Development
Economics
Research
Group

Working Paper Series
02-2020

Merchandise export diversification strategy for Tanzania - promoting inclusive growth, economic complexity and structural change

Christian Estmann
Bjørn Bo Sørensen
Benno Ndulu
John Rand

10-2020

ISSN 2597-1018

University of Copenhagen
Faculty of Social Sciences
Department of Economics
www.econ.ku.dk/derg
#DERGDK

Publications of the Development Economic Research Group (DERG)
doi: 02.2020/DERG.2020.

Merchandise export diversification strategy for Tanzania
– promoting inclusive growth, economic complexity and structural change

Christian Estmann[1], Bjørn Bo Sørensen[1], Benno Ndulu[2], and John Rand[1]
[1]Development Economics Research Group (DERG), University of Copenhagen, Denmark; Corresponding author: ceh@econ.ku.dk
[2]Department of Economics, University of Dar es Salaam, Tanzania

Abstract

In the pursuit of structural transformation and inclusive growth, this paper identifies industries in Tanzania which can accumulate new productive knowledge and diversify the economy. The analysis has two main components. First, a Product Space analysis identifies niches primarily within the manufacturing sector, which Tanzania should promote in order to move up the complexity scale and stimulate structural change. The identification process applies a supply-side network method following the literature on Economic Complexity and combines it with a demand-driven gravity model on merchandise export. Hence, we identify industries that are tangible given Tanzania's current productive knowledge and are most feasible for Tanzania to target given product-specific trade resistance and geographically dispersed demand. Second, as generating jobs for the rapidly growing labour force is a prime political priority in Tanzania, we construct a labour opportunity index in order to display which industries are correlated with a high labour intensity. We find that there is a larger scope for learning spillovers in the relatively more complex sectors, such as machinery and chemicals, whereas the less complex sectors, such as agro-processing and construction, are correlated with higher employment creation. The paper is, to the best of our knowledge, the first comprehensive study of economic complexity and structural change in Tanzania that systematically accounts for both supply and demand-side factors.

Keywords: Inclusive Growth – Economic Complexity – Tanzania – Product Space – Structural Transformation

1 INTRODUCTION

According to Baldwin (2016), there are three fundamental constraints to globalisation; trade cost (cost of moving products), communication cost (cost of moving ideas) and face-to-face cost (cost of moving people) [1]. Before the industrial revolution, all three costs were high, but by the end of the nineteenth century, they began to decrease. Reduction in costs did not happen simultaneously and the order in which they fell had dramatic implications for the global economic landscape.

The decline in trade costs enabled the spatial unbundling of production from consumption, *the first unbundling*, and originated modern globalisation (ibid). The drop in communication costs led by the revolution in Information and Communication Technology (ICT) facilitated the global offshoring of production stages, *the second unbundling*, as well as the organisation of economic activity in global value chains (GVCs), distributed globally, yet governed locally by lead firms (the GVC revolution) [1]–[3].

Structural change (transformation) occurs when economic resources shift from lower to higher productivity sectors in the economy [4]. There are two prominent perspectives on how developing countries can foster structural transformation and grow in this globalised economic system; the GVC perspective and the industrial policy perspective.

The GVC perspective proposes identifying niches within the value chains where developing countries are able to compete [3]. The internationalisation of the division of labour brought awareness of the interconnections among companies and the degree to which local suppliers could learn from the lead firms [3], [5]. The offshoring of factories meant offshoring of knowledge [1]. The GVCs denationalised comparative advantages, enabling different countries' sources of comparative advantage to be put together, shifting from a focus of finished products to components. This enabled the emerging economies to engage in manufacturing (ibid.).

However, the GVC approach may not be viable. New evidence suggests that the internationalisation of production has been in retracement in recent years [6], [7]. There are several reasons why this may continue. Firstly, the ICT revolution fostered the automation of both production and service activities. Jobs in manufacturing are in a particularly fast decline [8]. The relative importance of labour costs in GVCs will presumably continue to diminish as new information technologies, such as industrial robots, "smart factories", and 3-D printing advances [9]. The labour-saving technologies can lead to a surge of lead firms reshoring their production in order to be nearer to their customer base (ibid.). Secondly, the Chinese factories require fewer imports of intermediate goods, as these have been heavily subsidised by domestic production or from supplier networks in Southern Asia [10]. Due to the lower fragmentation in Chinese manufacturing and the lower demand in the North after the financial crisis in 2008, emerging countries have started to redirect their export from global towards regional value chains [3]. Thirdly, many environmentalists across the globe are pushing for deglobalisation due to environmental concerns. Their main argument is that globalisation causes income-levels and global demand to rise, resulting in the increased exploitation of the environment (the scale effects)[1] [11], [15], [16]. Lastly, the COVID19 pandemic has reintroduced discussions about protectionism and production structures favouring "localisation". Political leaders are questioning the reliance on global supply chains, especially in the case of medicaments and foodstuffs [2].

In contrast, if offshoring and manufacturing continue to constitute a central part of the global economic system, the cost of labour may still be a critical dispersion force. Despite many years of "*economic development with unlimited supplies of labor*" [18], wages have begun to increase in China [1]. Hence, the lead firms may move manufacturing stages to lower-income countries, such as Tanzania. Some unskilled manufacturing jobs have already moved within East Asia, i.a., from China to Bangladesh and Vietnam. The mobility in GVCs may expedite further as advancements in digital technologies depreciate separation costs, making the geography of global production networks less susceptive to distance (ibid.).

The industrial policy perspective focuses on how to develop the collective learning in order to diversify the domestic supply chain and create globally competitive industries. In the post-Washington consensus era, the state needs to play a more significant role in fostering structural transformation in developing countries, cf. the Stockholm Statement [3], [19], [20]. One particular government task is to develop industrial strategies that are able to pick winners or at least provide some strategic guidelines. Our analysis follows this perspective.

When it comes to distinguishing which particular industries to promote, Hausmann and Hidalgo's (2009) Method of Reflection has proven a powerful tool to associate development with complexity. As opposed to examining the accumulation of the factors of production, the method considers how an economy can diversify its export structure and become competitive in more complex industries given its current productive knowledge [21]. The analysis in this paper is related to the literature taking economic complexity ideas as a starting point to guide industrial policies in developing economies.

We apply the Method of Reflection in order to analyse Tanzania's merchandise export structure. We identify the industries of highest potential to diversify from a supply-side perspective. We split the analysis into two strategies, a "low-hanging fruits" strategy focusing on industries that are highly related to Tanzania's existing know-how (parsimonious transformation) and a "long-jump" strategy focusing on industries with high diversification opportunity and complexity (strategic bets). Whereas the low-hanging fruits strategy, to a large extend, identifies products within the agro-processing cluster, a large proportion of industries discovered by the long-jump strategy are located in the electrical/machinery and chemical sectors.

This paper provides two main contributions to the literature. First, we combine the supply-side economic complexity methodology with a gravity model to structurally represent the demand side. This allows us to rank the industries found by the two strategies based on their predicted future export value, given product-specific trade resistance and geographically dispersed demand. Our analysis discovers that the industries within the metal and electrical/machinery, as well as plastic/rubber sectors, have high potential to accumulate new knowledge and promote structural transformation in the country.

The gravity equation, additionally, identifies which trade partners are most likely to import the target products. Today, Tanzania's exports are concentrated primarily to Asia and moderately to the region of sub-Saharan Africa (SSA). In line with the recent trade literature, our analysis suggests promoting regional trade, especially within the Free Trade Area of the East African Community (EAC) and Southern African Development Community (SADC) [3]. In 2017, Tanzania exported for a total value of USD 497 million (M), around 10 per cent of total trade to the EAC. Our model suggests that the exported value should be significantly higher. To Kenya alone, we estimate that the target products can generate up to USD 4 Billion in export revenue, given that Tanzania becomes competitive in the commodities. Outside the region, we find that the large economies such as United States (US), China and South Africa, as well as the former colonial powers of Germany and the United Kingdom (UK), are important trade partners.

Secondly, one of the most important political priorities in Tanzania is creating new jobs for the rapidly growing labour force. Hence, we construct an employment absorption strategy. Specifically, we estimate a revealed labour intensity index by calculating, for each commodity, a weighted average of the labour-to-capital ratio in the economies that export the commodity. We apply a modification of the Balassa's (1986) Revealed Comparative Advantage index as weights. Then, the revealed labour intensity index is incorporated into the economic complexity variables and from this, a labour opportunity index is formed. This index is then applied to rank the industries correlated with the highest labour intensity and employment creation opportunity. The evidence suggests a trade-off between product complexity and labour intensity. In contrast to the other strategies, the employment absorption strategy indicates that promoting agriculture, the construction sectors (metal and wood products), as well as the growing textile industry, will foster more employment generation

[1]On the other hand, GVCs elevate the transferring of knowledge and advancements in techniques of production across countries, leading to environmental improvement (the technique effects) [11]. Lead firms are found to pollute significantly less than local firms [12]. Additionally, the World Trade Organization (WTO), as well as many Regional Trade Agreements (RTA), hold environmental cooperation agreements, such as The Agreement on Trade-Related Aspects of Intellectual property (TRIPS) [13]. To meet these standards the Chinese Government shut down hundreds of factories and announced a New Environmental Protection Tax [14]. Pushing for deglobalisation, countries will likely not satisfy these international standards and consumers across the globe would be forced to acquire domestic goods manufactured with higher pollution.

[2]However, according to Baldwin and Evenett (2020), it is unreliable for every country to manufacture the necessary medical supplies [17]

and consequently be more pro-poor.

Our findings are somewhat consistent with the conclusions in the related literature and Tanzania's current policy focus. On one hand, a number of CGE-models have been conducted for Tanzania, identifying agro-processing to be important for inclusive growth [22], [23]. Similarly, the UNIDO industrial upgrading and modernization project (IUMP) focuses on promoting dairy, edible oil and food processing industries in Tanzania [22], [24]. Many of the sub-sectors we identify in the low-hanging fruits strategy and the employment absorption strategy are mentioned in the current Five Year Development Plan (FYDP) of Tanzania 2016/17-2020/21, [25]. On the other hand, the clusters found to enable the highest diversification opportunities and export demand, such as plastic and machinery production, are not mentioned in great detail in the development plan. The analysis can be applied as a starting point for the discussions on which industries to promote in Tanzania's next FYDP.

This paper is structured as follows; Section 2 will describe the theory of Economic Complexity in more detail. Section 3 defines the paper's strategy to diversify Tanzania's economy. This is followed by the central analysis, organized in three sections, the supply-side factors (section 4), the demand-side factors (section 5) and the employment factors (section 6). The three sections have further been divided into a methodology, data, implementation and result subsection respectively. We sum up the results in section 7 and discuss the application possibilities and critically relate it to the discussion on the future possibilities for manufacturing in SSA in section 8. Section 9 presents our concluding remarks.

2 THE THEORY OF ECONOMIC COMPLEXITY

The term upgrading is widely utilised, yet not explicitly specified in the literature [2], [26]. To overcome this obstacle, measures of *complexity* have been introduced. The overall concept rests on the idea that "*economies grow by upgrading the type of products they produce and export*" [27].

Lall et al. (2006) were among the first to develop a formula for export complexity [28]. They "*construct a sophistication index based on the income levels of exporting economies*" [28]. Hausmann, Hwang and Rodrik (2007) similarly constructed an index with the objective to describe country-specific comparative advantages by moving toward more complex products [5], [29].

However, their estimate expressed an economy's current abilities, not their possibilities [30]. Hidalgo et al. (2007) highlighted the importance of accounting for the interconnectedness between products and introduced a data-driven approach to examine the network, named the Product Space [26], [27]. Empirically, they discovered that countries tend to enter new export-markets highly related to their consisting export composition, arguing that economies are restricted by knowledge diffusion in the pursuit of diversification [27], [31]. The Product Space was incorporated in Hausmann et al. (2007), although merely as a one-dimensional scalar of product complexity [29], [32]. It was later claimed that this would not adequately account for the influence of the relatedness between products and the network approach was employed going forward [32]. However, similar to Lall et al. (2006), the complexity estimates of Hausmann et al. (2007) were derived from the level of income of the exporting countries. The use of income was criticised as the estimates formed the circular result that "*rich countries export rich country products*" [33]. Hausmann and Hidalgo (2009) addressed this by adjusting their methodology, thus detaching the network structure and income information. By assuming that the complementary capabilities are layered within countries and products, the product and country complexity were measured by the product's ubiquity and country's diversification, respectively [21], [34]. Hence, countries that are able to export a diverse set of products are assumed to possess a larger set of complementary capabilities (ibid).

This framework can be applied to examine the path through which a country diversifies and accumulate productive knowledge. The Product Space examines the learning spillovers associated with production [27], [35].

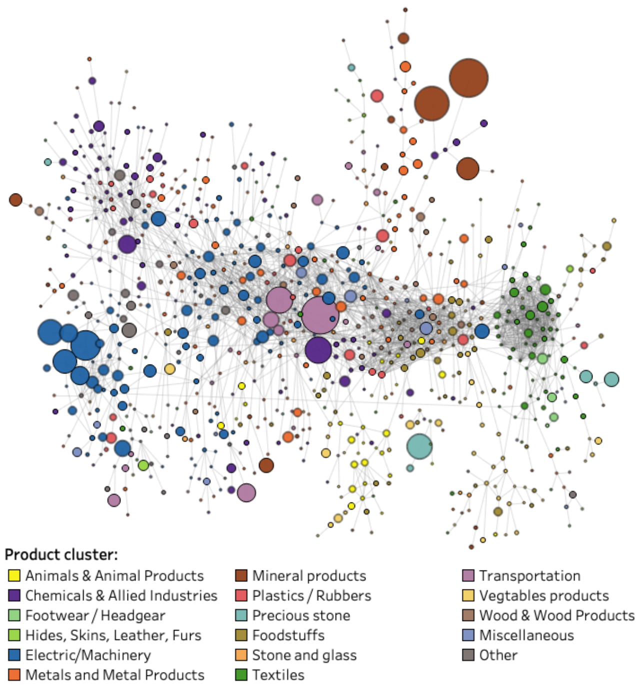
The proximity between pairs of products is defined as their probability to be co-exported. Products with high proximity are assumed to share similar embedded knowledge and capability requirements [33]. Hence, these products are located close to each other in the visualisation of the network, forming dense parts of the Product Space (see Figure 1). Moreover, Hausmann et al. (2014) find that more sophisticated goods, often manufacturing goods, are closely linked to other manufacturing commodities, implying that once the industrialisation process has started, it is easier to diversify into other manufacturing products [36], [37].

As illustrated in Figure 1, the Product Space is noticeably heterogeneous. Some product groups, such as textiles (green) are closely related yet have few links to other product clusters. On the contrary, machinery and electronics (blue) are widely dispersed and connected to various other product clusters. From the heterogeneous properties of the network, Hidalgo (2007) base their argument that structural change varies in velocity depending on the different capabilities economies possess [38].

3 DIVERSIFICATION STRATEGY

Similar to several other nations in SSA, Tanzania has a large growing labour force, where the majority are employed in the low-productive informal agricultural sector [41]. Tanzania has, since the beginning of the twenty-first century, managed to double GDP per capita in PPP-terms, yet it is still only half of the SSA average [42]. Despite the strong economic growth, it is difficult to verify whether the progress has served the poorest in the economy[3] [41].

[3]The number of individuals below the national poverty line has fallen from 34.4 to 26.4 per cent from 2007 to 2018, and extreme poverty has fallen from 11.7 to 8.0 per cent, indicating that economic growth has become more inclusive. Yet, the velocity of poverty decline has stalled since 2012 [43]. The average decline has fallen from one percentage point a year to just 0.3 percentage points per year between 2007-12 and 2012-18. Moreover, due to rapid population growth, the



Source: Author's calculations based on [39]. Inspired by the Atlas [40]. Sizes reflect world trade.

Figure 1. *The Product Space (2018), HS4-code.*

Like other emerging Africa economies, the growth in Tanzania has mainly been commodity-driven [45]. Nevertheless, Ellis et al. (2017) found that structural transformation in Tanzania has been growth-enhancing since the early 2000s [46]. Yet, employment in non-agricultural activities has largely remained in the informal sector, and the positive structural transformation was not supplemented by within-sector productivity growth, as seen in East Asia [45]. Ellis et al. (2017) found productivity decline in six out of ten modern sectors in Tanzania [46]. Moreover, the country has a large tourism sector and a vast variation of natural resources. It has the benefit of not being landlocked, yet many elements are similar to the SSA region as a whole, making Tanzania a valid representative of the region.

Since the 1980s, Tanzania has been exceedingly dependent on very few products, in particular coffee and gold, making the economy exposed to fluctuations in commodity prices and weather changes. In the 1980s, coffee accounted for up to 44 per cent of total exports. Government interventions and a higher cost of cultivation led to a large drop in the production, and at the beginning of the twenty-first century, the coffee share was below 10 per cent [47]. After the Government of Tanzania (GoT) opened up for international investment in the mining sector in 1997, gold has replaced coffee with an export basket share of up to 35 per cent in recent years (ibid). Being one of the highest valued products in the world, the extractions of gold and other minerals can become a significant revenue opportunity. Primarily if the lessons learned related to the resource curse is implemented [8]. However, reliance on a single income resource places the economy in an unprecedented high-risk [48].

According to the Method of Reflection, economic diversification is related to a more sustainable and robust economic growth [36]. Diversifying Tanzania's economy, becoming more centrally positioned in the Product Space, will reduce the reliance on a few income sources and reduce the risk for long and deep recessions in the future [49]. Additionally, diversification of production has both been found to enhance a more stable urban and rural employment creation, has been associated with a more inclusive growth path and has several positive political and social impacts, such as fighting corruption, political stability, social- and institutional reforms [50]–[52].

When designing Tanzania's diversification strategy, several noticeable constraints are crucial to take into account:

- **Supply factors**: The productive knowledge in an economy, accumulated through education and learning by doing in manufacturing, is the major constraint in the diversification process [21], [53]. Tanzania's current export basket is largely composed of lower-complex agricultural and mineral products, cf. Figure 10. Hence, the predicted available know-how is relatively restrained.
- **Demand factors**: In a country with scarce resources and a historically large negative trade balance, it is relevant to estimate which industries are likely to generate the most export revenue and what trade partners compound the most important export markets. There are two obvious export markets, the Free Trade Area of EAC and SADC, and the rest of the world.
- **Labour absorption**: Due to a continuing high fertility rate in Tanzania of around five children per woman, the labour force will continue to expand into the far future [54]. The diversification strategy should focus on promoting industries which are labour intensive in order to enhance job creation. Neglecting this could lead to massive youth unemployment and potential societal conflicts [55].

On the one hand, managing stringent international standards and demanding buyers in GVCs is associated with improved firm productivity and product quality [56]. On the other hand, Tanzania's weak infrastructure and trade logistics present severe hindrances in the firms' ability to compete in high-complex products on the global market (ibid.). If effective, higher sophisticated industries will foster positive structural transformation. Yet, due to the potential lack of experience in the new industries, deserting activities in which Tanzania holds a competitive advantage or are making inroads (e.g. textiles) too early can originate more unemployment and negative structural transformation [57].

Hence, the diversification strategy is split in two; a low-hanging fruits strategy identifying products highly related to Tanzania's existing know-how and a long-jump strategy identifying products further away but with higher opportunity to increase the

absolute number of people under the international poverty line has increased from 13 to 14 million (M) between 2007 to 2018. The demographic pressure will undoubtedly pose additional challenges, as Tanzania works to prevent further poverty reduction and economic growth (ibid.). The population is expected to increase from 53.4 M inhabitants in 2017 to 82.9 M in 2030 [44].

economic complexity of the nation. The industries which are tangible given Tanzania's productive knowledge are ranked by two separate indices. The indices balance the trade-offs considered in the two strategies, respectively. In consideration of the foregoing, we take account for the demand factors by ranking the top industries identified by the two indices in accordance with their industry-specific trade resistance and geographically dispersed demand. Lastly, we conduct an employment absorption strategy in order to rank the tangible products by their labour intensity.

4 SUPPLY SIDE FACTORS

4.1 Methodology

In order to compare countries and products, the Method of Reflection applies Balassa's (1986) determination of Revealed Comparative Advantage (RCA) [27], [58]. A country is defined to have an RCA in a given product if its export share is larger or equal to the product's share of the overall world trade. This measure has been widely used in the literature, yet it suffers from both theoretical foundation and empirical distribution weaknesses [59]. See more in Box 1 (app.). We adjust the RCA to mollify shifts in exports caused by price fluctuations in goods by averaging the denominator over the preceding four years.

$$RCA_{cpt} = \frac{X_{cpt}}{\sum_c X_{cpt}} / \frac{1}{4} \sum_{i=t}^{t-3} \frac{\sum_{pi} X_{cpi}}{\sum_{cpi} X_{cpi}} \tag{1}$$

, where X_{cp} is the value of product p that a country c exports in USD [60]. Tanzania made an export ban on gold and a price floor on raw cashew-nuts in periods of 2018, resulting in a significant reduction in the exported value of the two commodities [61], [62]. The traded value of gold and cashew-nuts combined usually accounts for 30-45 per cent of Tanzania's total exports. Hence, relative to the rest of the world, Tanzania looks more complex in 2018, not due to an increase in new productive knowledge, but political interventions. For more detail see Box 2 (app.).

To ensure that fluctuations due to temporary shocks will not have a major impact in the analysis, we define a country to be a prime exporter of a product if it has an average RCA above or equal to one for the past four years, corresponding to the duration of the average business cycle in emerging economies [63]. This is captured in the matrix, $M_{c,p}$, for the country c and the product p:

$$M_{cpt} = \begin{cases} 1 & \text{if} \quad \frac{1}{4}\sum_{i=t}^{t-3} RCA_{cpi} \geq 1 \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

We develop two complexity indices for countries (ECI) and products (PCI) based on the estimates of diversity and ubiquity, respectively. Going forward we drop the time-period subscripts to avoid notations confusion, but the measurements remain time-dependent. The diversity and ubiquity measures are found by summing the columns and rows of the M_{cp}-matrix, respectively:

$$Diversity_c = k_{c,o} = \sum_p M_{c,p} \tag{3}$$

$$Ubiquity_p = \kappa_{p,0} = \sum_c M_{c,p} \tag{4}$$

Diversity and ubiquity can, respectively, be applied as "*crude approximations of the variety of capabilities available in a country or required by a product.*" [36]. However, as some products such as many natural resources are rare, yet require few skills, the measures are imperfect [33]. Despite this, they can create efficient relative valuations of countries' productive knowledge and a product's complexity by iteratively adjusting for one another as biases are complementary (ibid.). Hence, by increasing the level of *reflection* to $k_{c,1}$ and $\kappa_{p,1}$, estimating the average ubiquity of the commodities exported by country c and the average diversification of the countries exporting the product p we obtain a higher degree of accuracy [64], [65]:

$$k_{c,1} = \frac{1}{k_{c,0}} \sum_p M_{cp} \cdot \kappa_{p,N-1} \tag{5}$$

$$\kappa_{p,1} = \frac{1}{\kappa_{c,0}} \sum_c M_{cp} \cdot k_{c,N-1} \tag{6}$$

Insert 6 into 5 we obtain the following:

$$\begin{aligned} k_{c,N} &= \frac{1}{k_{c,0}} \sum_p M_{cp} \frac{1}{\kappa_{p,0}} \sum_{c'} M_{c',p} \cdot k_{c',N-2} \\ &= \sum_{c'} \sum_p \frac{M_{c,p} M_{c',p}}{k_{c,0} \kappa_{p,0}} k_{c',N-2} \\ &= \sum_{c'} \widetilde{M}_{c,c'} k_{c',N-2} \end{aligned} \tag{7}$$

where the diversity matrix of interest is defined as

$$\widetilde{M}_{c,c'} = \sum_p \frac{M_{c,p} M_{c',p}}{k_{c,0} \kappa_{p,0}}. \tag{8}$$

The ubiquity matrix is symmetric to the diversity matrix. Hence, by substituting products for countries we find the $\widetilde{M}_{p,p'}$. The complexity indices are achieved by obtaining the eigenvector with the second largest eigenvalue from the two matrices, respectively [36]. Hausmann et al. (2014) state that these eigenvectors obtain the largest variance of the system [4].

The Product Space variables

The *distance* between commodities arise from the assumption that know-how and product diffusion are path-dependent [36]. If an economy's productive structure is closely related to a new commodity, the economy is presumed to process many of the

[4]Normally, the eigenvector, that is associated with the largest eigenvalue (scaling factor), λ, captures the largest variation in the matrix [66]. Yet, in the case of $\widetilde{M}_{c,c'}$ and $\widetilde{M}_{p,p'}$ this eigenvector will not be informative, as it is a vector of ones ($k_{c_N} = k_{c,N-2} = 1$) [65].

capabilities needed to procure that good, reflected in a low distance value. By promoting diffusion into "nearby" goods, the economy diminishes what Hausmann et al. (2014) refer to as the "*chicken and egg problem*".

Hausmann et al. (2014) estimates the distance by first introducing the *proximity* between goods, which is the minimum conditional probability that an economy co-exports two goods, e.g. oranges (o) and fruit juice (j):

$$\phi_{o,j} = min(P(M_o \mid M_j), P(M_j \mid M_o)) \tag{9}$$

For a given product and economy, the distance is then calculated as the sum of the proximities of which the economy does not have an RCA relative to the sum of proximities of all products:

$$Distance_{cp} = \frac{\sum_{p'}(1 - M_{(cp')}\phi_{p,p'}}{\sum_{p'}\phi_{p,p'}} \tag{10}$$

The distance measure is applied to calculate the Economic Complexity Outlook Index (COI). The COI captures a country's diversification opportunities given its current position in the Product Space and how sophisticated the nearby products are:

$$\text{COI}_c = \sum_p (1 - distance_{cp})(1 - M_{cp})PCI_p \tag{11}$$

The COI, however, does not capture the gain affiliated with a country diversifying into a new product in the Product Space. Hence, Hausmann et al. (2014) developed a measure of a given product's *opportunity gain* (OG) [36]. The OG, captures the change in COI (additional opportunity to diversify), a given new product provides[5]:

$$\text{OG}_p = \sum_{p'} \frac{\phi_{p,p'}}{\sum_{p'}\phi_{p',p'}}(1 - M_{c,p'})PCI_{p'} \tag{12}$$

4.2 Data

To estimate the variables defined above, international trade data, formerly conducted by the United Nation's Commodity Trade Statistics (Comtrade) is employed. The data applied are collected from the BACI trade database, where the Comtrade data has been cleaned by a method of harmonisation [39], [65]. The products are classified by the Harmonized Commodity Description, also known as Harmonized System (HS). The data consist of "*bilateral values and quantities of exports at the HS 6-digit product disaggregation, for more than 200 countries.*" [67]. To avoid volatility, the data is reduced to a 4-digit disaggregation. The paper uses the original 1992 classification.

The BACI (2020) dataset includes the value of trade flows in current US dollars (USD), identified by the exporter, the importer, and the product category from the year 1995 till 2018 [39]. We furthermore restrict the sample by conducting a set of time-independent and dependent filters. For the time-independent filters, we follow Hausmann et al. (2011) by excluding a number of countries which do not provide a sufficiently comprehensive sample to analyse their productive knowledge [68]. We limit the dataset to countries for which there exist product-level trade data for the period 1995-2018, that have a population above 1.2 M in 2018 and which total export value exceeded 1 billion (B) USD per year, on average, between 2016 and 2018 [54], [67]. Lastly, due to critical data quality issues we exclude Iraq, Macau and Chad from the sample.

For the time-dependent filters, we first nullify any country-product combination that involves less than USD 5,000 in exports. To have a balanced data set, we exclude products from the sample which was not traded in the year of interest (2018). Hence, we end up with 1220 products and 134 countries, accounting for 91 per cent of world trade and 96 per cent of the world population.

The Product Space analysis below applies the following supply-side variables; RCA, Distance, PCI, COI, and OG. The variables are calculated following the methodology described in section 4.1. The commodities have been categorised into 17 clusters, following the United Nations Statistical Division (UNSD) [69]. This is done to obtain a higher detailed classification compared to the Atlas of Economic Complexity (Atlas), that consists of just 9 clusters.

4.3 Identifying target products

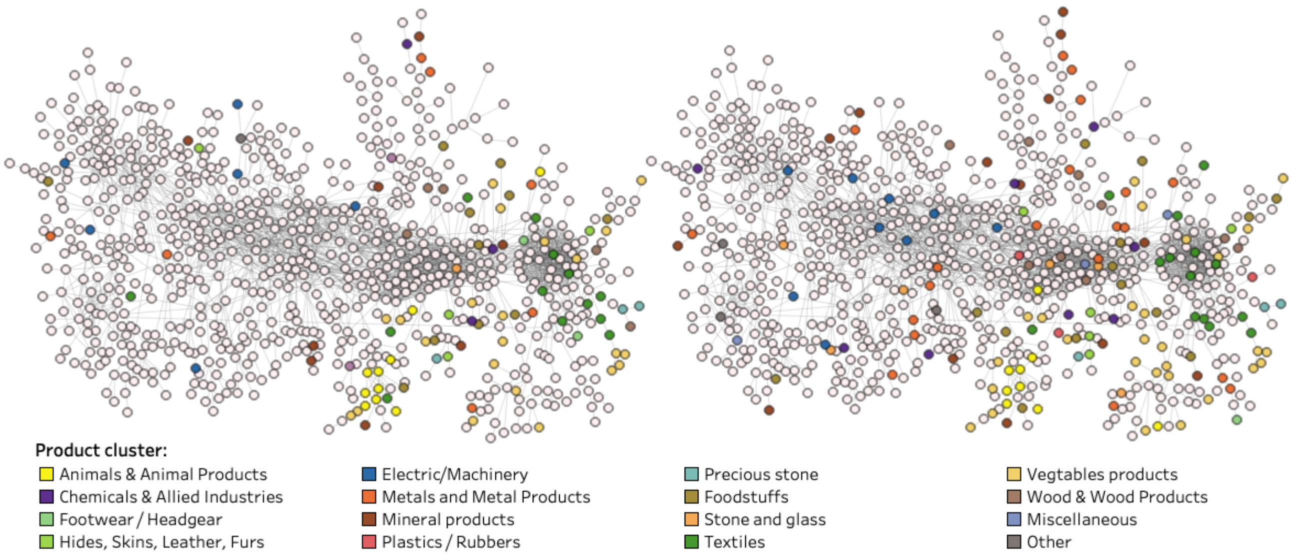
Figure 2 illustrates the Product Space of Tanzania in 2000 (left) and 2018 (right). Products of which Tanzania is a prime exporter are marked in colours, showing multiple products in the agricultural (yellow) and mining industry (brown and light blue). These commodities are located in the periphery of the space, with few links to other products and low complexity. Since the commodities in the sparse part of the network can be exceedingly attractive, such as gold and oil extraction, many developing countries have had difficulties diffusing to other sectors [37]. This is also called the quiescence trap.

Comparing the Product Space from 2000 to 2018 we find that Tanzania is starting to populate the dense part of the textile cluster and making inroads into the dense part of the network, cf. Figure 2. Hence, the road to a more diverse and complex economy can become less challenging. Since 2000, Tanzania has diversified its economy with 52 new products indicating that Tanzania's productive knowledge has increased significantly. Some, of the newly achieved RCAs, are, however, just above the threshold. Were it not for the political interventions in gold and cashewnuts, Tanzania may not have been listed as a prime exporter in these industries. Yet, the data still indicate a positive trend in the accumulation of new knowledge in Tanzania.

Precious stones, including gold, diamonds, and others (e.g. tanzanite), still contribute to 17.1 per cent of the total export value in 2018, cf. Table 7 (app.)[6]. The vegetable cluster is down from USD 1.4 B in 2017 to 736 M in 2018, reflecting the price

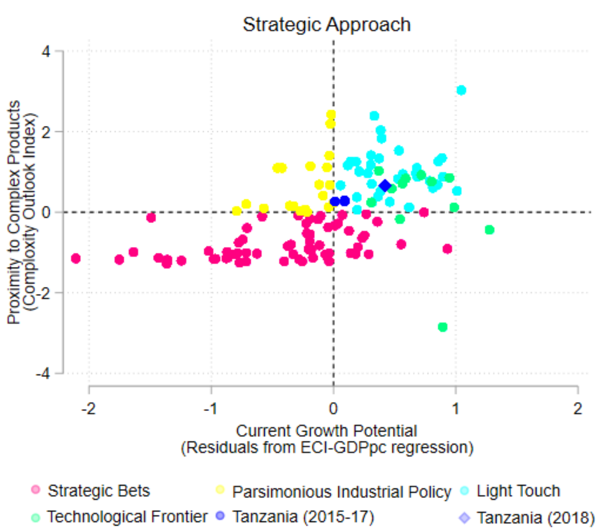
[5] For visual purposes we multiply the OG variable with 100.

[6] In 2019, gold export rebounded close to the 2015-2017 average of 32.3 tons, increasing from 28.3 tons in 2018 to 31.6 tons in 2019 [70]. This reflects an increase in tons of 11.6 per cent, but an increase in the value of 45.5 per cent due to a boom in gold prices (ibid).



Source: Author's calculations based on BACI (2020) [39]. Inspired by the Atlas [40]

Figure 2. *Product Space of Tanzania,* ***left year 2000*** *and* ***right year 2018****, HS4, RCA* ≥ 1.



Source: Author's calculations based on BACI 2020 [67]. Inspired by Hausmann, Morales and Santos (2016)

Figure 3. *Residuals vs COI.*

floor of raw cashew nuts. Out of the 207 products, just 16 products are in the agro-processed food cluster (Foodstuffs).

Figure 3 illustrates the 134 countries' current diversification opportunity in relation to their position in the Product Space (reflected in the COI) and the countries' growth potential given the countries' current economic complexity (reflected in the residuals from a simple regression of ECI against Real GDP per capita). Following Hausmann, Morales and Santos (2016), a country's location in the plot indicates which strategies we would advise for them to follow [71]. In the top-left quadrant, countries struggle with low complexity, yet is positioned close to new opportunities. Hence, it would be advisable to focus primarily on parsimonious transformation (the low-hanging-fruits strategy). In the top-right quadrant, countries have many connections (low-hanging fruits) and can grow from its existing structure. Hence a light-touch approach is advised. We furthermore distinguish between two types of countries. One which has low complexity due to potentially being stuck in the quiescence trap (bottom quadrants). Hence, these countries should focus primarily on the strategic bets (the long jumps strategy) approach. The other set of countries may have fewer opportunities, due to being highly diversified (the 90th percentile in terms of ECI) (ibid). Due to the sudden jump in the amount of RCAs in 2018, Tanzania moved significantly from being in the centre of the space to become located in the light-touch approach cluster. Hence, the products of which Tanzania has become a competitive exporter in from 2017 to 2018, are products of relatively high complexity and opportunity gain. Assuming that the market has comprehensive information about the product diffusion potential in Tanzania, the GoT should employ the market signals and promote these sectors. We label these industries, *existing targets* and present them in Table 8 (app.).

Comparing the economies in the EAC, Tanzania and Uganda are reasonably similar, whereas Kenya is the most diversified economy in the region, cf. Box 3 (app.). The landlocked economies of Burundi and Rwanda are less diversified. The low competition, together with united external tariffs in the EAC, facilitates a unique opportunity for Tanzania to export higher complex commodities (long jumps) to the region. Yet, the structure of

Tanzania's exports indicates that the country has many nearby opportunities, suggesting a low-hanging fruits strategy. We, therefore, split the following analysis into two strategies.

4.4 Implementation of the strategy

Employing the Product Space methodology, following among others Hausmann and Chauvin (2015) and Hausmann et al. (2014), our analysis identifies tangible products for which Tanzania is advised to focus its effort in order to diversify its export structure [53], [57]. Ideally, the commodities should meet three central criteria:

1. Introduce new productive knowledge (high complexity)
2. Facilitate further diversification (high opportunity gain).
3. Be credible in terms of existing knowledge (low distance)

Trade-offs exist among the three criteria. Figure 4 (A1) shows the association between product complexity (PCI) and the distance variable for products for which Tanzania is yet to exploit (RCA<1). The red horizontal line represents Tanzania's average PCI in the period 2015-18. To identify the tangible industries, all products associated with a complexity lower than Tanzania's average PCI are left out (marked dark green), *criteria one*. Similarly, the commodities affiliated with a high opportunity gain tend to be further away (Figure 4, A2). Yet, as all products contribute to accumulating new productive knowledge, they all satisfy *criteria two*. Tanzania is an economy of insufficient resources and is highly dependent on FDI in order to promote specific sectors. Not to overstretch, the *third criteria* is crucial for the products to be tangible. We follow Hausmann and Chauvin (2015), applying the median distance as the sealing [53]. Products with a distance value above the median are excluded.

While this narrows Tanzania's tangible product space down to a set of 347 attractive products (marked light green in Figure 4), it is too broad for meaningful policy targeting. One instinctive way to select a smaller number of target products from the pool of tangible products is by focusing on the products above the fitted lines in Figure 4. Investing in commodities below the line would be inefficient, as it would always be possible to invest in an industry with similar distance, but higher PCI and OG. The products above the line are named the feasible products (marked blue). This approach is, however, still too broad, classifying 185 products.

Low-hanging fruits and Long-jump strategy

We can with relative ease identify the products of highest opportunity gain and complexity by regressing the distance against the OG and PCI variables. The products with the lowest residuals become the frontier target products. However, it is our objective to provide recommendations within two sets of target products - one with high density (1-distance) reflecting a low-hanging-fruits strategy and one with low density reflecting the long-jump strategy. The two separate indices shall balance the trade-offs considered:

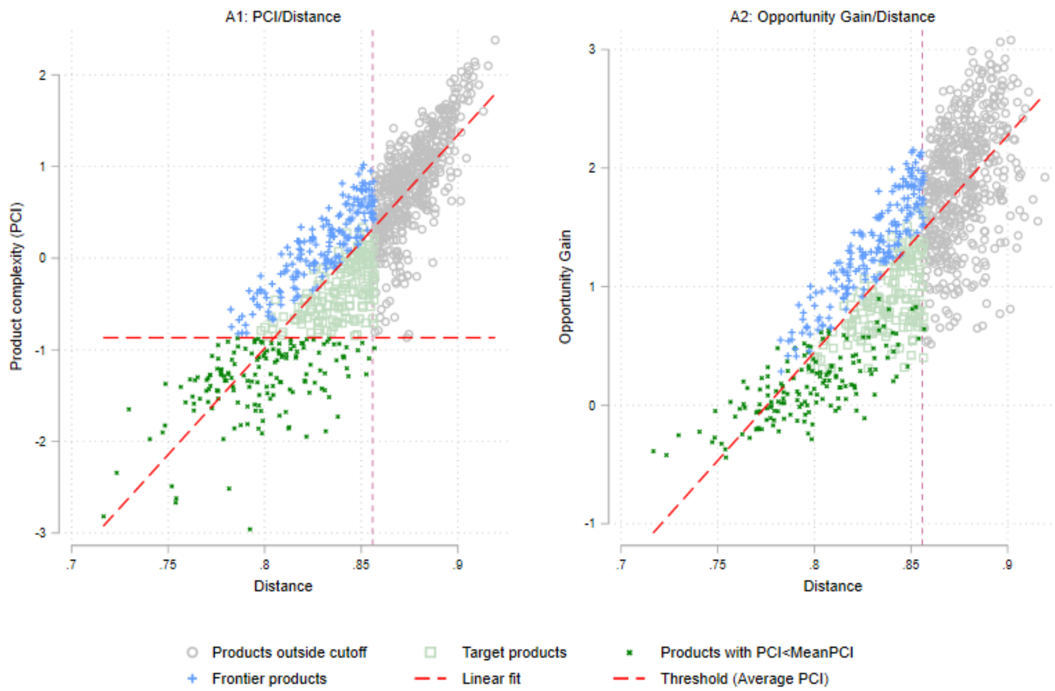
- **Parsimonious transformation index**: The low-hanging fruits strategy shall identify products which offer moderate opportunity and higher than average complexity, yet lay in the neighbourhood of Tanzania's existing set of capabilities. Hence, product diffusion requires less investment and risks.
- **Strategic bets index**: The long-jump strategy shall identify frontier products of relatively high PCI and opportunity gain. The targets identified by the index are of great strategic value, yet the distance will be considerably higher, involving comprehensive investments and possibly attractions of FDI to be successful.

The indices are created by weighting the three normalised variables of interest, reflecting the objectives previously stated. By normalising, the variables become comparable. We influence the individual importance through the use of weights with relative ease. However, in the literature of applied economic complexity, the method in which these weights are determined is not unequivocally defined [53], [57], [71]. Hence, the weighting-schemes become somewhat arbitrary. It is important to regard the weighting-schemes as highly subjective and a result of political consideration.

Following Sørensen et al. (2020) we select our weights from propositions informed to some extend by theory and empirical analysis [72]. The first proposition considers Tanzania's location in Figure 3, described above. As Tanzania has a variety of higher complexity opportunities nearby, Hausmann, Morales and Santos (2016) suggest Tanzania follow the Light Touch Approach [71]. Hence, the density measure for the two indices is set relatively high - for the parsimonious transformation index we set it to 0.60 and for strategic bets index, 0.40 [72].

The ratio of the PCI/Opportunity Gain is of higher importance, the lower the density weighting, cf. Figure 11 (app.). For the parsimonious transformation index, the variation of products identified as being in the top 50 does not vary significantly, whereas the products for the strategic bets index vary notably more. However, this is also desirable.

The second proposition states that the market actors have an incentive to move into higher complex products relative to products with a connection to the higher complex product, due to high externalities [72]. According to Hausmann and Klinger (2006, 2007), firms will, ceteris paribus, have an incentive to invest in higher complex products when the new product increases the firm's total profits [73], [74]. The cost of producing a new product depends on the degree to which the firm needs to acquire new knowledge. When new knowledge is generated, the entire economy can benefit as the societal value is not secure in the original firm, due to labour mobility and firms emulating. It can even be socially optimal to enable firms to invest in product upgrading, when it incurs a loss for the firm. Hence, without government interventions, such as subsidies or partnerships with public universities etc., the firms will under-invest (ibid). Although complexity and opportunity gain are highly correlated, products with a higher opportunity gain will have higher positive spillovers to other sectors. In order to identify industries which generate high externalities and thereby reaching the socially optimal investment levels, we, from a structural transformation perspective, prefer a higher weight to OG relative to PCI. Sørensen et al. (2020) em-



Source: Author's calculations based on BACI 2020 [40], [67].

Figure 4. *Tangible and feasible products in trade-off plots, HS4, RCA $\geq$ 1 for Tanzania in 2015-2018*

pirically compute a linear probability model, that, by holding the density measure constant, indicates that countries are more likely to move into products with high PCI scores and lower OG [72]. This confirms that selecting a higher weight to the opportunity gain variable is desirable (ibid).

The chosen weights for the analysis are shown in Table 1.

Table 1 *The strategic weights*

Weights	Density*	PCI	OG
Parsimonious transformation index	0.60	0.10	0.30
Strategic bets index	0.40	0.20	0.40

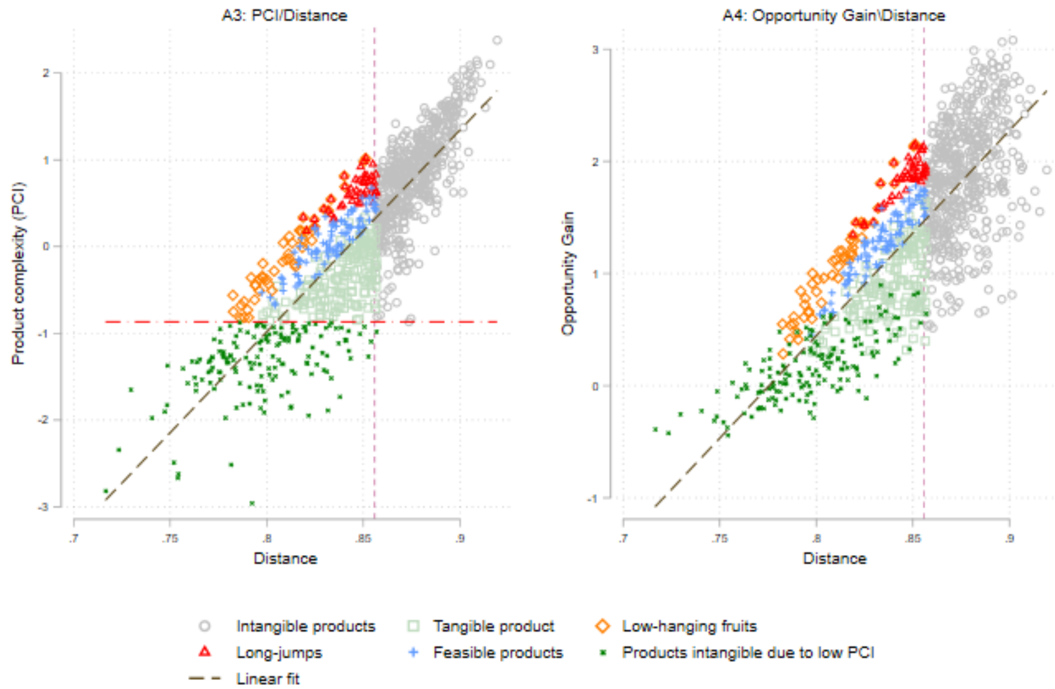
* Density is defined as (1-distance)

4.5 Results

The 50 best-ranked target industries identified by the two indices, respectively, are illustrated in Figure 5. The long-jumps are marked red, whereas the low-hanging fruits are marked orange. The top 25 target industries found by the two indices, respectively, are, furthermore, presented in Table 2.

Table 2 grants an abstraction of which particular sectors aggregate important pillars for structural change in Tanzania and enables us to match these to the priority sectors recognised in the Integrated Industrial Development Strategy (IIDS) 2025 and the ongoing FYDP. According to Tanzania's FYDP, the manufacturing sector faces many challenges [25]. It is noted that the Tanzanian firms have had difficulty diversifying towards higher sophisticated industries (ibid.). In contrast, our analysis uncovers that Tanzania has several opportunities to diversify its economy through derived industries.

The agro-processing sector (Foodstuffs) and the construction sectors (Metals and Wood products) are identified as important drivers of transformation by the lower-hanging fruits strategy. These sectors are included as priority sectors in the IIDS and FYDP. Improving the agro-processing sector, in order to export final food products instead of raw materials, would increase the value of Tanzania's export substantially. The cluster accounted for USD 668 M in export value in 2018, which is almost four times the value of Tanzania's entire textile industry, cf. Table 7 (app.). The GoT has attempted to push for agro-processing by setting a floor on raw products, explicitly in the cashew-nuts industry. Ninety per cent of the nuts from Tanzania are exported raw, processed in India and Vietnam and then re-exported [75]. The raw cashew exports have increased by 450 per cent over the last decade, and with growing global demand, due to higher consumer spending in Asia in particular, the cashew-nut production has become a key export industry for Tanzania [75]. The local farmers have, however, not nourished from this. The farmers are often offered a price for their crops, much under the market value, mainly due to weak auction systems and monopolistic middle-men [8], [75], [76]. The GoT doubled the price of raw cashew nuts in 2018 and pushed for processing of the nuts before exporting [61]. Stiglitz



Source: Author's calculations based on BACI 2020 [40], [67]. Top 50 products ranked by index.

Figure 5. *Target products in trade-off plots, HS4, RCA ≥ 1 for Tanzania in 2018*

(2018) suggests an import substitution-like approach towards agro-industry, involving the country in the full chain from inputs to the crop to the final product [8].

The long-jump strategy finds industries within the more complex clusters. Especially the clusters of chemical and plastic & rubber are identified as prime sub-sectors. These sectors are highly relevant concerning structural transformation but are considered subsidiary in the existing industrial strategies. These products are of particularly high complexity and located in the center of the Product Space. It may seem far-fetched that Tanzania should bet on these highly sophisticated industries that lie far from Tanzania's productive knowledge. However, some of the target products within these clusters are also identified by the low-hanging fruit strategy, indicating that Tanzania has some complementary knowledge in these industries.

5 DEMAND FACTORS

5.1 Methodology and data

To incorporate demand factors into the analysis, we develop a structural gravity model. The aim is to predict the trade-volume of the different target products and which markets are most likely to demand these products given Tanzania's geographical position, cultural ties and trade alliances. Following Head and Mayer (2014), we consider a structural gravity model:

$$X_{ei} = \frac{Y_e}{\vartheta_e} \frac{X_i}{\varphi_i} \Phi_{ei} \tag{13}$$

Here X_{ei} is the total trade between exporter, e, and importer, i. The total value of production by the exporters and importers are denoted Y_e and X_i, respectively [77]. The ϑ_e and φ_i are the multilateral resistance terms and ϕ_{ei} represents the distance measures between the exporter and importer. In implementing eq. 13 empirically, we consider three specifications suggested in the literature and estimate the model by OLS in its logarithmic form and by Poisson in its multiplicative form.

The first implementation approach was to estimate the model by OLS in its logarithmic form and apply different distance measures between countries as a proxy for trade costs as well as various size controls, such as population or GDP [78]. This approach we call the naive specification. Anderson and van Wincoop (2003) clarified that neglecting the multilateral resistance terms in the structural gravity model may induce critical biases to the estimations [79]. The traditional specification attempts to account for multilateral resistance by considering "remoteness indices", a function of GDP and bilateral distance[7] [81]. We name this specification the traditional approach. Following Silva and Tenreyro (2006), we include a

[7] There are many suggestions on how to calculate remoteness. We apply the following formula, argued by Head and Mayer (2014) to be the best proxy for

Table 2 *Top 25 products ranked by the parsimonious transformation index (top) and strategic bets index (bottom)*

			Top 25 products ranked by the **parsimonious transformation index**							
Rank Index	Product cluster	ID (HS4)	Product name	PCI	Distance	OG	RCA	Export ($M)	World ($B)	Strategic Value
1	Foodstuffs	1704	Confectionery sugar	-0.56	0.78	0.55	0.28	4.05	11.56	0.46
2	Foodstuffs	2202	Waters, flavored/sweetened	-0.36	0.79	0.84	0.80	8.52	20.30	0.46
3	Plastic/Rubber	3923	Packing lids	-0.20	0.80	1.00	0.25	3.20	53.65	0.45
4	Wood Products	4819	Cardboard packing containers	-0.36	0.80	0.91	0.34	4.21	24.36	0.40
5	Foodstuffs	2103	Sauces and seasonings	-0.44	0.79	0.78	0.01	0.04	12.99	0.40
6	Foodstuffs	2403	Manufactured tobacco	-0.67	0.79	0.54	0.10	0.64	7.34	0.39
7	Vegetables	1104	Worked cereal grains	-0.45	0.79	0.72	0.40	0.72	1.73	0.38
8	Metal Products	7602	Waste/scraps, aluminium	-0.82	0.79	0.61	1.00	6.40	14.14	0.38
9	Foodstuffs	2007	Marmalades	-0.63	0.79	0.55	0.04	0	3.30	0.38
10	Foodstuffs	2106	Food preparations n.e.c.	0.04	0.81	1.11	0.04	0.74	44.09	0.37
11	Stone and glass	7001	Cullet and scraps of glass	-0.43	0.80	0.95	0.06	0	0.43	0.37
12	Chemicals	3305	Hair products	0.12	0.81	1.20	0.04	0.47	14.44	0.37
13	Foodstuffs	2104	Soups and broths	-0.28	0.80	0.96	0	0	3.23	0.35
14	Chemicals	3402	Cleaning products	0.18	0.82	1.46	0.55	19.98	35.47	0.35
15	Wood Products	4818	Toilet paper	0.34	0.82	1.34	0.28	3.68	27.05	0.35
16	Foodstuffs	1904	Cereal foods	-0.38	0.80	0.84	0.01	0.09	6.42	0.35
17	Foodstuffs	2001	Pickled fruits and vegetables	-0.75	0.78	0.28	0	0	2.16	0.34
18	Plastic/Rubber	3917	Plastic tubes and fittings	0.04	0.81	1.20	0.54	8.25	26.29	0.34
19	Plastic/Rubber	3921	Plastic plates, sheets etc.	0.82	0.84	1.99	0.07	1.63	26.36	0.34
20	Chemicals	3208	Paints, nonaqueous	0.55	0.83	1.80	0.11	0.28	14.89	0.34
21	Mineral products	2710	Petroleum oils, refined	-0.82	0.79	0.42	0.27	118.57	736.51	0.34
22	Foodstuffs	2309	Animal feed	-0.15	0.81	1.12	0.12	0.02	30.53	0.34
23	Metal Products	7306	Tubes etc. of iron/steel	-0.38	0.80	0.65	0.56	14.70	24.43	0.33
24	Miscellaneous	9406	Prefabricated buildings	0.19	0.82	1.30	0.04	0.07	8.83	0.33
25	Foodstuffs	2101	Coffee extracts	-0.61	0.79	0.61	0.33	1.13	8.67	0.33

			Top 25 products ranked by the **strategic bets index**							
Rank	Product cluster	ID	Product name	PCI	Distance	OG	RCA	Export	World	SV
1	Electric/Machinery	8431	Parts for hoists/excavation machinery	1.02	0.85	2.15	0.33	20.09	56.89	0.56
2	Metal Products	7326	Articles of iron or steel	0.98	0.85	2.13	0.03	1.06	52.32	0.55
3	Plastic/Rubber	3921	Plastic plates, sheets etc.	0.82	0.84	1.99	0.07	1.63	26.36	0.53
4	Wood Products	4902	Newspapers, journals and periodicals	0.95	0.85	2.1	0.07	0.32	3.15	0.48
5	Other	9033	Parts for machines and appliances	0.92	0.85	1.99	0.03	0	2.77	0.48
6	Plastic/Rubber	4016	Articles of vulcanized rubber	0.76	0.85	2.04	0.03	0.93	27.56	0.48
7	Plastic/Rubber	3926	Articles of plastic	0.81	0.85	2.11	0.09	7.46	78.14	0.47
8	Chemicals	3208	Paints, nonaqueous	0.55	0.83	1.80	0.11	0.28	14.89	0.46
9	Chemicals	3004	Medicaments, packaged	0.79	0.85	2.00	0.01	1.48	365.71	0.44
10	Transportation	8716	Trailers and semi-trailers	0.75	0.85	2.04	0.54	19.32	29.61	0.44
11	Chemicals	3823	Industrial monocarboxylic fatty acids	0.68	0.86	2.13	0.06	2.15	55.11	0.44
12	Electric/Machinery	8503	Parts for use with electric generators	0.77	0.85	1.91	0	0	18.05	0.44
13	Wood Products	4911	Printed matter	0.69	0.84	1.80	0.28	3.80	10.71	0.42
14	Electric/Machinery	8434	Dairy machinery	0.82	0.85	1.94	0	0	2.17	0.42
15	Chemicals	3003	Medicaments, not packaged	0.59	0.84	1.85	0.03	0.34	17.54	0.41
16	Transportation	8608	Railway track fixtures	0.75	0.85	1.93	0	0	0.98	0.41
17	Electric/Machinery	8432	Machinery for soil preparation or cultivation	0.67	0.84	1.84	0.27	2.21	8.38	0.41
18	Metal Products	7616	Articles of aluminum	0.75	0.85	1.98	0.01	0.12	18.03	0.40
19	Wood Products	4811	Cellulose wadding, coated	0.57	0.85	1.96	0.10	1.26	19.67	0.39
20	Miscellaneous	9508	Fairground amusements	0.83	0.86	1.96	0.05	0.03	1.72	0.38
21	Wood Products	4823	Paper cut to size	0.53	0.84	1.85	0.02	0.14	10.17	0.38
22	Electric/Machinery	8476	Automatic goods-vending machines	0.75	0.85	1.91	0	0	1.86	0.37
23	Wood Products	4901	Books, brochures etc.	0.57	0.85	1.85	0.26	3.1	16.32	0.37
24	Electric/Machinery	8418	Refrigerators, freezers	0.82	0.85	1.85	0.24	16.17	46.47	0.37
25	Electric/Machinery	8504	Electrical transformers	0.73	0.85	1.86	0.51	59.38	90.46	0.37

Source: Author's own calculations, classification by Section from UNSD. Data Source: BACI (2020) [67], [69]

Note: Some names have been shortened in the table. *Regional trade is in USD M and World trade in USD B.

control dummy for whether the countries are landlocked [78]. We, furthermore, introduce year dummies in both the naive and the traditional specification.

Yet, the remoteness indices have been heavily criticized, as they display little similarity with the theory [77]. In more recent years it has become common practice to apply exporter-year and importer-year fixed effects in dynamic gravity models to control for multilateral resistance as well as other fixed observed and unobserved individual factors [78], [79], [82]. However, there are several weaknesses with the log-linearisation approach. Silva and Tenreyro's (2006) simulation study showed how the presence of heteroscedasticity can generate severe misinterpretations of the OLS estimates even when controlling for fixed effects [78]. Furthermore, the existence of zero values can too distort the results when applying the logarithmic form. Since we study trade values between pairs of countries at a disaggregated product level, about 90 per cent of the observations are zeroes. Silva and Tenreyro (2006, 2011) found that by estimating the gravity model in its multiplicative form and by a Poisson pseudo-maximum-likelihood (PPML) method, it is possible to obtain consistent estimates under heteroscedasticity and with many zero observations in the dependent variable [78], [83]. Another beneficial property of Poisson, highlighted by Arvis and Shepherd (2011), is its additive property, ensuring that the total estimated trade flows are identical to the total actual trade flows [84]. Hence, the PPML fixed-effect (FE) specification is preferred. In order to rank the top 50 target products found by the two indices above, respectively, we run the models separately for each product, allowing product-specific slope parameters and fixed effect:

$$X_{ei}^{p} = exp\left[\beta^{p'} ln\Phi_{ei} + \gamma_{et}^{p} + \theta_{it}^{p}\right] \cdot \xi_{eit}^{p} \tag{14}$$

where γ_{et} and θ_{it} are exporter-year and importer-year fixed effects [77].

As we want to estimate which of the target products are more feasible for Tanzania to promote ex-ante, assuming Tanzania becomes equally competitive in the target products, the exporter-year fixed effects at the current non-export level will be undefined. Leaving the export fixed effect out in the prediction gives us an indication of which industries can generate the highest return and which trade-partners are more willing to import them:

$$\hat{X}_{eit}^{p} = \alpha^{p} + \hat{\beta}^{p'} ln\Phi_{ei} + \hat{\theta}_{it}^{p} \tag{15}$$

The estimated export values are summed over each target product from Tanzania to all importers for a period of eight years, corresponding to the duration of two average business cycles. We then divide by the number of years to obtain the average annual estimated export of each product:

$$ProductExport_{p} = \frac{1}{8}\sum_{it} \hat{X}_{TZA,it}^{p} \tag{16}$$

Due to the fact that we run eq. 14 separately for each product, the $ProductExport_p$ represents an index of which product can generate most revenue given the bilateral accessibility (distance measures) and import structure.

Similarly, we calculate the total average annual estimated trade volume of all products for each importer and generate an index representing, which trade partners will most likely import the target products:

$$CountryImport_{i} = \frac{1}{8}\sum_{pt} \hat{X}_{TZA,it}^{p} \tag{17}$$

Similarly to the supply-side analysis, we apply BACI (2020) data (4-digit HS code) [39]. Yet, for the demand analysis, we exclude only Iraq, Macau and Chad, and thereby apply a much larger sample of 202 countries. We estimate the model with data from 2011-2018. The distance measures are colonial ties, common language, common border, physical distance, and being in a free-trade-agreement (FTA). These, as well as the dummy for whether the countries are landlocked, are obtained from CEPII's GeoDist and Gravity databases, who have dyads for 225 different countries [85], [86]. The GDP and GDP per capita are derived from the World Development Indicators [54].

5.2 Results

The differences between products and importers are captured from the product-specific intercepts and importer-year fixed effects. The different distance measures capture variations in products' transportation cost (physical distance), cultural value (colonial ties, common language) and trade alliances (FTA). In Table 3, the average point estimates are presented for the different distance measures for the various models. Both average robust (in parenthesis) and average clustered standards errors (in brackets) are reported in the table[8]. In our preferred model, PPML-FE, we find that, on average, the dummy variables are positive, as expected. Increasing the distance by one per cent, the predicted trade volume decreases with 0.9 per cent on average. This is in accordance with the empirical literature, that typically finds a coefficient around -1 [86]. The contiguity variable (capturing if the country shares a border with the trade partner) and the common-language dummy are roughly in align with the findings of Silva and Tenreyro (2006) [78]. Yet, our model predicts a considerably higher effect of colonial ties. Our estimate of the impact of FTAs is very close to the benchmark found in the literature [88]. An estimate of $\hat{\beta}_{FTA} = 0.74$ implies that after a typically phase-in

remoteness:

$$Remote_{et} = ln\left[(\sum_{i} \frac{GDP_{it}}{Dist_{ei}})^{-1}\right]$$

and analogously for Remote$_{it}$ [77], [80]

[8] We cluster the residuals over country-pairs to correct for association pattern between pairs of economies over time that could potentially still exist in the standard error of estimate [81]. There are limitations to both robust and clustered standard errors when applied in FE panel regressions. For the discussion, see Stock and Watson (2008) [87]

period of 10 years, the formation of an FTA increases trade by 110 per cent on average [9].

When comparing the results of the naive and traditional models, we find that the estimations of the effects of distance are significantly higher in the traditional models (column 2 and 5) than in the naive models (column 1 and 4), while the estimations of the effects of common language and contiguity are smaller. These outcomes suggest that the estimates from the naive model, which did not account for the multilateral resistance, are biased as proposed by Anderson and van Wincoop (2003) [79], [81]. In consistence with the literature, the estimates of the importer's remoteness indices are positive, although insignificant and negative for the exporters. This implies, ceteris paribus, that countries which are more isolated from the rest of the world tend to trade more. However, as mentioned, the remoteness indices only partially control for multilateral resistance. When the country-year fixed effects are applied, the negative impact of distance increase further and the magnitudes on the dummy variables change. In fact, the effect of distance is 49 per cent stronger in the OLS FE specification compared to the Naive OLS and 14 per cent in the case of Poisson. This confirms the importance of accounting properly for multilateral resistance in order to obtain consistent gravity estimates. Comparing PPML estimates (column 6) with the OLS estimates (column 3) reveals significant differences in terms of the size of the effects. The estimations for contiguity and colonial ties are significantly lower, whereas FTA is considerable higher.

With relatively large coefficients on contiguity, 0.52, and FTA, 0.74, it is no surprise that we estimate a relative high future export to Tanzania's border countries, all of which are in a Free Trade Area, cf. Figure 6. Both Kenya (top 2) and Uganda (top 25), whom Tanzania has a similar level of economic complexity, are found to be important trade partners. The model additionally predicts that the non-EAC neighbouring countries which Tanzania has limited export to today, such as Zambia, Mozambique, as well as Central African countries (Angola and Nigeria) have the potential to become important trade partners. Despite Nigeria, these countries are all members of the Free Trade Area - Southern African Development Community (SADC) with Tanzania. The large economies of the United States and China are in top 3, followed by South Africa and Japan. The former colonial powers, the United Kingdom and Germany are too found to be important trade partners. The largest importer of Tanzania's current exports, India, importing more than the UK, Germany and the US combined, is found to be a less important destination for Tanzania's more complex target products. Today, India is primarily importing low-complex primary agricultural and mineral products, such as gold, vegetable oils and raw cashew nuts, from Tanzania.

Table 4 shows which of the target industries identified by the low-hanging fruit and long-jump strategy Tanzania should direct its efforts on from a demand perspective. First, the current prioritisation of production affiliated to the electric & machinery and plastic & rubber cluster, as well as some lower complex industries in the agro-processing (foodstuff) and construction sectors (metals and wood products) are well-founded by the empirical evidence presented here. When combining this with the result of the supply-side analysis, these sectors indicate a high potential to drive both structural transformation and export revenue. We find, however, that the products with the highest potential are the products furthest away from Tanzania's existing export structure.

Due to considerable overlap between the two indices, many of the top industries are similar for the two strategies. Not surprisingly, the model estimate that there continue to be a relatively high demand for petroleum oil. However, the current export of petroleum oil is most likely reexport[10]. According to Hausmann et al. (2014), countries should diversify away from the dependence of natural resources as these are associated with low complexity and limited spillovers to other sectors [57]. In contrast, Stiglitz (2018) highlights the importance of natural resources as a relevant tool for revenue and believes that long-run linkages to other sectors can be discovered [8]. In the discovery of oil in Uganda, studies have confirmed such linkages [91]. In 2015, Uganda and Tanzania agreed on a 3.5 Billion USD investment, constructing the East African Crude Oil Pipeline Project (EACOP) from Uganda to the Indian Ocean Coast of Tanzania [92]. Cheap crude oil and oil-waste from Uganda can potentially create new diversification opportunities for Tanzania, primarily within the industries of plastic & rubber as well as chemicals. These relative complex industries are highly associated with knowledge diffusion and identified as key target industries.

The industry with the largest estimated export, despite petroleum oil, is medicaments (packed). An industry associated with high demand and low competition among the EAC partners. Today, Tanzania imports around 89 per cent of medicaments but have a total of 14 registered pharmaceutical manufacturers[11] [93]. Table 12 (app.) shows the dosage forms that are being produced in East Africa in 2011 [94]. Tanzania has a strong existing production base in simple dosage forms, such as plain tablets, hard capsules, but have yet to produce more advanced formulation (e.g. sustained release, layered tablets), cf. Table 12. Additionally, according to the World Health Organization (WHO), the Tanzania Food and Drug Authority (TFDA) is the first well-functioning, regulatory system for medical products in Africa [95]. However, cheap imports from especially India, high production costs due to weak infrastructure, as well as lack of skilled personal and access

[9] The magnitude effect by a change in a dummy variable, such as FTAs, can be computed into a percentage by the following formula:

$$\left[e^{\hat{\beta}_{Dummy}} - 1\right] \cdot 100$$

.

[10] Since 1952, there have been attempts to discover oil and gas in Tanzania [89]. The discovery of oil has been disappointing. However, in the last decade, substantial natural gas reserves were uncovered (ibid.). Equinor has an agreement with the Tanzania Petroleum Development Corporation to explore the main gas explorations [90]. The project is predicted to provide gas and electricity to the domestic market and export an average of 7.5 M tonnes of liquefied natural gas (LNG) a year for over 30 years.

[11] One of which is Shelys Pharmaceuticals. Shelys Pharmaceuticals has a strong position on the Tanzanian market, producing among others, pain and fever drugs, antimalarial and antibiotics [93].

Table 3 *Average coefficient estimates and standard errors across target products*

	OLS			PPML		
	Naive	Traditional	FE	Naive	Traditional	FE
Log of distance	**-0.778*****	**-0.885*****	**-1.163*****	**-0.727*****	**-0.788*****	**-0.907*****
	(0.019)	(0.021)	(0.022)	(0.040)	(0.044)	(0.032)
	[0.041]	[0.046]	[0.046]	[0.100]	[0.109]	[0.077]
Contiguity	**0.808*****	**0.749*****	**0.701*****	**0.641*****	**0.626*****	**0.522*****
	(0.061)	(0.063)	(0.059)	(0.093)	(0.093)	(0.068)
	[0.141]	[0.144]	[0.131]	[0.239]	[0.239]	[0.169]
Common language	**0.364*****	**0.266*****	**0.462*****	**0.086**	**0.034**	**0.526*****
	(0.036)	(0.038)	(0.044)	(0.076)	(0.076)	(0.072)
	[0.078]	[0.082]	[0.091]	[0.191]	[0.19]	[0.175]
Colonial tie	**0.369*****	**0.407*****	**0.643*****	**0.422***	**0.435***	**0.439****
	(0.06)	(0.06)	(0.061)	(0.099)	(0.098)	(0.076)
	[0.137]	[0.137]	[0.133]	[0.246]	[0.242]	[0.185]
Free trade agreement (WTO)	**0.303*****	**0.306*****	**0.328*****	**0.79*****	**0.781*****	**0.743*****
	(0.035)	(0.035)	(0.041)	(0.081)	(0.079)	(0.062)
	[0.074]	[0.073]	[0.08]	[0.191]	[0.185]	[0.142]
Log exporters GDP	0.579***	0.589***		0.824***	0.853***	
	(0.009)	(0.01)		(0.02)	(0.021)	
	[0.02]	[0.02]		[0.051]	[0.052]	
Log importers GDP	0.435***	0.443***		0.671***	0.641***	
	(0.008)	(0.008)		(0.02)	(0.019)	
	[0.017]	[0.017]		[0.05]	[0.046]	
Log exporters GDP per capita	0.065**	0.043		0.053	0.015	
	(0.014)	(0.016)		(0.032)	(0.034)	
	[0.03]	[0.033]		[0.078]	[0.083]	
Log importers GDP per capita	-0.012	0.038		0.042	0.107	
	(0.012)	(0.013)		(0.029)	(0.032)	
	[0.025]	[0.027]		[0.069]	[0.076]	
Exporters remoteness		-0.096			-0.165	
		(0.03)			(0.072)	
		[0.064]			[0.175]	
Importers remoteness		0.425***			0.331*	
		(0.037)			(0.077)	
		[0.082]			[0.195]	
Landlocked exporter		-0.303***			-0.158	
		(0.048)			(0.097)	
		[0.103]			[0.242]	
Landlocked importer		-0.209**			-0.136	
		(0.041)			(0.077)	
		[0.089]			[0.194]	
Importer-year FE	No	No	Yes	No	No	Yes
Exporter-year FE	No	No	Yes	No	No	Yes
N	31653	31653	32297	254201	254201	212317

Note: Robust SE in parentheses. Cluster SE in brackets and reflected in $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$
Data Source: BACI (2020) [39]

to affordable finance remain obstacles for the local manufacturers' ability to succeed [94]. In this situation, Stiglitz would likely advise the GoT to implement a strategy somewhat similar to the import substitution strategy towards the pharmaceutical industry during the edifying period: *"Only one simple story tends to repeat itself: behind the rise of every export was an earlier import substitution investment."* (Serra, Spiegel and Stiglitz, 2008) [19].

6 REVEALED LABOUR INTENSITY

6.1 Methodology and data

This paper introduces a Revealed Labour Intensity (RLI) index calculated as a weighted average of the relative labour to capital endowments of countries exporting a given product. We follow Shirotori et al. (2010) weighting the factor abundance by a modified version of Balassa's RCA, w_{pct}. The denominator of w_{pct} is changed to be the sum of product p's export share across nations [96]. We do this to assure that country size does not distort the ranking of products. Hence, w_{pct} indicates whether a country's export share in a product is beyond the average of all countries' share:

$$RLI_{pt} = \sum_c w_{pct} \frac{L_{ct}}{K_{ct}}, \quad (18)$$

where

$$w_{pct} = \frac{X_{cpt}}{\sum_c X_{cpt}} / \sum_c \frac{X_{cpt}}{\sum_c X_{cpt}} \quad (19)$$

Another issue when calculating the RLI is agricultural distortions [96]. When rich countries identify as prime exporters of agricultural commodities, it may not arise from comparative advantage, but rather a result of substantial subsidisation of agricultural production (ibid). Hence, RLI becomes downward biased concerning agricultural commodities. To work around this, we use data from the World Bank's research project on "*Distortions to Agricultural Incentives*" in which they estimate a Nominal Rate of Assistance (NRA) [97]. The NRA_{cp} reflects the degree to which the price of a product p is distorted in the country c, due to domestic taxation, subsidisation, or tariffs (ibid). By excluding observations (country-commodity combinations) characterised by positive NRAs when calculating the w_{cp}, we reduce the effect of subsidisation. The RLI is arguably a crude estimate, but it does nevertheless provide us with a useful indication of the labour intensity in production of the different product.

Furthermore, we incorporate the RLI into the Product Space methodology by introducing a Labour Opportunity Gain (LOG) variable, capturing the opportunities of a new product in the form of further diversification and employment creation[12]:

$$\text{LOG}_p = \sum_{p'} \frac{\phi_{p,p'}}{\sum_{p''} \phi_{p'',p'}} (1 - M_{c,p'}) \cdot (RLI_{p'}) \quad (20)$$

[12] Before computing the LOG, the RLI is standardised

The Penn World Tables (9.1) (PWT9.1) created by the University of Pennsylvania constructs an estimate of capital and labour endowments across countries based on data of investment by type of assets and geometric depreciation rates (assumed to be constant over time) (ibid.). We apply the latest data (2017) to construct the RLI. The NRA data for the control of agricultural distortion is obtained from the World Bank [97]. We apply the latest data (2010) and assume the policy interventions has not changed dramatically since then.

6.2 Implementation and results

To implement the two labour variables, we construct a similar index as in the supply-side analysis but solely from a distance and labour perspective. Yet, by restricting the index to focus only on tangible products, we indirectly account for complexity. This ensures that the industries identified will have an above mean complexity. The index weights are shown in Table 5.

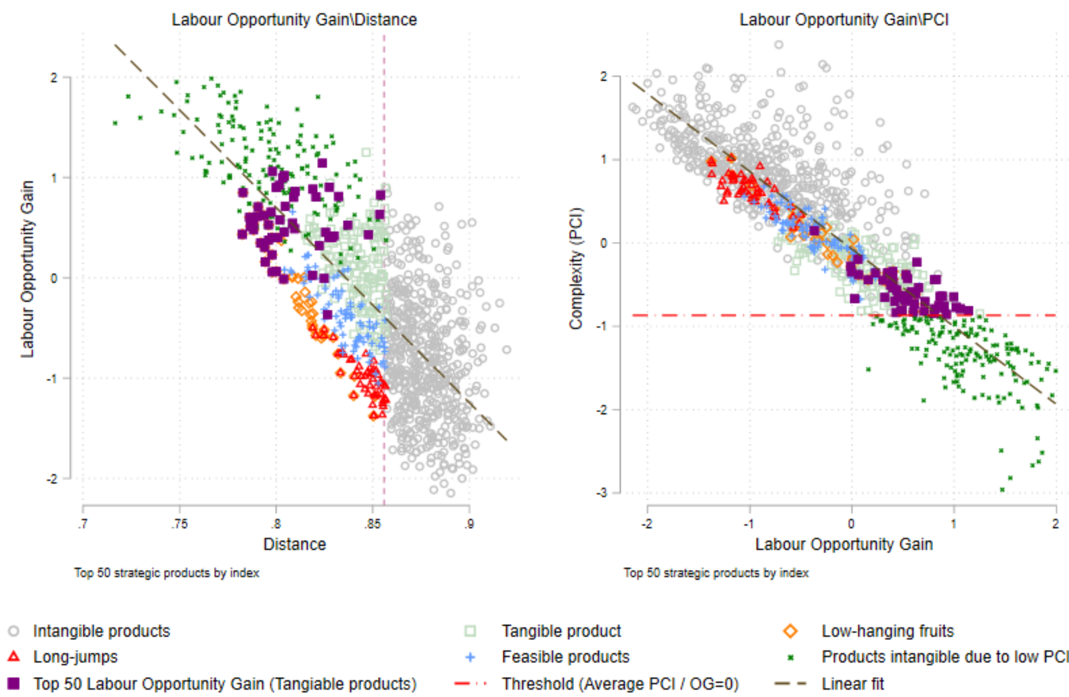
The labour opportunity gain is found to be negatively correlated with the economic complexity variables, PCI, OG and distance, cf. Figure 7. Hence, the less complex products which are in close proximity with Tanzania's existing export basket have a higher estimated employment creation opportunity. Consequently, we find a significant overlap in the target industries identified by the employment absorption strategy and the lower-hanging fruits strategy. In addition to this, the index discovers several products in the textile cluster, indicating that this industry is particularly important from an employment perspective. Table 10 (app.) showcase the top 50 products by the labour opportunity index.

7 RESULTS - SUMMARY

The strategies successfully identified frontier target industries reflecting the desired objectives. In the low-hanging-fruits strategy, we found lower complexity sectors, such as agro-processing (foodstuffs), and construction (wood and metal products). According to GlobalData, a total of 287 flagship infrastructure projects, worth collectively USD 209 B are currently in motion in East Africa [98]. The projects will plausibly create numerous jobs as well as increase the demand for construction commodities. The gravity model (cf. Table 4) captures the high demand, whereas the supply analysis shows that Tanzania is making inroads into many of these products. Likewise, the labour opportunity index finds several industries in the wood and metal clusters. Both the agro-processing sector and construction sectors (particularly the metal industry) is already reflected in Tanzania's current FYDP. In the agro-industry, the FYDP emphasises editable oil, sugar as well as food and beverages as priority sub-sectors. The low-hanging fruits strategy and the gravity model similarly identifies confectionery sugar, as one of the most feasible parsimonious transformation industries. Confectionery sugar is too ranked in the top 10 by the labour opportunity index, reflecting that the industry is highly associated with employment creation, cf. Table 10. Sutton and Olomi (2012) argue that the future growth of Tanzania lies in the current capabilities of the country's industrial

Source: Author's calculations based on BACI 2020 [40], [67].

Figure 6. *Destination of target products by trade-partners (eq. 17)*



Source: Author's calculations based on BACI 2020 [40], [67]. Top 50 products ranked by indices.

Figure 7. *Target products in trade-off plots - Labour opportunity index, HS4, RCA ≥ 1 for Tanzania in 2018*

Table 4 *Top 25 products ranked by estimated future export (Gravity equation) for the two strategies, respectively.*

			Target products initially identified by the **parsimonious transformation index**							
Rank Eq*	Rank Index	Product cluster	ID (HS4)	Product name	PCI	Distance	OG	RCA	Export ($M)	World ($M)
1	21	Mineral products	2710	Petroleum oils, refined	-0.82	0.79	0.42	0.27	118.57	736.51
2	41	Electric/Machinery	8431	Parts for hoists/excavation machinery	1.02	0.85	2.15	0.33	20.09	56.89
3	49	Metal Products	7308	Structures and their parts, of iron or steel	0.43	0.83	1.46	0.17	0.47	49.67
4	40	Metal Products	7326	Articles of iron or steel	0.98	0.85	2.13	0.03	1.06	52.32
5	44	Foodstuffs	2208	Spirits < 80% alcohol	-0.51	0.80	0.74	0.38	4.25	32.10
6	43	Plastic/Rubber	3920	Plates of plastics	0.41	0.83	1.58	0.21	5.50	58.06
7	3	Plastic/Rubber	3923	Packing lids	-0.20	0.80	1.00	0.25	3.20	53.65
8	15	Wood Products	4818	Toilet paper	0.34	0.82	1.34	0.28	3.68	27.05
9	14	Chemicals	3402	Cleaning products	0.18	0.82	1.46	0.55	19.98	35.47
10	10	Foodstuffs	2106	Food preparations n.e.c.	0.04	0.81	1.11	0.04	0.74	44.09
11	22	Foodstuffs	2309	Animal feed	-0.15	0.81	1.12	0.12	0.02	30.53
12	28	Wood Products	4707	Paper waste	-0.17	0.81	0.99	0.24	0.55	9.76
13	23	Metal Products	7306	Tubes etc. of iron/steel	-0.38	0.80	0.65	0.56	14.70	24.43
14	19	Plastic/Rubber	3921	Plastic plates, sheets etc.	0.82	0.84	1.99	0.07	1.63	26.36
15	18	Plastic/Rubber	3917	Plastic tubes and fittings	0.04	0.81	1.20	0.54	8.25	26.29
16	45	Foodstuffs	2203	Beer	-0.23	0.81	1.12	0.18	1.62	15.89
17	4	Wood Products	4819	Cardboard packing containers	-0.36	0.80	0.91	0.34	4.21	24.36
18	8	Metal Products	7602	Waste/scraps, aluminium	-0.82	0.79	0.61	1.00	6.40	14.14
19	20	Chemicals	3208	Paints, nonaqueous	0.55	0.83	1.80	0.11	0.28	14.89
20	2	Foodstuffs	2202	Waters, flavored/sweetened	-0.36	0.79	0.84	0.80	8.52	20.30
21	24	Miscellaneous	9406	Prefabricated buildings	0.19	0.82	1.30	0.04	0.07	8.83
22	47	Wood Products	4911	Printed matter	0.69	0.84	1.80	0.28	3.80	10.71
23	16	Foodstuffs	1904	Cereal foods	-0.38	0.80	0.84	0.01	0.09	6.42
24	12	Chemicals	3305	Hair products	0.12	0.81	1.20	0.04	0.47	14.44
25	50	Mineral products	2620	Slag and ash containing metals	-0.63	0.80	0.72	0.67	2.52	8.44

			Target products initially identified by the **strategic bets index**							
Rank	Rank	Product cluster	ID	Product name	PCI	Distance	OG	RCA	Export	World
1	9	Chemicals	3004	Medicaments, packaged	0.79	0.85	2.00	0.01	1.48	365.71
2	25	Electric/Machinery	8504	Electrical transformers	0.73	0.85	1.86	0.51	59.38	90.46
3	7	Plastic/Rubber	3926	Articles of plastic	0.81	0.85	2.11	0.09	7.46	78.14
4	1	Electric/Machinery	8431	Parts for hoists/excavation machinery	1.02	0.85	2.15	0.33	20.09	56.89
5	44	Metal Products	7308	Structures of iron or steel	0.43	0.83	1.46	0.17	0.47	49.67
6	26	Electric/Machinery	8502	Electric generating sets and rotary converters	0.49	0.85	1.88	0.20	0.43	21.55
7	24	Electric/Machinery	8418	Refrigerators, freezers	0.82	0.85	1.85	0.24	16.17	46.47
8	11	Chemicals	3823	Industrial monocarboxylic fatty acids	0.68	0.86	2.13	0.06	2.15	55.11
9	2	Metal Products	7326	Articles of iron or steel	0.98	0.85	2.13	0.03	1.06	52.32
10	45	Chemicals	3304	Make-up preparations	0.31	0.83	1.59	0.90	40.61	52.25
11	29	Plastic/Rubber	3920	Plates of plastics, noncellular	0.41	0.83	1.58	0.21	5.50	58.06
12	32	Electric/Machinery	8474	Machinery for working minerals	0.60	0.85	1.84	0.27	1.38	16.98
13	37	Metal Products	7606	Aluminum plates > 0.2 mm	0.64	0.86	1.93	0.04	0.02	35.88
14	38	Wood Products	4818	Toilet paper	0.34	0.82	1.34	0.28	3.68	27.05
15	6	Plastic/Rubber	4016	Articles of vulcanized rubber	0.76	0.85	2.04	0.03	0.93	27.56
16	33	Chemicals	3402	Cleaning products	0.18	0.82	1.46	0.55	19.98	35.47
17	10	Transportation	8716	Trailers and semi-trailers	0.75	0.85	2.04	0.54	19.32	29.61
18	12	Electric/Machinery	8503	Parts for use with electric generators	0.77	0.85	1.91	0	0	18.05
19	19	Wood Products	4811	Cellulose wadding, coated	0.57	0.85	1.96	0.10	1.26	19.67
20	3	Plastic/Rubber	3921	Plastic plates, sheets etc.	0.82	0.84	1.99	0.07	1.63	26.36
21	23	Wood Products	4901	Books, brochures etc.	0.57	0.85	1.85	0.26	3.10	16.32
22	18	Metal Products	7616	Articles of aluminum	0.75	0.85	1.98	0.01	0.12	18.03
23	8	Chemicals	3208	Paints and varnishes, nonaqueous	0.55	0.83	1.80	0.11	0.28	14.89
24	21	Wood Products	4823	Paper cut to size	0.53	0.84	1.85	0.02	0.14	10.17
25	13	Wood Products	4911	Printed matter	0.69	0.84	1.80	0.28	3.80	10.71

Source: Author's own calculations, classification by Section from UNSD. Data Source: BACI (2020) [67], [69]

Note: *Gravity equation: Ranked by expected exports. Some product names has been shorten in the table. *Current export is in USD M and World trade in USD B.

Table 5 *The strategic weights*

Weights	Density	RLI	LOG
Labour Opportunity index	0.50	0.30	0.20

companies. In their comprehensive report "*An Enterprise Map of Tanzania*" they describe some of the largest corporations in Tanzania [99]. In the agro-processing sector, one company stands out. The Mohammed Enterprises Tanzania Ltd (METL), has more than 20.000 employees in Tanzania, of which around 12.000 is in the sisal business. Sisal is applied in many sustainable industrial productions as it is a good substitute for synthetic products. It is applied in the production of everything from ropes and geotextiles to building materials and car manufacturing (ibid.).

The long-jump strategy and the gravity model identifies the pharmaceutical industry in the chemical cluster to be a prime strategic industry. This is a prime sub-sector in the FYDP. However, less focus has been imposed on other chemical products, as well as industries within the plastic & rubber and the electrical & machinery clusters. These clusters are found to be highly associated with the accumulation of new knowledge, diversification opportunity, as well as the ability to generate substantial export revenue[13].

8 DISCUSSION

The new structuralist economists vary in their view of the prospect of manufacturing maintaining the ability to propel structural change. Our analysis assumes that industrialisation will continue to be the primary enabler of structural change. Where Lin (2014) is optimistic, Stiglitz (2018) is less so [8], [100]. Lin (2014) presents a neoclassical structural transformation framework to uncover development in the twenty-first century, which continues to revolve around manufacturing [100]. He claims that policy recommendation under this framework varies from that under Washington Consensus, as it acknowledges the importance of an economy's endowment structure (ibid.). He argues that the main lesson to be learned from development literature is simple:

"*The government's policy to facilitate industrial upgrading and diversification must be anchored in industries with a latent comparative advantage so that, once the coordination and externality issues are overcome, and new industries are established, they can quickly become competitive domestically and internationally*" (Lin, 2014, p. 242).

Our analysis can, to some extent, be related to Lin's argument. However, Lin (2014) asserts that the industrial policies should "follow" the RCAs, rather than "defy" them [100], [101]. To develop industries that "defy" the RCAs are, however, what drove to the successes in countries like Japan and South Korea [101]. The analysis above examined Tanzania's endowment structure and identified industries which can complement these endowments and develop new capabilities. According to the theory, diversification occurs by applying derivative industries to develop new capabilities. By incorporating the gravity equation, we were further able to rank the industries identified by their estimated ability to generate export revenue. We hope that these findings can help politicians in the preparation of the next Five Year Development Plan. The analysis suggests that Tanzania has great opportunities to diversify its economy. We find that many intermediate-complex industries in the agro-processing, construction and the chemical sectors are relatively close to Tanzania's existing productive knowledge.

Whereas CGE-models to a large extend has proposed that Tanzania ought to promote certain primary agricultural products, such as maize, [22] and cassava [23], our analysis finds that promoting higher complex products in machinery and chemicals, Tanzania can significantly diversify its knowledge base and build a more robust economy [14].

Yet, for Tanzania to become a semi-industrialised middle-income nation, three additional constraints needs to be addressed. Firstly, under-utilisation of capacity persists in almost all sectors in Tanzania, cf. Table 13 (app.) [102]. Secondly, the non-existence of medium-sized enterprises prevents the distribution of value-addition and job creation along the value chain. Enterprises with over 100 workers manufacture nearly 80 per cent of the value-added in the industrial sector in Tanzania. The remainders are small-scale semi-informal fabrication[15]. Thirdly, as perceived by McMillan and Rodrik (2011), structural transformation needs both the emergence of new industries and the shift of resources from low-productive activity to high-productive activity: "*Without the first, there is little that propels the economy forward. Without the second, productivity gains don't diffuse in the rest of the economy.*" [103]. The Labour Opportunity Index indicates which sectors are associated with more comprehensive employment creation. We find that the index is negatively correlated with complexity, indicating that the target industries identified by the low-hanging fruits strategy may generate less knowledge diffusion but generate more employment.

Industrial policies, or the so-called learning, industrial, and technology (LIT) policies, are essential tools the government can employ to address these constraints. Some of the key findings of the literature on promoting industries are listed here:

[13] The Sumaria Group is for instance heavily invested in Tanzania. This company has more than 3000 employees in Tanzania, producing all from household plastic goods, rubber footwear and pipes to chemicals products such as soap and toothpaste [99]. It is named one of the largest and most modern firms in SSA (ibid).

[14] The CGE-model can analyse what effect a given policy change have on different industries of the economy and from this showcase which of the current production entities to promote in order to foster growth and job creation. The economic complexity model, on the other hand, makes it possible to compare all industries at once and reveal which sectors can foster the highest knowledge-diffusion and structural change when becoming competitive in industries not yet pursued.

[15] Tanzania's exports are even further concentrated. Sutton and Olomi (2012) find that just 22 firms produce over half of Tanzania's exports [99].

Improve the basics: The basics refer to hard and soft infrastructure, as well as building effective institutions which facilitate a competitive business environment with strong and reliable public-private relationships. Precise and reliable communication between the state entities and the private sector based on commitment and accountability from both sides is necessary for the LIT policies to be effective [57], [102]. Since Tanzania's independence, the political settlement has shifted rather vastly [102]. Under the current president, John Pombe Magufuli, power has been concentrated, and the public-private relationship has been authoritarian. This has strongly diminished corruption in the country yet worsened the business environment (ibid.). The multi-prong strategy highlights the importance of balancing the involvement of the market, the state, and the civil society [8]. According to Andreoni (2017), Magufuli has in his second term progressed towards coalition-building in the private sector [102]. The paper suggests addressing the structure between the three bodies as well as between the different government entities, in order to enhance effective collaboration.

Promote export and economic diversification: Firms which engage in exports have historically had faster productivity improvements than domestic-oriented firms [56]. Hence, the theory of learning by exporting. There is a large literature on how to promote exports which is beyond the scope of this paper[16]. The export-push strategy has been profoundly unsuccessful in Africa (ibid.). The Product Space analysis, employed in the case of Tanzania in this paper, identified specific sectors in which a country could develop capabilities through derived industries [36].

Benefit from agglomeration externalities: It takes less effort to attract a marginal firm to an existing agglomeration than to move to a greenfield [56]. State-owned Export Processing Zones (EPZ) and Special Economic Zones (SEZ) can create industrial agglomeration when run efficiently. These are areas where business and trade regulations differ from the rest of the economy. In developing economies like Tanzania, it is unmanageable to accommodate the necessary inputs to businesses nationwide. By clustering the industrial activity, the GoT can facilitate the provision and enable firms to benefit from agglomeration externalities (ibid.). Kinyondo, Newman and Tarp (2016) found that the SEZs in Tanzania are not operating efficiently. For the agglomeration to have an impact on the domestic economy, despite job creation, open architecture is required [104]. Stiglitz (2018) suggest providing Micro, Small, and Medium Enterprises (MSMEs) access to credit at close to commercial rates, which is to the authors' knowledge not part of the fiscal incentives in the existing zones [8], [105].

Despite the overt large economies, the demand-side analysis finds substantial market opportunities for the target products in Tanzania's regional and neighbouring countries. Many of which Tanzania is already engaged in a free trade agreement. In the EAC, the partners have agreed on a list of sensitive commodities in which they have a common external tariff [106]. Tanzania has benefited immensely from the tariff protection, as 30 per cent of all intra-trade export from Tanzania are listed products. The textile industry has benefited in particular from a 50 per cent external tariff, becoming the largest manufacturing industry in Tanzania with 22 factories in 2014 (ibid.). The textile industry, however, is not highlighted by our economic complexity analysis. It is, although, discovered by our employment absorption strategy to be a strategic sector from an employment perspective. Several countries, such as Thailand, has diversified its economy through the garment industry. A World Bank report estimates that the garment industry alone has pushed up to 8 million people between 2010-2016 out of poverty in Bangladesh [107]. An additional positive feature of the garment industry is that it primarily employs women. Nearly 80 per cent of the employees in the industry in Bangladesh are women and as a result, the return to education for girls, one of the prime indicators of economic development, has increased rapidly [108], [109]. Larsen and Hollos's (2003) empirical study from Tanzania found that empowerment and employment of women were highly associated with declining fertility rates, which altogether will help Tanzania stabilize its economy in the long run [110]. Hence, despite not being correlated with the highest diversification opportunities, the textile sector should not be overlooked entirely. For further research, an economic complexity analysis should examine which industries the region as a whole should promote in order to ensure that the sensitive products listed by the EAC represent the regions dynamic comparative advantages.

[16] This involves among others, exchange rate determination, macroeconomic management, great coordination between Foreign Investment Promotion Agencies and SEZs [56].

8.1 Limitation of The Method of Reflection

Global value chains

The knowledge diffusion idea behind the Method of Reflection can be associated with the first generation of economic development thinking and the import-substitution industrialisation (ISI) strategy [5], [111]. The ISI strategy involved the formation of an entire domestic supply chain, that before the ICT revolution was most likely required to become internationally competitive in an industry [5]. However, the second unbundling opened a new pathway to industrialisation through the entering of the GVCs.

After the second unbundling global trade and demand increased. In Krugman's (1998) "*New Economic Geography*", the enhanced demand for exports expanded the investments in new commodities and capabilities [112]. In the Method of Reflection formalism, this is equivalent to economic diversification leading into more complex goods. Lin (2011) finds that newly industrialised countries often progress in a leader-follower pattern or, in other words, a "*flying geese pattern*" [113]. However, the Method of Reflection does not account for the influence of lead firms in the internationalisation of value chains. The GVC revolution led to an increase of multinational corporations taking advantage of wage arbitrage across borders, moving production factories from the global North to the global South (ibid.).

One of the main shortcomings of the Method of Reflection is that it observes industrialisation as a "black box", in which production and exports are assumed to hold information exclusively from countries' private know-how and technologies [5]. The second unbundling made awareness of the relations among firms and the extent to which local suppliers can learn from lead firms [3], [5]. However, the transfer of knowledge across borders is very firm-specific and to protect the firm's competitive advantage only a particular part of the lead firm's value chain is transferred, diminishing the distribution of the firm's productive knowledge to the local economy [5]. This suggests that the knowledge may be unusable in other settings and that functional upgrading thereby is limited. Additionally, the second unbundling allowed for the fragmentation of production across borders. This may cause a misinterpretation of a nation's capabilities based on the export structure. A nation exporting a final product, e.g. smartphones, may not reflect the capabilities to produce smartphones, just assembling them and should the lead firms move the production elsewhere, the country may not be able to apply the knowledge gained.

Moreover, the Product Space analysis follows products, not the economic value. Firstly, the value-added has, to a large extent, moved toward services in the pre- and post-fabrication stages, leaving less value in manufacturing [114]. Secondly, the organisational form of the multinationals who are increasing their monopoly power by vertical and horizontal integration of the GVCs shifts the profit from production and sales to the location of their respective headquarters [3]. However, in the Method of Reflection, the focus is not on the products or values, but the knowledge diffusion.

With the EOI strategy, it became more accessible to join a GVC. Yet if the emerging economies engage in low complexity tasks, such as assembling parts, they do not develop institutions, productive knowledge or a consumer market to support the industries which delimit the purpose [3]. For small developing countries, this has often been the case [115], [116]. Foster-McGregor et al. (2016) reveal that African countries have substantial participation in GVCs, yet the vast majority is in primary upstream production with limited upgrading opportunity [116]. However, as mentioned in the introduction, the global economic landscape can rapidly change. New evidence suggests that the growth in the global fragmentation of production is in decline and the trade-in tasks have in recent years been shifted to a regional value chain dynamic. This suggests that the misinterpretation of the Method of Reflection may be confined.

Services

Our analysis focuses solely on tradable goods, primarily in manufacturing. Table 9 (app.) shows a comprehensive scope for catch up in manufacturing in SSA, should the production shift from China to Africa, as China move to higher-skilled production following the flying geese pattern [8]. Lin (2011) predicts that roughly 85 million manufacturing jobs can be released and potentially shifted to Africa [113]. He believes that this can reinitiate the industrialisation process in Africa (ibid.). Haraguchi et al. (2017) argue that premature deindustrialisation of SSA is not a sign of long-term shifts in the possibilities of industrialisation [117]. They claim that the decline of manufacturing value-addition and employment is a result of global clusterisation of production in a few economies, not a lack of opportunities (ibid.).

However, until now the manufacturing industry has not been able to absorb the move out of agriculture combined with the rapidly increasing labour force in SSA [45]. This has pushed workers into lower productive sectors, resulting in *"growth reducing"* structural transformation in the 1990s. Rodrik (2016) questions the ability of industrialisation to foster growth in SSA and argues that

> "*in the absence of sizable manufacturing industries, these economies will need to discover new growth models. One possibility is services-led growth. Many services, such as IT and finance, are high productivity and tradable, and could play the escalator role that manufacturing has traditionally played.*"
> Rodrik (2016) [118].

Another fundamental limitation of the Product Space methodology is the explicit use of export data. As non-exported commodities and services are not accounted for, a bias exists in the estimates of the countries' complexity. Traditionally, services were considered non-tradeable, yet new technologies have made many services tradeable [1]. In fact, the service-trade has risen faster than traditional goods since the 1980s [45]. In 2017, 46.5 per cent of the total export came from services (predominantly tourism) in Tanzania [40]. The exports of goods account for just around 8 per cent of Tanzania's GDP [54]. Hence, this analysis is far from capturing the complete set of capabilities that exists in Tanzania. Ellis, McMillan and Silver (2017) found that on average the service sector in Tanzania is approximately 3.5 times more productive than the agricultural activity, yet half as productive as the manufacturing sector [46].

Newfarmer et al. (2018) identify a subgroup of services and agricultural activities, such as horticulture, business services and tourism, that hold several similar characteristics as manufacturing [45]. These involve managing a logistical supply chain, acting in response to shifting trends while preserving product integrity, as well as administer stringent international standards and demanding buyers [56]. Due to these similarities, Newfarmer et al. (2019) claim that the well-known industrial policies to advocate manufacturing are transferable to these other sectors, which they name *"industries without smokestacks"*. Rodrik (2013) found that services, as a block, do not converge unconditionally as manufacturing [119]. Tradeable services may differ, as they similarly benefit both from technological change and productivity growth [56]. There exist three main components of tradable services that are important to take into account in a diversification strategy for Tanzania: Tourism (making up 26 per cent of all export in 2017), transport (14 per cent) and ICT/Digital economy (5 per cent). Consider them in turn:

Tourism: In 2014 the tourism sector was estimated to generate 2.6 M jobs directly or indirectly through close linkages to industries such as transport, food and beverage, retail trade and accommodation [120]. Since then the sector has grown, increasing the number of visitors to Tanzania from 1.1 M to 1.5 M a year and in 2019 contributing to an estimated one percentage point to GDP growth [70], [120]. Due to its high labour intensity of low-skilled workers and the widespread linkages to other industries, the sector is highly inclusive and pro-poor [121]. It is the goal of the GoT to increase the quality of the tourism services, for Tanzania to become an exclusive tourist destination attracting a very rich clientele [45]. With a global ranking of 95 out of 140 destinations in the world (2019), Tanzania has a high potential for improvements [122]. Under the current COVID-19 pandemic, the tourism sector is severely affected. The main tourism operators project a revenue decline of 80 per cent in 2020 and a very slow recovery in 2021 [70].

Transport: Dar es Salaam port is one of the largest and geographically best-located ports to handle transit goods from and to Tanzania's landlocked neighbouring countries. Transit trade is estimated to account for 75 per cent of the total exports in transport services, accounting for 1.3 B USD in 2019 [70]. However, despite many attempts to improve the performance of Dar Port, the dwell time, a prime indicator of the port's efficiency, remain high of 11-14 days in recent years for transit cargo, compared to about four days in Mombasa, Kenya's largest port [123], [124]. By improving the performance of Dar Port to the level of Mombasa, Tanzania would, according to the World Bank, increase its revenue from transit goods with USD 1.8 B annually [125].

Digital economy: Investing in capabilities for digital readiness can foster service-led growth in Tanzania by creating new job opportunities, diversification and building new value chains [126]. Empirical studies have found a positive association between higher broadband penetration and economic growth yet the returns to telecommunications technology are poorer in SSA than elsewhere, possibly due to the sparse population density as well as under-utilisation [17] [127]–[129]. Hjort and Poulsen (2019) find that access to fast internet in Africa did increase employment and narrowed the employment inequality, as well as contributed positively to structural transformation [130]. The GoT has taken key steps to develop the country into a regional e-commerce hub, such as adopting a series of e-Government services and creating a national e-commerce platform in order for MSMEs to get access to the domestic as well as the regional EAC markets [126]. However, the current usage of Tanzania's international bandwidth is only a third of Kenya's, despite three underground international cables. This is partly due to digital literacy constraints [18] and the fact that the retail prices are among the highest in the region [70]. Efforts on making the internet more accessible for the general population should focus on making smartphones and data baskets more affordable, as well as expanding mobile money and adopting legislation on Electronic Commerce [70], [126].

According to Baldwin (2019), a new wave of globalisation, driven by new technologies in telepresence and augmented reality will allow companies to exploit the large wage arbitrages across the globe and offshore higher-skilled service occupations [131]. The ongoing negotiation towards a global Trade in Services Agreement (TISA) and new online platforms, such as Upwork, will allow access to foreign service providers and the counterparties to connect [45], [131].

There are extensive synergies between the manufacturing and service sectors, suggesting that manufacturing is necessary to establish a thriving service-sector [132]. Yet, with the new technologies and changed nature off opportunities for economic transformation and knowledge diffusion in the digital age, the lack of industry in Tanzania may not be a limitation to boost service-led growth. In an empirical analysis of service-led prosperity in India, Dasgupta and Singh (2005) find that in "*the case of IT, in particular, it seems that the services are leading to the expansion of manufacturing, rather than the other way round*" [133]. However, access to ICT tends to reflect the inequalities in education. For Tanzania to take part in this new wave of globalisation and compete in these higher sophisticated services, Tanzania needs to invest heavily in higher education [134]. In 2019, the enrollment rate for upper secondary education in Tanzania was only two per cent [70].

The multi-prong strategy

Related to this discussion, Stiglitz (2018) has formalised a strategy which takes a broader sectoral focus. The multi-prong strategy concentrates on four sectors; the agricultural sector, the service sector, the extraction sector [19], and the manufacturing sector [8]. The primary pillars of the strategy are the agricultural sector, thought to be the source of employment, and the service sector considered the source of growth. According to Stiglitz (2018), the neglection of agriculture in the Washington Consensus policies' led to the poor development outcomes in SSA. As the majority of the labour force in SSA is engaged in the agricultural sector, reconstructing the sector to create a more dynamic learning climate will improve productivity and stimulate job creation in both agro-processing and service industries [8], [135]. The strategy towards agriculture can, to some extend, be associated with the import-substitution approach - establishing a domestic value chain of prepared foods prior to exporting. In general, growth generated from productivity increases in the agricultural sector is on average two to three times more effective at diminishing poverty than growth in other sectors [136], [137]. With an estimated 75 per cent of the poor in Tanzania employed in agriculture, the sector and the industries related hereto are crucial for poverty reduction [70]. Where the service- and industry GDP per capita has risen by 26 and 55 per cent, respectively, from 2011 to 2018, agriculture has increased by just 10 per cent (ibid.). This is consistent with the disappointing low poverty reduction and consumption growth at the bottom of the income distribution observed in Tanzania despite the strong growth in GDP in recent years [20].

The strategy acknowledges the ability of the manufacturing sector to promote economic and social upgrading, due to exceptional learning and economic spillovers to other sectors (e.g. services) as well as institutions by requiring more reliable financial

[17] The studies estimate an average increase in GDP about 1.3 per cent given a 10 per cent rise in broadband penetration in developing countries [127], [128].

[18] Social media penetration, a good proxy for digital skills is well below Kenya's and indicate a large skills gap between the urban and rural population [70]

[19] Provided that the economy occupies natural resources.

[20] The World Bank (2020) estimates that the consumption growth between 2011 and 2018 has been between zero and one per cent for the poorest 50 per cent of the population while the top 50 per cent has increased between one to three per cent [70].

and educational systems. Manufacturing has had a prime role in structural transformations due to its high labour intensity [138]. However, with the new technologies, the export-oriented industrialisation (EOI) strategy led by international fragmentation of production is unlikely to ensure the number of jobs required to employ the fast-growing labour forces of Tanzania and the rest of sub-Saharan Africa [8]. Hence, Stiglitz (2018) is worried that emerging economies will compete in granting financial exemptions to lead firms, with only a limited amount of assembling jobs in return. With manufacturing anticipated to play a minor role in the future, the transformation to a more formal economy will likely be slower. Hence, the focus on formal job creation should be central. In line with our analysis, the multi-prong strategy instead encourages countries to identify niches within manufacturing which they have dynamic comparative advantages and promote diversification by LIT policies (ibid.). Our findings suggest that in order to create more employment, Tanzania should support the target industries identified by the lower-hanging fruits strategy.

9 CONCLUSION

Few countries have endured prosperity without undergone an industrialisation process in some form or another [5]. As a result, this has been the heart of numerous development strategies. The GVC revolution and its fundamental transformation of trade, as well as the technological advances in automation, may have compromised the role of traditional industry in enforcing job creation and structural transformation [3], [8]. On the one hand, involvement in GVCs can introduce new possibilities for developing countries as firms will learn from administering stringent international standards and demanding buyers [45]. On the other hand, the functional upgrading and knowledge spillovers to the rest of the economy may be limited due to the exploration of lead firms [3], [116]. The lessons learnt from China may not be plausible in Africa's relatively small countries, as the magnitude of the domestic markets is insufficient to employ as leverage in order to attract and seize knowledge transfer from multinational companies [5]. Stiglitz's (2018) multi-prong strategy stresses the need for developing economies to broaden their sectoral focus with an emphasis on agro-industry and service-led growth [8]. For this to be sustainable, the basics, such as the educational level, needs to be improved significantly [139]. Hence, the role of the state becomes increasingly important. In the multi-prong strategy, the manufacturing sector should explore niches in which the particular country has a dynamic comparative advantage [8].

We explore these niches in Tanzania, by conducting a Product Space analysis taking into account both supply and demand factors. Our analysis successfully identified several niches for Tanzania to promote. The strategy was split in two, a low-hanging fruits strategy and long-jump strategy. The analysis suggests that Tanzania has fairly substantial productive knowledge which generates multiple diversification opportunities. The numerous nearby industries, identified by the low-hanging fruits strategy, contain a higher complexity than Tanzania's average and is correlated with higher employment creation. These industries are in particular located in the agro-processing and construction sectors. As the majority of the labour force today is, and according to the multi-prong strategy, will continue to be engaged in agriculture, further research should conduct a Product Space analysis on a higher disaggregated level evolving solely around agricultural and agro-processing manufacturing products. The long-jump strategy, on the other hand, identifies industries which can foster a high degree of structural transformation and further diversification opportunities. Of particular significance are industries within the electronic & machinery, plastic & rubber, and the chemical sectors. In order to accumulate new knowledge, we recommend that these relatively more complex sectors, which are associated with a prospective larger scope for learning spillovers, are to be emphasized in the new FYDP. Our gravity model, furthermore, suggests that many of these products can generate large export revenues for Tanzania in the future. Our demand-side model finds that Tanzania to a large extend should promote its trade relations in the region. The EAC, as well as the Free Trade Area of SADC, create a unique opportunity for Tanzania to marketing its target products in the regional markets. When conducting Tanzania's future development plans, the two suggested diversification strategies can be employed to identify which specific sub-sectors to target.

REFERENCES

[1] R. Baldwin, *The great convergence*. Harvard University Press, 2016.

[2] M. Rehnberg and S. Ponte, "From smiling to smirking? 3d printing, upgrading and the restructuring of global value chains", *Global Networks*, vol. 18, no. 1, pp. 57–80, 2018.

[3] G. Gereffi, *Global Value Chains and Development: Redefining the Contours of 21st Century Capitalism*. Cambridge University Press, 2018.

[4] C. Newman, J. Page, J. Rand, A. Shimeles, M. Söderbom, and F. Tarp, "The pursuit of industry", *Manufacturing Transformation*, 2016.

[5] R. Baldwin, "Trade and industrialisation after globalisation's 2nd unbundling: How building and joining a supply chain are different and why it matters", National Bureau of Economic Research, Tech. Rep., 2011.

[6] UNCTAD, "World investment report 2019", 2019.

[7] K. De Backer and D. Flaig, "The future of global value chains: Business as usual or "a new normal"?", 2017.

[8] J. E. Stiglitz, "From manufacturing-led export growth to a twenty-first-century inclusive growth strategy", Technical report, WIDER Working Paper 2018/176, Tech. Rep., 2018.

[9] M. Hallward-Driemeier and G. Nayyar, *Trouble in the Making?: The Future of Manufacturing-led Development*. World Bank Publications, 2017.

[10] M. P. Timmer, B. Los, R. Stehrer, and G. J. de Vries, "Peak trade? an anatomy of the global trade slowdown", *GGDC Research memorandum*, vol. 162, 2016.

[11] 2. World Bank, "World development report 2020: Trading for development in the age of global value chains.", 2020. [Online]. Available: `https://openknowledge.worldbank.org/handle/10986/32437`.

[12] G. S. Eskeland and A. E. Harrison, "Moving to greener pastures? multinationals and the pollution haven hypothesis", *Journal of development economics*, vol. 70, no. 1, pp. 1–23, 2003.

[13] WTO. (2020). Wto rules and environmental policies: Other relevant wto texts, [Online]. Available: `https://www.wto.org/english/tratop_e/envir_e/issu3_e.htm`.

[14] J. Wu and A. Tal, "From pollution charge to environmental protection tax: A comparative analysis of the potential and limitations of china's new environmental policy initiative", *Journal of Comparative Policy Analysis: Research and Practice*, vol. 20, no. 2, pp. 223–236, 2018.

[15] T. A. Cavlovic, K. H. Baker, R. P. Berrens, and K. Gawande, "A meta-analysis of environmental kuznets curve studies", *Agricultural and Resource Economics Review*, vol. 29, no. 1203-2016-95134, pp. 32–42, 2000.

[16] J. Heine and R. Thakur, "The dark side of globalization", 2011.

[17] R. Baldwin and S. J. Evenett, *Covid-19 and trade policy: Why turning inward won't work*, 2020.

[18] W. A. Lewis, "Economic development with unlimited supplies of labour", *The manchester school*, vol. 22, no. 2, pp. 139–191, 1954.

[19] N. Serra and J. E. Stiglitz, *The Washington consensus reconsidered: Towards a new global governance*. Oxford University Press on Demand, 2008.

[20] J. Stiglitz, *Globalization and Its Discontents Revisited: Anti-Globalization in the Age of Trump.* New York: Norton & Company, 2017.

[21] C. A. Hidalgo and R. Hausmann, "The building blocks of economic complexity", *Proceedings of the national academy of sciences*, vol. 106, no. 26, pp. 10 570–10 575, 2009.

[22] K. Pauw and J. Thurlow, "Agricultural growth, poverty, and nutrition in tanzania", *Food policy*, vol. 36, no. 6, pp. 795–804, 2011.

[23] C. Arndt, K. Pauw, and J. Thurlow, "Biofuels and economic development: A computable general equilibrium analysis for tanzania", *Energy Economics*, vol. 34, no. 6, pp. 1922–1930, 2012.

[24] Z. Xingfei, "Tanzania's sunflower oil producers come into bloom", 2016.

[25] T. MoF, "National five year development plan 2016/17-2020/21", 2016.

[26] F. Bontadini, "Power and export sophistication in buyer-supplier relationships: Insights from colombian customs data", 2019.

[27] C. A. Hidalgo, B. Klinger, A.-L. Barabási, and R. Hausmann, "The product space conditions the development of nations", *Science*, vol. 317, no. 5837, pp. 482–487, 2007.

[28] S. Lall, J. Weiss, and J. Zhang, "The "sophistication" of exports: A new trade measure", *World development*, vol. 34, no. 2, pp. 222–237, 2006.

[29] R. Hausmann, J. Hwang, and D. Rodrik, "What you export matters", *Journal of economic growth*, vol. 12, no. 1, pp. 1–25, 2007.

[30] R. Hausmann, B. Klinger, R. Wagner, *et al.*, "Doing growth diagnostics in practice: A'mindbook'", Center for International Development at Harvard University, Tech. Rep., 2008.

[31] B. Jun, A. Alshamsi, J. Gao, and C. A. Hidalgo, "Relatedness, knowledge diffusion, and the evolution of bilateral trade", *arXiv preprint arXiv:1709.05392*, 2017.

[32] C. A. Hidalgo and R. Hausmann, "A network view of economic development", *Developing alternatives*, vol. 12, no. 1, pp. 5–10, 2008.

[33] C. A. Hidalgo *et al.*, "The dynamics of economic complexity and the product space over a 42 year period", Center for International Development at Harvard University, Tech. Rep., 2009.

[34] J. Felipe, U. Kumar, A. Abdon, and M. Bacate, "Product complexity and economic development", *Structural Change and Economic Dynamics*, vol. 23, no. 1, pp. 36–68, 2012.

[35] B. Klinger *et al.*, "South africa's export predicament", Center for International Development at Harvard University, Tech. Rep., 2006.

[36] R. Hausmann, C. A. Hidalgo, S. Bustos, M. Coscia, A. Simoes, and M. A. Yildirim, *The atlas of economic complexity: Mapping paths to prosperity*. Mit Press, 2014.

[37] A. Noman, R. Kanbur, and J. E. Stiglitz, *The Quality of Growth in Africa*. Columbia University Press, 2019.

[38] C. Hidalgo, B. Klinger, A.-L. Barabasi, and R. Hausmann, "The product space and its consequences for economic growth", in *APS Meeting Abstracts*, 2007.

[39] G. Gaulier and S. Zignago, "Baci: International trade database at the product-level (the 1994-2007 version)", 2010.

[40] 2. The Atlas. (2020). The growth lab at harvard university. the atlas of economic complexity., [Online]. Available: `http://www.atlas.cid.harvard.edu.`.

[41] 2. World Bank, "Tanzania - mainland poverty assessment (vol. 2).", 2015. [Online]. Available: `http://documents.worldbank.org/curated/en/530601468179976437/Main-report`.

[42] (2019). Penn world table version 9.1, [Online]. Available: `https://www.rug.nl/ggdc/productivity/pwt/`.

[43] E. I. Modamba, C. L. Delgado, S. A. Simons, R. A. Swinkels, F. Fatima, N. Mwingu, G. J. Teri, S. S. Baregu, M. A. Saldarriaga Noel, L. Nabeta, *et al.*, "Tanzania economic update: Transforming agriculture-realizing the potential of agriculture for inclusive growth and poverty reduction", The World Bank, Tech. Rep., 2019.

[44] UN, "World population prospects: The 2017 revision, key findings and advance tables", *United Nations, Department of Economic and Social Affairs, Population Division*, no. Working Paper No. ESA/P/WP/248. 2017.

[45] R. Newfarmer, J. Page, and F. Tarp, *Industries without Smokestacks: Industrialization in Africa Reconsidered*. Oxford University Press, 2019.

[46] M. Ellis, M. McMillan, and J. Silver, "Employment and productivity growth in tanzania's service sector", *Industries without Smokestacks*, p. 296, 2017.

[47] J. Baffes, "Tanzania's coffee sector: Constraints and challenges in a global environment", 2004.

[48] R. Auty, *Sustaining development in mineral economies: the resource curse thesis*. Routledge, 2002.

[49] R. Hausmann, D. Rodrik, and A. Velasco, "Growth diagnostics", *The Washington consensus reconsidered: Towards a new global governance*, pp. 324–355, 2008.

[50] M. Busse and S. Gröning, "The resource curse revisited: Governance and natural resources", *Public choice*, vol. 154, no. 1-2, pp. 1–20, 2013.

[51] D. Serra, "Empirical determinants of corruption: A sensitivity analysis", *Public Choice*, vol. 126, no. 1-2, pp. 225–256, 2006.

[52] J. L. Hammond, "The resource curse and oil revenues in angola and venezuela", *Science & society*, vol. 75, no. 3, pp. 348–378, 2011.

[53] R. Hausmann, J. Chauvin, *et al.*, "Moving to the adjacent possible: Discovering paths for export diversification in rwanda", Tech. Rep., 2015.

[54] (2020). World development indicators.

[55] J. A. Goldstone, "Population growth and revolutionary crises", in *Theorizing revolutions*, Routledge, 2003, pp. 108–125.

[56] C. Newman, J. Page, J. Rand, A. Shimeles, M. Söderbom, and F. Tarp, *Made in Africa: Learning to compete in industry*. Brookings Institution Press, 2016.

[57] R. Hausmann, B. Cunningham, J. M. Matovu, R. Osire, and K. Wyett, "How should uganda grow?", 2014.

[58] B. Balassa, "Comparative advantage in manufactured goods: A reappraisal", *The Review of Economics and Statistics*, pp. 315–319, 1986.

[59] E. Leromain and G. Orefice, "New revealed comparative advantage index: Dataset and empirical distribution", *International Economics*, vol. 139, pp. 48–70, 2014.

[60] C. A. Hidalgo and R. Hausmann, "Supplementary material for: The building blocks of economic complexity", 2009.

[61] N. Dausen, C. Uwiringiyimana, and S. Fenton, "Tanzania seeks buyers for surplus cashew nut output -minister", *Reuters*, 2018. [Online]. Available: `https://de.reuters.com/article/tanzania-cashewnuts-idAFL8N1YX0AR`.

[62] Barrick. (2019). Barrick and tanzanian government progress discussions in settlement of acacia disputes, [Online]. Available: `https://www.barrick.com/English/news/`.

[63] J. Rand and F. Tarp, "Business cycles in developing countries: Are they different?", *World development*, vol. 30, no. 12, pp. 2071–2088, 2002.

[64] R. Hausmann and C. Hidalgo, "Country diversification, product ubiquity, and economic divergence", 2010.

[65] A. Simoes and C. Hidalgo, "The economic complexity observatory: An analytical tool for understanding the dynamics of economic development. workshops at the twenty-fifth aaai conference on artificial intelligence", 2011. [Online]. Available: `https://atlas.media.mit.edu/en/resources/methodology/`.

[66] J. Shawe-Taylor, N. Cristianini, *et al.*, *Kernel methods for pattern analysis*. Cambridge university press, 2004.

[67] C. BACI. (2020). Baci 2020: 2018 flows available, [Online]. Available: `http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=1`.

[68] R. Hausman, C. Hidalgo, *et al.*, "The atlas of economic complexity", *Mapping path to prosperity/R. Hausmann, CA Hidalgo, S. Bustos, M. Coscia, S. Chung, J. Jimenez, A. Simoes, MA Yildirim//Puritan Press.–2011.–364 p*, 2011.

[69] UNSTATS. (2019). Hs 2002 classification by section, [Online]. Available: `https://unstats.un.org/unsd/tradekb/Knowledgebase/50043/HS-2002-Classification-by-Section`.

[70] T. J. C. Kelly, S. Esselaar, M. A. Saldarriaga Noel, R. A. Swinkels, F. Fatima, L. Nabeta, and E. A. Mungunasi, "Tanzania economic update: Addressing the impact of covid-19", The World Bank, Tech. Rep., 2020.

[71] R. Hausmann, J. R. M. Arilla, M. A. Santos, *et al.*, "Panama beyond the canal: Using technological proximities to identify opportunities for productive diversification", Center for International Development at Harvard University, Tech. Rep., 2016.

[72] B. B. Sørensen, C. Estmann, E. Sarmento, and J. Rand, "Economic complexity and structural transformation: The case of mozambique", 2020, forthcoming.

[73] R. Hausmann and B. Klinger, "Structural transformation and patterns of comparative advantage in the product space", 2006.

[74] R. Hausmann, B. Klinger, *et al.*, "The structure of the product space and the evolution of comparative advantage", Center for International Development at Harvard University, Tech. Rep., 2007.

[75] F. Awadh, "Why tanzania is the world's most important country in the global cashew economy", 2018.

[76] P. Masawe, F. Hartwich, M. Ikongwe, F. Romani, and J. Kabege, "Tanzania's cashew value chain: A diagnostic", 2011.

[77] K. Head and T. Mayer, "Gravity equations: Workhorse, toolkit, and cookbook", in *Handbook of international economics*, vol. 4, Elsevier, 2014, pp. 131–195.

[78] J. S. Silva and S. Tenreyro, "The log of gravity", *The Review of Economics and statistics*, vol. 88, no. 4, pp. 641–658, 2006.

[79] J. E. Anderson and E. Van Wincoop, "Gravity with gravitas: A solution to the border puzzle", *American economic review*, vol. 93, no. 1, pp. 170–192, 2003.

[80] R. Baldwin and J. Harrigan, "Zeros, quality, and space: Trade theory and trade evidence", *American Economic Journal: Microeconomics*, vol. 3, no. 2, pp. 60–88, 2011.

[81] Y. V. Yotov, R. Piermartini, J.-A. Monteiro, and M. Larch, *An advanced guide to trade policy analysis: The structural gravity model*. World Trade Organization Geneva, 2016.

[82] M. P. Olivero and Y. V. Yotov, "Dynamic gravity: Endogenous country size and asset accumulation", *Canadian Journal of Economics/Revue canadienne deconomique*, vol. 45, no. 1, pp. 64–92, 2012.

[83] J. S. Silva and S. Tenreyro, "Further simulation evidence on the performance of the poisson pseudo-maximum likelihood estimator", *Economics Letters*, vol. 112, no. 2, pp. 220–222, 2011.

[84] J.-F. Arvis and B. Shepherd, "The poisson quasi-maximum likelihood estimator: A solution to the 'adding up'problem in gravity models", *Applied Economics Letters*, vol. 20, no. 6, pp. 515–519, 2013.

[85] T. Mayer and S. Zignago, "Notes on cepii's distances measures: The geodist database", 2011.

[86] K. Head, T. Mayer, and J. Ries, "The erosion of colonial trade linkages after independence", *Journal of international Economics*, vol. 81, no. 1, pp. 1–14, 2010.

[87] J. H. Stock and M. W. Watson, "Heteroskedasticity-robust standard errors for fixed effects panel data regression", *Econometrica*, vol. 76, no. 1, pp. 155–174, 2008.

[88] S. L. Baier and J. H. Bergstrand, "Do free trade agreements actually increase members' international trade?", *Journal of international Economics*, vol. 71, no. 1, pp. 72–95, 2007.

[89] REPOA. (2018). Petro factbook 2018, [Online]. Available: `https://media.africaportal.org/documents/Petro_Factbook_2018.pdf`.

[90] Equinor. (). Block 2 project, tanzania, [Online]. Available: `www.equinor.com/content/dam/statoil/documents/where-we-are/equinor-block-2-project-121018.pdf`.

[91] R. Sen, "Enhancing local content in uganda's oil and gas industry", WIDER Working Paper, Tech. Rep., 2018.

[92] EACOP. (2019). East african crude oil pipeline: The eacop project, [Online]. Available: `https://eacop.com/about-us/overview/`.

[93] Shelys. (2008). Shelys africa limited, [Online]. Available: `https://www.aspenpharma.com/2008/05/05/shelys-africa-limited/`.

[94] EAC, "2nd eac regional pharmaceutical manufacturing plan of action 2017–2027", 2018.

[95] N. Shija Rose; Kileo. (2018). Tanzania food and drug authority becomes the first to reach level 3 of the who benchmarking programme.

[96] M. Shirotori, B. Tumurchudur, O. Cadot, *et al.*, *Revealed factor intensity indices at the product level*. UN, 2010, vol. 44.

[97] K. Anderson, M. Kurzweil, W. Martin, D. Sandri, and E. Valenzuela, "Measuring distortions to agricultural incentives, revisited", *World Trade Review*, vol. 7, no. 4, pp. 675–704, 2008.

[98] Y. Ghozzi, "Infrastructure insight: East africa", 2018. [Online]. Available: `www.globaldata.com/store/report/gdif0023ii--infrastructure-insight-east-africa/`.

[99] J. Sutton and D. Olomi, *An enterprise map of Tanzania*. International growth centre, 2012.

[100] J. Y. Lin, *The Quest for Prosperity: How Developing Economies Can Take Off-Updated Edition*. Princeton University Press, 2014.

[101] D. Rodrik, "Comments on "new structural economics" by justin yifu lin", *The World Bank Research Observer*, vol. 26, no. 2, pp. 227–229, 2011.

[102] A. Andreoni, "Anti-corruption in tanzania: A political settlements analysis", 2017.

[103] M. S. McMillan and D. Rodrik, "Globalization, structural change and productivity growth", National Bureau of Economic Research, Tech. Rep., 2011.

[104] A. Kinyondo, C. Newman, and F. Tarp, "The role and effectiveness of special economic zones in tanzania", WIDER Working Paper, Tech. Rep., 2016.

[105] EPZA. (2019). Epza (2019). avaliable at: [Online]. Available: `http://www.epza.go.tz/invest.php?p=232`.

[106] S. Karingi, O. Pesce, and L. Sommer, "Regional opportunities in east africa", *Industries without Smokestacks*, p. 364, 2016.

[107] R. Hill and M. E. Genoni, "Bangladesh poverty assessment: Facing old and new frontiers in poverty reduction", The World Bank, Tech. Rep., 2019.

[108] J. P. Estudillo and K. Otsuka, *Moving out of poverty: An inquiry into the inclusive growth in Asia*. Routledge, 2015.

[109] S. Klasen, "Low schooling for girls, slower growth for all? cross-country evidence on the effect of gender inequality in education on economic development", *The World Bank Economic Review*, vol. 16, no. 3, pp. 345–373, 2002.

[110] U. Larsen and M. Hollos, "Women's empowerment and fertility decline among the pare of kilimanjaro region, northern tanzania", *Social Science & Medicine*, vol. 57, no. 6, pp. 1099–1115, 2003.

[111] P. Gala, I. Rocha, and G. Magacho, "The structuralist revenge: Economic complexity as an important dimension to evaluate growth and development", *Brazilian Journal of Political Economy*, vol. 38, no. 2, pp. 219–236, 2018.

[112] P. Krugman, "What's new about the new economic geography?", *Oxford review of economic policy*, vol. 14, no. 2, pp. 7–17, 1998.

[113] J. Y. Lin, *From flying geese to leading dragons: New opportunities and strategies for structural transformation in developing countries*. The World Bank, 2011.

[114] S. Shih, *Millennium transformation: change management for new Acer*. Aspire Academy, 2010.

[115] A. Andreoni, *A generalised linkage approach to local production systems development in the era of global value chains, with special reference to africa*, 2018.

[116] N. Foster-McGregor, F. Kaulich, and R. Stehrer, "Global value chains in africa", 2015.

[117] N. Haraguchi, C. F. C. Cheng, and E. Smeets, "The importance of manufacturing in economic development: Has this changed?", *World Development*, vol. 93, pp. 293–315, 2017.

[118] D. Rodrik, "Premature deindustrialization", *Journal of Economic Growth*, vol. 21, no. 1, pp. 1–33, 2016.

[119] ——, "Structural change, fundamentals, and growth: An overview", *Institute for Advanced Study*, 2013.

[120] A. Elliot, "European investment in tanzania: How european investment contributes to industrialisation and development in tanzania", 2014.

[121] H. Bhorat, F. Steenkamp, C. Rooney, N. Kachingwe, and A. Lees, "Understanding and characterizing the services sector in south africa", *Industries without Smokestacks*, p. 275, 2016.

[122] L. Calderwood and M. Soshkin, "The travel & tourism competitiveness report 2019", 2019.

[123] MPNCCC. (2020). Mombasa port and northern corridor community charter newsletter: Issue 1 january - march 2020.

[124] TTFA. (2020). Central corridor transport observatory annual report 2019, [Online]. Available: `https://centralcorridor-ttfa.org/e-resources/#`.

[125] J. Morisset, "Tanzania economic update : Opening the gates : How the port of dar es salaam can transform tanzania", 2013.

[126] S. Laaksonen, "Tanzania rapid etrade readiness assessment", 2020. [Online]. Available: `https://unctad.org/en/PublicationsLibrary/dtlstict2020d2_en.pdf`.

[127] C. Z.-W. Qiang, C. M. Rossotto, and K. Kimura, "Economic impacts of broadband", *Information and communications for development 2009: Extending reach and increasing impact*, vol. 3, pp. 35–50, 2009.

[128] C. Scott, "Does broadband internet access actually spur economic growth?", *Paper, December*, vol. 7, 2012.

[129] C. Calderon, G. Kambou, V. Korman, M. Kubota, and C. Cantu Canales, *Africa's Pulse, No. 19, April 2019: An Analysis of Issues Shaping Africa's Economic Future*. The World Bank, 2019.

[130] J. Hjort and J. Poulsen, "The arrival of fast internet and employment in africa", *American Economic Review*, vol. 109, no. 3, pp. 1032–79, 2019.

[131] R. Baldwin, *The Globotics Upheaval: Globalization, Robotics, and the Future of Work*. Oxford University Press, 2019.

[132] N. Kaldor *et al.*, "Strategic factors in economic development", 1967.

[133] S. Dasgupta and A. Singh, "Will services be the new engine of indian economic growth?", *Development and Change*, vol. 36, no. 6, pp. 1035–1057, 2005.

[134] J. B. Jensen, "Overlooked opportunity: Tradable business services, developing asia, and growth", *Asian Development Bank Economics Working Paper Series*, no. 326, 2013.

[135] A. C. for Economic Transformation (ACET), "African transformation report 2017", 2017.

[136] M. Ivanic and W. Martin, "Sectoral productivity growth and poverty reduction: National and global impacts", *World Development*, vol. 109, pp. 429–439, 2018.

[137] L. Christiaensen and W. Martin, *Agriculture, structural transformation and poverty reduction: Eight new insights*, 2018.

[138] H. B. Chenery, S. Robinson, M. Syrquin, and S. Feder, *Industrialization and growth*. Citeseer, 1986.

[139] B. Singh, "Is the service-led growth of india sustainable?", *International Journal of Trade, Economics and Finance*, vol. 3, no. 4, p. 316, 2012.

[140] H. P. Bowen, "On the theoretical interpretation of indices of trade intensity and revealed comparative advantage", *Weltwirtschaftliches Archiv*, vol. 119, no. 3, pp. 464–472, 1983.

[141] T. L. Vollrath, "A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage", *Weltwirtschaftliches Archiv*, vol. 127, no. 2, pp. 265–280, 1991.

[142] K. Laursen, "Revealed comparative advantage and the alternatives as measures of international specialization", *Eurasian Business Review*, vol. 5, no. 1, pp. 99–115, 2015.

[143] R. Hausmann, C. Hidalgo, D. Stock, and M. A. Yildirim, "Implied comparative advantage", 2019.

[144] S. Bustos, M. A. Yildirim, *et al.*, "Production ability and economic growth", Center for International Development at Harvard University, Tech. Rep., 2019.

[145] T. L. Vollrath, *Competitiveness and protection in world agriculture*, 567. US Department of Agriculture, Economic Research Service, 1989.

[146] ——, "Revealed competitiveness for wheat", *Economic Research Service Staff Report, No AGES861030, US Dept. of Agriculture, Economic Research Service. Washington, DC*, 1987.

[147] A. Costinot, D. Donaldson, and I. Komunjer, "What goods do countries trade? a quantitative exploration of ricardo's ideas", *The Review of economic studies*, vol. 79, no. 2, pp. 581–608, 2012.

[148] E. Leromain and G. Orefice. (2020). Cepeii, rca data 2020.

[149] USAID, "U.s. embassy, dar es salaam: Tanzania relaxes protectionist regulations in mining sector", 2019.

[150] Reuters, "Tanzania's new mining rules impose restrictions on foreign banks, insurers", 2017.

[151] S. A. Sona Sejpal and S. Mohamed, "Legal alert: Tanzania enacts significant reforms to the mining local content regulations",

[152] E. Graham-Harrison. (2016). The world looks away as blood flows in burundi.

[153] E. B. Mensah, A. Szirmai, *et al.*, "Africa sector database (asd): Expansion and update", *UNU-MERIT Working Paper*, no. 2018-020, 2018.

[154] C. Estmann, "What development strategy would lead to inclusive growth and structural change for the developing countries in the twenty-first century?", 2019.

APPENDIX

Box 1: Different measurements of RCA

It is important to evaluate the method in which we calculate comparative advantages as it is a central component in our analysis. The traditional Balassa RCA index (BI) has been criticised for not rivalling the original Ricardian idea of comparative advantage [59], [140], [141]. Where the theory is based on the elemental (ex-ante) nature of relative productive structures, the BI is based on the actual (ex-post) bilateral trade flows. The empirical criticism evolves around the index double-counting goods and countries, using gross exports instead of net exports, as well as the distribution, being heavily skewed and not stable over time [59], [142]. Hence, other methods have been proposed. Some with minor modifications, such as the Shirotori et al. (2010) changing the denominator to the sum of the given products export shares across countries in order to reduce large values of RCA arising from the denominator being close to zero [96]. This method is applied in the estimation of the Revealed Labour Intensity. Others, such as in Hausmann et al. (2019) and Bustos and Yildirim (2019), change the denominator to reflect differences in the size of the population and not trade-flows [143], [144]. This measurement is more stable over time, yet it is much more skewed towards small high-income countries, cf. Figure 8. European countries with large export relative to their population size obtain 400+ more RCAs, whereas less developed countries with larger populations, such as Tanzania reduce the number of products with RCAs with up to 200. Hence, this measurement may be interpreted to some extent as an absolute advantage rather than a relative advantage, making it unsuitable for our purposes.

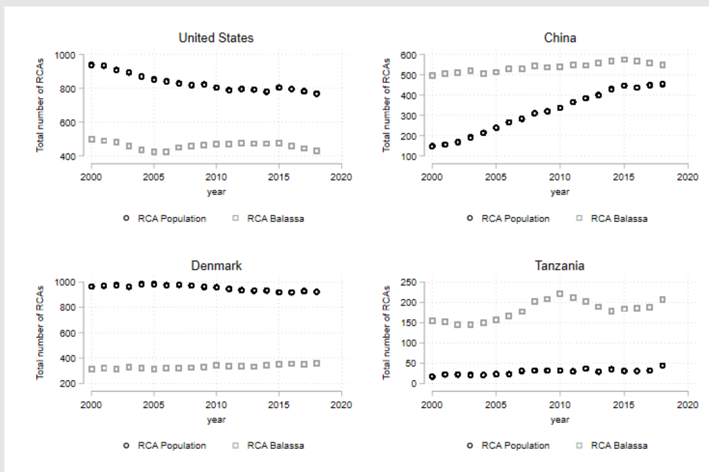


Figure 8. *Total number of RCAs (4 year moving average) in selected countries over time, HS4 (Source: BACI 2020)*

Laursen (2015) suggest that the Method of Reflection may be inaccurate due to the asymmetry of the RCAs [142]. Vollrath (1991) propose to deal with the problem by taking the logarithm of the BI index, yet Laursen (2015) argues that this is not sufficient [141], [142]. He argues that the BI is not comparable on both sides of the unite value (one) and suggest making the index symmetric, where a positive value indicates the country is specialised in the product and negative if not. He calls this measure for the Revealed Symmetric Comparative Advantage (RSCA): RSCA = RCA-1/RCA$+1$. Other measures, such as Michaely index, Contribution to the Trade Balance, the Chi-Square measure and the Net Trade Index exists (ibid). Laursen (2015) considers the different measurements and concludes that the *"RSCA better reflects the concept of specialization"* [142]. For the purpose of calculating the economic- and product complexity indices, the BI and the RSCA will give us the same result as we do not apply the RCAs directly but through the M_{cp} matrix (eq. 2). Vollrath's (1987, 1989) estimation of RCA, on the other hand, could potentially reveal a different complexity score altogether as he incorporates both import and export dimensions and eliminates double counting:

$$RCA_{c,p} = \frac{X_{c,p}/X_{c,-p}}{X_{-c,p}/X_{-c}} - \frac{M_{c,p}/M_{c,-p}}{M_{-c,p}/M_{-c}}, \tag{21}$$

where $X_{c,-p}$ stands for country c's total exports excluding product p: $X_{c,-p} = X_c - X_{c,p}$. $X_{-c,p}$ and X_{-c} is exports of product p for all countries except country c and world exports except country c, receptively. M is import [145], [146].

The above mention indices are, however, still based on ex-post trade flows. Costinot et el. (2012) proposed a new methodology using a Ricardian structural gravity model [147]. By estimating the *"country pair-product specific export flows using exporter-product and importer-product fixed effects"*[148], they managed to compute an ex-ante comparative advantage measure, which they name Ricardian RCA. For trade flows to be a good representative for industry technological advantages, as in the theory of Ricardo, they argue it must be erased from all country-pair definite factors, such as colonial ties, trade barriers, common language, and physical distance[59], [147]. By controlling for this, they claim the Ricardian RCA is much more in line with the theory.

Click here to return to section 4.1.

Box 2: Gold in Tanzania

FDI specific to the extraction sector has increased rapidly during the last two decades in Tanzania. Mineral rents have since 2004 exceeded one per cent, peaking to five per cent in 2011 [102]. The international companies owning the vast majority of the mines in Tanzania pay just four per cent in royalties [149]. In recent years, the GoT has tried to increase its control over the mines. A considerable tax dispute with the largest gold mining company in the country, Barrick Gold Corporation, led to a total export ban of gold and copper [150]. Figure 9 clearly shows how the total gold export fell significantly in 2018, making Tanzania's total export relatively to the world trade decline.

The dispute between Barrick Golds and GoT has ended with an out-of-court agreement, in which the GoT is set to obtain a 16 per cent share of the companies three mines and 50 per cent of the revenue created [62]. Additionally, new mining laws have raised the royalty payment to six per cent, required mining companies to be partly owned by Tanzanians, and enforced that all mining-related transaction must go through banks of which have at least 20 per cent Tanzanian shareholders [151]. This has made the small, local banks able to compete with the large international banks in servicing the mining sector, that may create the spill-overs in the extraction sector of which Stiglitz (2018) refers in the multi-prong strategy [8].

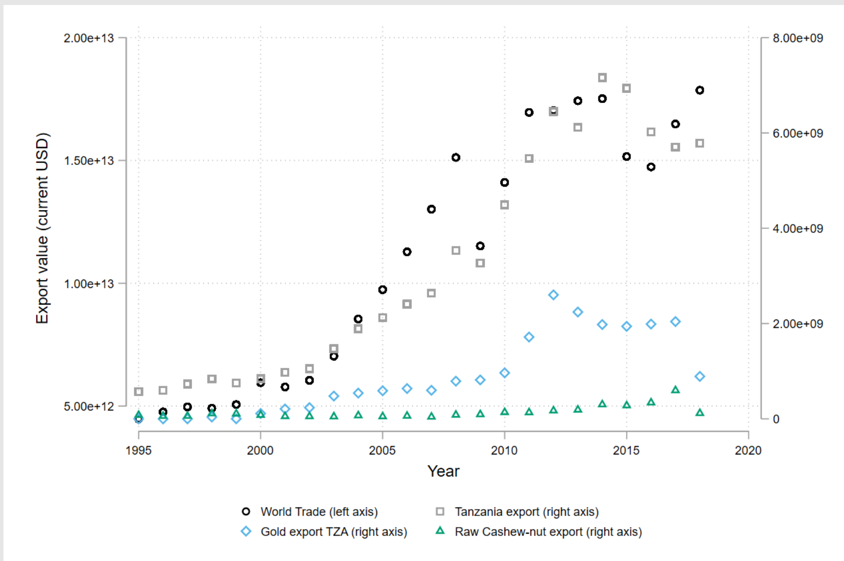


Figure 9. *Tanzania export vs World Trade - as well as Gold and Cashew-nuts exports. Source: BACI (2020)*

Additionally, large natural gas reserves have been found in Tanzania. The challenge is to avoid being stuck in the peripheral part of the Product Space [57]. Extractions of natural resources are a serious obstacle for economic diversification, through the resource course and the Dutch Disease phenomenon (ibid.). The Dutch Disease relates to the shrinking of the tradable sectors as workers shift towards non-tradable activities [45]. This befalls as the exploration of natural resources leads to significant rises in FDI, that appreciates the currency, manifesting in a higher exchange rate and thereby weakening the competitiveness of the tradable sectors [57]

The degree to which Tanzania experiences the "disease" depends on the extent to which the gas revenue is spent on promoting productivity growth in the tradable sectors as well as the elasticity of the supply of labour. If the rural under-employed agricultural sector supplies workers and the gas revenue is spent on, e.g. soft and hard infrastructure, Tanzania may avoid the Dutch disease (ibid.).

Click here to return to section 4.3.

Box 3: Regional comparison:

We see from Table 6 that Tanzania has a significant more RCAs in 2018 than in 2017. Due to the abnormality in the export structure of Tanzania in 2018, the country appears to be the most diversified economy. Tanzania distinguishes from Uganda by having substantially more mineral products, whereas Uganda has a more significant number of agro-processed foods (prepared foodstuffs), that is in general associated with higher complexity. Kenya has made inroads into one considerably higher complex sector, such as chemicals. The unstable country of Burundi, which is experiencing a sizeable internal conflict is the less developed country in the region with just 53 products of RCA. [152].

Table 6 *Comparing Tanzania with its partner countries in EAC*

	Countries in the East African Community*					
Product cluster	Tanzania (2018)	Tanzania (2017)	Kenya	Uganda	Rwanda	Burundi
Animal Products	16	17	13	15	3	1
Chemicals	8	10	24	14	3	3
Electric/Machinery	9	3	1	2	2	0
Foodstuffs	16	16	28	26	8	5
Footwear / Headgear	1	2	4	3	0	2
Hides, Skins, Leather, Furs	7	8	6	6	5	6
Metal Products	26	13	15	16	8	6
Mineral products	21	22	12	8	7	6
Miscellaneous	3	2	5	3	2	1
Other	9	5	2	2	1	1
Plastic/Rubber	3	2	4	5	0	1
Precious stone	3	3	2	2	2	1
Stone and glass	10	10	5	6	3	3
Textiles	23	24	33	13	5	4
Transportation	1	1	5	6	0	0
Vegetables	38	40	31	38	13	12
Wood Products	13	9	10	14	4	1
Total	207	187	200	179	66	53

Source: Author's calculations at the HS4 level (BACI 2020) [39], [69]

Inspired by Hausmann and Chauvin (2015) [53]. *Limited data for South-Sudan (excluded)

Click here to return to section 4.3.

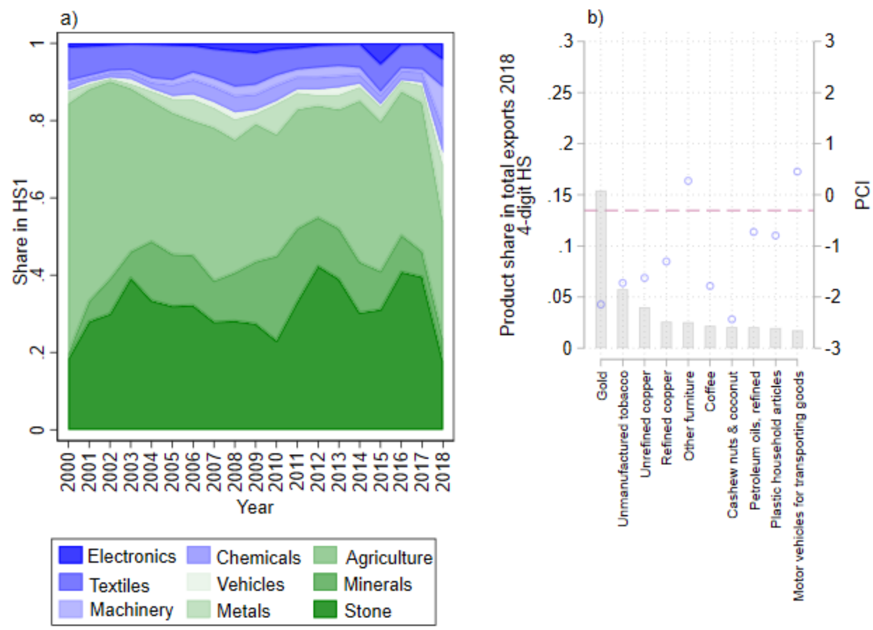


Figure 10. *Overview of Tanzania's export structure over time (a) and current top 10 largest products, by export value (b)*

Table 7 *Tanzania's exports with RCA (2018)*

Product cluster	Products Tanzania has RCA	Change between 2017-2018 in 2018*	Total products in cluster	Export value (USD M)	Share of Tanzanias exports
Animal Products	16	-1	42	195	3.4
Chemicals	8	-2	175	196	3.0
Electric/Machinery	9	6	133	564	9.8
Foodstuffs	16	0	78	668	12.0
Footwear / Headgear	1	-1	19	3	0.1
Hides, Skins, Leather, Furs	7	-1	20	11	0.2
Metal Products	26	13	149	847	14.6
Mineral products	21	-1	66	332	5.8
Miscellaneous	3	1	32	398	6.9
Other	9	4	67	139	2.4
Plastic/Rubber	3	1	43	177	3.1
Precious stone	3	0	18	992	17.1
Stone and glass	10	0	48	40	0.7
Textiles	23	-1	148	168	2.9
Transportation	1	0	38	164	2.8
Vegetables	38	-2	77	736	12.7
Wood Products	13	4	67	153	2.6
Total	207	20	1220	5782	100

*Number of products of change from 2017 to 2018. Inspired by Hausmann and Chauvin (2015) [53].

Source: Author's calculations. Data at the HS4 level from BACI (2020)[39], [69].

Click here to return to section 3, 4.3 and 4.5.

Table 8 *Existing targets - gained from 2017 to 2018*

Product cluster	ID (HS4)	Product name	PCI	Distance	OG	Labour OG	MA RCA	Current Export
Electric/Machinery	8516	Electric heaters	0.51	0.83	0	0	1.05	80.70
Electric/Machinery	8425	Pulleys and winches	0.73	0.85	0	0	6.28	69.09
Electric/Machinery	8546	Electrical insulators of any material	0.88	0.85	0	0	2.38	8.89
Electric/Machinery	8524	Tapes, cassettes, records and compact disks	1.12	0.85	0	0	4.84	14.38
Electric/Machinery	8485	Machinery parts, not containing electrical features, n.e.c.	1.36	0.86	0	0	1.67	25.22
Electric/Machinery	8466	Parts and accessories for metal working machines	1.41	0.86	0	0	3.30	97.75
Foodstuffs	1605	Prepared aquatic invertibrates	-1.68	0.76	0	0	1.07	15.86
Foodstuffs	2201	Waters	-0.64	0.79	0	0	3.68	18.64
Foodstuffs	1905	Bakery products	-0.20	0.79	0	0	1.67	78.23
Metal Products	8105	Cobalt	-1.73	0.74	0	0	5.01	59.67
Metal Products	7313	Barbed wire of iron or steel	-1.08	0.76	0	0	8.81	2.67
Metal Products	8306	Ornaments, statuettes, etc. of metal	-0.73	0.79	0	0	5.89	21.17
Metal Products	8201	Handtools for gardening	-0.35	0.80	0	0	2.40	5.68
Metal Products	7413	Copper wire, uninsulated	-0.30	0.82	0	0	3.93	12.15
Metal Products	7418	Household articles of copper	0.16	0.83	0	0	2.39	2.58
Metal Products	7314	Cloth of iron or steel wire	0.23	0.82	0	0	1.14	8.96
Metal Products	8206	Retail tool sets	0.34	0.83	0	0	7.24	11.66
Metal Products	8303	Safes	0.48	0.84	0	0	2.22	4.08
Metal Products	8304	Paper trays and similar office equipment, of base metal	0.50	0.83	0	0	107.45	54.55
Metal Products	7212	Flat-rolled iron, width < 600mm, clad	0.70	0.84	0	0	1.41	9.80
Metal Products	7211	Flat-rolled iron, width < 600mm, not clad	0.71	0.84	0	0	1.37	10.64
Metal Products	8205	Hand tools n.e.c.	1.10	0.85	0	0	1.20	11.19
Mineral products	2504	Natural graphite	-0.98	0.79	0	0	3.14	2.56
Miscellaneous	9403	Other furniture and parts	0.32	0.82	0	0	1.83	146.56
Miscellaneous	9611	Hand-operated stamps	0.77	0.85	0	0	128.93	69.80
Other	9206	Musical instruments, percussion	-1.02	0.81	0	0	1.92	1.28
Other	9202	Musical instruments, string	0.09	0.83	0	0	6.56	9.86
Other	9023	Instruments designed for demonstrational purposes	0.34	0.84	0	0	12.13	57.85
Other	9009	Electrostatic photo-copyers	0.37	0.83	0	0	7.39	18.27
Other	9207	Musical instruments, electric	0.60	0.84	0	0	7.01	24.31
Other	9201	Pianos	0.83	0.84	0	0	3.93	5.37
Plastic/Rubber	3922	Baths, sinks etc.	0.35	0.81	0	0	2.81	15.48
Textiles	5208	Woven fabrics of cotton of > 85% weighing < 200 g/m2	-1.18	0.79	0	0	1.02	3.49
Vegetables	0906	Cinnamon	-1.31	0.76	0	0	1.22	1.06
Wood Products	4504	Agglomerated cork	-0.68	0.78	0	0	1.17	1.58
Wood Products	4414	Wooden frames	-0.44	0.82	0	0	6.93	10.14
Wood Products	4417	Wooden tools	-0.18	0.80	0	0	21.38	12.17
Wood Products	4415	Packing boxes	0.26	0.81	0	0	1.60	8.86
Wood Products	4817	Letterstock	0.33	0.82	0	0	20.51	30.86
Wood Products	4905	Maps	0.37	0.83	0	0	1.12	0.24

Source: Author's own calculations, classification by Section from UNSD. Data Source: BACI (2020) [67], [69]
*Some product names has been shorten in the table.

Click here to return to section 4.3.

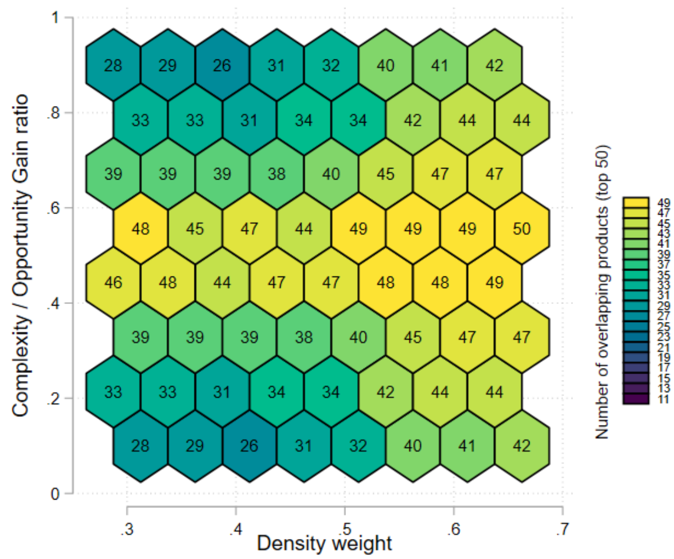


Figure 11. *Number of top 50 products overlapping when changing the PCI/OG ratio at a given Density weight. Mean of all countries*

TECHNOLOGY	BI	KE	RW	SS[45]	TZ	UG	EAC
Plain tablets	✓				✓		✓
Film-coated tablets	✓				✓		✓
Sustained release tablets		✓					✓
Layered tablets		✓					✓
Hard capsules	✓				✓		✓
Soft capsules		✓					✓
Sustained release capsules							
Powders	✓				✓		✓
Dry granules (suspensions)	✓				✓		✓
Suspensions (internal)	✓				✓		✓
Syrups/elixirs/solutions (internal)	✓				✓		✓
Ointments and creams	✓				✓		✓
Lotions and suspensions (external)	✓				✓		✓
Small volume injections (sterile)							
Large volume injections (sterile)			✓			✓	✓
Ophthalmic formulations (sterile)		✓					✓
Ocular formulations (sterile)		✓				✓	✓
Ocular formulations (non-sterile)		✓			✓	✓	
Implants							
Inserts							
Sprays and inhalations							
Medicated dressings							
Immune sera and immunoglobulins							
Vaccines						✓	
Diagnostic agents						✓	

Figure 12. *"Dosage forms which is produced in East Africa"[94] Source: EAC-GIZ survey (2011) [94]*

Click here to return to section 4.4 and section 5.2.

Product description (All products and selection)	Average capacity utilization
All products (CPC code)	63%
Products of agriculture, horticulture etc	65.3%
Dairy products	53.1%
Meat, fish, fruit, vegetables, oils and fats	57.3%
Beverages	63%
Textile articles other than apparel	59.6%
Basic chemicals	66.7%
Basic metals	59.4%
Electricity, town gas, steam and hot water	75%

Source: Census of Industrial Production, Nbs, 2013

Figure 13. *"Production capacity utilisation."[102] Source: Andreoni (2017).*

Click here to return to section 8

Table 9 *Sectoral Employment and Value-added in SSA*

	Sectoral Employment Shares (%)				
Sectors	1985	1995	2005	2010	2015
Agriculture	66.6	63.3	56.8	53.4	49.4
Industry	10,2	10,8	11,5	12,5	14,2
Mining	1.4	1.1	0.9	1.1	1.5
Manufacturing	5.7	6.3	7.0	7.4	7.6
Utilities	0.5	0.4	0.4	0.4	0.5
Construction	2.6	3.0	3.2	3.6	4.6
Services	24.1	26.7	32.4	35.0	37.3
Trade services	7.5	9.5	13.3	15.2	16.7
Transport services	2.0	2.2	2.6	3.0	3.0
Business services*	1.0	1.6	2.6	3.2	3.8
Government services	7.1	7.5	8.0	8.0	7.9
Personal services	6.5	6.0	5.9	5.6	6.0
	Value-added (% of GDP)				
Sectors	1985	1995	2005	2010	2015
Agriculture	26.0	25.0	22.3	21.7	19.1
Industry	27,8	26,0	25,1	24,5	24,8
Mining	9.0	6.7	5.9	6.0	6.0
Manufacturing	13.4	12.4	12.1	10.4	9.0
Utilities	1.9	2.5	2.6	2.4	2.5
Construction	3.5	4.4	4.5	5.7	7.3
Services	46.1	49.0	52.6	53.9	56.1
Trade services	13.4	14.9	15.4	15.9	16.9
Transport services	7.0	6.9	8.3	8.3	8.5
Business services*	10.5	11.8	12.8	13.4	13.8
Government services	12.8	12.8	13.0	13.4	13.7
Personal services	2.5	2.6	3.0	2.9	3.2

Source: Author's calculations from Extended Africa Sector Database [153], [154]

*Business services include Dwellings. Click here to return to section 8.1.

Table 10 *Top 50 products ranked Labour Opportunity Index*

Rank LO*	Rank PT*	Rank SB*	Product cluster	ID (HS4)	Product name	PCI	Distance	OG	Labour OG	MA RCA	Current Export
1	339	333	Metal Products	7502	Nickel unwrought	-0.23	0.85	0.66	0.63	0	0
2	314	329	Mineral products	2704	Coke	-0.70	0.84	0.57	0.53	0	0
3	6	161	Foodstuffs	2403	Manufactured tobacco	-0.67	0.79	0.54	0.51	0.10	0.64
4	77	87	Metal Products	7604	Aluminum bars	0.15	0.83	1.27	-0.37	0.01	0.05
5	121	276	Textiles	6113	Garments knit with impregnated fibers	-0.85	0.80	0.41	0.92	0	0
6	113	278	Textiles	6310	Used or new rags textile scraps	-0.79	0.80	0.30	1.06	0.22	0
7	27	204	Foodstuffs	2005	Vegetables, prepared or preserved	-0.73	0.79	0.47	0.61	0.30	0.14
8	8	169	Metal Products	7602	Waste/scraps, aluminium	-0.82	0.79	0.61	0.48	1.00	6.40
9	17	217	Foodstuffs	2001	Pickled fruits and vegetables	-0.75	0.78	0.28	0.85	0	0
10	1.00	127	Foodstuffs	1704	Confectionery sugar	-0.56	0.78	0.55	0.43	0.28	4.05
11	21	209	Mineral products	2710	Petroleum oils, refined	-0.82	0.79	0.42	0.60	0.27	118.57
12	39	233	Foodstuffs	2308	Vegetable materials for animal feeding	-0.82	0.79	0.41	0.71	0.30	0.18
13	7	125	VegeTables	1104	Worked cereal grains	-0.45	0.79	0.72	0.30	0.40	0.72
14	154	293	Textiles	6115	Socks, stockings, etc., knit	-0.77	0.80	0.31	1.02	0.03	0.13
15	25	173	Foodstuffs	2101	Coffee extracts	-0.61	0.79	0.61	0.62	0.33	1.13
16	294	316	Textiles	5808	Braids in piece	-0.79	0.83	0.63	0.81	0.03	0
17	168	216	Chemicals	2836	Carbonates	-0.35	0.82	0.92	-0.01	0.70	7.45
18	9	163	Foodstuffs	2007	Marmalades	-0.63	0.79	0.55	0.54	0.04	0
19	104	260	Footwear / Headgear	6405	Footwear, other	-0.76	0.80	0.40	0.90	0.10	0.11
20	11	108	Stone and glass	7001	Cullet and scraps of glass	-0.43	0.80	0.95	0.40	0.06	0
21	172	243	Miscellaneous	9507	Fishing and hunting equipment	-0.44	0.82	0.76	0.81	0.11	0.55
22	13	99	Foodstuffs	2104	Soups and broths	-0.28	0.80	0.96	-0.01	0	0
23	236	273	Textiles	5809	Woven fabric incorporating metal threads	-0.54	0.83	0.79	0.40	0	0
24	139	257	Metal Products	7806	Articles of lead	-0.81	0.81	0.62	0.49	0.22	0
25	23	145	Metal Products	7306	Tubes etc. of iron/steel	-0.38	0.80	0.65	0.53	0.56	14.70
26	59	220	Electric/Machinery	8544	Insulated electrical wire	-0.53	0.80	0.45	0.65	0.03	3.28
27	2	86	Foodstuffs	2202	Waters, flavored/sweetened	-0.36	0.79	0.84	0.35	0.80	8.52
28	61	203	Chemicals	2828	Hyopchlorites	-0.59	0.80	0.63	0.57	0.07	0.01
29	318	323	Textiles	6214	Shawls, scarves, etc.	-0.83	0.85	0.89	0.43	0.03	0.02
30	232	282	Textiles	5212	Woven cotton fabrics, other	-0.63	0.83	0.72	0.45	0.53	0.23
31	117	252	Wood Products	4412	Plywood	-0.70	0.80	0.51	0.71	0.16	3.16
32	4	93	Wood Products	4819	Cardboard packing containers	-0.36	0.80	0.91	0.23	0.34	4.21
33	26	154	Animal Products	0407	Eggs, in shell	-0.51	0.80	0.66	0.38	0.06	0.22
34	142	225	Plastic/Rubber	4004	Scrap of rubber	-0.67	0.82	0.91	0.03	0.02	0
35	74	211	Chemicals	3101	Animal or vegetable fertilizers	-0.65	0.80	0.67	0.46	0.02	0
36	126	266	Footwear / Headgear	6406	Parts of footwear	-0.64	0.80	0.38	1.00	0	0
37	95	214	Textiles	5608	Nets	-0.43	0.81	0.65	0.55	0.44	0.38
38	32	165	Vegetables	0811	Fruits and nuts, frozen	-0.34	0.80	0.60	0.40	0.01	0.01
39	155	272	Textiles	5609	Articles of yarn, rope etc	-0.64	0.81	0.48	0.86	0.03	0.02
40	338	330	Textiles	5901	Stiffened textiles	-0.44	0.85	0.78	0.83	0	0
41	3	63	Plastic/Rubber	3923	Packing lids	-0.20	0.80	1.00	0.06	0.25	3.20
42	264	312	Textiles	5810	Embroidery in the piece	-0.81	0.82	0.54	1.13	0	0
43	5	118	Foodstuffs	2103	Sauces and seasonings	-0.44	0.79	0.78	0.16	0.01	0.04
44	204	302	Stone and glass	6802	Worked building stone	-0.84	0.81	0.32	0.80	0.26	0.55
45	284	311	Metal Products	7901	Unwrought zinc	-0.70	0.83	0.60	0.42	0.08	0.33
46	16	121	Foodstuffs	1904	Cereal foods	-0.38	0.80	0.84	0.06	0.01	0.09
47	238	296	Metal Products	7605	Aluminum wire	-0.65	0.82	0.57	0.32	0.03	0
48	214	248	Textiles	5210	Fabrics of cotton of < 85% w < 200 g/m2	-0.47	0.83	0.85	0.40	0.13	0.13
49	207	280	Textiles	6217	Clothing accesories	-0.64	0.82	0.62	0.88	0.93	0.11
50	291	324	Textiles	5206	Cotton yarn of < 85%	-0.78	0.83	0.48	0.90	0	0

Source: Author's own calculations, classification by Section from UNSD. Data Source: BACI (2020) [67], [69]. Note:*Ranked by the Labour Opportunity index (first column), *Parsimonious transformation rank (second column) and *Strategic Bets rank (third column). Some product names has been shorten in the table.

Click here to return to section 6.2