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Mineral Taxation and Resource Nationalism in Zambia

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This article examines the resource nationalism cycle in Zambia. The resource nationalism cycle has episodically plagued investors in resource rich nations. Host states, lacking the financing and technical know-how, invite foreign investors to explore and exploit their vast natural resources. The former offer all sorts of fiscal incentives to appear attractive to the latter. Once operations commence and the resource experiences a sustained upward growth trend, the host state may retract the fiscal incentives previously offered, or simply nationalise assets, in a bid to exercise greater control over their natural resources and maximise the benefits accruing from high prices. The cyclical nature of the resource nationalism cycle can be seen in countries like Zambia.

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1. Introduction

The resource nationalism cycle is a phenomenon that has episodically plagued investors in resource rich nations. It describes a situation whereby host states, lacking the financing and technical know-how, invite foreign investors to explore and exploit their vast natural resources (Fatouros, 1962). The former will offer all sorts of fiscal incentives to appear attractive to the latter. Once operations commence and the resource experiences a sustained upward trend, the host state may either retract the fiscal incentives previously offered, or simply nationalise assets belonging to the investor. This is in a bid to exercise greater control over their natural resources and maximise the benefits accruing from high prices (Stevens, 2008).

The cyclical nature of the resource nationalism cycle can be seen in countries like Zambia. It is a mono-economy, relying primarily on its vast copper reserves. By the time Zambia attained its independence in 1964, the copper industry was dominated by the Anglo-American Corporation (AAC) and the Roan Selection Trust (RST). Both were foreign entities. These were nationalised by the government of Zambia in 1969 (Mwambwa, Griffiths and Kahler, 2010). A decline in copper prices, the oil crisis, massive debt and outright mismanagement led to the decline of the mining industry in Zambia. This eventually led to the privatisation of mines and their eventual sale to foreign corporations. Most of the development agreements entered into between the government of Zambia and foreign mining companies were completed between 2002 and 2004. Once this had occurred, the price of copper in Zambia dramatically increased from $2,500 per ton in 2004 to more than

$8,000 per ton in 2008. The Mwanawasa administration was thus compelled to increase mineral taxation in 2008 (Ng'ambi, 2010). Due to capital flight, this was retracted by the Banda administration in 2009. Various new taxes were introduced by the Sata administration between 2011 and 2014. However, by 2015 these were being reconsidered by the Lungu administration.

The aim of this article is to look at the resource nationalism cycle in Zambia. To that end, section two will consist of a general discussion of the resource nationalism cycle and the factors contributing to it. Section three will discuss the resource nationalism cycle in Zambia. Section four will conclude.

2. The Resource Nationalism Cycle

The resource nationalism cycle describes a situation whereby a host state solicits foreign direct investment and then later seeks to maximise the benefits accruing from such an investment, once it has been sunk. This could either mean increasing taxes or nationalising assets belonging to an investor outright. In the beginning the host state essentially solicits foreign direct investment. However, after operations commence and the natural resource experiences a sustained upward growth trend, the host state seeks to exercise greater control over the investment. Another factor contributing to this cycle is the system of governance adopted by the host state. It will be seen that democracies are the least likely of regimes to adopt resource nationalist policies. This also applies to autocratic regimes. The most likely to adopt resource nationalist policies are "hybrid systems", which hold regular elections, but are also characterised by weak institutions that are typically unable to perform necessary checks and balances on the arbitrary use of power by the executive (Guriev, Kolotilin and Sonin, 2009).

A practical example of the resource nationalism cycle is Venezuela where oil is the "engine of the economy" (Karl, 1997). The oil industry started out in private hands and by the end of the 1920s Venezuela was one of the world's leading oil exporters. Venezuela's oil companies were nationalised in the 1970s and put in the hands of the state run *Petróleous de Venezuela, S.A.* (PDVSA). Due to a fall in oil prices and mismanagement, Venezuela's oil industry saw a decline. This led to the reprivatisation of Venezuela's oil industry after the election of President Caldera in 1994. When Hugo Chavez became President in 1998, he introduced various policies which culminated in the nationalisation of Venezuela's oil industry. Since renationalisation, Venezuela's oil production has decreased. By 2009, the attitude of the government had changed and the government was beginning to tone down its nationalist rhetoric, in a bid to attract foreign direct investment (Corrales and Penfold, 2011).

2.1 The Need for Foreign Direct Investment

Host states typically lack the finances and technical know-how to explore and exploit their natural resources. They thus solicit foreign direct investment in order to do so. This process is invariably fostered by the granting of concessions to foreign investors. The problems arise once the investment has been sunk and the natural resource experiences a sustained upward growth trend (Duncan, 2006). In such a situation, the host state will seek to exercise greater control over their natural resources. This may be influenced by various factors. To begin with, the host state will wish to gain a greater share of the profits being generated by foreign investors. In addition, there may be public pressure on the host state, especially if the perception exists that the investor is making excessive windfall profits through no real effort of its own and to the detriment of the people of the host state. In such a situation, the host government may feel compelled to either increase taxes or nationalise the investor's assets outright.

2.2 The Role of Government Systems

The type of system also plays a role in whether the host state undertakes resource nationalist policies or not. A democratic government is the least likely to adopt a resource nationalist stance, because it is susceptible to public pressure. This is due to a variety of factors, including regular elections. Thus, if a democratic government adopts unpopular policies it is likely to be reflected in election results. A democratic government, however, is unlikely to adopt resource nationalist policies even in the face of public pressure. This is due to the fact that democracies are characterised by strong, independent institutions. Such institutions perform checks and balances on the arbitrary use of power. Such institutions also make it less likely for the executive to operate in a way that detrimentally affects the interests of foreign investors. For this reason, democratic host states receive a lot of foreign direct investment.

Autocratic regimes are also unlikely to adopt resource nationalist policies. Although autocratic governments are characterised by weak institutions and are therefore not susceptible to the same checks and balances that are typical of their democratic counterparts, they also lack regular free and fair elections. For this reason, they are less predisposed to popular pressure. Therefore, public calls for increased taxes or nationalisation are likely to be ignored. Moreover, autocratic regimes will regularly utilise their state machinery to ruthlessly squash any protests or uprisings. Given this fact, autocratic regimes are not obliged to adopt resource nationalist policies. Policies pertaining to foreign direct investment are more likely to remain stable, as long as that particular government continues to maintain political hegemony. For this reason, autocratic regimes also receive a substantial amount of foreign direct investment.

The most likely regime to adopt resource nationalist policies is a hybrid system. This is a system that holds regular elections but lacks the strong institutions that are found in democratic systems of governance. Instead, they have a highly centralised executive and weak institutions, which are unable to check the arbitrary use of executive power (Petrov, Lipman and Hale, 2010). The fact that there are regular elections means that host governments of hybrid systems are subject to public pressure. This includes calls to raise taxes or nationalise industries. The risk of being ousted in the next election places pressure on the host government to take measures that will appease the masses. The lack of institutional checks and balances makes it easier for host governments of hybrid systems to roll out their resource nationalist agenda.

2.3 An Expression of Nationalism

It could also be argued that resource nationalism is an expression of nationalism and not an expression of socialism (Chua, 1995). That is to say that host states adopting resource nationalism wish to place a national identity on their industries. This is typically in response to a perceived foreign domination of the state's industries. In so doing, the host state not only eliminates the foreign national, it also eliminates foreign capital. Once the initial euphoria subsides, it oftentimes happens that the host state experiences severe economic problems. A factor contributing to this is the mismanagement of nationalised entities. There may also be a depreciation in the price of the natural resource. The need to eliminate foreign domination from the economic paradigm is suddenly subjugated by the demand for development and modernisation. As such, the host state will once again seek foreign capital, which will be facilitated through the solicitation of foreign direct investment. This effectively brings us back to square one of the resource nationalism cycle.

3. The Resource Nationalism Cycle in Zambia

The aim of this section is to demonstrate how the Zambian copper mining industry fits into the resource nationalism cycle. It will be seen that just like Venezuela, Zambia has gone through various waves of the resource nationalism cycle since independence in 1964. At independence Zambia's mining industry was in private hands, yet it was subsequently nationalised in the 1970s, before being privatised again in the 1990s. Since then, however, the government has episodically sought to introduce new taxes, so as to maximise on the benefits accruing from high copper prices. Zambia is a hybrid system. Although it is characterised by regular elections, like a democracy, the system still remains highly centralised and institutions are relatively weak. This makes it easier for Zambia as a host state to adopt resource nationalist policies when the price of copper experiences a sustained upward growth trend.

3.1 Zambian Mines in Private Hands

Commercial mining commenced in Zambia in the 1920s (Roan Consolidated Mining Ltd., 1978). This was due to the British South Africa Company (BSAC) granting various concessions, which eventually culminated in the mining industry being dominated by the Anglo American Corporation and the Roan Selection Trust. The BSAC derived their right to grant concessions through the acquisition of various concessions from Paramount Chief Lewanika of Barotseland and various other chiefs in Northern Rhodesia (Ndulo, 1988). The BSAC was then able to use these concessions as a means of asserting ownership over all minerals throughout Zambia and this meant that they could do whatsoever with these minerals including levying royalties 'on all minerals won by whoever won them' (Ndulo, 1988).

3.2 Nationalisation of the Zambian Mining Industry

Zambia attained independence in 1964. The administration of President Kenneth Kaunda expressed concerns that the mining industry was dominated by foreign entities. The President, in his Mulungushi Reforms speech (1968), also expressed concerns that despite the exorbitant profits being made by mining companies, no new mines had been opened since independence. Simultaneously, the Kaunda administration also adopted the socialist policy of "humanism" and became a one-party state (Phiri, 2001). Under this policy it was the role of the Zambian government to look after each citizen. This was in line with various African governments who had adopted their own forms of socialism. Tanzania had adopted "ujamaa" (Nyerere, 1968) and Ghana had adopted "consciencism" (Nkrumah, 1964). Zambia thus proceeded to nationalise the mines and amalgamated them into the Zambia Consolidated Copper Mines (ZCCM). This not only helped to eliminate foreign domination over the mining industry, it also did a lot to advance the government policy of humanism (Fraser and Lungu, 2006).

The mines were used as a cash cow to advance this quixotic ideology. However, it was not to last long. A depreciation in copper prices, two oil crises in 1974 and 1979 and mismanagement of the mines led to a decline of the mining industry in Zambia. This meant that the government had to borrow money in order to keep the economy afloat, which in turn led to a debt crisis. Moreover, copper production declined from a staggering 750,000 tonnes in 1973 to just 257,000 tonnes in the year 2000. This decline in the industry necessitated attracting foreign direct investment to refinance the mines.

3.3 Full Circle: Privatisation and the Subsequent Introduction of a Windfall Tax in 2008

Multiparty democracy was reintroduced to Zambia in 1990 and in the following year President Chiluba's Movement for Multiparty Democracy (MMD) won a landslide election

victory. Despite this fact, Zambia remained a hybrid system under which power weighs heavily in favour of the executive. In order to be a minister in the Zambian government, one has to be a Member of Parliament (Constitution of Zambia). Moreover, since the reintroduction of multiparty democracy the legislature has generally been dominated by the party of the ruling executive, making it easier to roll out its own agenda (Electoral Commission of Zambia). Although the judiciary is completely separate from other arms of government, judges are appointed by the President and the judiciary is funded by the executive. Any questions raised, as to its independence, would therefore be legitimate.

When the MMD came to power in 1991 they promised to privatise the mines. In order to enforce this, the Privatisation Act 1992, Investment Act 1993 and the Mines and Minerals Act 1995, were introduced. The mines were unbundled and sold to various investors (Craig, 2001). This was fostered through development agreements, under which various incentives were offered, including preferential tax rates. To ensure that these incentives would subsist for the duration of the contract, tax stability clauses were also inserted. Under these clauses the government promised not to undertake any administrative or legislative measures that would adversely affect the profits of foreign investors. This was done in order to present Zambia as a favourable investment destination and thus attract foreign direct investment.

When these agreements were signed, the price of copper stood at $2,500 per ton in 2004. This increased dramatically to $8,000 per ton in 2008. This meant that the mining companies were earning profits beyond what they had envisaged. For example, Vedanta in 2005 was able to recoup its initial investment of $25 million rendered the year before, due to a doubling of copper prices. There were thus calls to introduce some sort of a tax, so as to capture a greater share of the revenue that mining companies were making. This essentially sparked another wave of the resource nationalism cycle in Zambia. This was further exacerbated by the fact that there was a general election in 2006, in which the MMD lost all seats in the mining towns, even though President Mwanawasa ultimately won the presidential election. Mwanawasa was able to maintain a majority in parliament because an incumbent President is constitutionally able to appoint eight members of parliament (Gould, 2007).

The lost seats in the 2006 election prompted the Mwanawasa administration to cancel all development agreements through the Mines and Minerals Act of 2008. It then proceeded to raise the corporate tax from 25 percent to 35 percent. The mineral royalty was raised from 0.6 percent to 3 percent. A windfall tax was also introduced and this was triggered by pressure at various levels. It was hoped that these measures would bring in revenue of $415 million in 2008 (Lungu, 2009). However, these changes rendered mining operations more onerous. The effective tax rates for high cost mines ranged between 64 and 96 percent and for low cost mines between 57 and 64 percent. This was clearly above the intended rate of 47 percent (Musokotwane, 2009).

Because these changes rendered operations more onerous, the mining companies resisted these measures. It was noted by the Minister of Finance that the windfall tax had

some major flaws and was very weak in its design. As a result, the effective tax rate was higher than that intended. In 2009, world copper prices fell as a result of the effects of the global financial crisis (Mwambwa, Griffiths and Kahler, 2010). Consequently, the mining companies announced that there would be major job losses. This compelled the Banda administration, which had come to power in a presidential bye-election in 2008, to announce several concessions to the mining sector, including abandoning the windfall tax. This is evidence of Zambia as the host state retreating from its resource nationalist position to ensure that the advantages of foreign direct investment would continue to exist.

This changed, however, when the administration of Michael Sata came into power in 2011. Sata's administration introduced various taxes to the mining sector. Of note was the increase in mineral royalties to 20 percent. As a result, Barrick Gold, which owned Lumwana Mine, announced that it would suspend its operations. President Edgar Lungu came to power in the 2015 presidential bye-election. In March 2015, he announced that the mineral royalties increase would be revisited and revoked. This was subsequent to mining companies threatening a suspension of projects due to high taxes (Lusaka Times, 2015). Royalties were thus revised to 9 percent and corporate tax to 30 percent (England, 2015).

4. Conclusion and Policy Recommendations

This article has demonstrated the cyclical nature of resource nationalism, manifested in Zambia's copper industry. The copper mining industry went from being in the hands of private foreign corporations to being nationalised. Subsequently, the industry has been privatised again. However, since privatisation copper prices have appreciated and various attempts have been made by successive governments to maximise the benefits of the high copper prices. This has led to various taxes being introduced and then withdrawn again, once the mining companies would threaten to reduce production, which would mean job cuts.

There appears to be a clash between the government of Zambia's legitimate public functions, on the one hand, and the investor's legitimate expectations, on the other. As a means of ensuring cooperation between the host state and the investor there needs to be constant dialogue. One way of ensuring this is by insisting on the insertion of renegotiation clauses in development agreements between the government and foreign mining companies. Such clauses define, inter alia, the events that would trigger renegotiation, the outcome of these renegotiations, an obligation to renegotiate in good faith and the way forward, should renegotiation fail.

Such clauses are more flexible than the tax stability clauses in the development agreements. It has been noted that host states seldom abide by contracts that are too rigid (Asante, 1979). For this reason flexibility is needed and this could be ensured through the insertion of renegotiation clauses. In that way, when natural resource prices increase it would place a legal obligation on both the host state and the investor to come back to the renegotiation table, as and when circumstances would dictate this. They are then able to

create mutually beneficial solutions and through this a long term relationship can be fostered. In this manner both the legitimate public functions of the host state and the legitimate expectations of the investor would be protected.

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Homegrown or Imported? Frugal Innovation and Local Economic Development in Zambia

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Innovation and entrepreneurship have the potential to stimulate economic growth. Yet it remains unclear whether top-down or bottom-up innovations are more likely to lead to local economic development. By looking at three cases of frugal innovation on the Zambian Copperbelt, in the spheres of housing, water and energy, it will be argued that polycentric innovation (which connects local and international actors) is most likely to generate inclusive development. Yet even a polycentric approach does not guarantee desired outcomes, as innovation remains context specific.

1. Introduction

> In Zambia, entrepreneurship can be a challenge in terms of identifying and supporting viable innovations and sourcing capital to invest in these untested but potentially worthwhile ideas. As a consequence, many brilliant ideas never reach the stage of commercial production. (http://www.saisprogramme.com/financing-options-for-innovative-and-technology-oriented-startups/ Accessed 20 April 2015).

Zambia does certainly not lack innovative potential or entrepreneurship. In his weekly columns "Innovation made in Zambia" in the Daily Mail in 2011 Dr. Evans Wala Chabala highlighted innovative ideas developed in Zambia, such as a water tank for hand washing after *nshima* eating, devised by Enoch Banda and now found in numerous market stalls (https://www.youtube.com/watch?v=TtMD6CwurfE Accessed 20 April 2015). Similarly, in "Inventors of Zambia" Victor Crutchley, inspired by ideas of Appropriate Technology prevalent in the 1980s, underscored rural technology and entrepreneurship. Ranging from relatively simple wire toys to highly complex hydroelectricity schemes, these innovations breathe creativity (Crutchley, 1996). Even though Zambian entrepreneurs have a good understanding of local markets and contextual constraints, they struggle to become involved in wider technology networks which will integrate them in broader international innovation systems (Pedersen & McCormick, 1999; Cozzens & Sutz, 2014).[1] Innovative ideas rarely reach a larger scale, becoming economically self-sufficient or profit generating and much of

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[1] This problem applies to African entrepreneurs in general, although in some countries such as Kenya, Ghana and South Africa, this has begun to change recently (see: Gewald, Leliveld & Peša, 2012).

Zambia's innovation consequently remains "below the radar" (Clark et al., 2009). Most innovation in African countries is still capital intensive and research and development (R&D) led, implemented by large multinationals in a top-down manner, providing little scope for local participation (Kaplinsky, 2011; Chataway, Hanlin & Kaplinsky, 2014). Such 'innovations that emerge from formal scientific, technological and productive structures and organizations rarely address the needs of the poor' (Santiago, 2014, p. 1). Fertilisers tested in a laboratory have proven of only limited use to smallholder farmers in rural Zambia, for example. Nonetheless, academics, businessmen and policymakers are increasingly linking innovation and entrepreneurship to economic growth (Wolf 2007; Roxburgh et al., 2010; UNECA 2015). Whether top-down or bottom-up innovations are better able to stimulate local economic development remains a hotly contested issue (George, McGahan & Prabhu, 2012; Chataway, Hanlin & Kaplinsky, 2014; Papaioannou, 2014). In recent years, "frugal innovation" has emerged as an alternative polycentric innovation pathway, connecting local and international entrepreneurs. Frugal innovation claims to provide more scope for local initiative in the production, marketing and use of innovations, whilst facilitating collaboration with international partners to enable innovations to reach scale and become economically viable (Radjou & Prabhu, 2014; Zeschky, Winterhalter & Gassmann, 2014). Can frugal innovation truly provide a bridge between homegrown and imported innovations and can it thereby contribute to more equitable and sustainable patterns of economic growth in Zambia?

Already in the 1980s, the Appropriate Technology movement aimed to produce small-scale and labour-intensive technologies, suitable for a local context. Despite the successes of some such technologies, they failed to disrupt dominant patterns of technological development, which continued to revolve around formal R&D in multinationals (Kaplinsky, 2011). In a similar manner, frugal innovation aims to provide more scope for local African innovation and entrepreneurship than previous forms of top-down innovation and technology (Bhatti, 2012). Can frugal innovation indeed contribute to local economic development in Zambia? This paper will first give a tentative definition and literature review of frugal innovation, after which it will elaborate on cases of innovation in housing, water and energy on the Zambian Copperbelt. Are these frugal innovations locally adapted and does this affect their potential to bring about "inclusive development"?

2. Frugal Innovation: Towards a Definition

Frugal innovation can be defined as the (re)design and/or stripping of products, services or systems to make them affordable for low-income customers without sacrificing user value (Peša, 2014). Since *The Economist* placed frugal innovation in the spotlight in 2010, academic and practitioner attention for the phenomenon has surged (Radjou & Prabhu, 2014). A range of new products has resulted, from low-cost ultrasound devices, to mobile money services (M-PESA in Kenya and Zoona in Zambia) and affordable solar energy sources

(such as Sun King Pro). Frugal innovation aims to take customer needs as a vantage point and is geared towards alleviating the institutional and resource constraints of low-income customers (Zeschky, Widenmayer & Gassmann, 2011; Papaioannou, 2014). Because it involves the entire innovation cycle, from idea generation to production, marketing and consumption, frugal innovation connects various actors and forms of innovation, from formal R&D in large multinationals, to bottom-up innovation and indigenous knowledge in the informal sector (Peša, 2014). Being a polycentric innovation process, frugal innovation has the potential to play a role in creating more equitable and sustainable forms of economic growth and inclusive development (Bhatti, 2012). Polycentric innovation entails 'networking international talent, capital, and ideas to meet global demand for new products and services', seizing local opportunities through creative synergies on an international scale (Radjou, 2009a & 2009b). More so than conventional types of innovation and technology networks, frugal innovation may allow the incorporation of Africa's producers and consumers in the design, production, marketing and distribution of products and services (Chataway, Hanlin & Kaplinsky, 2014). Does frugal innovation indeed offer scope for Zambian producers and consumers to more equitably participate in innovation value chains? Are frugal innovations locally produced and do they consequently have beneficial effects, or do they continue to be imported with little multiplier effects? A first attempt to address these questions empirically will be made below.

3. Housing, Water and Energy on the Zambian Copperbelt

Instead of focusing on the usual suspects of frugal innovation, namely fast moving consumer goods and financial services (Radjou & Prabhu, 2014), frugal innovation in the spheres of housing, water and energy in Kitwe, on the Zambian Copperbelt, deserves attention. These sectors touch upon daily needs and are crucial to understanding local economic development, because of their large customer base (Myers, 2011). Three cases of frugal innovation in these spheres will be analysed, namely water kiosks managed by the Nkana Water and Sewerage Company (NWSC); a low-cost housing scheme run by the Zambia Homeless and Poor People's Federation (Federation); and sawdust pellets combined with micro gasifying cook stoves.[2] These three cases of frugal innovation have been designed and adapted to meet customer requirements and to alleviate local resource constraints, but can they be labelled as successful examples of polycentric, homegrown innovation, which contributes to local economic development in Kitwe?

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[2] Research for this paper was carried out from September-November 2014. In total, over 50 interviews have been conducted with company officials, managers and customers. Where relevant, written documentation has been consulted to back up the interview data. I thank Mrs. Maria Kankondo and Mrs. Lyness Mumba Lubemba for their assistance with the interviews and the interviewees for their time, cooperation and insights.

3.1 NWSC Water Kiosks

The establishment of water kiosks resulted from the desire to provide low-cost water to previously unserved customers in peri-urban areas (Robinson, 2002; Self, 2010). Whereas Kitwe's formal residential areas enjoy individual household water connections, peri-urban areas are less regularly connected to the main water lines or lack connections at all (Mutale, 2004; Kazimbaya-Senkwe & Guy, 2007). Therefore, the commercial utility, NWSC, decided to construct its first kiosk in Kitwe in 2001 and since then 135 kiosks have been built. Because water kiosks serve 1000 households, they are much cheaper to construct and maintain than investing in individual household connections (NWASCO, 2013; Interview with Mr. Chenshe 10 October 2014). At minimal costs to NWSC, this frugal innovation has the potential to expand water coverage dramatically. Community consultations accompanied the process of kiosk construction. Kiosk design, location and management were discussed with local representatives, whilst NWSC officials engaged in sensitisation and drama shows to stimulate kiosk use (Interview with Mrs. Chiwala 10 October 2014). The kiosk manager in Ipusukilo linked this participatory approach to enhanced kiosk use, recounting that a kiosk relocation had induced an increased number of users (Interview with Mr. Kosamu 16 October 2014). Nonetheless, kiosks continue to be plagued by numerous difficulties. Users fear barenness after drinking kiosk water, long distance to the kiosk prevents daily use and consequently most kiosks receive only a handful of customers a day instead of the envisaged thousand (Interview with Dr. Malama 21 October 2014; Self, 2010). Despite elaborate consultations and the benevolent aim to provide water to low-income customers, kiosks have not reached their full potential and are not successfully serving targeted customers (Robinson, 2002). Customers perceive water kiosks as a top-down innovation introduced by NWSC managers. Because decision-making about kiosk placement is not transparent, customers are left wondering why kiosks are established in one area but not in another (Interview with Mrs. Mwaba 24 October 2014). Consequently, there is a lack of community ownership of kiosks. This results in water wastage, vandalism and eventually kiosk malfunctioning. Shallow wells and illegal tap connections continue to challenge kiosk use, even though water from these sources is not regulated and can be hazardous to health (Interview with Mrs. Margaret 22 October 2014). These factors hamper the potential of water kiosks to contribute to local economic development.

3.2 Federation Low-Cost Housing

In an attempt to remedy the deficiency of low-cost housing in Kitwe, the Federation has formed savings schemes to support housing construction. The Federation is a grassroots savings scheme of the urban poor, supported by the NGO People's Process on Housing and Poverty in Zambia, which is part of a larger organisation, Slum Dwellers International (SDI, 2014). Through cross-border trade from Zimbabwe the idea to found small-scale savings

groups spread to Zambia, where it found ready acceptance among female traders in Livingstone (Interview with Mrs. Chirwa and Mr. Ncube 2 October 2014). Poor urban residents come together in savings groups, where they invest a small sum of money on a daily basis (for example 1 Kwacha), with which they can undertake construction and other productive activities. Through training, the Federation has enabled female headed households to engage in low-cost housing construction using innovative building materials (hydraform blocks and ecosan toilets) independently (Interview with Kawama Federation Members 9 October 2014). Beneficiaries can also take out loans to engage in other economic activities, such as vegetable gardening, tailoring or small-scale trade (Interview with Mrs. Agness and Mrs. Catherine 28 October 2014). The individual savings schemes receive support from the NGO but are not controlled by it, and therein lays their strength. As long as they repay their loans, members are free to decide about fruitful economic activities. The grassroots character of the Federation enables economic empowerment of the beneficiaries, yet it has proven difficult to upscale such schemes (Interview with Mrs. Chirwa and Mr. Ncube 2 October 2014). Although to date 158 houses have been constructed in Kawama,[3] Kitwe, plans to build another 300 houses have been stalled at council level. The Federation requests land at reduced rates and consequently the city council is not eager to dispense its scarce formal land. Moreover, Federation membership remains limited, because outsiders regard the schemes as NGO driven and reject the onerous social obligations of membership (Interview with Mr. George 28 October 2014). Institutional constraints and popular perceptions thus prevent Federation schemes from disrupting existing patterns of housing construction and bringing about profound, lasting social change.

3.3 Sawdust Pellets and Micro Gasifying Cook Stoves

In 2009 an entrepreneur from Luanshya came up with the idea of using sawdust as cooking energy, as an alternative to charcoal and *mbaula* stoves on the Copperbelt (Interview with Mr. Kauti 1 October 2014). Out of this idea a polycentric initiative emerged, resulting in the development and marketing of sawdust pellets and micro gasifying cook stoves. Out of environmental considerations this entrepreneur sought to utilise the piles of sawdust waste, which the mining and timber industries discard daily. He found that sawdust can be converted into cooking energy to replace polluting charcoal. Yet he struggled to turn this innovative idea into a viable business proposition until he received assistance from the Swedish embassy (Interview with Mr. Kauti 1 October 2014; Interview with Mr. Ohlson 3 October 2014). Together with Swedish entrepreneurs, he has since 2011 been working to develop the production and marketing of sawdust pellets and improved cook stoves in Kitwe. Whereas the Swedes brought technical and business knowledge, the Zambian entrepreneur contributed the initial idea and intimate customer knowledge, which together ensured

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[3] Kawama is a low-income high-density area in the northern part of Kitwe.

business viability. Furthermore, the company holds regular customer surveys and support meetings, so as to guarantee product uptake (Interview Mr. Ohlson 3 October 2014).

Yet even with this polycentric approach, sales figures have experienced marked fluctuations. Marketing has proved difficult, requiring reliable resellers, follow-up visits and customer support (Interview with Mr. Kauti 1 October 2014). The practice of cooking on sawdust pellets differs so radically from the charcoal to which customers are used, that most households hesitate to switch over from one fuel to another. Consumers state that they are 'just too much used to charcoal' (Interview with Mrs. Mwaba 24 October 2014). Although using sawdust pellets in combination with micro gasifying stoves can lead to a 40 percent reduction on fuel expenditure, when compared to charcoal and *mbaula*, the pellets and stoves are not reaching the low-income households for which they had been intended (Interview with Mr. Ohlson 27 October 2014). Instead, sawdust pellets are used as a back-up option by relatively wealthy customers,[4] in case of electricity blackouts. The sawdust pellets and micro gasifying cook stoves are now mostly used by institutions such as schools, hospitals and restaurants (Interview with cook at Olympic Stadium Lusaka 20 November 2014). Because these institutions use the stoves intensively, there are convincing cost reductions in fuel expenditure. This has been an unexpected outcome of the introduction of a frugal innovation. Even though this is a local idea, sawdust pellets are perceived as being foreign products, introduced by international business and donors (Interview in St. Anthony 7 November 2014).[5] This example illustrates that even a local entrepreneur can fail to fully understand the dynamics of customer demand. The polycentric approach, advocated by frugal innovation, does thus not always result in viable innovations which further local economic development in a straightforward manner. Rather, the innovation pathway is unpredictable, depending on specific local circumstances and dynamics.

4. Innovations and Local Economic Development

The three cases of frugal innovation discussed above are all polycentric, subject to both local and international dynamics (Radjou, 2009a). The Federation scheme, which resulted from local grassroots organisation, enjoys international NGO backing. On the other hand, more internationally originating frugal innovations, such as the micro gasifying cook stoves, have been locally adapted, even though this adaptation has not always been successful. So on the basis of these three cases, can it be claimed that either homegrown or imported innovations hold more potential for local economic development? It is doubtful whether either top-down

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[4] Wealthier consumers are also more educated and aware about the environmental benefits of sawdust pellets than low-income consumers.

[5] Paradoxically, sawdust pellets are referred to as *malasha,* which is the word for charcoal in Bemba. This points to a local appropriation of the sawdust pellets and their association with familiar charcoal. Micro gasifying cook stoves are perceived as fundamentally foreign – they are predominantly imported – and are always referred to using the English word stove, never *mbaula*. Charcoal and *mbaula* producers are the main competitors to sawdust pellets and micro gasifying cook stoves and prevent their massive market uptake.

or bottom-up innovations will provide the silver bullet for Zambia's development (Chataway, Hanlin & Kaplinsky, 2014). It should be questioned whether 'ideas that emerge from and integrate with the local context have better chances of adoption or success than those planned elsewhere and subsequently imported into a resource-limited setting' (George, McGahan & Prabhu, 2012, p. 664). A mixture of innovation types is needed, the polycentric approach advocated by frugal innovation. Whereas innovations in the informal sector have struggled to be upscaled, formal innovations are not always locally accepted. In all likelihood, 'both top-down and bottom-up processes are crucial in the sourcing and driving forward of inclusive innovation initiatives' (George, McGahan & Prabhu, 2012, p. 677). In the case of polycentric frugal innovation, top-down and bottom-up innovation processes are in dialogue and this offers prospects for more inclusive types of innovation (Radjou, 2009b). Frugal innovation seeks to combine local ideas and knowledge with international expertise to develop low-cost products that enjoy maximum user-value. Yet even the polycentric approach remains a matter of trial and error, as the case of water kiosks illustrates (Radjou & Prabhu, 2014). Nonetheless, frugal innovation does show marked potential, because it can help to formalise grassroots ideas and initiatives, making them commercially viable whilst safeguarding local acceptability (Zeschky, Winterhalter & Gassmann, 2014). Innovation, being subject to local specificity, should be adaptable. What works in one area will not necessarily work in another. Also, preferences can change over time, requiring continual adaptations to successful innovations. All this underlines the need for polycentric frugal innovation, as this can connect local innovations and demand to international resources and knowledge, enabling a flexible solution to resource and institutional constraints (Radjou, 2009a).

5. Conclusion

Innovation and entrepreneurship are increasingly linked to economic growth and development. Consequently, innovation and policies which foster innovative solutions have received much attention among Zambian policymakers:

> THE United Nations (UN) family has pledged to support Zambia develop and build innovative and effective industrial policy institutions that will enhance industrialisation and structural transformation (…) which would be a major vehicle to create decent jobs, reduce poverty and narrow inequalities. (Times of Lusaka 4 July 2014 http://www.lusakatimes.com/2014/07/04/un-help-zambia-develop-build-innovative-effective-industrial-policy-institutions/ Accessed 20 April 2015).

Yet policymakers do not agree whether innovation can more usefully be stimulated by supporting formal R&D among multinationals, or whether local entrepreneurship should be promoted. Frugal innovation, with its emphasis on polycentric innovation networks,

suggests that neither imported top-down technology nor homegrown bottom-up innovation will provide the solution for Zambia's economic development. Instead, various actors should work together to produce locally attuned innovations which can be marketed using the networks of international players. The examples dealt with here, however, equally show that even carefully crafted polycentric innovation will not always succeed. The number of innovations which become successful is small, but nonetheless, by adopting an iterative process of product development and integrating marketing, distribution and consumption into the innovation cycle, it becomes more likely that developed products and services will meet a need and contribute to sustainable and inclusive development (Radjou & Prabhu, 2014). Frugal innovation and its polycentric approach attempt to combine existing best practices to produce affordable goods and services, whilst maximising user value and the potential for local economic development.

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The Impact of Labour Productivity on Economic Growth: The Case of Mauritius and South Africa

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This study explores the impact of labour productivity on economic growth in Mauritius and South Africa. We establish that investments in physical capital have a positive effect on labour productivity and by implication on economic performance. Labour employment in industry is counterproductive, while the cumulative effect of new technologies on labour productivity is negligible in the three-year intervals. It is the initial stock and subsequent accumulation of human capital that stimulates faster output growth in both countries.

1. Introduction

Several studies demonstrate the positive effects of labour productivity on economic growth and development (Campbell, 2009; Kazuya, 2009; Palle et al., 1995; Wu, 2013; Chan et al., 1987). Labour productivity is accorded prominence in standard growth accounting models following Solow (1956). Mankiw, Romer and Weil (1992) essentially validated the standard Solow model and argued for an extended model that includes both physical capital and human capital. Recent studies such as Hall and Jones (1999), Prescott (1998), Ahmad et al. (2010) and Fosse et al. (2014) adopt more flexible growth accounting functional forms to measure the impact of labour productivity on economic growth.

Most studies build their argument on appropriate specifications of structural equations for measuring total factor productivity (TFP) and emphasise the role of technology in explaining growth. In this regard, countries can increase output either through more labour effort or through increases in labour productivity. As labour force growth slows and unemployment remains at relatively low levels, countries must increasingly look to productivity enhancements to maintain high rates of output and income growth (Highfill, 2002). However, no studies specifically analysed countries at similar levels of industrial development but with huge differences in terms of labour endowments.

In this paper, we argue that the divergence in gross domestic product (GDP) growth of countries such as Mauritius and South Africa, which are at the same level of industrial

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[*] The opinions expressed in this paper are those of the authors and do not necessarily reflect the views of the Economic Commission for Africa.

development, can be explained by differences in labour endowments and labour productivity. Although manufacturing performance in the two countries has been similar over the years (Figure 1), the economies have different labour employment indicators. We focus on the manufacturing sector because it is a good proxy for levels of industrialisation and also because of the sector's high contribution to gross domestic product in both countries.

Figure 1: Manufacturing Value Added (% of GDP) for Mauritius and South Africa
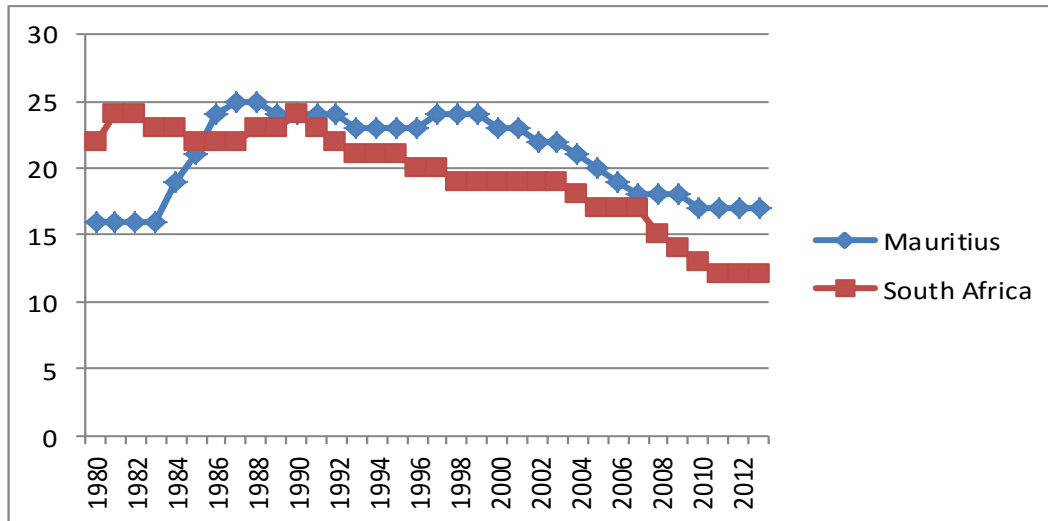
Source: World Bank Database

We also argue that the difference in unemployment rates between the two countries is not just structural, but also a reflection of differences in labour productivity. South Africa, with a nominal GDP of $349.8 billion in 2014, is the second biggest economy in Africa after Nigeria, but has one of the highest unemployment rates, hovering around 25 percent of the total population and over 50 percent for youth aged between 15-24 years since 2010. In contrast, Mauritius, which relies mainly on tourism and services, recorded a GDP of $12.6 billion in 2014, with a total unemployment rate of about 8 percent and youth unemployment ranging between 21 and 23 percent since 2010 (World Development Indicators, 2013).

The World Bank (2011) observed from trend data that labour productivity in South Africa was driven predominantly by rising capital intensity, but admitted that a comprehensive assessment was needed to render support to this observation. While some studies argue that higher technology input (capital intensity) leads to higher productivity, we argue that labour productivity is a consequence of investment in human capital that translates into better skills and usage of technology for productive use. This is consistent with arguments by other policy analysts that if African countries are to sustain high economic growth and lift millions of people out of poverty, then they have to make deliberate choices to invest in their abundant human capital through education, training and retooling

to enhance labour productivity and, by implication, raise economic growth (ECA and AU, 2013; ECA and AU, 2014).

Structural changes in South Africa may be more important in explaining unemployment. For instance, it is argued for South Africa that the demand for unskilled labour declined in the agricultural and mining sectors while there was a concurrent increase in the supply of less skilled labour, mostly of African women, into the labour market (Banerjee et al., 2008). Furthermore, the structural shift of skill-biased technical change in South Africa amplifies the unemployment consequences of the increase in supply of unskilled workers. While Mauritius appears to be immune to structural unemployment, its unemployment rate may be driven by business cycles or global trends, affecting mainly tourism and manufacturing. Specialised labour skills and high productivity are needed for countries to maintain international competitiveness. A number of policy levers and strategies were employed by both countries to boost labour productivity as a platform for economic growth. Mauritius aims at becoming a knowledge economy through increased investments in human capital. South Africa uses fiscal incentives, among others to encourage firms to offer training and reskilling of their employees to raise productivity. In addition, both countries have instituted broad economic and labour reforms to promote labour productivity.

It is therefore imperative to investigate, with the support of empirical data, to what extent labour productivity has contributed to economic growth in the two countries. However, long-run growth policymakers in both South Africa and Mauritius would need to understand the consequence of the cumulative skills gap and mismatch, as the economies experience industry-led growth. The present paper effectively demonstrates the link between labour productivity and economic growth on the one hand, and between labour productivity and unemployment on the other.

2. The Manufacturing Sector in Mauritius and South Africa

The structure of the Mauritian economy has significantly changed in recent years, from a heavy focus on agriculture to the services sector and industry. The share of the agriculture, forestry and fishing sector in the GDP has dropped. Manufacturing has also experienced a fall but was still above many comparator countries in Southern Africa. In fact, manufacturing continues to play a prominent role in the Mauritian economy, contributing an average of 20.8 percent to GDP between 1980 and 2013 (Table 1 and Figure 1). The sector comprises mainly production of sugar, food (excluding sugar), textile and others for export to the European Union (EU) and other markets. However, it is the services sector that dominates the economy, contributing 64 percent to GDP in 2000 and 72.2 percent in 2013.

Table 1: Percentage Contributions of Selected Sectors to Mauritian GDP

Sector	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture, hunting, forestry and fishing	5.6	4.8	4.3	4.3	3.6	3.6	3.4	3.4
Mining and quarrying	0.1	0.0	0.0	0.0	0.4	0.4	0.3	0.3
Manufacture	20.0	19.8	20.1	19.5	17.0	16.9	16.7	16.5
Sugar	0.9	0.7	0.6	0.5	0.3	0.4	0.3	0.3
Food (excluding sugar)	5.6	5.9	7.1	7.2	6.0	6.0	6.6	6.5
Textile	6.6	0.5	5.4	4.9	5.3	5.1	4.9	4.8
Other	7.0	6.7	7.0	7.0	5.4	5.4	4.9	4.9

Source: Mauritian Bureau of Statistics, 2013

The country places a high premium on high-tech manufacturing geared towards both domestic and export markets. More specifically, the Mauritian Government through the 2014 budget measures introduced an investment tax credit scheme to spur high-tech manufacturing. From 2007 to 2013, labour productivity in the manufacturing sector registered an average annual growth rate of 3.3 percent – consistent with the improvement in labour productivity index in recent years from 100.0 in 2007 to 121.8 in 2013 (Republic of Mauritius, 2013).

The manufacturing sector in South Africa continued to show resilience, contributing an average of 19.4 percent to GDP between 1980 and 2013 (Figure 2). Umjwali (2012) noted that South African manufacturing increased in dollar terms from $30.8 billion in 1990 to $44.4 billion in 2010 (in constant 2005 prices), but South Africa's share of world manufacturing output decreased from 0.61 percent in 1990 to 0.5 percent in 2010.

Table 2: Shares of GDP – South African Economy, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Agriculture, value added (% of GDP)	3	3	3	3	3	3	3	2	3	2
Services, etc., value added (% of GDP)	66	66	66	66	65	66	67	68	69	70
Industry, value added (% of GDP)	31	31	31	31	32	31	30	30	28	28
Manufacturing, value added (% of GDP)	19	18	17	17	17	15	14	13	12	12

Chemicals (% of value added in manufacturing)	6	6	7	7	6	7	7			
Food, beverages and tobacco (% of value added in manufacturing)	16	17	18	18	19	20	22			
Textiles and clothing (% of value added in manufacturing)	5	4	4	4	3	3	2			
Machinery and transport equipment (% of value added in manufacturing)	14	15	15	14	13	14	14			
Other manufacturing (% of value added in manufacturing)	59	58	56	58	59	56	55			

Source: World Development Indicators

Manufacturing contribution to GDP in South Africa consistently declined between 2004 and 2013 (Table 2). However, there were wide variations among individual sectors that constitute the manufacturing sector in the country. For example, the value added of chemicals to manufacturing was 6 percent in 2004 before marginally rising to 7 percent in 2010. Food, beverages and tobacco's value added to manufacturing was 16 percent in 2004 and then jumped to 22 percent in 2010. Textiles and clothing's value contribution to manufacturing was 5 percent in 2004 before dipping to 2 percent in 2010. Machinery and transport provided a value to manufacturing of 14 percent in 2004 and six years later in 2010 it was still at 14 percent. Other manufacturing activities' contribution to overall manufacturing was a notable 59 percent in 2004 before registering a decline of 4 percent to 55 percent in 2010. However, the services and industry sectors took a lion's share in terms of contribution to GDP between 2004 and 2013. Notably, services contributed 66 percent to GDP in 2004 before peaking at 70 percent in 2013.

Generally, labour productivity has been on the rise in South Africa since 2000, save for 2008 when the economy was adversely affected by the pass-through effects of the global financial and economic crises (Figure 2). Several factors account for rising labour productivity, including job shedding in industry, as the economy opened up to global trade at the end of apartheid, and differences in the rate of increase in employment which is slower than overall output growth. The country has also invested heavily in education and skills development to reverse the legacy of apartheid education policies, which are said to be responsible for the diverse unemployment rates across various race groups, with whites having an average unemployment rate of close to 5 percent, compared to the national average of around 25 percent, whilst that of blacks/Africans is approximately 30 percent (IDC, 2013).

Figure 2: Labour Productivity and Nominal Unit Labour Cost in South Africa (2000-2011)
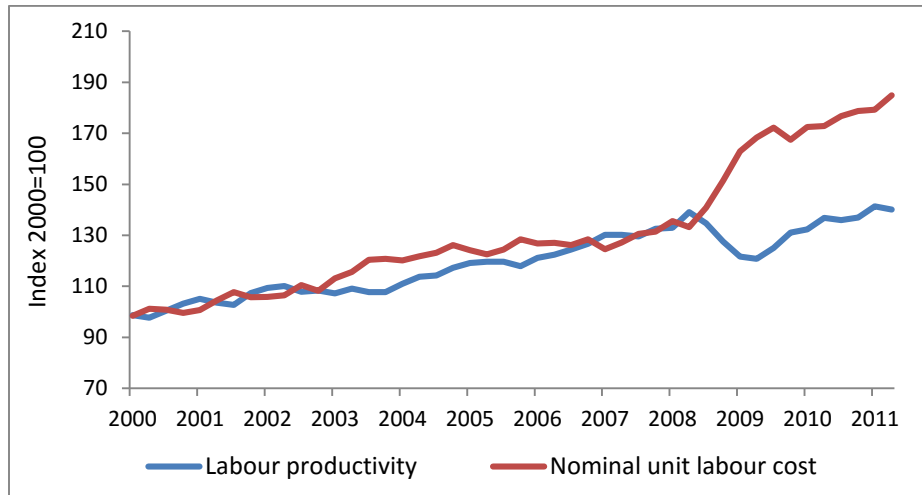
Source: Adapted from Umjwali (2012), using data from the SA Reserve Bank

3. Literature on Labour Productivity and Economic Growth

Several studies have attempted to explain sources of growth and determinants of labour productivity in developing countries. Ahmed (2011) analysed the effects of labour productivity, capital deepening and total factor productivity in ASEAN5 (Malaysia, Indonesia, Philippines, Singapore and Thailand) plus 3 (China, Japan and South Korea) and concluded that there was a slight contribution of total factor productivity (TFP) intensity to economic growth.[6] He noted that capital intensity had a strong and significant impact on labour productivity in the concerned countries. Wu (2013) used output and employment indicators for 33 industries in China over a period of 21 years and noted that the Chinese economy achieved nearly a fourfold growth in labour productivity averaging 6.6 percent per annum. These findings are consistent with Bosworth and Collins (2007), who earlier established that China's high growth performance is attributable to a very high rate of capital accumulation and from gains in TFP, while that of India is as a result of more substantial gains in TFP relative to capital accumulation.

Fedderke and Bogetic (2009) explored whether infrastructure investment is an influential factor of economic growth, using a panel of South African manufacturing sectors over the 1970-2000 period. They concluded that infrastructure had both a direct impact on output per worker and an indirect impact via total factor productivity. Of the 19 categories of infrastructure, road infrastructure has a very strong impact on labour productivity. However, they also found that the skills ratio of manufacturing employment was consistently negative and significant. They cited measurement problems for the human capital input as a

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[6] ASEAN is the Association of Southeast Asian Nations consisting of Brunei Darussalam, Cambodia Indonesia, Laos PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.

probable explanation, but also highlighted the history of underinvestment in human capital as another explanation, implying that industries with a strong human capital requirement have not been able to hire the required workers.

Svirydzenka and Petri (2014) used a standard growth accounting framework to assess drivers of growth in Mauritius over the past 60 years, and used results to project growth until 2030. Their findings include a declining contribution of labour, with capital and TFP playing a dominant role. However, the contribution of labour improves with investment in education over the assessment period. They also noted that labour regulations were a constraint to job creation and structural mobility of labour across sectors. They recommended upgrading and expanding of the country's capital stock (infrastructure) to improve competitiveness and for further increases in economic growth through deregulation of labour laws to attract high skilled foreign labour, reforms of pensions and social benefits, and policies to increase fertility.

Ding and Knight (2009) used a panel of 146 countries, including China, to examine the extent to which the rapid growth of China and the huge gap in the growth rate between China and other countries can be explained by the augmented Solow model. They argued that human capital can raise the individual productivity of workers and improve adaptability, allocative efficiency and the technical level of an economy. For instance, Ding and Knight (2009) noted that the average years of schooling in China over age 15 (5.6 years) were higher than that of South Asia (3.1 years) and sub-Saharan Africa (2.9 years). They also found that China's relative success in economic growth is due to high physical capital investment, conditional convergence gain, dramatic changes in the structure of employment and output and low population growth.

Studies in developed countries draw similar conclusions, but have superior data for analysing the link between technology, innovation and productivity. For example, Griffith et al. (2006) applied a structural model that describes the link between R&D expenditure, innovation output and productivity for manufacturing firms in France, Germany, Spain and the UK. The model was used to explain whether EU's poor performance lies in low investment in R&D or elsewhere. They found heterogeneity between countries, but the determinants of R&D were similar. Comparable processes drive firm decisions to engage in R&D, government funding plays an important role in all countries, with national funding having the greatest impact, and firms that operate in international markets are more likely to engage in formal R&D, as are firms in industries where greater use is made of formal or strategic methods to protect innovation. They concluded that product innovators devote more effort to R&D and are stimulated by customers while process innovators have higher investment per worker with suppliers providing valuable information.

Thus, the literature and empirical evidence strongly suggest that labour productivity plays a significant role in the determination of economic growth across countries and is worth investigating further. Distinctively, endogenous growth models take capital as an input in production technology for innovation and long-run differences in productivity are

seen as endogenous, while growth accounting approaches focus on the role of technological efficiency in determining economic growth. In our study we consider technological change and investment as inseparable, hence the need to incorporate structural change variables in the augmented Solow model to capture the role of both factor accumulation and productivity growth in international variations on output growth.

4. Estimation Method and Results

There are various ways of specifying a growth accounting framework, depending on data and estimation methods available. The most common approach based on the Solow model (neoclassical framework) is a standard Cobb-Douglas production function relating output (Y) to capital (K) and labour (Y), assuming constant returns to scale.

$$Y = AK^{\propto}L^{1-\propto} \tag{1}$$

Given this specification, total factor productivity (A) is expressed as a residual (exogenous) since the only data available are for output, labour and capital. Thus the change in output is decomposed as follows:

$$\frac{dY}{Y} = \frac{dA}{A} + \propto \frac{dK}{K} + (1-\propto)\frac{dL}{L} \tag{2}$$

The basic Solow model does not adequately explain the sources of growth as it only highlights the role of saving and capital accumulation. Alternative specification based on endogenous growth theory focuses on explaining sources of technological progress, and highlights human capital, skills and knowledge as drivers of growth (Arrow, 1962; Romer, 1989). An empirical workhorse representing a compromise between the two approaches is the augmented Solow model which includes both technology and human capital accumulation. In addition, our model is based on a continuous time economy and thus allows us to differentiate the aggregate production function with respect to time, which in turn yields more information than many growth models.

In this paper we followed Ahmed's (2011) estimation procedure, which is based on a standard production relating output to labour, capital and other inputs.[7] The analysis is based on aggregate data obtained from the World Bank World Development Indicators (WDI). The data on working age population (15-64 age group), real GDP, savings, investment and employment shares (for agriculture, industry and services) were obtained from the 2013 edition of WDI.

Our innovation includes estimating a simple regression for each country based on the Solow growth model as presented in equation 1. The results were used to obtain the

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[7] See Appendix 1 for a detailed mathematical specification of the model.

elasticity of output with respect to inputs and exogenous technical progress estimates for each country. We then proceeded to estimate equation 1 in Appendix 1 using a pooled generalised least squares regression, where output per worker is treated as a dependent variable. We assume the unobserved panel-level effects are correlated with the lagged dependent variables, making standard estimators inconsistent.

Our findings (Table 3) suggest that in both Mauritius and South Africa saving, which is a proxy for investment in physical capital, has a strong positive effect on labour productivity and economic growth. This is consistent with both the neoclassical and endogenous growth models. Capital accumulation benefits labour particularly in sectors requiring skilled employees. The effect of exogenous technological progress on the two economies is, however, negative and highly significant. The low coefficient suggests that new technologies not only impact on labour productivity negatively, but also that the rate at which new technologies impact on labour productivity is too slow. Both countries face a labour skills gap that fails to match technology advancement, hence the cumulative effect of exogenous technology on labour productivity is negligible in the three year intervals. In other words, economic growth in the two countries is driven by accumulation of traditional inputs of labour and capital and to some extent, exogenous technical progress, which masks the quality aspects of the traditional inputs, particularly labour productivity.

Our results are comparable to Dao (2014), who found that the growth rate of per capita GDP is linearly dependent on technological progress, gross capital formation, the initial level of output per capita and labour productivity growth, measured as the growth rate of the value added per worker, as well as human capital formation, measured as the growth rate of the average number of years of formal schooling among all persons aged 15 and above. The results are also supported by Felix and Anna-Elizabeth (2013) and Andrew Jia-Yi (2014), who noted strong performance in growth due to intensity in labour productivity.

Table 3: Econometric Results

Dependent variable: Output per worker	Coefficient	Standard error	z	P>|z|
$y_{i,t-1}$(lagged output per worker)	0.918	0.038	24.070	0.000
ln(s) (saving rate)	0.124	0.036	3.450	0.001
$\ln(n + g + \delta)$ (Change in productive capacity represented by growth rate of the labour force, technical progress and depreciation of physical capital)	0.253	0.051	5.000	0.000
$\ln A - lnA_0$ (exogenous technical progress)	-0.027	0.008	-3.210	0.001
Employment in industry (% of the total)	-0.320	0.230	-1.390	0.163

Constant	-0.362	0.306	-1.180	0.237
Wald chi2(5)	4819.54			
Prob> chi2	0.000			
Number of observations	44			

Unlike Ding and Knight (2009), we found a consistent positive relationship between population growth (the labour force in our case) and output per worker. The accumulation of labour force is good for both economies as it raises productivity. For Mauritius, this result renders support to the policy of attracting skilled labour to fill gaps as the country invests in preparing young Mauritians for high-skilled jobs. In the case of South Africa, accumulation of labour is beneficial only moderately, and on sector basis, particularly in manufacturing where the high capital input offsets low labour productivity. Consistent with the Solow model, South African manufacturing depicts a typical positive relationship between output and labour at low levels of capital or technology input before diminishing returns set in. This may not hold in neoclassical models that assume steady state equilibrium, since the relationship between output per worker and population growth is expected to be negative, occasioned by the ease with which new technologies may be diffused within a lower workforce.

Our results are also indicative of structural factors that determine labour productivity. For instance, the simultaneous inclusion of the share of employment in industry proves that a high share of labour employment in industry has a negative impact on the output per worker. Although the variable is not significant, the negative relationship indicates the presence of strong structural issues in the labour market that impact on labour productivity and employment. In the case of South Africa there is a mismatch between specialised skills needed in the labour markets and those being produced by the educational system, thus leading to structural unemployment in the economy, while Mauritius has a fairly high pool of specialised skills needed for its labour market. Thus the study takes note of these fundamental differences, including differences in initial technological endowments, the role of political and economic institutions as drivers of growth and the quality of the labour force.

We also found that a lower value of output in the three year intervals is associated with a lower output per worker and vice versa. This is consistent with the intuitive conclusion above that both countries are not yet at their steady state output and that output per worker drives economic growth. Most importantly, unlike studies that conclude that capital accumulation is an inferior source of growth due to diminishing returns, our results suggest that capital deepening is still important for economic growth in Mauritius and South Africa. In particular, with technology or capital accumulation outstripping human capital

growth rate, it is both the initial stock and the subsequent accumulation of human capital that stimulate faster output growth.

5. Conclusion

This paper aimed to explain the sustained economic growth in Mauritius and South Africa and how labour productivity impacts on economic growth. It also sought to find the probable explanation for the discrepancies in manufacturing and unemployment rates, given that industries in both economies have consistently performed well in recent years.

The growth of the labour force has been positive for general economic growth in both Mauritius and South Africa. We argue, however, that high-quality skilled labour is needed to maintain productivity and economic growth. Although labour productivity has important implications for GDP growth, our findings in this paper suggest that unemployment is a consequence of cumulative skills mismatch as the economies experienced industry-led growth rather than an increase in structural unskilled labour supply. This explains why a high share of employment in industry is detrimental to labour productivity, particularly in South Africa. This implies that both countries should place emphasis not just on keeping unemployment low, but also on skills development efforts to improve labour productivity, particularly in industry.

The quality of labour employment will be important for sustaining growth of productivity. In this context, apprenticeship and reskilling of the labour force through appropriate training to increase productivity is highly recommended in both countries. Unlike many studies that conclude that capital deepening is not very critical to output growth, the findings in this study point to the need to match the level of technological development with skills accumulation. We particularly take note that technological change and investments are inseparable and hence the need to incorporate structural change variables in the augmented Solow model to capture the role of both factor accumulation and productivity growth.

We also recommend sustainable investments in research and development in both countries, with a special focus on upgrading technology to boost labour productivity. More importantly, we conclude that it is both the initial stock and subsequent accumulation of human capital that stimulates faster output growth in both Mauritius and South Africa.

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Appendix 1: The Econometric Method

We follow Ahmed's (2011) estimation procedure and use a standard production as follows:

$$Y_{i,t} = f(K_{i,t}, L_{i,t}, T_{i,t})$$ (1)

Where for country i= 1, 2 (Mauritius and South Africa) in year t= 1990-2010, Y is the GDP adjusted for purchasing power parity and the inputs are: fixed physical capital K, number of persons employed L (or number of hours worked to capture labour productivity) and time T, proxies total factor productivity (TFP) or technological progress of the two countries.

Following Ding and Knight (2009) and ignoring country specific subscripts, the dynamics of a country's growth rate towards the steady state can be expressed as the logged difference of the output per worker at time t and at some initial date:

$$ln\frac{Y_t}{L_t} - ln\frac{Y_0}{L_0} = -\theta ln\frac{Y_0}{L_0} + \theta\frac{\alpha}{1-\alpha}\ln(s) - \theta\ln(n + g + \delta) + \theta\ln A_0 + g_t$$ (2)

Where n is the exogenous growth rate of labour, A is technical progress (growing at rate g), A_0 is the initial level of efficiency, s is the constant fraction of output that is saved and invested, δ is the depreciation rate of physical capital, α is the elasticity of output with respect to physical capital, $\theta = 1 - e^{-\tau t}$, where τ is the rate of convergence measured as $\tau = (1 - \alpha)(n + g + \delta)$.

For estimation, the output per worker at three year intervals beginning with 1990, 1993, 1996, and 2011, can be expressed as in the equation below:

$$\Delta y_{i,t} = (\alpha - 1)y_{i,t-1} + x'_{i,t}\beta + \gamma_t + v_{i,t}$$ (3)

Where $\Delta y_{i,t}$ is the log difference in real GDP per worker over the three year interval, $y_{i,t-1}$ is the logarithm of the real GDP per worker at the beginning of each period, $x_{i,t}$ is the vector of other explanatory variables measured either at the beginning of each period or averaged over the 3-year interval, γ_t is the time dummy reflecting productivity changes common to both countries, and $v_{i,t}$ is the error term.

The vector of other explanatory variables $x_{i,t}$ includes physical capital to account for changes in productive capacity, human capital accumulation to account for employment effects of productivity, and structural change variables to account for differences in economic structure between the two countries. The structural variables are proxied by the industry share of total employment.

Appendix 2: Trends in Output and Inputs in Mauritius

Table 4: Trends in Output and Inputs in Mauritius – Total Economy, 2002-2012

(Index 2007 = 100)

Year	Real output		Labour input		Capital input	
	Index	Growth rate (%)	Index	Growth rate (%)	Index	Growth rate (%)
2002	78.7	1.6	94.2	0.2	77.7	4.8
2003	83.6	6.3	95.3	1.2	82.0	5.6
2004	87.2	4.3	96.3	1.0	86.3	5.2
2005	89.6	2.7	96.8	0.6	90.0	4.3
2006	94.6	5.6	98.4	1.6	94.8	5.4
2007	100.0	5.7	100.0	1.6	100.0	5.5
2008	105.5	5.5	103.7	3.7	105.2	5.2
2009	108.8	3.1	104.2	0.5	111.1	5.7
2010	113.3	4.2	106.6	2.3	116.8	5.1
2011	117.3	3.5	106.9	0.3	122.4	4.8
2012	121.2	3.3	108.6	1.6	127.7	4.3

Average annual growth rate 2002 - 2012	4.4%	1.4%	5.1%

Source: Mauritian Bureau of Statistics

Book Review

Review of "Interventions: A Life in War and Peace", by Kofi A. Annan, Penguin Books, 2012, 383 pp.

This book offers a highly informative account of the life story of the seventh UN Secretary-General, Kofi Atta Annan, the first Sub-Saharan African UN Chief to emerge from within the vast bureaucracy of the United Nations. It is a riveting account narrated by the consummate UN diplomat who served in all the Organisation's major duty stations ranging from Geneva, Switzerland, through Addis Ababa, Ethiopia, to a peacekeeping mission in the hot and dusty Sinai Peninsula, Egypt, and ultimately the 38th Floor of the UN Headquarters, New York.

The book has eight chapters. Annan begins by tracing his youth in a period of immense political tumult in his native Gold Coast (Ghana). At that time Ghana's charismatic leader Kwame Nkrumah was in the vanguard of agitating for self-rule in Ghana and other colonies in sub-Saharan Africa. Annan grew up in a happy and stable middle class family headed by his father, Henry Reginald Annan, 'an Executive of a European trading company, a Freemason, and a devout Anglican in a culture of tribes and ancestral worship.' (Annan, 2012: 15).

The future Secretary-General of the United Nations was to commence his undergraduate studies at the University of Science & Technology in Kumasi, Northern Ghana, where he manifested leadership potential by being elected Vice President of the National Union of Ghanaian Students. He was then granted a scholarship by the Ford Foundation to study economics in an icy cold environment, St Paul College, Macalester, Minnesota, United States. Upon completion of his studies in the US, the young and idealistic Kofi Annan joined the World Health Organization (WHO) at the level of P1, Step 1 (the lowest professional rank in the United Nations).

This book is a UN insider's account that demonstrates the daunting challenges the world body had to surmount in a world that was transiting from the Cold War in the 1990s, into a post-Cold War world of crises and general disorder. Annan shows how there was an exponential increase in peacekeeping operations after the end of the Cold War and how the UN was ill prepared to assume the responsibility of managing the proliferation of peacekeeping missions. Annan deserves credit here, because he graciously acknowledges the ground-breaking work of his predecessor, Secretary-General Dag Hammarskjöld in "inventing" the concept of peacekeeping.

The unenviable task of guiding the UN in this scenario of uncertainty and instability lay on the shoulders of Annan's predecessor, the Egyptian Boutros Boutros-Ghali, who in 1992 on the instruction of the first ever United Nations Security Council Summit of Heads of

State & Government authored an "Agenda for Peace" which 'focused on the civil wars gripping different parts of the world'. (Annan, 2012: 32-3).

Annan tells the story how it should be told, with candour, lucidity and openness. As Assistant Secretary-General and later Under Secretary-General in charge of the Department of Peacekeeping Operations (DPKO), which was hived out of the Office of Special Political Affairs in 1992, Annan provides the reader with a rare insight into the politics of UN peacekeeping missions. The book enumerates in detail the frustrations Annan as a senior bureaucrat at UN Headquarters and his closest aides experienced, when classic peacekeeping as defined by his predecessor Hammarskjöld, failed to halt blood baths in Bosnia, Rwanda and Somalia. Simply put, UN Member States instructed the Secretary-General to keep the peace, when there was no peace to keep.

Chapter Five, entitled, "The Fate of the Continent; Africa's Wars, Africa's Peace", makes very refreshing reading for anyone interested in Africa's political governance. The former UN Chief recalls his attendance of the 1997 Summit of the Organisation of African Unity (OAU) in Harare, Zimbabwe. Thus he observed: 'assembled in the audience were the heads of state and government from all over Africa, many of whom were in that position only by the grace of arms: coup plotters enthroned simply because of the illegitimate power represented in their military uniforms.' (Annan, 2012: 35). In his address to the Summit, Secretary-General Annan said: 'Armies exist to protect national sovereignty, not to train their guns on their own people.' (Annan, 2012: 174-5). He further added: 'Africa can no longer tolerate, and accept as faits accomplis, coups against elected governments and the illegal seizure of power by military cliques, who sometimes act for sectional interests, sometimes simply for their own.' (Annan, 2012: 118-9).

This statement marked a "paradigm shift" in the sense that here was a Secretary-General of the United Nations, the first from sub-Saharan Africa, departing from customary diplomatic platitudes and etiquette, to bluntly urge African leaders to improve political governance in their countries. This candid statement was consistent with Annan's position that sovereignty is not absolute and that the international community has the obligation to intervene in territories where gross violations of human rights are perpetrated by illegitimate regimes under the veil of national sovereignty – "The Responsibility to Protect(R2P)".

In my view, the book has one omission. Annan does not delve into the politics of his election as UN Secretary-General in 1996, after the United States vetoed Boutros-Ghali's bid for re-election. He prudently avoids commenting on the state of his personal relationship with his predecessor. He does however mildly criticise Boutros-Ghali's management style, when he discusses the bureaucratic nightmare of trying to harmonise the vague and imprecisely worded resolutions of the UN Security Council with the operations of the Department for Peacekeeping Operations and the whims of troop contributing countries. Thus Annan writes: 'Compounding this problem was the style of management embraced by

Boutros-Ghali as Secretary-General. He took great pains, in particular to restrict the flow of information to and from the Security Council.' (Annan, 2012: 38).

In the final analysis, Annan succeeded Boutros-Ghali in a field comprising three other Sub-Saharan African candidates: Amara Essy (Cote d'Ivoire), Hamid Al-Gabid (Niger) and Ahmedou Ould Abdallah (Mauritania).

All things considered Annan's brilliant narration of his time in the service of the United Nations reinforces the view that the UN commands universal legitimacy. Notwithstanding its frailties and flaws, the United Nations remains an indispensable and irreplaceable instrument for global peace, development and stability. Hence, "Interventions: A Life in War and Peace" is a "must read" for all those who appreciate and value the work of the UN all over the world.

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Njunga Michael Mulikita
(Dag Hammarskjöld Institute, Copperbelt University)

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