical analysis for the German manufacturing sector, CESifo Working Paper No. 264.
- Harris, R. & Silverstone, B. 2001. 'Testing for asymmetry in Okun's law: A cross-country comparison', *Economics Bulletin*, 5(2): 1–13.
- Islam, R. 2006. The nexus of economic growth, employment and poverty reduction: An empirical analysis: issues in employment and poverty. Discussion Paper No. 14. Employment Strategy Department, International Labour Office, Geneva.
- Kapsos, S. 2005. The employment intensity of growth: Trends and macroeconomic determinants. Employment Strategy Papers, 2005/12. International Labour Office, Geneva.
- Khan, A.R. 2001. Employment policies for poverty reduction, IEPDP No. 1. ILO, Geneva.
- Koop, G. 2005. *Analysis of Economic Data*, 2nd edition. John Wiley & Sons.
- Hull, K. 2009. 'Understanding the relationship between economic growth, employment and poverty reduction', In *Economic Growth, Employment and Poverty Reduction: Promoting Pro-Poor Growth*. Paris: OECD.
- Lee, J. 2000. 'The robustness of Okun's law: Evidence from OECD countries', *Journal of Macroeconomics*, 22: 331–356.
- Lim, D. 1976. 'On estimating the employment–output elasticity for Malaysian manufacturing', *Journal of Developing Areas*, 10: 305–316.

- Loayza, N. & Raddatz, C. 2006. 'The composition of growth matters for poverty alleviation,' *Mimeo*. Washington, DC: World Bank.
- Nickell, S. 1999. 'Why do unemployment rates differ?', *Wirtschaftspolitische Blätter*, 46: 219–224.
- N'Zué, F.F. 2001. 'Employment and economic growth in the Cote d'Ivoire: An analysis of structural determinants', *African Development Review*, 13(1): 98–113.
- Okun, A. 1962. 'Potential output: Its measurement and significance,' *Proceedings of the Business and Economic Statistics Section of the American Statistical Society*.
- Okun, A. 1970. 'Potential GDP: Its measurement and significance', In Okun, A. (ed.), *The Political Economy of Prosperity*. Washington, DC.
- Osmani, S.R. 2006. 'Employment intensity of Asian manufacturing: An examination of recent trends'. New York: UNDP.
- Palley, T.A. 1993. 'Okun's law and the asymmetric and changing cyclical behavior of the USA economy', *International Review of Applied Economics*, 7: 144–162.
- Pini, P. 1997. 'Occupazione, tecnologia e crescita: modelli interpretativi ed evidenze empiriche a livello macroeconomico'. Paper presented at Conference of Accademia Nazionale dei Lincei on 'Sviluppo tecnologico e disoccupazione: trasformazione della società', Rome, 16–18 January 1997.
- Prachowny, M.J.F. 1993. 'Okun's law: Theoretical foundations and revisited estimates', *Review of Economics and Statistics*, 75: 331–336.
- Ravallion, M. 2001. 'What is needed for a more pro-poor growth process in India?', *Economic and Political Weekly*, 35(13).
- Ravallion, M. & Chen, S. 1997. 'What can new survey data tell us about recent changes in distribution and poverty?', *World Bank Economic Review*, 11(2): 357–382.
- Revinga, A.L. & Bentolila, S. 1995. 'What affects the employment intensity of growth?', Discussion Paper of the Bank of Spain No. 9517.
- Satchi, M. & Temple, J. 2006. 'Growth and labour markets in developing countries', Department of Economics, University of Bristol Discussion Papers. Bristol, United Kingdom.
- Silvapulle, P., Moosa, I.A. & Silvapulle, M.J. 2004. 'Asymmetry in Okun's law', *Canadian Journal of Economics*, 37: 353–374.
- Siphambe, H.K. 2007. 'Growth and employment dynamics in Botswana: A case study of policy coherence', Working Paper No. 82. International Labour Office, Policy Integration and Statistics Department, Geneva.
- Stirböck, C. & Buscher, H.S. 2000. 'Exchange rate volatility effects on labor markets', *Intereconomics*, 9–21.
- Virén M. 2001. 'The Okun Curve is non-linear', *Economics Letters*, 70: 253–257.