Tanzania's Revealed Comparative Advantage and Structural Transformation

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Abstract

This study examines Tanzania's structural transformation by using the revealed comparative approach using export data for 2001, 2002 and 2011, at the second level of the Harmonised System (HS). Using global data, the study finds that for 2002 and 2011, agricultural products, fish and minerals have comparative advantage over other product groups. For the periods 2001 and 2011 for which Tanzanian data is used, these results are further corroborated; agricultural products dominate Tanzania's comparative advantage for both years, although minerals assume the first rank in 2011. Specifically, 70% of the product groups are agricultural, with the rest being mineral products. These findings suggest that no structural transformation has occurred in the Tanzanian economy over the last decade, and this is supported by the Spearman's Rank Correlation coefficient calculated using the country data. The policy implication is that since Tanzania reveals strong comparative advantage in agriculture and mineral products, it is important to add value to these products for higher export earnings. This means ensuring that products from agriculture, mining and fishery sectors are locally processed to meet international standards. Local processing will also ensure that the much needed jobs are created in the country.

Key words: Comparative advantage; revealed comparative advantage, Tanzania, structural transformation
JEL Classification: F1; F14; N77

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1. Introduction

This paper examines whether there has been any inter-temporal shift in Tanzania's comparative advantage, and what that says about the structural transformation of the economy. This assessment is done based on Tanzania's revealed comparative advantage between 2001/2002 and 2011. The paper finds that Tanzania's revealed comparative advantage has marginally changed over the years, implying only a marginal but statistically insignificant structural transformation has taken place.

Structural transformation refers to "the reallocation of economic activity across three broad sectors (agriculture, manufacturing, and services) that accompanies the process of modern economic growth" (Herrendorf *et al.*, 2013, p.5; McMillan, 2014). The term is often used interchangeably with structural change. An economy's structural transformation is important because it reveals the extent of its economic development, and the degree to which policies put in place to steer the economy are effective. Structural change is also a key driver of economic development (McMillan, 2014). Timmer *et al*. (2012) give a list of four processes that define structural transformation, which are; a decline in the share of agriculture in gross domestic product (GDP) and employment, a rapid urbanization process, a rise in a modern industrial and service sector, and a demographic transition from high births and deaths to low ones (p.1). Structural transformation involves both changing the quantity of output produced in different sectors, and qualitative changes. The increase in quantity produced is what constitutes growth, and qualitative changes involve improvements in the quality of products and composition of goods produced, labour productivity, and allocation of labour across sectors (Timmer *et al*., 2012). For example, suppose that productivity in agriculture increases over time, which fuels setting up of factories to process agricultural products. This can lead to a movement of peasant farmers to seek employment in these factories. A structural transformation would have occurred in that the workers in factories are now wage employees as opposed to peasant farmers relying on subsistence agriculture. Their wages would be used in demanding more industrial products, which in turn propels growth in the industrial sector. This is the sense in which structural change drives poverty reduction.[1]

A country's export content can also reflect its structural transformation. Das (1998) shows that for the newly industrialising economies of Hong Kong, Korea, Singapore and Taiwan, agriculture's contribution to GDP declined from 17% to 4% between 1970 and 1995. Over the same period, the contribution of industry and services increased from 33% to 37% and from 51% to 59%, respectively. This structural transformation was reflected in a change in their export structure. Over roughly the same period, from 1975 to 1996, exports of manufactured products as a percentage of total exports increased from approximately 70% to 90%. It is important to remember that deliberate policies were put in place by the governments of these countries to encourage exports, such as export targets and tax concessions, without forgetting investing in human capital (Forbes and Wield, 2002; Cheng, 1993). Given this connection between the structure of the economy and export content, what can Tanzania's comparative advantage tell us about the extent to which the structure of the economy has changed and transformed over the years?

[1] McMillan (2014) however notes that not all countries that undergo structural change also reduce poverty. This can be the case if structural change occurs into protected or subsidized sector at the expense of other activities, resulting in growth that is not sustained to remove people out of poverty. Thus, the effectiveness of structural change at reducing poverty depends on the extent to which people move from lower into higher productivity activities (p.2).

The paper is structured as follows; after the introduction in Section One, Section Two provides the background and context of the study. Section Three discusses the indicators and causes of structural transformation. Section Four reviews some theoretical models in international economics that deal with comparative advantage and discusses the measures of comparative advantage used in this study. Section Five presents the results of the indices of revealed comparative advantage and discusses the implications on structural transformation of the Tanzanian economy. The Spearman's Rank Correlation coefficients are also calculated to determine the interdependence of the ranks for both global and country data. Section Six concludes the paper and makes some policy recommendations.

2. The Background and Context

In more advanced economies, the agriculture sector does not constitute a significant proportion of their GDP when compared to less developed countries, and when compared to the same economies several decades ago. Literature shows that the importance of the agriculture sector in the developed world has diminished over time (Herrendorf *et al.*, 2013). This increase in industrial output as a contribution to GDP compared to agriculture has also involved qualitative change in peoples' lives as they increasingly have been absorbed in the industrial sector with higher wages. Figure 1 shows that in Tanzania, there was a marginal relative change in the broad sectoral contributions of agriculture, industry and construction, and services between 1998 and 2005 and between 2005 and 2011. On average, agriculture's contribution to GDP fell between the two periods, while the contribution by industry and services marginally increased. Over the entire period, the agriculture sector's contribution GDP fell by about 8%, while the contribution by industry and services increased by approximately 4%. Average annual sectoral growth rates show that agriculture fell by 0.4 percent between the two periods. Industry's average annual growth over the same period marginally rose by 0.1 percent. The average annual growth of services registered a 1.4 percent increase over the same period. Overall economic growth registered healthy growth rate ranging from 6 percent in 1998-2005 to about 7 percent in 2005-2011.[2]

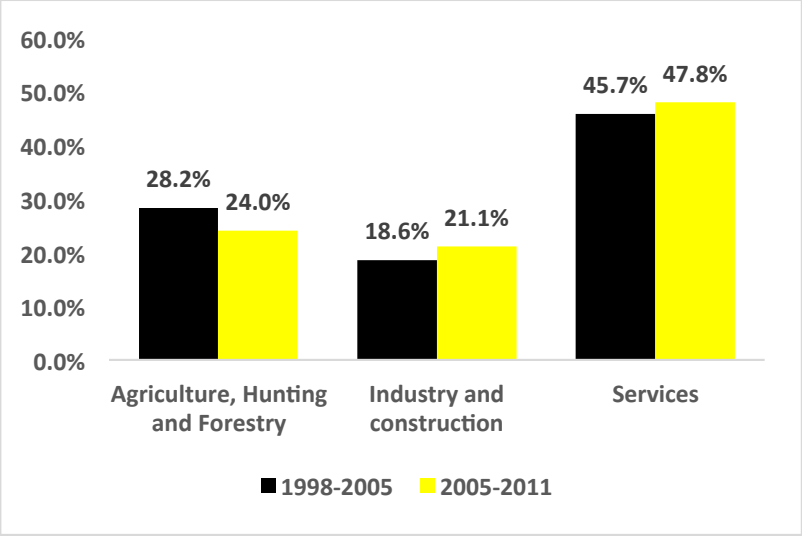
The marginal change in the structure of the economy raises questions regarding how effective policies in place have been to help boost agriculture productivity and raise the contribution of the industrial sector to GDP. More importantly, since the agriculture sector still employs a significant proportion of the labour force while its average percentage contribution to GDP between 2005 and 2011 is under a quarter, it implies the labour productivity declined over the period.[3] This is a concern as it translates into inability to reduce poverty in rural areas and ineffective policies to achieve a revolution in agriculture. Perhaps this is why the Kilimo Kwanza[4] initiative was launched by the government to boost agricultural productivity.

[2] The growth rates are calculated from data from (URT 2011), *The Economic Survey 2011, 2010& 2007.*

[3] According to the 2006 Labour Force Survey, the agricultural sector accounted for approximately 75 percent of total employment, with the majority based in rural areas (URT, 2007).

[4] Kilimo Kwanza means "Agriculture First" in Kiswahili. Launched in 2009, Kilimo Kwanza is a private sector-driven resolve to accelerate transformation of Tanzania's agriculture, and it outlines ten pillars that are important for its implementation. Its key emphasis is modernization and commercialization of agriculture, meaning improvement of current technology used, and access and participation of smallholder farmers in markets (Mkenda and Van Campenhout, 2011).

Figure 1: Evolution of Contribution of Broad sectors to Tanzania's GDP – Average Percentage Contribution (2002-2011)



Source: United Republic of Tanzania (URT), The Economic Survey 2011, 2010 & 2007, President's Office, Planning Commission, Dar es Salaam.

The question then is; has this affected the composition of Tanzania's exports? Table 1 gives the average percentage export shares of Tanzania's traditional and non-traditional exports. It shows that although the export share of all traditional exports[5] (except tobacco), declined over time, that of non-traditional exports increased (with the exception of minerals). Overall, the average share of traditional exports fell between the periods by about 7%, and that of non-traditional exports rose by approximately the same percentage (see Figure 1A in the appendix). A further question addressed in Section Five is to what extent the marginal changes in the sectoral contribution to GDP translate into structural transformation as indicated in Tanzania's export basket.

Table 1: Average Export Share (%)

	2001-2006	2007-2011	Change
Coffee	4.3	3.1	-1.2
Cotton	4.2	2.5	-1.7
Sisal	0.6	0.2	-0.4
Tea	2.3	1.2	-1.1
Tobacco	4.4	4.7	0.3
Cashew nuts	4.2	1.8	-2.4
Cloves	0.7	0.3	-0.4
Minerals	42.3	38.1	-4.2
Manufactured goods	8.1	17.8	9.7
Others	28.9	30.2	1.3
Total	100	100.0	

Source: United Republic of Tanzania (URT), (2011), The Economic Survey 2011 & 2010; President's Office, Planning Commission, Dar es Salaam.

Note: Others includes fish and fish products, horticultural products, re-exports & other exports.

[5] Traditional exports consist of coffee, cotton, sisal, tea, tobacco, cashew nuts and cloves, while non-traditional exports are minerals, manufactured goods, and others (that is, fish and fish products, horticultural products, and re-exports).

3. Indicators of Structural Transformation and its Causes

Whether an economy has undergone structural transformation or not can be assessed by using various indictors. Herrendorf *et al.* (2013) discuss two types of measures, namely production-based measures and consumption-based measures. Using these measures, Herrendorf *et al.* (2013) find that overall the stylized facts on structural transformation are borne out; that as countries increase their level of development, employment share in agriculture, the share of value added in agriculture, expenditure on food decline. In manufacturing, their findings show the characteristic hump shape for employment, value added and consumption of manufacturing output. For services, an increase in the share of employment, share of value added and share in consumption expenditure of services is evident as countries develop. Besides summarizing the basic facts of the structural transformation of developed countries, Herrendorf *et al*. (2013) also compare findings of structural transformation of currently rich countries with those of currently poor countries. Indeed, the findings indicate some differences that are insightful. For example, for currently poor countries, the employment share in agriculture is large, in spite of agriculture being the least developed. This differs with the currently rich countries' employment share and value added when they were at the same level of development. In trade literature, one finds yet another measure of structural transformation; the export content of a country's products through assessing how its comparative advantage has changed over time. This indicator has been used by many researchers (see for example, Saboniene, 2011; Hausmann and Klinger, 2010; Hausmann and Klinger, 2007; Gertler, 2006; Batra and Khan, 2005; Sharma and Dietrich, 2004; Das, 1998, among others).

Structural transformation of an economy can result from among others, a change in factor endowments and deliberate policies to drive the economy toward a desired path. As an economy grows, its factor endowments will also change, including the skill levels of its people. An improvement in the skill levels of labour can contribute to improving the goods produced in an economy, as the more skilled manpower are applied in productive activities and hence enabling the economy to move from low skilled products to high skilled products. This in turn allows the economy to move from exporting raw materials when the skill levels of its labour were lower, to exporting processed products as the skill levels become higher. Another example is when technical skills of its human resources improve and are then used in producing high technology goods that were not produced before, or were produced less efficiently. Such changes mean that an economy's comparative advantage would be changing over time. Clearly, investment is crucial in improving both the skills levels of manpower as well as physical capital in order to make a difference in a country's structural transformation and comparative advantage.

The comparative advantage of a nation can change if a change in government policies invites investment or favours some sectors that were neglected before. Thus, from a policy standpoint, the comparative advantage of a nation can be steered in a direction that policy makers see as encouraging and beneficial to the nation. For example, the governments of the East Asian Tigers put specific policies to steer their economies in a certain way, which accelerated their growth through becoming more export-oriented, resulting in structural changes (Das, 1998). Forbes and Wield (2002) also note that in Korea, subsidies and import protection were combined with export incentives for the local industry, which accelerated the building of an industry that beats world standards. In Singapore, the government combined strong investment in education with pushing industry up the value chain to create a strong industrial sector.

Thus, besides relative labour productivities and factor endowments, new sources of comparative advantage include how policies interact with the regulatory environment in specific sectors. For example, better financial development, better rule of law, and flexible labour market policies are also sources of comparative advantage. The implication is that the comparative advantage of a nation is dynamic (Das, 1998; Forbes and Wield, 2002), and its evolution is driven by key factors. These factors are how the nation structurally transforms its production, how the factor endowments change over time and application of deliberate government policies to steer the economy in a certain direction (Batra and Khan, 2005; Das, 1998). There are disagreements in the literature regarding the policy implication of the theory concerning the extent to which government policies can influence comparative advantage. On one hand, Deardorf (2011) asserts that interference with comparative advantage through government policies to sectors where a country has 'natural' comparative advantage can reduce gains from trade. Rodrik (2008) on the other hand maintains that broad policies such as those relating to education or capital markets can influence development conditions of some activities more than others (see also Kowalski and Stone, 2011).

Given that the comparative advantage of a nation can change depending on how an economy's structure evolves over time, the extent and nature of that structural transformation can be deduced from trade data, or specifically, its export content or basket. Indeed, numerous studies have been done which have employed the revealed comparative approach to assess the extent and nature of transformation of various economies. Revealed Comparative Advantage (RCA), developed by Bela Balasssa (1977, 1965), builds on the concept of comparative advantage, which reflects a country's specialisation, given differences in opportunity costs in producing the goods that it exports. RCA is calculated from a country's ex-post trade data because theoretically, comparative advantage is expressed in terms of relative prices evaluated in the absence of trade. Since these are not observed, comparative advantage is measured indirectly (Mikic and Gilbert, 2007).

4. Theoretical Observations and Measurement of Revealed Comparative Advantage

The theory of comparative advantage not only lies at the core of trade theory (Bebek, 2011), but it is also important from a policy standpoint. Since the theory stresses the importance of countries to focus on what they do best or produce efficiently to maximise gains in international trade, the policy response is that sectors in which a country does well must be supported by appropriate policies. This will ensure that countries derive gains in those particular sectors, and also continue to establish dominance in producing and exporting goods produced in those sectors.

When the theory of comparative advantage was first coined by Ricardo, who extended Adam Smith's theory of absolute advantage theory to consider a country that could be less efficient in producing both goods, he showed that trade would still take place, based on comparative advantage. Thus, Ricardo built on Smith's observations, and developed the theory of comparative advantage. According to Ricardo, the benefits of trade arise to countries if their pre-trade relative prices of goods are lower than those of their trading partners. In other words, comparative advantage reflects differences in opportunity costs that countries face, and it implies that countries can export those goods in which they have a comparative advantage and import those in which they have a comparative disadvantage (Bowen *et al,* 2001). Since countries have comparative advantage in different goods, they benefit by engaging in trading with each other.

Empirical examination of the products in which countries have a comparative advantage in employs the concept of revealed comparative advantage (RCA). It refers to how nations perform relative to each other in terms of trade in specific commodities. Assuming that different nations' trade composition in terms of commodities reflect differences in the relative costs they face in producing them, once calculated , the RCA index "reveals" the comparative advantage of nations. As an economy's structure changes, the RCA can change, as well as if there is an improvement in world demand for the products, and when trade specialization changes (Batra and Khan, 2005).

Balassa's RCA index is calculated as follows;

$$RCA_i = \frac{X_{ij} / X_{it}}{X_{wj} / X_{wt}}$$

In equation 1, $X_{ij}$is country i's exports of commodity j, X_{it} is country i's total exports, X_{wj} are world exports of commodity j, and X_{wt} are world total exports. The index thus divides the share of a country's exports of a particular good in its total exports by the world's share of exports of that good in total world exports. The index is used for identifying the commodities in which a particular country's comparative advantage lies or does not lie. The interpretation of the index is straightforward; if the calculated value is greater than 1 in any product category, then it implies that the share of that good in a country's exports is more than the world share, and hence it has a comparative advantage in that particular good. The index is used in identifying the comparative advantage of countries or regions, and it can be calculated for particular markets (for instance the market for minerals or vegetables), regions (for example for the East African Community or the Southern African Development Community) or for the global market. This paper calculates the RCA index for the global market.

A simpler method of calculating the revealed comparative advantage has been proposed in the literature (see for example, Peneder, 2009), which is calculated using country data only, as given in equation 2.

$$RCA_i = \ln\left(\frac{X_i / M_i}{X_m / M_m}\right)$$

The variables are as defined in equation 1, and *M*are the total imports, and the subscript *i* refers to a particular sector, while*m* is the total of all sectors. If positive values are found, it means that the country has a comparative advantage in those sub-sectors, while negative values indicate comparative disadvantage. This study computes both the Balassa index and the simpler version that uses only country data.

Badra and Khan (2005) point out that a key advantage of using the index is that the intrinsic advantage of particular export commodities is considered, which is consistent with how an economy's relative factor endowment and productivity changes. The disadvantage

lies in the fact that it does not differentiate between improvements that occur as a result of factor endowments and those that occur due to pursuing appropriate trade policies, since it is an aggregate index (see also Bender and Li 2002). Bender and Li (2002) further elaborate that although the two are interrelated in that changes in policies can affect trade improvement while revealed comparative advantage emphasises improvement in factor endowments. The problem with this is that nations can affect outcomes of their revealed comparative advantage by pursuing suitable policies than their factor endowments. A further limitation that Bender and Li (2002) point out is that the RCA index can give a biased picture since it is based on relative export shares that are affected by protection policies and tastes. Other weaknesses have been found by other researchers (see for example, Sharma and Dietrich, 2004), and suggestions have been made on how to rectify them.

Despite these weaknesses, the approach is still used in empirical analysis related not just to structural transformation as briefly surveyed in this paper, but also for studies pertaining to the extent to which patterns of specialisation change over time, as Proudman and Redding (2000) do for the United Kingdom and the United States. The Balassa index has also been used in assessing the technological content of manufacturing industries, as Amador *et al.* (2007) do for Portugal. Thus, the concept of revealed comparative advantage is indeed a major pillar in empirical trade literature as Bebek (2011) asserts. The RCA index has been used in empirical studies on structural transformation, competitiveness and changing specialization. For example, Batra and Khan (2005) undertake a comparative study of China and India's structural transformation using the RCA approach. In terms of sectoral transformation, Saboniene (2011) analyses how Lithuania's manufacturing sector had transformed and how it could be assisted in becoming more competitive in Europe.

This study employs the RCA approach to examine the extent to which the Tanzanian economy has structurally changed. The results are given and discussed in Section 5. The calculated indices are based on the two-digit level data, and hence do not provide an opportunity to examine revealed comparative advantage at a more disaggregated level. This is due to lack of data at such a disaggregated level. Balassa's revealed comparative indices are calculated using global data as well as data for Tanzania only.

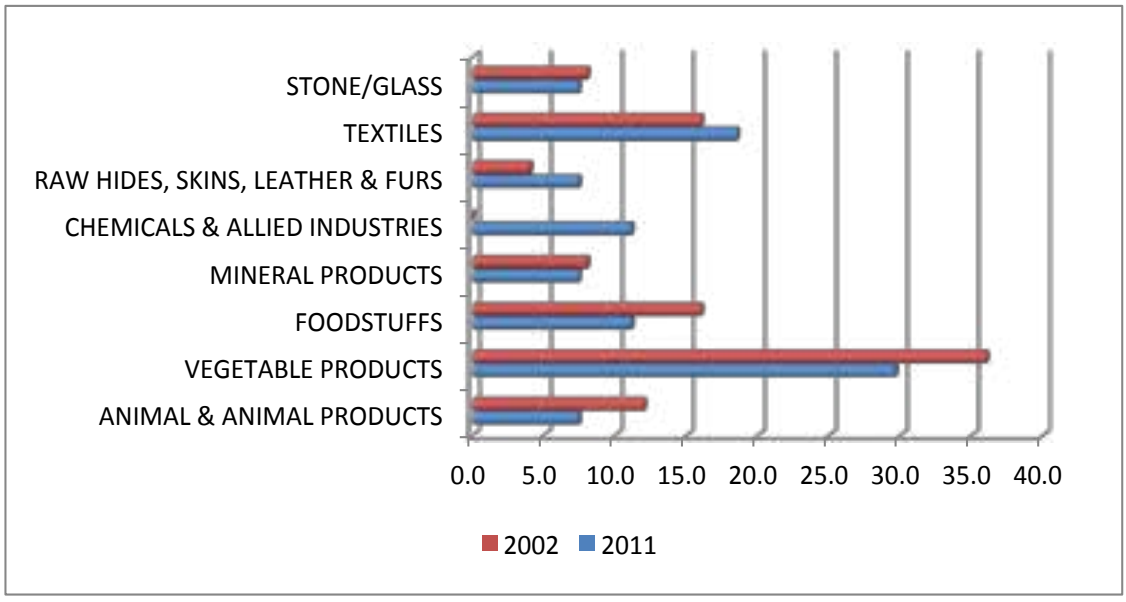
5. The Application of RCA to Tanzania

This section applies the RCA approach to Tanzania. An overview of Tanzania's comparative advantage is examined based on both global and country data. Broad sectors are used to determine in which ones Tanzania's comparative advantage lies, and product groups are also ranked to determine in which ones comparative advantage is strongest. A dynamic analysis of Tanzania's structural transformation is done, and the Spearman's Rank Correlation coefficients to determine the interdependence of the ranks are calculated and implications discussed.

5.1 Broad Sectoral Analysis

The results for Balassa's RCA indices for 2002 and 2011, using global data, are given in the appendix in Table 1A and Table 2A respectively. The RCA indices were calculated for all 97 product groups, and the tables give the product groups in which Tanzania had comparative advantage. In 2002, Tanzania had comparative advantage in 25 product groups, and this increased to 27 in 2011. When classified into broad sectors , Figure 2 shows that the largest number of product groups were from vegetable products, which contributed 36% and approximately 29% in 2002 and 2011 respectively. This was followed by textiles, foodstuffs, and animal products. All the broad sectors are basically agricultural, and they all the registered a fall between the two periods, except for textiles. For example, the contribution from vegetable products fell by 7%, and that from textiles increased by 2.5%. Another remarkable result is that of chemical and allied industries; from contributing nothing in 2002, it shot up to contributing 11%.

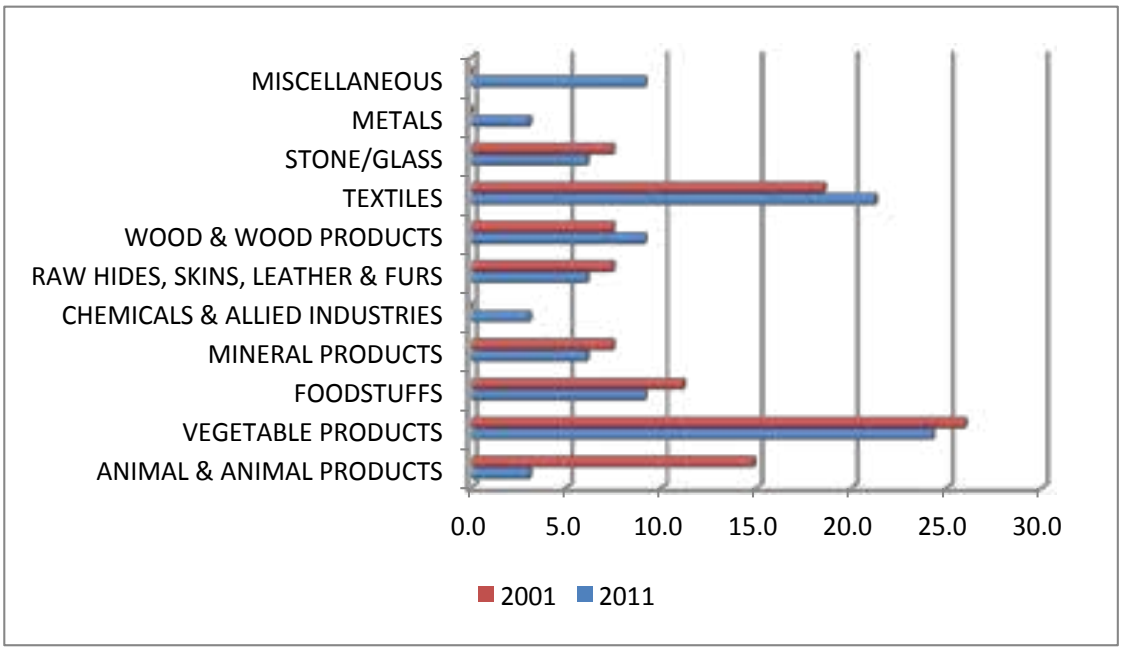
Figure 2: Percentage Contribution of Product Groups to Sectors – Global Data



Using country data, the RCA indices are reported in Table 3A and 4A for 2001 and 2011. The results show that Tanzania had comparative advantage in 27 product groups in 2001, which increased to 33 product groups in 2011. In terms of broad sectors, Figure 3 shows that the largest contribution was from vegetable products (26% and 24% in 2001 and 2011 respectively), followed by textiles (19% and 21% in 2001 and 2011 respectively). This is similar to the results found using global data. The other broad sectors that had high contributions are foodstuffs, animal products, and wood and wood products.

As with global data, the broad sectors with the highest contribution faced a decline between the two periods, except for textiles. There are also some sectors with no contribution in the earlier period but appear in the latter period; these are chemicals and allied industries, and metals. Another key difference with country data is that wood and wood products appear as one of the sectors in which Tanzania has comparative advantage when it does not appear in global data. Similar to the observation made with global data, Tanzania's comparative advantage lies in primary sectors. In the next section, the product groups that feature in the top ten are looked at in more detail.

Figure 3: Percentage Contribution of Product Groups to Sectors – Country Data



5.2 Ranking the Product Groups

The product groups are ranked from the one with the highest RCA index to the one with the lowest. Figure 4 and Figure 5 illustrate the top ten product groups using global data, and they show that comparative advantage has not changed much between 2002 and 2011. In both years, the product groups are dominated by agricultural products. If anything, agricultural-related products in Tanzania's export basket became even more dominant in 2011 compared to 2002, accounting for 80% of the top ten products in 2011, up from 70% in 2002. It is also notable that the product group with the highest value of the RCA index for both years is coffee, tea, mate and spices.

Apart from agricultural products, fish and minerals appear in the first ten product groups, although their ranks fell. Fish fell from being ranked fourth in 2002 to eighth in 2011, while minerals fell from a rank of fifth and seventh in 2002 to fourth and third respectively in 2011. Overall, the calculated RCA indices using global data indicate that structurally, the Tanzanian economy evolved marginally, but remained dominated by primary or natural resource-based exports of agricultural and minerals products.

Figure 4: Top Ten Product Groups, 2002 (Global Data)

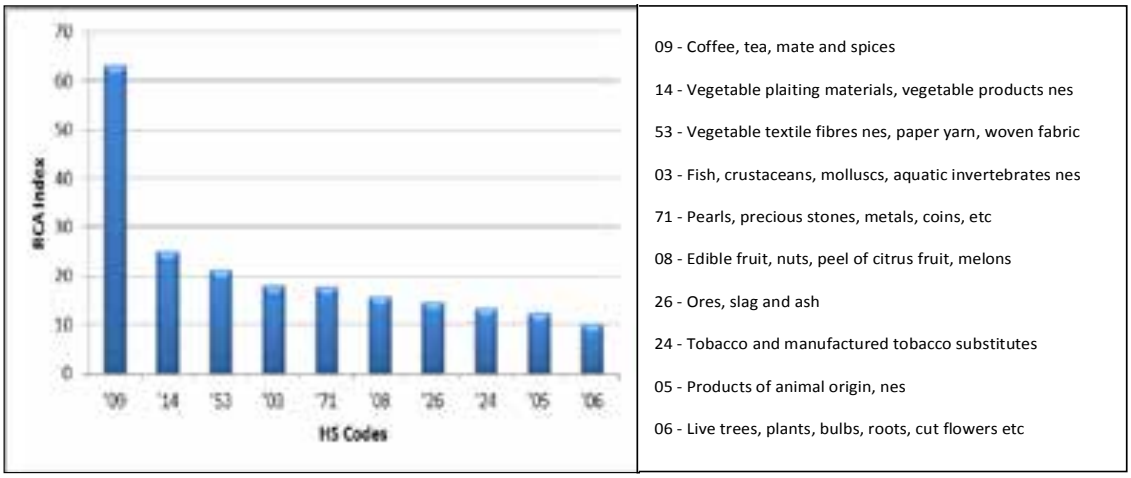
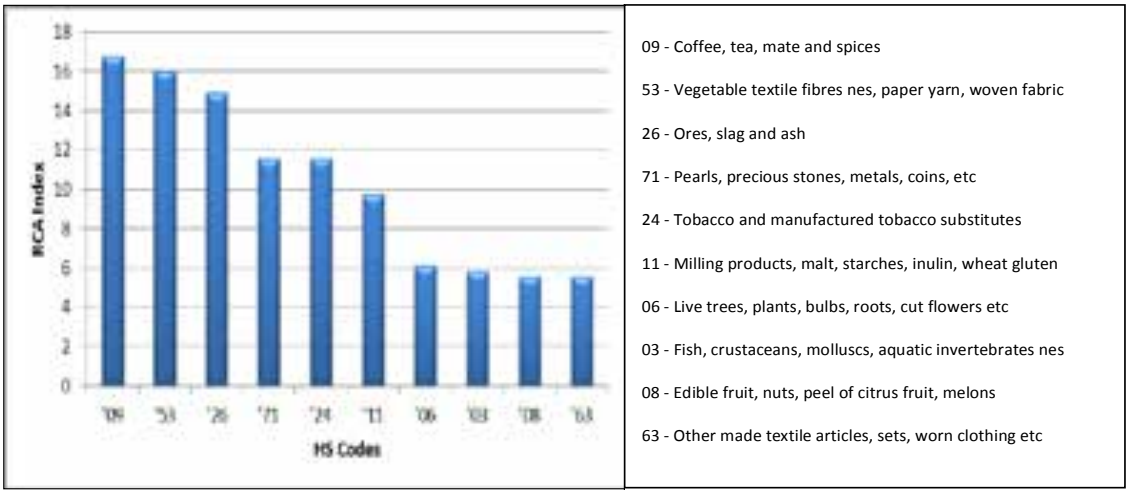


Figure 5: Top Ten Product Groups, 2011 (Global Data)



Using country data the results are given in Table 4A and Table 5A in the appendix, where the product groups are also ranked. Figure 6 and Figure 7 illustrate the top ten product groups for 2001 and 2011 respectively. The results confirm earlier ones found for the Balassa index; agricultural products dominate Tanzania's comparative advantage for both years; 70% of the product groups are agricultural, and the rest are mineral products.

Figure 6: Top Ten Product Groups, 2001 (Country Data)

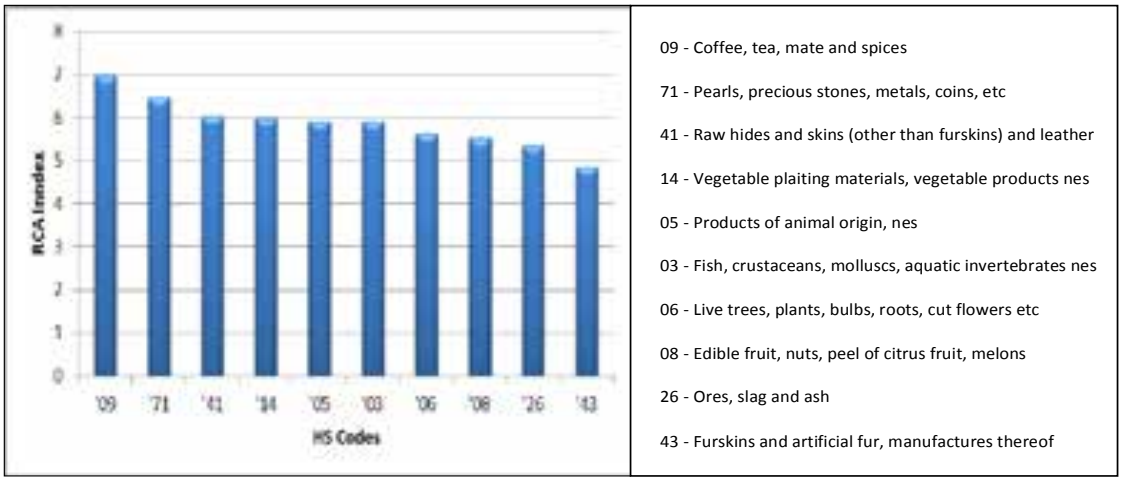
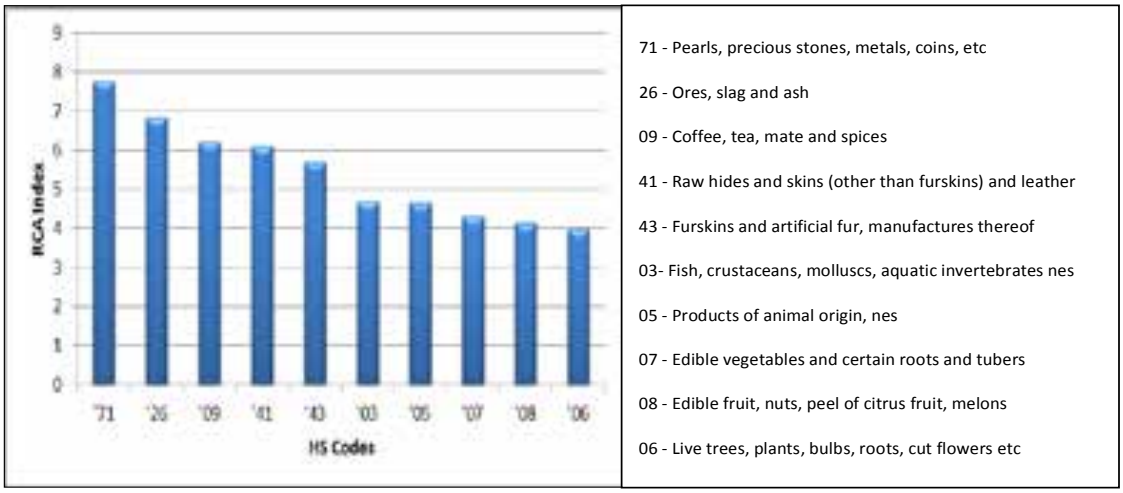


Figure 7: Top Ten Product Groups, 2011 (Country Data)



5.3 Inter-temporal Variation in Tanzania's RCA and Structural Transformation

Further examination of the inter-temporal variation in Tanzania's RCA index based on global data shows that the number of product groups in which Tanzania has a comparative advantage increased from 25 in 2002 to 27 in 2011 (Table 2). It shows that 24 product groups retained their comparative advantage while 10 lost their advantage (10 of them), and others gained (14 of them). Two product groups gained and lost their ranking by more than 10 ranks, while only one product group gained. Details of the actual product groups are given in Table 6A in the appendix, and it is evident that the product groups are predominantly agricultural and mineral based. One would have expected that these products groups in which Tanzania has overall advantage, none should be losing its advantage over time.[6] Loss of comparative advantage

[6] This seems paradoxical in that structural change that is associated with development entails reduction in the contribution of the agricultural sector. Recent research findings predict that "… hope for the 'modernisation' of Africa that will bring formal sector jobs needed to sustain productivity growth lies in the agricultural sector" (McMillan, 2014, p.21). This is based on several investments being done in the agricultural sectors of some African countries, for example Ethiopia in the leather sector, Ghana in fruit processing, and in Mozambique's cashew sector. Such investments could lead to rapid structural change, higher labour productivity and better lives for people (McMillan, 2014).

could be due to a lack of supportive policies and investment to cement the advantage in these sectors. It is important therefore that in order for comparative advantage to be maintained and let alone to grow, deliberate policies must be put in place to help develop those sectors.

Table 2: Inter-temporal Variation of Tanzania's RCA

Product groups for which Tanzania holds comparative advantage: 2001: 25 2011:27
Number of product groups that retained advantage: 24
Number of product groups that gained advantage[1]: 10
Number of product groups that lost advantage[1]: 14
Number of product groups that retained their ranking: 3
Number of product groups that gained/lost more than ten ranks: Product groups that gained: 1 Product groups that lost: 2

Note: [1]Gain or loss determined by increase or decrease in ranking based on the value of the RCA index, respectively.

It is unfortunate to note that the number of product groups that lost advantage is more than the product groups that gained advantage. The ability to improve upon the advantage that Tanzania has in some product groups in agriculture and minerals will greatly depend on investing in adding value to these product groups. That is, it would pay to invest more in these sectors that Tanzania already has comparative advantage. More specifically, it is prudent to ensure that these products are locally processed to add more value to them before exporting. For example, while Tanzania has comparative advantage in raw hides and skins (see Figure 6), it may be more beneficial if such hides are processed and even turned into final products such as shoes and handbags before exporting them. This is because adding more value to them would guarantee higher export earnings and employment opportunities for thousands of youths. It is notable that although Tanzania is ranked third in Africa (after Ethiopia and Sudan) in terms of cattle population (Program for Africa's Seed Systems (PASS) Trust, 2013), its performance in the export market and employment generation is poor. Tanzania's exports of by-products of livestock are dominated by exports of raw hides, while at the same time local leather and tannery factories operate under capacity, and some of them are on the brink of closure due to lack of raw materials (Board of External Trade (BET), 2004; Daily News, 2014). The eight leather companies currently existing in the country are all based in urban areas, denying jobs to the regions that are among the biggest producers of livestock.[7]

An opportunity thus exits to attract investment into leather processing. However, supportive policies are required for the investment to be successful. For example, addressing the constraints that the leather industry faces should go hand in hand with attracting investment in the sector. Some of the constraints include addressing transport problems that hamper transportation of animals, high electricity prices that escalate costs of production, educating farmers on the best cattle raising methods, improving technology in abattoirs, and educating youths in the technical skills required in leather factories (BET, 2004).

[7] Among the biggest producers of livestock, only Mwanza has a leather processing company. The other regions, that is Tabora, Shinyanga and Manyara do not have meat or skin and hides processing factories (Tabora City Investment Promotion Unit, 2013).

Table 3 gives Spearman's Rank Correlation (SRC) coefficients calculated for both data (global and country).[8] For global data the calculated coefficient is less than the critical value at 1% level of significance, which means that we accept the null hypothesis of non-existence of a correlation between the ranks. This means that a structural change occurred between 2001 and 2011. The interpretation of this result is that as highlighted in the discussion in the sub-section above that agricultural products continue to dominant Tanzania's export structure, but mineral products made their presence known by ranking first in later years.

Table 3: Spearman's Rank Correlation Coefficients

	Global data	**Country data**
Rho (r)	*0.382*	*0.713*
Critical values at 1%; 5%, and 10% respectively	*0.516; 0.378; 0.299*	*0.482; 0.352; 0.277*

However, the calculated coefficient is greater than the critical values at 5% and 10% level of significance. Thus, the null hypothesis of a correlation not existing between the ranks is rejected, which means that means that there is correlation between the ranks in the study periods, an indication of no structural change in the Tanzanian economy at these levels of significance. This result can be interpreted as indicating that the structural transformation that has occurred was modest. Agricultural products continue to dominant Tanzania's export structure, and although mineral products have climbed in their ranking, this has not been significant enough to register as a structural transformation.

For country data, the calculated correlation coefficient of 0.71 exceeds the critical values at 1%, 5% and 10% levels of significance, which rejects the null hypothesis of lack of correlation. The high correlation found indicates that there has not been a significant structural transformation of the economy between the two periods. This means that there was insignificant change in the ranking of the products groups appearing in the two periods, implying insignificant change in Tanzania's comparative advantage.

The results are not surprising given the little change that is seen in the percentage shares of GDP of key sectors (Figure 1). For example, although the construction sector has contributed a large share to industry and construction[9], its contribution cannot be picked up in indices such as the RCA since the sector to a large extent consists of non-exportable products. It is also important to remember that the two-digit level data that has been used is not sufficiently disaggregated to ascertain structural transformation at the commodity level, and hence these findings must be interpreted cautiously.[10]

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[8] The SRC coefficient is calculated as $r_s = 1 - \frac{6\sum d^2}{n^3 - 1}$, where n is the number of items in each data set; d is the difference in ranks for any pair of data values; Σd^2 is the sum of the difference of the squares of the ranks for the data sets. This nonparametric test gives values from -1 to +1, with values close to +1 or -1 interpreted as strong positive and strong negative correlation respectively. A value of zero means that there is a complete lack of correlation, and a low value meansthat the ranking of product groups between the two periods has changed, indicating structural change. A high value on the other hand means that the ranking of product groups has changed very little.

[9] According to the classification used in *The Economic Survey*(URT, 2011), the sectors under "Industry and Construction" are; mining and quarrying, manufacturing, electricity and gas, water supply, and construction. The construction sector's contribution to Industry and Construction was second from the manufacturing sector. On average between 2002 and 2011, it contributed 33 percent to Industry and Construction's percentage contribution to GDP (URT, 2011).

[10] Ideally, analysis at the six-digit level would give a better picture of structural change at the commodity level.

6. Conclusions and Recommendations

Balassa's RCA index has been used in empirical studies to examine the evolution of a country's comparative advantage, to understand how specific sectors change over time as nations engage in trade, and in studying the structural transformation of countries. Following such studies, this paper examined whether there has been any structural transformation in the Tanzanian economy between the early 2000 and 2011. Using data for 2001, 2002 and 2011, indices were computed using trade data at the two-digit HS code, and the product groups were ranked. Analysis was then done on how the indices have evolved over the study period.

The findings from the calculated indices using global data are that for the periods 2002 and 2011, the product groups were dominated by agricultural products. Apart from agricultural products, fish and minerals appear in the first ten product groups, although their ranks fell within the top ten product groups. RCA indices based on Tanzanian data only were also calculated covering the periods 2001 and 2011. The results confirmed findings from global data that agricultural products dominate Tanzania's comparative advantage in both years. Specifically, in both years, 70% of the product groups were agricultural, and the rest were mineral products. The key conclusion therefore is that for the study period, the Tanzanian economy has not undergone significant structural transformation. The study also examined the inter-temporal variation in the products groups and identified product groups that retained, gained, and lost their advantage.

Although these results are derived from a period of time covering nine and ten years in which one might not expect significant structural changes in an economy, the findings are still significant as an input into policy. It is important to remember that the Tanzanian economy enjoyed a healthy growth rate during this period. That growth could have propelled the economy to more structural changes than what has been observed. Based on these results, a policy issue to consider that this study highlights is the need to invest more in the sectors that Tanzania already has strong comparative advantage. Since Tanzania reveals a strong comparative advantage in natural resource-based sectors, and this advantage seems not to have changed in close to a decade, it is prudent to ensure that the products in these products groups are locally processed to add more value to them before they are exported. Local processing of agricultural products, fish and minerals will ensure that Tanzania's export earnings are higher than they currently are, and it will also provide the needed graduation from exporting primary products to processed goods. For example, Tanzania's comparative advantage in raw hides and skins would provide more benefits if the hides were locally processed and turned into final products before exporting them. Local processing of primary goods would be more beneficial as they attract higher export prices, and they create employment opportunities. Local processing of primary products will require encouraging foreign investment, which has to go hand in hand with investing in human capital development and addressing constraints in the business environment. Hopefully, the recent discovery of gas will give Tanzania an opportunity to extract revenues from it and to ensure that the revenues are used to invest in human capital, in sectors that Tanzania enjoys comparative advantage, and in improving the business environment to attract investors.

Although the period under study is not long enough to expect significant structural transformation in the economy, still the findings send a strong message regarding Tanzania's comparative advantage, and how it reflects the economy's structure. The findings also confirm the known fact that Tanzania is predominantly an agricultural economy, with minerals also

increasingly becoming important. Such a natural resource-based economy requires strategic policies that will target value-addition to the natural resources in order to maximise export earnings. A suggestion for further research is relating Tanzania's evolution in comparative advantage to economic and industrial policies. This research would be insightful in providing further understanding of whether Tanzania's trade pattern and comparative advantage is correlated with policies over time.

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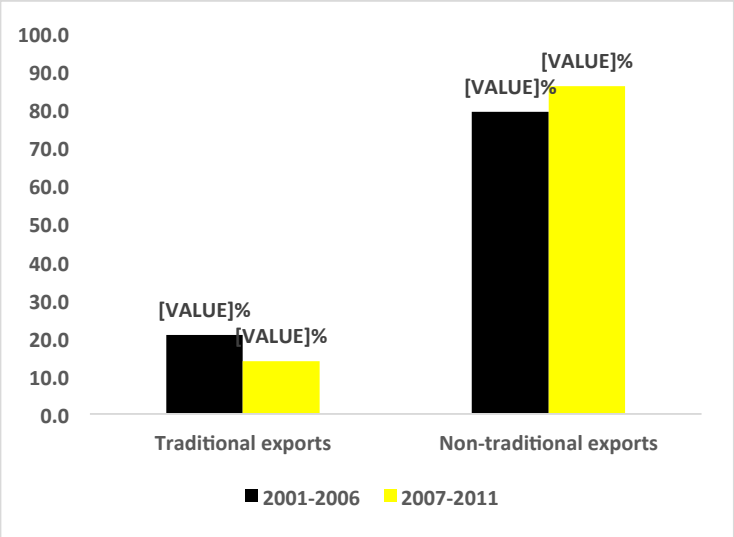
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Appendix

Figure 1A: Tanzania's Average Percentage Share of Traditional and Non-traditional Exports



Source: United Republic of Tanzania (URT), The Economic Survey 2011 & 2010, President's Office, Planning Commission, Dar es Salaam.
Note: Traditional exports consist of coffee, cotton, sisal, tea, tobacco, cashew nuts and cloves, while non-traditional exports are mineral, manufactured goods, fish and fish products, horticultural products, re-exports and other exports.

Table 1A: Ranking of Product Groups in which Tanzania enjoys Comparative Advantage, BRCA Index for 2002

RANK	HS CODE	PRODUCT GROUP	BRCA INDEX
1	'09	Coffee, tea, mate and spices	63.09
2	'14	Vegetable plaiting materials, vegetable products nes	24.96
3	'53	Vegetable textile fibres nes, paper yarn, woven fabric	21.32
4	'03	Fish, crustaceans, molluscs, aquatic invertebrates nes	18.10
5	'71	Pearls, precious stones, metals, coins, etc	17.88
6	'08	Edible fruit, nuts, peel of citrus fruit, melons	15.80

7	‘26	Ores, slag and ash	14.76
8	‘24	Tobacco and manufactured tobacco substitutes	13.49
9	‘05	Products of animal origin, nes	12.30
10	‘06	Live trees, plants, bulbs, roots, cut flowers etc	10.19
11	‘52	Cotton	8.25
12	‘07	Edible vegetables and certain roots and tubers	6.59
13	‘56	Wadding, felt, nonwovens, yarns, twine, cordage, etc	5.57
14	‘12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	5.41
15	‘17	Sugars and sugar confectionery	4.36
16	‘11	Milling products, malt, starches, inulin, wheat gluten	3.66
17	‘25	Salt, sulphur, earth, stone, plaster, lime and cement	3.47
18	‘18	Cocoa and cocoa preparations	3.04
19	‘41	Raw hides and skins (other than furskins) and leather	2.68
20	‘70	Glass and glassware	1.55
21	‘23	Residues, wastes of food industry, animal fodder	1.16
22	‘60	Knitted or crocheted fabric	1.33
23	‘10	Cereals	1.17
24	‘13	Lac, gums, resins, vegetable saps and extracts nes	1.86
25	‘01	Live animals	1.40

Source: Author’s calculation based on Intracen data.
Note: The BRCA Index was calculated using equation 1.

Table 2A: Ranking of Product Groups in which Tanzania enjoys Comparative Advantage, BRCA Index for 2011

RANK	HS CODE	PRODUCT GROUP	BRCA INDEX
1	‘09	Coffee, tea, mate and spices	16.80
2	‘53	Vegetable textile fibres nes, paper yarn, woven fabric	16.03
3	‘26	Ores, slag and ash	14.93
4	‘71	Pearls, precious stones, metals, coins, etc	11.53
5	‘24	Tobacco and manufactured tobacco substitutes	11.53
6	‘11	Milling products, malt, starches, inulin, wheat gluten	9.75
7	‘06	Live trees, plants, bulbs, roots, cut flowers etc	6.11
8	‘03	Fish, crustaceans, molluscs, aquatic invertebrates nes	5.83
9	‘08	Edible fruit, nuts, peel of citrus fruit, melons	5.58
10	‘63	Other made textile articles, sets, worn clothing etc	5.57
11	‘12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	4.81
12	‘07	Edible vegetables and certain roots and tubers	4.54
13	‘25	Salt, sulphur, earth, stone, plaster, lime and cement	4.10
14	‘52	Cotton	3.79
15	‘56	Wadding, felt, nonwovens, yarns, twine, cordage, etc	2.91
16	‘31	Fertilizers	2.63

17	‘18	Cocoa and cocoa preparations	1.98
18	‘15	Animal, vegetable fats and oils, cleavage products, etc	1.92
19	‘41	Raw hides and skins (other than furskins) and leather	1.82
20	‘14	Vegetable plaiting materials, vegetable products nes	1.64
21	‘23	Residues, wastes of food industry, animal fodder	1.47
22	‘34	Soaps, lubricants, waxes, candles, modelling pastes	1.37
23	‘70	Glass and glassware	1.25
24	‘59	Impregnated, coated or laminated textile fabric	1.22
25	‘43	Furskins and artificial fur, manufactures thereof	1.19
26	‘05	Products of animal origin, nes	1.08
27	‘36	Explosives, pyrotechnics, matches, pyrophorics, etc	1.02

Source: Author’s calculation based on Intracen data.
Note: The BRCA Index was calculated using equation 1.

Table 3A: Classification of Broad Sectors

01-05	Animal & Animal Products
06-15	Vegetable Products
16-24	Foodstuffs
25-27	Mineral Products
28-38	Chemicals & Allied Industries
39-40	Plastics / Rubbers
41-43	Raw Hides, Skins, Leather, & Furs
44-49	Wood & Wood Products
50-63	Textiles
64-67	Footwear / Headgear
68-71	Stone / Glass
72-83	Metals
84-85	Machinery / Electrical
86-89	Transportation
90-97	Miscellaneous
98-99	Service

Source: http://www.foreign-trade.com/.
Note: The classification of the broad sectors follows www.foreign-trade.com. That is, products groups under HS code are classified into the ones given above based on the commodities in those product groups.

Table 4A: Ranking of Product Groups in which Tanzania enjoys Comparative Advantage, RCA Index Using Country Data for 2001

RANK	HS CODE	PRODUCT GROUP	RCA INDEX
1	‘09	Coffee, tea, mate and spices	6.97
2	‘71	Pearls, precious stones, metals, coins, etc	6.47
3	‘41	Raw hides and skins (other than furskins) and leather	6.04
4	‘14	Vegetable plaiting materials, vegetable products nes	5.99
5	‘05	Products of animal origin, nes	5.90

6	‘03	Fish, crustaceans, molluscs, aquatic invertebrates nes	5.90
7	‘06	Live trees, plants, bulbs, roots, cut flowers etc	5.62
8	‘08	Edible fruit, nuts, peel of citrus fruit, melons	5.51
9	‘26	Ores, slag and ash	5.35
10	‘43	Furskins and artificial fur, manufactures thereof	4.84
11	‘60	Knitted or crocheted fabric	3.59
12	‘24	Tobacco and manufactured tobacco substitutes	3.25
13	‘53	Vegetable textile fibres nes, paper yarn, woven fabric	3.09
14	‘18	Cocoa and cocoa preparations	2.56
15	‘23	Residues, wastes of food industry, animal fodder	2.37
16	‘12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	2.08
17	‘07	Edible vegetables and certain roots and tubers	2.00
18	‘13	Lac, gums, resins, vegetable saps and extracts nes	1.88
19	‘52	Cotton	1.74
20	‘01	Live animals	1.43
21	‘44	Wood and articles of wood, wood charcoal	0.73
22	‘02	Meat and edible meat offal	0.70
23	‘25	Salt, sulphur, earth, stone, plaster, lime and cement	0.68
24	‘70	Glass and glassware	0.60
25	‘56	Wadding, felt, nonwovens, yarns, twine, cordage, etc	0.48
26	‘61	Articles of apparel, accessories, knit or crochet	0.15
27	‘46	Manufactures of plaiting material, basketwork, etc.	0.01

Source: Author’s calculation based on Intracen data.
Note: The RCA Index was calculated using equation 2.

Table 5A: Ranking of Product Groups in which Tanzania enjoys Comparative Advantage, RCA Index Using Country Data for 2011

RANK	HS CODE	PRODUCT GROUP	RCA INDEX
1	‘71	Pearls, precious stones, metals, coins, etc	7.77
2	‘26	Ores, slag and ash	6.85
3	‘09	Coffee, tea, mate and spices	6.20
4	‘41	Raw hides and skins (other than furskins) and leather	6.11
5	‘43	Furskins and artificial fur, manufactures thereof	5.69
6	‘03	Fish, crustaceans, molluscs, aquatic invertebrates nes	4.68
7	‘05	Products of animal origin, nes	4.65
8	‘07	Edible vegetables and certain roots and tubers	4.31
9	‘08	Edible fruit, nuts, peel of citrus fruit, melons	4.15
10	‘06	Live trees, plants, bulbs, roots, cut flowers etc	3.97
11	‘52	Cotton	3.69
12	‘24	Tobacco and manufactured tobacco substitutes	3.51
13	‘18	Cocoa and cocoa preparations	3.19
14	‘12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes	3.18
15	‘14	Vegetable plaiting materials, vegetable products nes	3.05

16	‘23	Residues, wastes of food industry, animal fodder	2.63
17	‘53	Vegetable textile fibres nes, paper yarn, woven fabric	2.08
18	‘50	Silk	1.75
19	‘59	Impregnated, coated or laminated textile fabric	1.69
20	‘97	Works of art, collectors pieces and antiques	1.66
21	‘56	Wadding, felt, nonwovens, yarns, twine, cordage, etc	1.03
22	‘91	Clocks and watches and parts thereof	0.89
23	‘47	Pulp of wood, fibrous cellulosic material, waste etc	0.83
24	‘63	Other made textile articles, sets, worn clothing etc	0.78
25	‘95	Toys, games, sports requisites	0.69
26	‘44	Wood and articles of wood, wood charcoal	0.68
27	‘11	Milling products, malt, starches, inulin, wheat gluten	0.67
28	‘61	Articles of apparel, accessories, knit or crochet	0.45
29	‘74	Copper and articles thereof	0.42
30	‘70	Glass and glassware	0.37
31	‘34	Soaps, lubricants, waxes, candles, modelling pastes	0.28
32	‘25	Salt, sulphur, earth, stone, plaster, lime and cement	0.22
33	‘46	Manufactures of plaiting material, basketwork, etc.	0.10

Source: Author’s calculation based on Intracen data.
Note: The RCA Index was calculated using equation 2.

Table 6A: Detailed Inter-temporal Variation of Tanzania’s RCA

Product groups for which Tanzania holds comparative advantage: 2001: 25	2011: 27
Number of product groups that retained advantage: 24	
Number of product groups that gained advantage[1]: 10	
HS CODE	PRODUCT GROUP
‘53	Vegetable textile fibres nes, paper yarn, woven fabric
‘71	Pearls, precious stones, metals, coins, etc
‘26	Ores, slag and ash
‘24	Tobacco and manufactured tobacco substitutes
‘06	Live trees, plants, bulbs, roots, cut flowers etc
‘12	Oil seed, oleagic fruits, grain, seed, fruit, etc, nes
‘11	Milling products, malt, starches, inulin, wheat gluten
‘25	Salt, sulphur, earth, stone, plaster, lime and cement
‘18	Cocoa and cocoa preparations
‘23	Residues, wastes of food industry, animal fodder
Number of product groups that lost advantage[1]: 14	
‘14	Vegetable plaiting materials, vegetable products nes
‘03	Fish, crustaceans, molluscs, aquatic invertebrates nes
‘08	Edible fruit, nuts, peel of citrus fruit, melons
‘05	Products of animal origin, nes
‘52	Cotton
‘07	Edible vegetables and certain roots and tubers

‘56	Wadding, felt, nonwovens, yarns, twine, cordage, etc		
‘17	Sugars and sugar confectionery		
‘41	Raw hides and skins (other than furskins) and leather		
‘70	Glass and glassware		
‘60	Knitted or crocheted fabric		
‘10	Cereals		
‘13	Lac, gums, resins, vegetable saps and extracts nes		
‘01	Live animals		
Number of product groups that retained their ranking: 3			
‘09	Coffee, tea, mate and spices		
‘07	Edible vegetables and certain roots and tubers		
‘41	Raw hides and skins (other than furskins) and leather		
Number of product groups that gained/lost more than ten ranks			
Product groups gained: 1		HS CODE	SECTOR
		‘11	Milling products, malt, starches, inulin, wheat gluten
Product groups that lost: 2		HS CODE	SECTOR
‘05 Products of animal origin, nes		‘14	Vegetable plaiting materials, vegetable products nes

Source: Author’s calculation based on Intracen data.