

WORKING PAPER

No. 5

UNCTAD/WP/2023/4

AUGUST 2023**Clovis Freire**

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Abstract

Realizing product diversification for structural change in African countries

Export diversification has been among the most cited policy recommendations for African countries to spur structural transformation and increase resilience. However, export diversification that benefits structural change is not an automated process and requires an analytical approach and complex decision-making. Applying an adjusted economic complexity and product space methodology on trade data of 54 African countries and their trading partners, this paper assesses export diversification opportunities that are feasible to realize, associated with structural change and of high demand in the world and on the African continent. Increasing complementarities of African exports and imports are crucial to yield higher benefits from the African Continental Free Trade Area (AfCFTA). The paper's focus on intra-African diversification opportunities allows for a continental mapping of current exports with export diversification opportunities and the identification of niche areas of individual countries. The paper finds that almost all countries have some potential for product diversification into light manufacturing (machinery and mechanical appliances; electrical machinery) and processed base metal products (articles of iron and steel), though in different products. The paper's findings can guide policymakers and development partners in identifying industrialization strategies and productive capacity needs.

Key words

AfCFTA, export diversification, product space, African economies

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Acknowledgements

This paper benefited from comments and suggestions from Habiba Ben Barka, Lisa Borgatti and Anida Yupari Aguado, two anonymous referees, and participants from the “Africa’s regional and global integration: Lessons from the past and implications for the future” conference, held in Bonn on 17-18 November 2022.

Introduction

The establishment of the African Continental Free Trade Area (AfCFTA) gives new momentum to promote export diversification at the continental level by providing a larger market and reducing trade costs. The paper discusses the potential of increasing regional trade complementarities and the potential of the AfCFTA in redressing the low levels of intra-African trade and export diversification. Most African countries largely depend on exporting a few commodities, often characterized by low-income elasticities, with little scope for productivity increases and strong price fluctuation. Due to the high volatility of export earnings and deterioration of a country's terms of trade, export diversification away from commodity dependence is key to promoting structural transformation and sustainable economic growth (e.g. Sarin et al., 2020).

The strand of literature on economic complexity (e.g. Hidalgo et al., 2007; Hidalgo and Hausmann, 2009) has been used to identify potential new exports that require productive capabilities similar to the ones already existent in the country, which could facilitate economic diversification and serve as an input to industrial policies.¹ Yet, for African countries, there remains limited policy recommendations, based on trade data and economic complexity analysis, on which sectors/product-groups have the greatest potential for export diversification due to high feasibility to produce, as well as favorable demand conditions. Successful export diversification requires the observation of market incentives (growth opportunities) and state intervention to provide sector inputs and facilitate market entrance (Freire, 2017).

Few attempts have been made to guide developing countries on export diversification opportunities, and no attempts have been made to date for the African continent. This paper provides evidence on feasible export diversification opportunities with benefits for structural change for all African countries. The analysis considers the demand for these feasible products both globally and on the continent. Although intra-African exports as a share of total exports are currently low, around 18 per cent, regional integration promises an important instrument to promote export diversification. Intra-African exports are less concentrated on a small number of products than exports to the rest of the world, and comprise a larger share of manufactured goods.

A literature review in Section 1 gives the rationale to assess product diversification opportunities that have the potential to benefit structural change. Section 2 briefly describes the data and methodology, and presents the results of overall export diversification opportunities. Section 3 focuses on product diversification opportunities with demand on the continent. Section 4 provides a toolkit of necessary policy considerations. Section 5 concludes.

1. The importance of product diversification for structural change

Successfully promoting diversification within and across sectors can help reduce volatility and contribute to long-term structural transformation and sustainable development (e.g. Gözgör and Can, 2017). In Africa, where 45 of the 54 countries are commodity-dependent (UNCTAD, 2022), export diversification can be a significant driver of productivity and production growth (Ben Hammouda et al., 2010).

¹ This literature assumes that products require a specific set of productive capacities to be produced. Countries have some of these capacities and will produce the products for which they have the capabilities. Countries that are very diversified and produce many products that are produced by only a few countries (i.e. not ubiquitous) would then have a large set of productive capacities and are considered more complex economies. If a product is produced by few countries (i.e. not ubiquitous) that are also very diversified, these products are considered to be more complex (Freire, 2021b).

Diversification results from increasing the number of goods and services produced/exported (horizontal diversification), measured by the number of active export lines or quality upgrading within already produced goods and services (vertical diversification), measured by their unit value. While Imbs and Wacziarg (2003) showed evidence for a slowing horizontal diversification with increasing GDP per capita levels, quality upgrading within products and sectors increased with rising income levels (Mau, 2016). The variety of exports is strongly path-dependent, as a country's current production capabilities (i.e. technologies, production factors, institutions, resource endowments) influence what can be produced in the future (e.g. Hidalgo et al., 2007). Spillovers of technology and skills through diversification trigger long-term structural change (Hausmann et al., 2007). Coniglio et al. (2021) explore path dependency in the diversification process for a sample of 221 countries and find that most countries that are less likely to diversify away from their comparative advantage are natural resource dependent.

Due to these path-dependencies and potential market imperfections (e.g. high discovery costs and lack of market information keep countries from producing a good that could be produced with a comparative advantage), detailed information on diversification opportunities and strategic government intervention is necessary. Moreover, export diversification must be targeted towards products with a higher benefit for structural change due to higher complexity.² In our analysis, structural change is defined by the movement from less to higher complexity goods. In less diversified countries, diversification policies that target 'related' products are more likely to succeed and develop comparative advantages in products that require similar production capabilities.³

A large portion of literature has emphasized the importance of regional trade as a stepping stone toward greater integration into world trade. Countries with similar endowments and income levels have a greater export variety in their bilateral trade basket (e.g. Parteka, 2020), and scale economies (domestic and foreign market size) positively drive export diversification (Parketa and Tamberi, 2013). Also, reducing trade costs significantly increases the export diversification levels of developing countries, while trade agreements positively impact export diversification for African countries (Vogel, 2022). Regolo (2017) confirms that regional markets are more accessible for newly exported products thanks to lower trade costs, including tariffs. While intra-African trade costs are still often higher than extra-African trade costs (UNCTAD, 2021a), the AfCFTA plays a role in reducing tariffs and non-tariff barriers, and is therefore expected to promote the introduction of new export products.

Currently, intra-African trade is low. Intra-African exports account for 17.73 per cent of total exports (compared to 52.68 per cent in the Americas, 58.47 per cent in Asia, 68.10 per cent in Europe and 6.41 per cent in Oceania (UNCTAD Statistics)). The main obstacles to intra-African trade include low trade complementarity due to low economic diversification and limited productive capacities, high non-tariff barriers, and lack of infrastructure. The AfCFTA is expected to address these trade frictions through various initiatives (UNCTAD, 2021a). The potential of facilitating intra-African trade for structural change stems from the observation that intra-African exports are more sophisticated (i.e. higher share of manufactured goods) and more diversified than exports to the rest of the world (UNCTAD, 2021a; ITC and UNCTAD, 2021).

Moreover, during a time of global tensions, such as the pandemic, the war in Ukraine, and a decline in globalization, South-South trade can provide developing countries with the untapped potential for export diversification (OECD and WTO, 2019). Countries with shorter bilateral distance trade more with each other⁴

² As shown in Gala et al. (2018), as the complexity of the export basket of developing countries increases, there is a greater likelihood that their income will converge with those of high-income countries.

³ Pinheiro et al. (2022) examines the role of related and unrelated diversification in the process of economic diversification and finds that related diversification is more common among less developed countries, while unrelated diversification (i.e. large jumps) becomes more important as countries climb the complexity ladder. UNIDO (2023) examines countries' diversification experiences over the past two decades and shows that 61% of "jumps" observed were short (high relatedness). These results highlight the importance of both forms of diversification in promoting economic growth and avoiding lock-in, while emphasizing the relevance of related diversification for less developed countries.

⁴ Empirical evidence in the literature is based on the theoretical foundations of the gravity model (see Bergstrand, 1985; Baier and Bergstrand, 2007; Egger, 2004).

and also have more diverse trade baskets (Bahar et al., 2014; Balland and Boschma, 2021). Empirical evidence has established a positive link between export diversification and common language, as well as common border (for a review of empirical literature, see Vogel, 2022) which highlights the importance of South-South trade for diversification. In addition, market access in the form of preferential trade agreements also matters for diversification. Currently, African countries largely export natural resources with little value addition. In fact, the value creation in high-income countries depends on the annual importing of resources from lower-income regions, which causes an unequal ecological exchange (Doring et al., 2021). Hence, a re-orientation of African trade towards the continent would not only keep more value added on the continent, but could also promote more equal trade relationships.

A major aim of diversification is promoting structural change by increasing product complexity. However, increasing the number of products exported does not necessarily mean that there has been a diversification into products with higher value. Literature on economic complexity (e.g. Hausmann et al., 2007; Hidalgo and Hausmann, 2009) shows that export diversification should be assessed according to the level of the current complexity of the export basket as it strongly influences a country's capabilities to export certain products, at least in the short- to medium-term. Linking the concept of product complexity to the product space method, proposed by Hidalgo et al. (2007), facilitates the identification of pathways for future diversification into more complex products. Particularly, by disaggregating trade data reported at the Harmonized System (HS) 6-digit level (further by quantity unit code and unit value range), our approach in this paper contributes to the literature by accounting for product differentiation.

Available literature that applies the product space method to identify export diversification remains limited, but is emerging. For the example of Tanzania, Estmann et al. (2022) use the product space method to explore diversification opportunities that are highly related to current exports and require relatively large-jumps to new products. Their assessment shows that while low-hanging fruit products are already targeted in the Five Year Development Plan of Tanzania, the product clusters with high export demand and diversification opportunities (such as plastics and machinery production) currently receive little attention.

Similarly, for Rwanda, Hausman and Chauvin (2015) calculate feasible strategic products for diversification with higher-than-average complexity and a high demand in both the world and region, based on HS 4-digit level trade data. Three clusters emerge in their analysis: i) machinery and electronics; ii) construction materials, and metal and wood products; and iii) chemical products. For instance, within the category of machinery, the authors find that the opportunities lay in supposedly simpler agriculture work, and food processing machinery and parts. Hausman and Chauvin (2015) acknowledge the ambition in such a diversification strategy, but that greater coordination and investment would also generate spillovers and facilitate future diversification and development (Hausman and Chovin, 2015). Applying the Growth Identification and Facilitation Framework to Uganda, Lin and Xu (2016) identified articles of apparel and clothing, footwear, leather, electrical machinery and equipment, agro-processing business, and iron and steel as feasible to produce and having export growth opportunities.

At the African regional level, an application of the product space method is provided by Si Tou (2021) for the East African Community, showing a high degree of complementarity among national productive structures of some of its partner states (Burundi, Kenya, Rwanda, Tanzania and Uganda). The results suggest that regional value chains (RVC) can contribute to producing a larger share of goods on the continent that are otherwise imported and are a means to promote industrial development. Despite the widely cited potential of RVC development, concrete RVC upgrading programmes are lacking. Moreover, there is a research gap in identifying diversification opportunities to inform regionally coordinated sector promotion strategies and industrial policy making. This paper closes that gap.

2. Identifying product diversification opportunities

2.1. Data

Trade data is from the United Nations COMTRADE database using HS classification 1992 6-digit level, covering 243 economies, including all 54 African countries. Only bilateral import data (country to country) at the 6-digit level was considered for the analysis. Due to the usual better quality of the reporting of imports for duties purposes, import data, rather than export data, is used. The assessment of potential new products is based on the years 2018/2019 (average). Furthermore, the method differentiates products according to differences in unit values. Empirical literature has shown that while exporting the same product to one country, the higher-income country will export the higher unit value product, while the lower-income country will systematically export the lower unit value product (Schott, 2004; Fontagné et al., 2008). Therefore, in the analysis, we have considered products of different prices as different products, as the capabilities available in these countries to produce the products will be considered inherently different. Analytically, trade data at the HS 6-digit level is further disaggregated by quantity unit code and unit value range. The method follows Freire (2017, 2021a). Unit values were calculated based on quantity and value data from COMTRADE⁵. The method statistically computes the interquartile ranges of the unit value distribution for each product and considers the products with unit value within different interquartile as different products. For example, it considers a women's dress made of cotton within the unit value range from US \$0.10 to \$13.50 as a different product than a women's dress made of cotton within the unit value range from US \$172 to \$223.⁶

As previously mentioned, the analysis uses data reported by importers to calculate the export of countries. Thus, data on exports from countries in Africa are of the same quality as data from other countries because they are from reporters that import from those countries, and the leading importers are developed nations. To reiterate, this approach makes an important contribution to the literature by accounting for product differentiation (different unit values within product groups/quality upgrading with products). The advantage of this method is that it allows for the assessment of different capabilities of countries even when they export the same product at the HS 6-digit level, if the products are of different unit value ranges. The disadvantage is that it requires the availability of quantity and value data in the COMTRADE dataset to calculate the unit values, and quantity data is not reported as well as value data. Freire (2017) estimates that from 2005 to 2013, around 10 per cent of trade flows by countries in COMTRADE were missing quantity information. This results in lower estimates for the complexity of countries than would be possible if all quantity information was available.

2.2. Methodology to identify product diversification opportunities

As highlighted in Section 1, there is a need to ensure that efforts to diversify exports are in line with targets of structural change and sustainable development. This paper focuses on the prospects for structural change, proxied by products that are of higher complexity than a country's average product basket. Future research and country strategies must also take into account environmental considerations, as well as the participation of women and youth in the targeted sectors. This exercise is beyond the scope of this paper (but the case study can provide an entry-point for discussions).

The paper focuses on the discussion of the most feasible new products with a higher complexity, as well as the opportunity to replace imports (which would relax the balance-of-payments constraint of export promotion). The analytical elements are described as follows:

⁵ Countries report the data based on criteria that have been established to ensure the comparability of the data.

⁶ Assuming that those unit value ranges resulted from the statistical analysis of interquartile ranges of unit value distribution for the product women's dress made of cotton. A detailed explanation of the methodology is available in Freire (2017).

i) *Proximity in the Product space*

The Product space method (Hidalgo et al., 2007) – which maps the distance between a country’s current exports basket and a new product – is based on how often countries export these products simultaneously. New products should be nearby in the Product space in order to have a higher likelihood of success. There is clearly a trade-off between diversifying into more complex products and the possibility of a successful diversification path (more distant products are also more difficult to develop) (Si Tou, 2021). Our analysis should not be understood as an upper limit of diversification potential. If countries realize larger jumps in the product space through targeted investments, additional export opportunities can arise. Although the commodities available in the country play an important role in diversification through value addition and as inputs to downstream sectors, in some cases, larger jumps in the product space can be necessary to promote structural change.

The measure of proximity between products A and B (Φ_{AB}) in the Product space is calculated using a method similar to that proposed by Hidalgo et al. (2007), as the minimum value between the conditional probability $P(A|B)$ of a country producing A given that it produces B and the conditional probability $P(B|A)$ of a country producing B given that it produces A:

$$\Phi_{AB} = \Phi_{BA} = \min(P(A|B), P(B|A)) \quad (1)$$

Therefore, the proximity between two products ranges from 0 per cent, in the case of no country produces both products, to 100 per cent, in the case of all countries that produce one good also produces the other. In this paper, we assume that “feasible products” are close products with an 80 per cent probability that the country has similar technological capabilities and knowledge to produce those products.

ii) *Product complexity index*

A desirable outcome of export diversification should be an increase in economic complexity to benefit structural change (see Section 1). Therefore, in the next step, only products of higher-than-average complexity are considered to promote diversification.

The product complexity index is calculated following Freire (2017) as a revised version of the method of reflections proposed by Hidalgo and Hausmann (2009). The modification is that the method considers all exports, not only the ones with a certain revealed comparative advantage (RCA), because an RCA is a volatile measure for those countries with low levels of diversification and that rely on few commodities for exports. The method of reflections iteratively calculates measures of diversification ($k_{c,N}$) and ubiquity ($k_{p,N}$), and produces, for each product p , an ordered list of N real numbers ($k_{p,0}, k_{p,1}, k_{c,p}, \dots, k_{c,N}$), where N is the number of iterations of the method. The number of countries that export product p is represented as $k_{p,0}$.

The product complexity index (PCOMP) is calculated as:

$$PCOMP = \frac{k_{p,5} - \overline{k_{p,5}}}{\sigma} \quad (2)$$

Where $\overline{k_{p,5}}$ is the mean and σ is the standard deviation of the distribution of $k_{p,5}$.

iii) *Import demand (export opportunity)*

There must be an actual global demand, hence, favorable demand conditions, for these products. The import demand in 2018/2019 is used as an indicator of market opportunity which is, by assumption, the same for each country.

To estimate the product’s export potential, this paper uses a monetized type of overlap index designed to measure the degree to which the potential new exports of one country match the expanding import markets of another (Freire, 2017). The method assumes that there are good opportunities for trade expansion towards these products based on the past growth rate of their import markets.

The indicator (XOP) is defined as the sum of the differences of the shares of the sectoral imports of the import country in total world imports between two periods:

$$XOP = \sum_i G_{isd}^{t0,t1} \times M^{2019} \quad (3)$$

Where M^{2019} is the total imports by all countries in all products for the year 2019, $G_{isd}^{t0,t1}$ is the growth in the global share of imports m of industry i in country d in the period between $t0$ (2018) and $t1$ (2019). The analysis only includes pairs of countries where the share of the sectoral imports in total world imports has increased between the two years, and the sector represents a potential new product for the export country.

Since the export opportunity is differentiated by country of import, it allows a differentiation of diversification opportunities for exports to the world and the African continent.

iv) *Import substitution potential*

Last, opportunities for import replacement through export diversification are also considered. African countries largely depend on imports, which make them highly volatile to exogenous prices and supply chain shocks. Focusing on export diversification opportunities that also have the potential to replace imports is more beneficial, and investment costs to build productive capacities would amortize faster through lower import costs.

Limitations

First, this paper applies a somewhat static assessment of product diversification opportunities, although such opportunities can only be realized over time and are expected to unlock additional diversification opportunities in the future. Further, the paper does not account for dynamic regional diversification processes, such as the “flying geese pattern” (leader-follower pattern), where less industrialized countries follow the diversification process of newly industrialized countries. While a dynamic product space assessment could be conducted at the country level, it is beyond the scope of this paper.

Second, the evolution of GVCs led to an increase in trade-in value added and tasks through services, rather than products. Additionally, especially with the evolution of GVCs, the value of re-exports is increasing. However, data on re-exports is poorly reported. Therefore, our analysis – which is based on official trade data – must be treated with caution, particularly for African countries with limited statistical capacity. The obtained results can only provide a first indication of diversification opportunities and must be carefully interpreted with regard to a country’s *real* production and export base. To the extent possible, the paper considers unreasonable export opportunities in the discussion of the results.

Third, our focus is on tradable goods and ignores the role of services. It is beyond the scope of this paper to identify diversification opportunities in services.

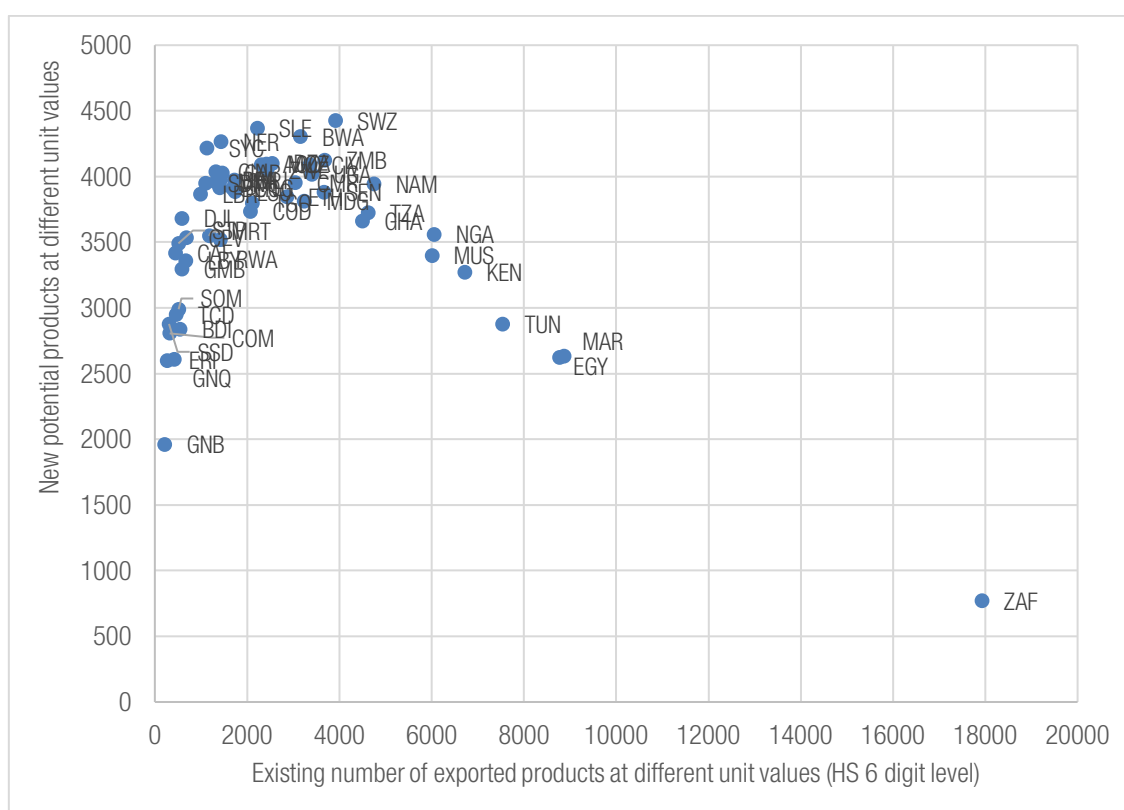
Fourth, the use of the product space methodology to identify potential new products for diversification is a valuable approach that can help countries discover new opportunities for economic growth. However, it is important to acknowledge the limitations of this approach, particularly its use of past trade data to estimate the export and import substitution opportunities for different products. While based on recent trade patterns, it may not fully capture emerging trends and changes in the global economy, such as the growing importance of green products and geopolitical shifts. Thus, the recommendations for diversification provided should only be considered in the short-term.

2.3. Results

i) *New products with at least 80 per cent proximity in the Product space*

The number of potential new products, considering different unit values within product groups, sharply increases with the number of existing products, at least to a certain threshold. If a country is already strongly diversified, such as South Africa, Egypt or Morocco, the opportunities of new products are lower (see Figure 1). However, for these countries, diversification across actors and firms can reduce regional concentration of export earnings on few enterprises.

Figure 1. Existing products and new potential products (with above-average complexity)



Source: Based on UN COMTRADE data; methodology based on Freire, 2017.

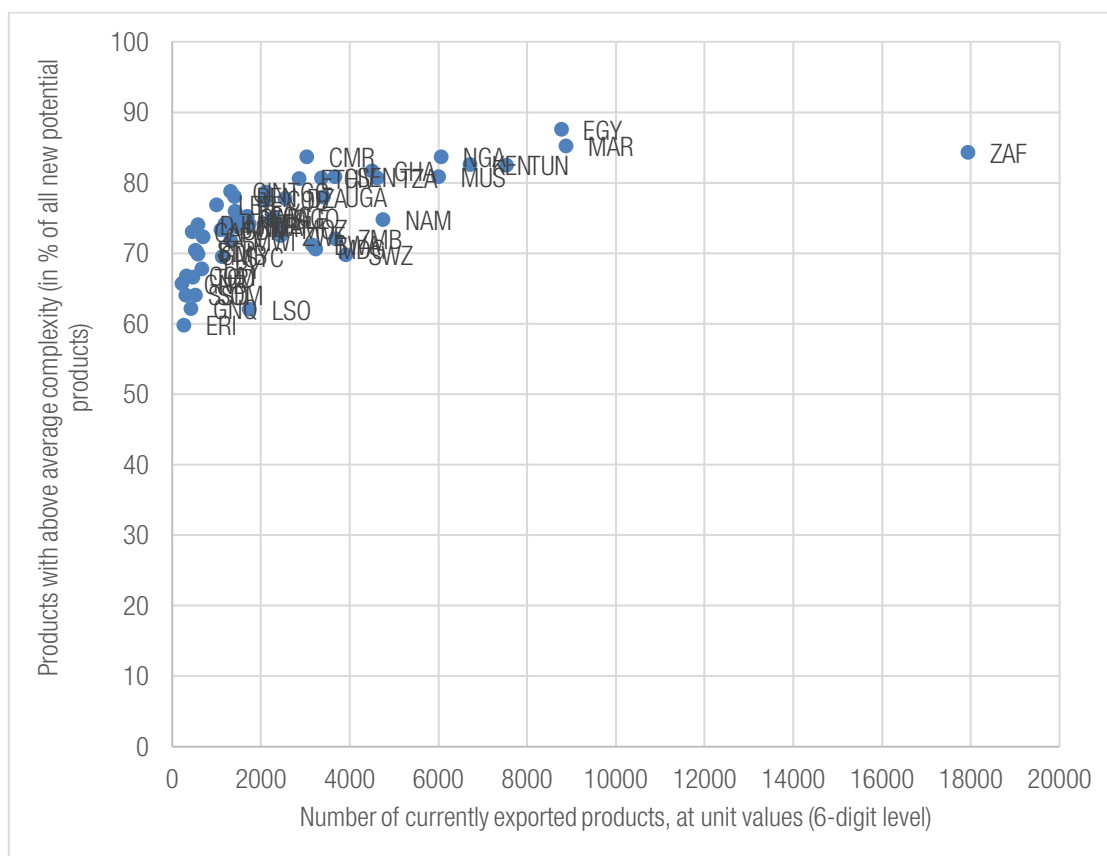
According to their current diversification stage, such differences across African countries implies different strategies and policy recommendations. The implication of this inverted-U shape curve for industrial and innovation policies is that for the less diversified countries, emulation of products that already exist in the world promise the most feasible pathway of diversification, as many of these new-to-the-country products can provide basic goods that are often currently imported. These less diversified economies should then focus their innovation and industrial policies on facilitating emulation. For example, through investment on and promotion of import substitution and upgradation of participation in existing value chains in commodities. In contrast, as countries diversify, the number of potential products to be emulated decreases and there is a stronger need to innovate new products that might be particularly relevant for the region's demand. Thus, more diversified countries should start to shift their innovation and industrial policies from emulation towards "new-to-the-world" innovation, investing and promoting R&D, for example.

ii) *New products with above-average product complexity*

The share of feasible new products with above-average complexity is illustrated by country in Figure 2 below. These are products with a higher-than-average complexity of the products produced in the country. The

diversification towards these products would, therefore, increase the complexity of the economy. Without accounting for the actual demand for these product opportunities, the share of those products with high proximity in the Product space, that are also more complex than the average, is more than 50 per cent for all African countries. However, for the small, often less developed countries, such as Eritrea and Lesotho, the share is only around 60-65 per cent, compared to almost 90 per cent for Egypt, Morocco and South Africa.

Figure 2. Number of currently exported products and share of potential new products with above-average complexity and export market opportunities

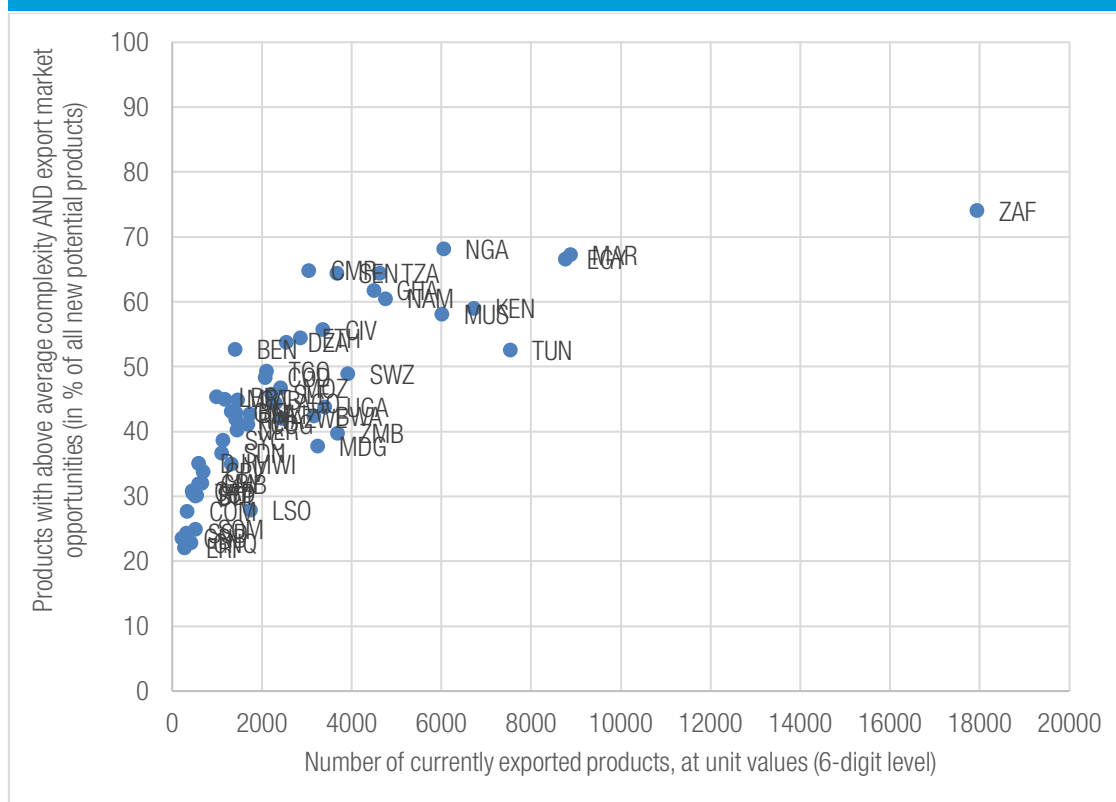


Source: Based on UN COMTRADE data; methodology based on Freire, 2017.

iii) Favourable import demand (export opportunities)

The picture becomes even more pessimistic when considering the demand for new product opportunities. Figure 3 illustrates the share of feasible new products with above average complexity and facing favorable demand conditions.

Figure 3: Number of currently exported products and share of potential new products with above-average complexity AND export market opportunities



Source: Based on UN COMTRADE data; methodology based on Freire, 2017.

Note: Table 3 in the Appendix provides detailed results by country.

The finding presented in Figure 3 suggests that for only 16⁷ of the 54 assessed African countries, product diversification based on relatively small jumps into new similar products would lead towards structural change, i.e. more than 50 per cent of the product diversification opportunities with high proximity in the product space are above-average-complexity, hence promoting overall structural change and facing favourable demand conditions. On the contrary, in 7 African countries (Lesotho, Comoros, Somalia, South Sudan, Guinea-Bissau, Equatorial Guinea and Eritrea), the share is only 20 per cent. Table 1 lists the countries by the share of feasible (proximity and demand) export product diversification opportunities with benefits for structural change (above average complexity).

For most African countries, a selective approach is necessary to guide diversification towards products with higher complexity to promote structural change. In the case of Group 1, the countries should focus on these 20 per cent of diversification opportunities and develop targeted policies that strategically promote their exports. At the sector level, an instructive way to select a smaller number of target products from the pool of tangible products is by focusing on products with highest product complexity. Regional cooperation efforts should give special attention to these countries with limited opportunities to diversify their baskets.

Our results do not suggest an upper limit of diversification opportunities. There is a trade-off between diversifying into more complex products and the possibility of a successful diversification path (more distant products are also more difficult to develop) (Si Tou, 2021). If countries realize larger jumps in the product space through targeted investments, additional export opportunities arise.

⁷ These are: South Africa, Nigeria, Morocco, Egypt, Cameroon, Senegal, Tanzania, Ghana, Namibia, Kenya, Mauritius, Côte d'Ivoire, Ethiopia, Algeria, Benin and Tunisia.

Table 1. List of countries by the share of feasible (proximity AND demand) export product diversification opportunities with benefits for structural change (above average complexity)

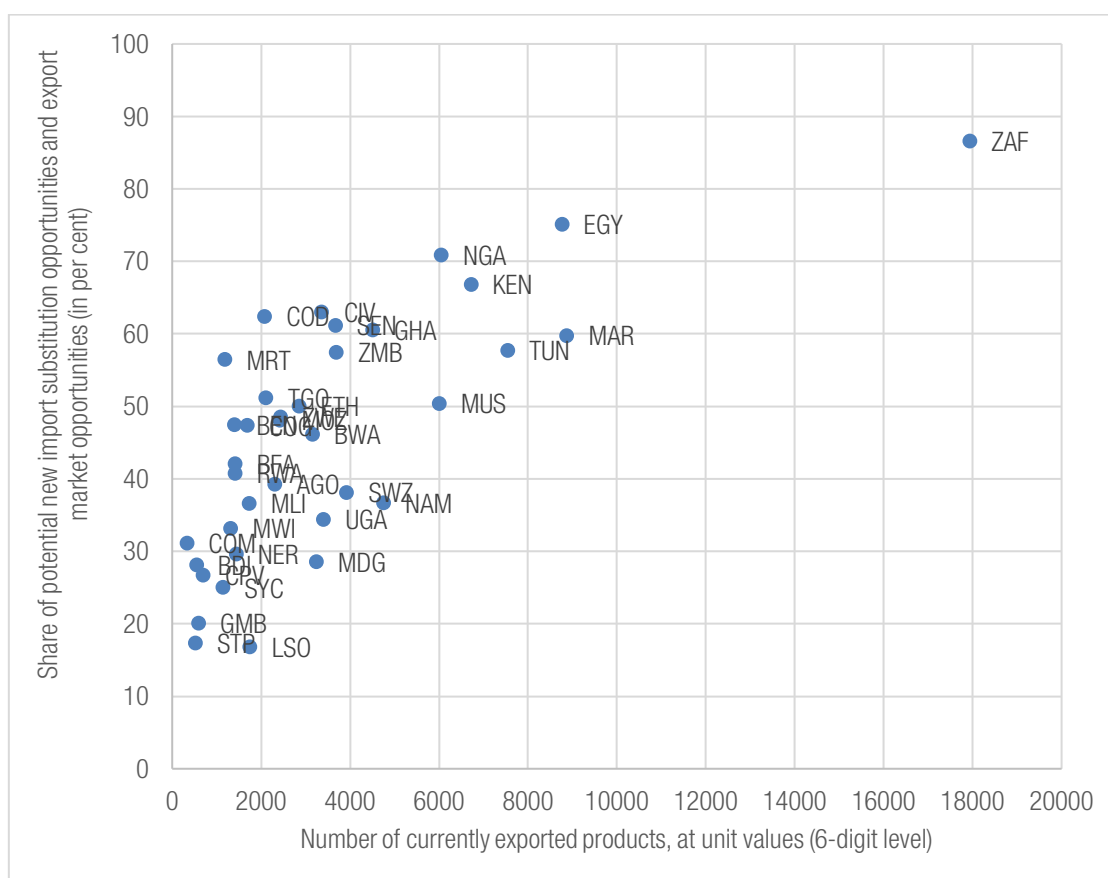
Between 20-30%		Between 30-40%		Between 40-50%		Above 50%	
Eritrea	22%	Sao Tome and Principe	30%	Niger	40%	Tunisia	53%
Equatorial Guinea	23%	Burundi	30%	Congo	41%	Benin	53%
Guinea-Bissau	23%	Chad	30%	Rwanda	42%	Algeria	54%
South Sudan	24%	Central African Republic	31%	Zimbabwe	42%	Ethiopia	54%
Somalia	25%	Gambia	32%	Botswana	42%	Côte d'Ivoire	56%
Comoros	28%	Libya	32%	Mali	43%	Mauritius	58%
Lesotho	28%	Cabo Verde	34%	Burkina Faso	43%	Kenya	59%
		Malawi	35%	Guinea	43%	Namibia	60%
		Djibouti	35%	Uganda	44%	Ghana	62%
		Sudan	37%	Angola	44%	United Rep. of Tanzania	64%
		Madagascar	38%	Gabon	45%	Senegal	64%
		Seychelles	39%	Mauritania	45%	Cameroon	65%
		Zambia	40%	Liberia	45%	Egypt	67%
				Sierra Leone	46%	Morocco	67%
				Mozambique	47%	Nigeria	68%
				Dem. Rep. of the Congo	48%	South Africa	74%
				Eswatini	49%		
				Togo	49%		

Source: Based on UN COMTRADE data; methodology based on Freire, 2017.

iv) Import substitution opportunities

In the fourth step, policy makers must consider the potential of replacing imports when promoting exports. While more than 50 per cent of the identified feasible products in the product space would be able to replace current imports, not all potential new product opportunities actually face favourable market conditions in terms of demand (Figure 4). Hence, there is an additional trade-off, and some priorities must be defined when targeting strategic sectors.

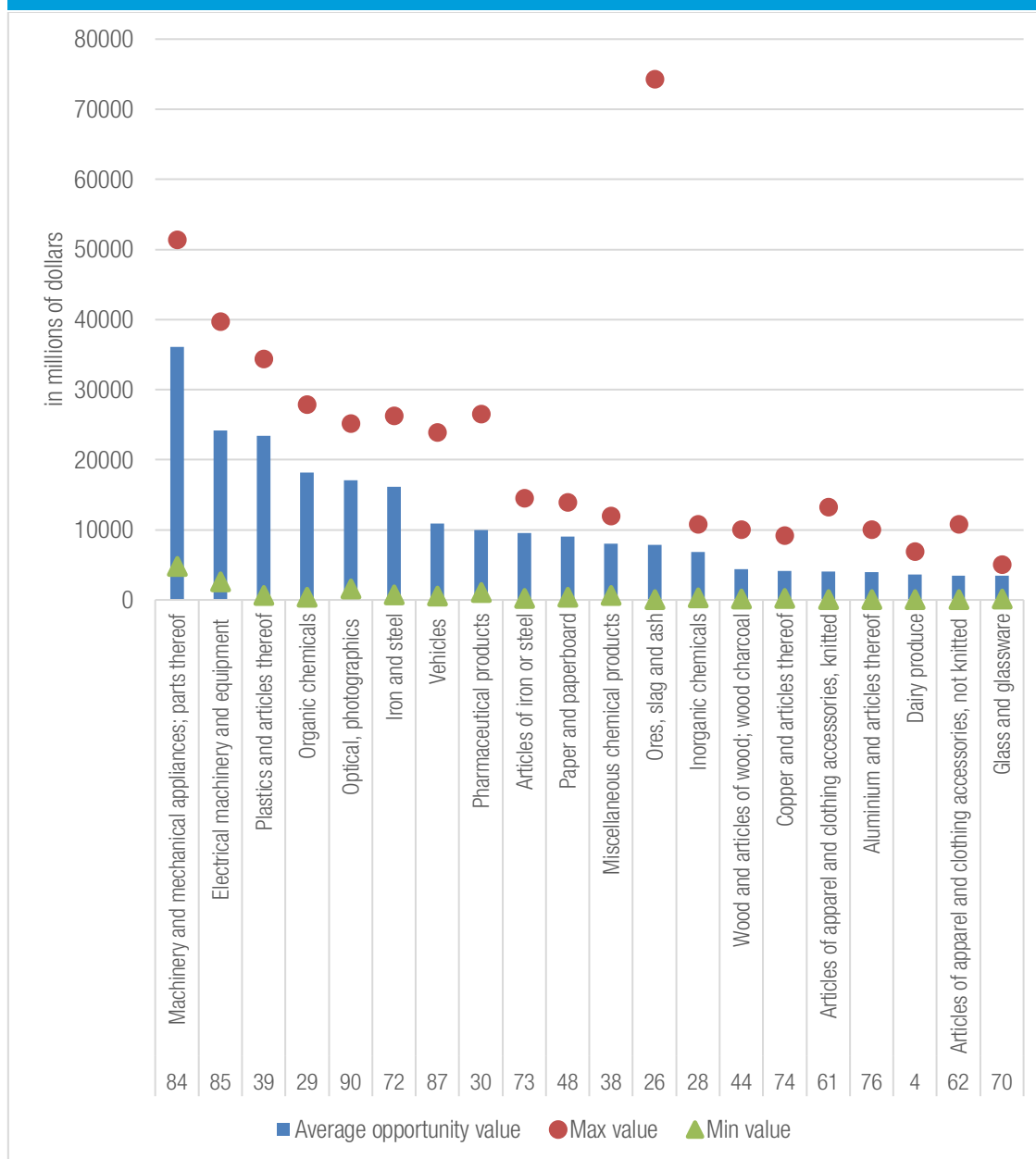
Figure 4: Share of potential import substitution opportunities that face favourable export market conditions



Source: Based on UN COMTRADE data; methodology based on Freire, 2017.

The potential sectors of product diversification vary widely across countries. Nevertheless, some common sectors have vast new export opportunities across African countries. Owing to their potential for upgrading, large unit values and favourable market conditions, the sectors with the best prospects for new export opportunities in value are machinery and mechanical appliances (HS 84), electrical machinery and equipment (HS 85), plastics and articles thereof (HS 39) and organic chemicals (HS 29) (see Figure 5 below). An assessment of feasible product diversification opportunities reveals that all countries have some potential for export diversification into all these sectors through relatively small jumps. The values reported in Figure 5 refer to the global increase in imports of the products, explaining the large opportunity values of export diversification. Hence, other countries producing those goods compete for the same expanding market. Nevertheless, the demand for these goods provides new export opportunities for African countries and firms. The largest demand is generated by Asia, followed by Europe and North America. Since the product diversification opportunities considered here are based on 2018–2019 export demand, Africa plays a minor role (2.3 per cent of all diversification opportunities). However, concerning future diversification, economic and population growth, the opportunities for the African market are expected to increase, underpinned by the benefits of intraregional trade and the potential role of the AfCFTA. Regional market opportunities as a steppingstone for export diversification and structural change are discussed in the next section.

Figure 5: Product diversification export opportunities to the world, by top 20 sectors, country average, maximum and minimum values in millions of dollars



Source: UNCTAD, 2022.

3. Leveraging regional export diversification opportunities

The dominance of lead firms in global value chains and the difficulty of many African countries to upgrade within global value chains have strengthened the emphasis on South-South integration to generate economies of scale, create employment and foster diversification. Regional trade and regional value chains seem to be more accessible for more small exporting firms than extra-regional trade. Although intra-regional exports only contributed around 18 per cent to total exports in 2019, the number of exporters exporting to Africa is larger than those exporting to outside the continent, with an equal distribution of export earnings across exporters (UNCTAD, 2021a). There are already some encouraging examples of regional value chains, such as the clothing value chain in Southern Africa and the expansion of the textile industry of Mauritius to operations in Madagascar (UNCTAD, 2021b).

Responding to regional demand, which is currently satisfied through imports from outside the continent, would make trade structures more complementary, potentially reduce environmental side effects of trading over large distances, and increase continental resilience to external shocks, such as the Covid-19 pandemic or the recent war in Ukraine.

For the East African Community, Si Tou (2021) confirmed the potential of leveraging the regional market to promote product diversification conducive to structural change. A large share of products covers types of fibres, indicating potential for developing a regional textile industry and agro-processing products, and chemical products (especially soaps and essential oils with higher complexity).

Competition between neighbouring countries on regional export opportunities is often cited as a major concern and can lead to diminishing efforts to strengthen regional integration. Therefore, in this section, we only consider feasible diversification opportunities to help achieve greater integration while avoiding intraregional competition. This is done by focusing on products (at the 6-digit level) for which the share of intra-African imports is below the current 12 per cent average import share.

Regional product diversification opportunities

On average, across the African countries, the analysis suggests 1,896 potentially new products at the 6-digit level (and 758 product-clusters at the 4-digit level) that are currently largely imported from outside the continent, but could be supplied from within the continent, based on current production capabilities. In particular, the assessment of intra-regional trade opportunities identifies between 540 new potential products (at the HS 6-digit level) for South Africa and 2,321 products for Côte d'Ivoire. While this number shows plenty of opportunities for diversification, targeting all of these products is not feasible. Therefore, only the top 40 products are considered in the next step for a continental mapping of product diversification opportunities.

Top 40 product clusters with high demand

When considering only the top 40 products at the 6-digit level identified for each African country, a total of 203 products are found, indicating a considerable overlap in product opportunities. As diversification policies are usually targeted at the industry level rather than the product level, a higher aggregation level at the 4-digit level is used in the following: of the 149 product-clusters for which intra-African trade diversification potential is provided, 8 product-clusters provide opportunities for more than 40 African countries including – structures and parts of structures of iron and steel (HS 7308), machines and mechanical appliances having individual functions (HS 8479), tubes and pipes of iron and steel (HS 7306), polycarboxylic acids (HS 2917), flat-rolled products of iron and steel (HS 7210), polyacetals (HS 3907) and polymers (HS 3904). Moreover, 42 product-clusters are feasible for production by only one country, and in most cases, this is South Africa (22 product clusters), followed by Kenya (6 product clusters) and Guinea-Bissau (6 product clusters). However, while South Africa has niche product diversification opportunities mainly in the high value-added sectors, such as Machinery and mechanical appliances, Guinea-Bissau has most of the diversification potential in low value-added agrarian sectors (e.g. crustaceans, maize, seeds). Although our analysis only considers the products for

which the share of intra-regional imports is below the current 12 per cent average import share, some of these products are already supplied by more diversified African countries and country-level studies are necessary to identify import markets and niche areas.

Sectors with highest diversification opportunities

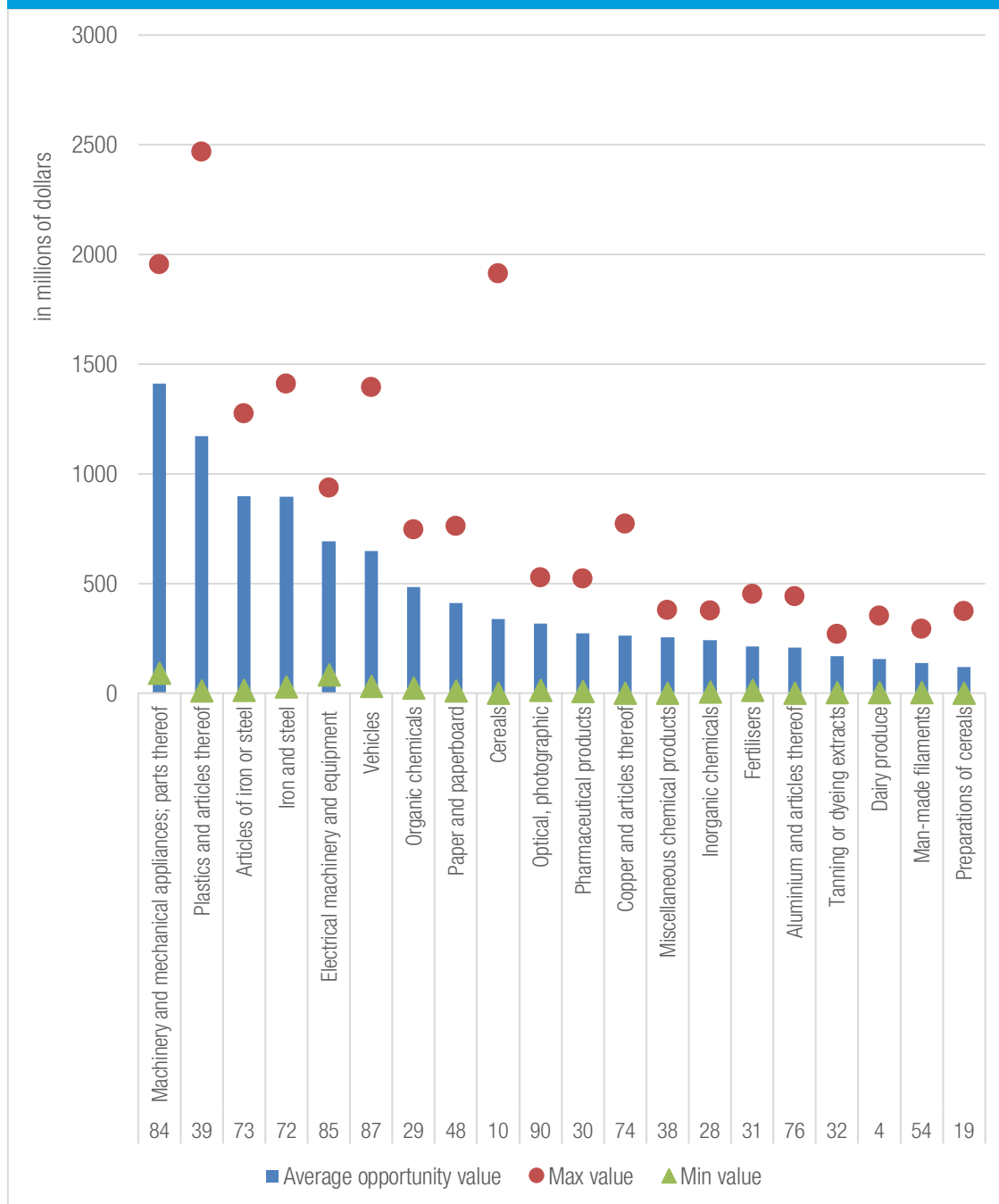
The sectors with vast export diversification opportunities and those in highest demand are illustrated in Figure 6 below. While machinery and mechanical appliances are still the leading sector, plastics and articles thereof are the second highest in demand, followed by articles of iron and steel. Many iron and steel products are essential for construction projects, such as railways. Importantly, all countries seem to have some potential for product diversification into light manufacturing (machinery and mechanical appliances; electrical machinery) and processed base metal products (articles of iron and steel). However, it should be noted that a careful assessment at the country-level is necessary, as re-exports cannot be isolated. As identified by UNCTAD (2021a), electrical machinery, iron and steel, and plastics are the main inputs to the vehicles and other manufacturing sectors, pointing to the potential of possible diversification paths for building regional value chains. For instance, the region has large reserves of iron ore, manganese ore, chromite, cobalt and nickel ores, and substantial reserves of coal, natural gas and oil.⁸ Today, the main producers and exporters of iron ore are South Africa, Mauritania and Algeria, but there are number of countries with significant deposits that have not yet been commercialized.

Concerning agro-processing regional value chains, UNCTAD (2021a) identified the preparation of cereals, and sugar and sugar confectionery as sectors with high export opportunities, owing to the rising demand for processed food. Similarly, the AfCFTA Secretariat and UNDP (2021) and UNCTAD (2021b) found that there is a scope for regional value chain development in soya and sugar confectionery based on sugar and cocoa endowments.

The product space method has its limitations in identifying diversification opportunities in the agro-processing industry, as agriculture production largely depends on the availability of natural resources. Only with regards to value addition with existing export products can the method identify quality upgrading opportunities.

⁸ <https://www.mesteel.com/lecture/steelinafrica.htm#Introduction>.

Figure 6: Product diversification export opportunities to Africa, by top 20 sectors, country average, maximum and minimum values in millions of dollars



Source: UNCTAD, 2022.

Sector case study

The following section examines the Machinery (HS 84) sector, which stands out due to its high potential to drive structural change (high complexity), its close density within the product space map and strong spillover effects, and the continent's high dependency on imports from outside the continent. In addition, product differentiation opportunities are more diverse in that sector, where branding and "love for variety" are more pronounced. While this is especially true compared to commodities, premium qualities and sustainability standards could also play a role in potential diversification pathways. Machinery is also an important input to many processing industries and a driver of upgrading. To date, mechanization, for instance, of farming systems, remains limited (Kirui and von Braun, 2018). Limited access to machinery is the biggest constraint,

along with lack of services and institutions to operative and repair machinery, and governance challenges (e.g., elite capture, corruption that limits machinery importation).

Developing industrial capacity is resource intensive; not all African countries can or should specialize in producing the same product groups despite overlapping export opportunities. Given similar production structure of many African countries, the feasible opportunities for intra-African export diversification are also similar. Therefore, a strategic approach becomes necessary to promote manufacturing of machinery and mechanical appliances as inputs in an efficient manner.

Tables 4 and 5 in the annex map the product groups at the 4-digit level currently reported as imports from each African country (Table 4) and the diversification potential with demand on continent (Table 5). The identified product groups with product diversification opportunities and with the strongest continental demand are Combustion piston engine (HS 8407: \$112 millions), Machinery for working rubber and plastics (HS 8477: \$105 millions) and Other office machines (HS 8472: \$91 million). Some of the results, especially at the country-level must be carefully interpreted and further assessed at the country-level. For instance, we find Machines (not elsewhere classified) to be close to current, officially reported, export products for 48 African countries. Given most African countries' small manufacturing sector which is often largely concentrated on food- and resource-processing industries, this finding comes as a surprise but is likely to the prevalence of re-exports and low quality of export data which is difficult to adequately address technically. For a country-specific analysis based on our results we suggest focusing on some targeted products and identify diversification opportunities from there.

To strengthen regional supply chains, there must be a strategic approach between African countries to increase the complementarities and efficient division of labour across product groups. The mapping of product diversification opportunities across all African countries in the Sector Machinery and mechanical appliances suggests that not all products can be produced by every country, based on their current productive capacities. In addition, value-chain-based industrial policy requires a better understanding of the intersectoral linkages within an economy and across borders. However, data limitations for African countries do not allow a cross-country approach, as provided in the underlying paper. Bam and de Bruyne (2022) combines the product space method with input-output tables for the iron and steel sector within countries of the South African Customs Union (SACU). Such an approach allows an overview of those product categories within particular value chains that are worthwhile targeting from a complexity point of view and on which parts of a value chain industrial policy should focus.

4. Realizing diversification opportunities: The role of the AfCFTA

The drivers of export diversification are diverse, ranging from institutional quality and governance, including regulatory transparency, low trade costs (distance, tariffs, non-tariff barriers), foreign direct investment, labour flows (Bahar et al., 2014). Moreover, Bahar et al. (2014) find that the probability that a new product is added to a country's export basket is 65 percent larger if a neighbouring country already exports that product, which can be explained by easier knowledge diffusion at short distances, but also similar demand preferences or similar initial productive structure of neighbouring countries. Similarly, Boschma and Capone (2016) provide empirical evidence for the European Union that countries have a higher probability to develop a new product if a neighbour already has a comparative advantage in it. These findings highlight the importance of regional integration to diversification. For this reason, this section focuses on the role of the AfCFTA in realizing diversification opportunities, especially with regards to the regional market. It also discusses elements of national policies that promote diversification. Although product diversification with export demand on the continent are only a fraction of global demand, the regional market (see Section 3) provides a learning platform and a steppingstone towards a more diversified export basket that faces strong world demand (Section 2).

Need for regionally coordinated industrial policy

Section 2 showed that for most African countries, less than half of the potential new products within the product space also have an above-average complexity. The section argued that targeted policies are needed to select a smaller number of target products from the pool of tangible products. Industrial policies to promote targeted sectors include a variety of measures and have been implemented across African countries (UNCTAD, 2022). Industrial policies must target the achievement of economies of scale and the development of domestic productive capabilities. The achievement of economies of scale often requires the extension towards regional markets, which makes regionally integrated and coordinated industrial policies a crucial element. Implicit elements of an industrialization strategy with a regional character are rules of origin and common external tariff rates. While this section does not provide a review of instruments and success of industrial policies at the national level, it emphasizes the need for a regionally coordinated policy.⁹ Without building productive capacity in the potential export sectors across African countries, trade liberalization under the AfCFTA will only benefit the most diversified economies. However, going beyond trade, the AfCFTA can be a catalyst to promote coordinated industrial policy across the region.

Governments support national producers in finding a place in the international market (Asche, 2021), yet there are several positive reasons for a coordinated approach. Trade policies and industrial policies are closely interlinked. If countries in a regional integration system promote the same products, neighbouring countries will end up with an exclusion list against each other in the same product, undermining national industrial policies (Odiije, 2019). In the case of West Africa, Nigeria had selected cement as a sensitive product because of industrial policies focusing on cement. However, this prompted regional neighbours Benin, Burkina Faso, Côte d'Ivoire, Ghana, Sierra Leone and Togo to apply industrial policies in cement production.

Moreover, formulating, implementing and monitoring industrial policy requires stable institutions and state capacity. The limited capacity of small developing countries provides another argument for a common industrial policy under the AfCFTA. In addition, the low levels of industrial activity in Africa naturally creates monopolies and such imbalances provide a third argument for a regionally coordinated industrial policy. Moreover, regionally coordinated industrial policies could provide special provisions to the least developed countries. Infrastructure funding in favour of the landlocked states could be an effective compensation mechanism to reduce imbalances in regional trade (Asche, 2021). Based on the country groups in Table 1, we compare the different product diversification opportunities for the Sector Machinery and mechanical appliances (HS 84). To inform a regionally coordinated industrial policy strategy, we argue that countries that face the lowest share of diversification opportunities that also benefit structural change should be allowed to “choose” their most promising sub-sectors first. Although some of these products might already be exported regionally at a small share by other African countries, most products are imported from outside the continent. By assumption, the assessment only includes the products where the share of regional imports is below the average intra-African share (i.e., 12 per cent).

Table 2 shows how such a strategic selection of targeted sectors could look. Country group 1, where only 20 per cent to 30 per cent of the diversification opportunities are above average complexity, would select the opportunities with largest benefits in terms of demand and benefits for structural change while being relatively close to exports. Again, based on the technical computation, this product groups would include Refrigerators and equipment (HS 8418) and Combustion piston engine (HS 8407). Second, country groups 2 and 3 (i.e., only 30 per cent to 50 per cent of feasible diversification opportunities are above average complexity) have similar opportunities and can be summarized. This country group would focus on the product groups that lay beyond the reach of country group 1. Those include, for instance, Office machines and Agriculture machinery,

⁹ Differences in the implementation of industrial policies has resulted in mixed results in the past. For instance, Chang and Zach (2018) argues that while infant industry protection worked in Taiwan, Province of China it failed in Pakistan, and export-orientation and FDI-driven policies showed large success in Malaysia but limited success in the Philippines. The difference in the impact of these policies is often due to implementation and misleading objectives.

which are in high demand on the continent. Finally, the countries where more than 50 per cent of the new product opportunities would benefit structural change, have more opportunities in the Machinery sector.

While the table orders product diversification opportunities by current continental demand, other factors such as the distance to new products and natural resource endowments must be considered for each country. Although this complex analysis and mapping of diversification opportunities is necessary for each country to inform the practical implementation of national and regionally coordinated diversification opportunities, such a discussion is beyond the scope of this paper. The paper rather provides an entry point for further research at the country-level.

African Regional Economic Communities (RECs) have drafted ambitious regional industrialization strategies, but their policy status remains unclear and implementation lags behind. Rather, these strategies are statements of intention without a clear policy framework for specific sectors. The most important ones include:

- East African Community—Industrialization Policy 2012–2032 (EAC 2012)
- SADC Industrial Development Policy Framework 2012
- SADC Industrialization Strategy and Roadmap 2015–2063 (SADC 2015)
- SACU Regional Industrial Development Policy
- West African Common Industrial Policy (WACIP) of 2010 (ECOWAS 2010b),
- COMESA Industrialization Strategy (2017–2026) (COMESA 2017)

At the continental level, some milestones in promoting African industrialization have been the Action Plan for Accelerated Industrial Development of Africa (AIDA), 2010, the African Mining Vision (AMV), 2009, the Programme for Infrastructure Development in Africa (PIDA), 2010, the Pharmaceutical Manufacturing Plan for Africa (PMPA), 2012, and the African Union Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024), 2014. Yet, the lack of a coherent system of industrial policies in Africa leads to variation in the form and origins of industrial policies and therefore, potential coordination problems.

Despite the challenging implementation of a regional industrial policy strategy, sector negotiations taking the form of a division of labour to build a regional value chain should still be promoted more actively by regional institutions.

Table 2: Top product groups with feasible (proximity AND demand) export product diversification opportunities with benefits for structural change (sorted by highest intra-African demand), by country group

	Country group 1 : between 20 - 30%	Country group 2 and 3: between 30 - 50%	Country group 4 : above 50%
HS 8418 (Refrigerators, freezers)	146.10	HS 8407	111.55
HS 8407 (Cumbustion piston engine)	111.55	HS 8477	104.27
HS 8477 (Machinery for working rubber or plastics)	104.27	HS 8472 (Office machines)	91.40
HS 8410 (Hydraulic turbines, water wheels)	91.12	HS 8410	91.12
HS 8479 (Machines and mechanical appliances with individual functions)	88.43	HS 8479	88.43
		HS 8429 (Self-propelled bulldozers)	85.52
		HS 8402 (Steam boilers)	57.25
		HS 8421 (Centrigues)	57.07
		HS 8432 (Agricultural machinery)	48.83
		HS 8428 (Lifting machinery)	48.42
		HS 8467 (Tools for working in the hand)	45.43
		HS 8407	111.55
		HS 8477	95.71
		HS 8479	88.43
		HS 8410	79.95
		HS 8402	57.25
		HS 8421	57.07
		HS 8432	48.83
		HS 8428	46.63
		HS 8467	45.43
		HS 8429	42.31
		HS 8485 (Machinery n.e.s.)	41.23
		HS 8423 (Weighing machinery)	31.35
		HS 8405 (Producer gas or water gas generators)	29.68
		HS 8427 (Fork-lift trucks)	29.45
		HS 8457 (Machining centres)	17.87
		HS 8422 (Dishwashing machines)	8.88
		HS 8416 (Furnace burners for liquid fuel)	7.87
		HS 8464 (Machine tools for working stone)	6.70
		HS 8458 (Lathes)	5.31
		HS 8426 (Ships' derricks)	3.88
		HS 8465 (Machine tools)	3.61
		HS 8418	3.37

Source: Authors.

Note: Country groups classification according to Table 1.

Taking the example of the European integration process, industrial policy has not been considered as a priority area for a long time. The EU industrial policy initiative of 2010 mainly complemented national efforts and proposed voluntary coordination to the member states. In March 2020, the EU developed 'A New Industrial Strategy for Europe' which emphasized the need for a common industrial policy among members of the EU. The policy identifies core projects and introduces specific joint policy and financing tools. The European Commission supports interregional partnerships through different tools, including the Smart Specialization Platform for industrial modernization.¹⁰ The EU Structural Funds and Cohesion Policy are designed to address economic imbalances in the region, and they have helped to some extent to reduce disparities between old member states and newly accessed countries. A new investment plan, called InvestEU, has been defined for 2021-2027, focusing on SMEs, research and innovation, sustainable infrastructure and social investment and skills, supported by the European Investment Bank (Pianta et al., 2020).

National interests are often conflicting with regional industrial strategies. What has been suggested as more feasible is, first, the creation of a learning platform where best practices and experiences are shared, and second, a negotiated division of labour that assigns productive rights to develop certain products (UNCTAD, 2022). The example of the Association of Southeast Asian Nations (ASEAN) and its industrial cooperation scheme shows how resource pooling and knowledge sharing can help build regional value chains and achieve diversification, for example, in the electronics and automotive industries. The temporary scheme which ran out in 2011 granted preferential tariff rates for raw, intermediate and finished goods to companies that formed an arrangement while operating in two different ASEAN countries. The arrangement had to involve industrial complementation and industrial cooperation. However, the scheme was not able to promote broad industrialization and SME development (Markowitz and Black, 2019).

Eliminating tariff, non-tariff barriers to trade and liberalization of services

Any viable industrial policy or targeted sector strategies need to take into account market opportunities (Section 2 and 3). Market opportunities are not only determined by demand but also by market access which is more favourable for intra-African than extra-African trade. The AfCFTA will reduce trade barriers, which increases access to output markets, intermediate inputs and services. Reduced trade costs would allow more firms to export their products due to increased productivity (Melitz, 2003). Under the AfCFTA, countries are expected to liberalize 90 per cent of their tariff lines, with 7 per cent phased out over a longer period according to the country's income status, while 3 per cent of tariff lines can be permanently excluded. Tariff liberalization under the AfCFTA can be a factor in realizing diversification potential through granting high market access, especially within countries that are currently not part of the same Regional Economic Community and in sectors that face high tariff rates.

Taking the example of the Machinery sector (HS 84), which was identified with the highest export diversification opportunities and highest demand, the average tariff rate applied by African countries on imports of Machinery (HS 84) from African countries (2018/2019) is moderate at 1.9 per cent (simple average; 1.1 weighted average), although the tariff rates vary by sub-sectors and countries. The highest tariffs are on average applied on HS 8415 (Air conditioning machines: 7.5 per cent), HS 8418 (Refrigerators, freezers: 7.23 per cent), HS 8450 (washing machines: 7.1 per cent), HS 8469 (Typewriters: 6.5 per cent). The countries with the highest applied tariff rate are Cameroon (10.5 per cent), Comoros (9.5 per cent), Gabon (10.6 per cent), Sao Tome and Principe (9.3 per cent) and Ethiopia (8.1 per cent). Regarding imports of Machinery from the world, the average applied tariff is 3.3 per cent (weighted tariff: 3.0 per cent) with highest tariffs applied by the same countries (Comoros: 17.8 per cent on average, Cameroon (11.7 per cent), Gabon (11.8 per cent), Sao Tome and Principe, Ethiopia: 8 per cent) and the same sub-sectors (HS 8415: 12 per cent; HS 8418: 11 per cent; HS 8450: 11.3 per cent; HS 8469: 7.4 per cent; HS 8470 (Calculating machines): 7.7 per cent; HS 8472 (Other office machines): 8.9 per cent). Submitted tariff offers under the AfCFTA suggest that only a few Machinery products might face longer liberalization periods or are excluded from tariff liberalization (e.g., 8479.89.00 according to CEMAC tariff concessions).

¹⁰ https://single-market-economy.ec.europa.eu/industry/strategy_en

A major hurdle, however, concerns rules of origin. As of July 2023, 88 per cent of product lines have agreed rules of origin. Complex Rules of origin are part of a range of non-tariff measures, including Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) measures. The AfCFTA Agreement aims to progressively eliminate non-tariff barriers and enhance cooperation in TBTs and SPS measures (Article 2). Further, as envisaged under Annex 5 on non-tariff barriers, the online mechanism for reporting non-tariff barriers (<https://tradebarriers.africa/home>), various subcommittees on non-tariff barriers and non-tariff measures, and an effective dispute settlement mechanism, hold promise for the reduction of non-tariff barriers.

Additional non-tariff barriers include lack of infrastructure and market information on export opportunities. Industrial firms often still have weak linkages with producers of primary products. This includes the majority of African farmers that face difficulties targeting outlets for their products. The rationalization of suppliers' contractual relationships with buyers, processors and exporters needs to be improved. In fact, some products might be specific to the African market and may not find specific inputs or demand outside the continent.

Services are essential to enhance export diversification. However, the utilization of business and communication services input is low in most African countries, they provide on average only 10 per cent to production, according to UNCTAD (2022). Key constraints to African firms to do business include limited access to finance and poor access to electricity. The recent growth of financial technologies and innovations in alternative financing has already been able to increase access to financing opportunities. Many legal and regulatory obstacles must be addressed to further promote this positive development.

Regarding the likely large share of re-exports in African countries' export statistics, there should be stronger attention to the value and costs that re-exports produce. Re-export hubs can fulfill the role of regional supply chains, but it requires integrated services to facilitate the movement of intermediate goods and coordination within value chains (Jones et al., 2020).

Harmonized investment policies to promote regional diversification

If channeled towards sectors with diversification potential, away from commodity dependence, investments are drivers of export diversification.

The Investment protocol of the AfCFTA will cover investment facilitation, promotion and protection. Although market opportunities and national investment climate will primarily guide investors, the joint protocol under the AfCFTA is still expected to facilitate intracontinental cross-border investment as it will address overlapping and sometimes contradictory regulatory investment frameworks within regional economic communities.

Diversification of exports can hardly be achieved without adequate infrastructure such as electricity, transportation, and logistics. Greater cooperation under the AfCFTA promises to mobilize finance and attract investment into those sectors. However, an efficient attraction of investments to where they are needed requires extensive market information, communication, and promotion of investment opportunities. A continental approach to promoting investments in development can reduce costs and foster spillovers. For instance, the COMESA Regional Investment Agency (<http://comesaria.org>), launched 2006, is in charge of promoting investment into its Member States.

Promote firms' ability to emulate and innovate new products to the country and the world

A limitation for market opportunities of potential export diversification paths is that most African countries are "latecomers" regarding new products. Most products/product variations already exist and are exported by other more developed countries.

Our results indicate that most African countries must adopt a selective approach to promote diversification towards products with higher complexity (see Table 1). Coordinated industrial policies need to take account of the different levels of diversification in order to ensure tailored support to the private sector to emulate or innovate new products. Less diversified countries have many opportunities to emulate developed countries and

more diversified regional neighbours. Technology transfer is a crucial source of diversification in early development (Cieslik and Parteka, 2021). A less stringent Intellectual Property Rights (IPR) regime at the global level would simultaneously increase the opportunities for emulation for all countries. The flexibilities under the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) such as voluntary licenses can help to contribute to development goals. For instance, in combination with the 2001 Industrial Property Act, Kenya built a domestic pharmaceutical manufacturing industry in Africa (Economic Commission for Africa and TradeMark East Africa, 2020). The AfCFTA could be used to strengthen the ability of Africa as a bloc to ensure that the flexibilities under the WTO are used to enable local production and access to essential products, such as medicines (UNCTAD, 2022). In addition, the AfCFTA Protocol on IPRs promises to overcome divergent and overlapping regional IPR regulation, and the two African intellectual property organization, namely the African Intellectual Property Organization and the African Regional Industrial Property Organization, can be leveraged to implement a strong continental regime (Trade Law Centre, 2021).

To improve firms' ability to emulate new products, human capital and skill development is essential. In addition, although regional market discovery is mainly the task of entrepreneurs, it often requires support from national governments and technical assistance, especially for countries with a small private sector (Asche, 2021).

For more diversified economies, innovation should be the priority to improve the quality and sustainability of existing export products. Innovation across industrial sectors is a main catalyst for sustainable economic growth (OECD 2012 Report on Innovation for development). In the words of Schumpeter (1942), innovation is a process of "creative destruction" and it enables the introduction of new products and processes. Innovative activity, however, also depends on the available knowledge stock (Ulku, 2007) which poses structural barriers for African countries to innovate. Trade can also promote innovation through products as a means of technology transfer, licensing agreements, and greater incentive due to high competition from new entrants (Onodera, 2008).

Moreover, despite the substantial portion of the informal sector in national output and employment in most African countries, the informal sector has received little attention in industrial or innovation policy, or in its potential role to promote structural change (Mustapha, et al., 2021).

To benefit from existing production knowledge in South Africa and Northern African countries where they are most developed, transmission channels for technological spill-overs and R&D knowledge must exist and a political willingness to use them effectively. Spill-overs among developing countries are barely automatic, and when, according to Asche (2021: p. 75) "the regional gatekeeper carefully preserves its regional monopoly, the proclaimed gateway remains a one-way-road for import goods into the wider region." Arguably, even a small landlocked country may carve out industrial niches, but it needs the region to assure the project's success.

Since regional knowledge and capabilities are weak in Africa, it is important to identify regions that face similar technological opportunities to exploit economies of scale and learn from each other. However, weak institutions might prevent a country from benefiting from spillovers and diversity.

Observe market dynamics that influence competitiveness of domestic firms

Any industrial policies should be complemented by policies and investments that improve the competitiveness of a country in order to successfully realize export diversification opportunities, as identified in Section 2. It must be noted that African countries are the least competitive countries according to the Global Competitiveness Index 4.0, which assesses the microeconomic and macroeconomic foundations of national competitiveness, defined as the set of institutions, policies, and factors that determine the level of productivity of a country. Of African countries, Mauritius, followed by South Africa and Morocco are the most competitive. In contrast, the least competitive countries were Chad, the Democratic Republic of the Congo and Mozambique. Many small African countries strongly depend on their neighbours to transit goods, emphasizing the benefits

of strong cooperation and trade coordination under the AfCFTA. In most of these least-competitive countries, political instability and violent conflicts prevent private investment and disrupt trade. Despite the resource-abundance of many African countries, growth booms thanks to their natural resources have often been too short-lived to translate increased revenues into investments into productive sectors (UNCTAD, 2022).

Wage competitiveness is a key determinant of entering foreign markets and realizing diversification. For the export diversification example of Uganda, Lin and Xu (2016) argue that especially for the case of garment, footwear and light manufacturing, the labour-intensive sectors in China, Viet Nam and India are losing comparative advantage as wages are rising. According to the authors, this provides Uganda and other African countries the opportunity to develop a competitive advantage and attract investments given their labour abundance. However, Gelb et al. (2020) argue that industrial labour is more costly for firms that are located in sub-Saharan Africa, relative to countries with comparable income levels, based on firm-level panel data from World Bank's Enterprise Surveys. Some exceptions for low-cost manufacturing candidates are Ethiopia.

Another element to increase competitiveness is to keep the country's currency competitive (Rodrik, 2008) or at least reduce exchange rate appreciations. Exporters of primary commodities often face the tendency of exchange rate appreciations which hinders the competitiveness of processed goods. Empirical evidence suggests that the exporter's currency depreciation is associated with export diversification (e.g. Goya, 2020). Policy makers should, however, not necessarily focus on the overall exchange rate performance, but special attention must be given to bilateral exchange rates with the main trading partners. For the example of Botswana, Barczikay et al. (2020) argue that there has been a real exchange rate appreciation in some bilateral trade relations that contributed to the failure to diversify.

Another factor that needs to be observed is the dynamic market structure in a sector and the potentially anticompetitive behaviour of existing firms which could undermine diversification efforts. Technological advancement at the firm level provides a degree of monopoly power as it decreases the number of competitor firms and countries capable of producing more complex goods (UNIDO, 2020). Adequate competition policy framework including antitrust laws need to be ensured to foster private investment and enterprise development. National capacity to reinforce anti-monopoly policies is low, leading to a low rate of report investigation, except for Kenya and South Africa (Cherif et al., 2020). Regional cooperation is necessary as large firms in small African countries usually operate in multiple jurisdictions. Supranational competition authorities for regional blocs that, for instance, started operation in COMESA and in WAEMU, serving as a steppingstone towards a continent-wide competition authority, established within the purview of the AfCFTA Secretariat (UNCTAD, 2021a).

Export diversification remains one of the main challenges for African countries. As export growth and diversification that benefit structural change cannot be expected to be only driven by market incentives, this paper addresses the need to identify potential sectors with high world and regional demand. Given the constraints of financial and human resources, governments often face challenges to promote strategic sectors. Moreover, strategic industrial policy making and promoting diversification is a complex process.

Applying the product space method, the paper shows that while considerable diversification opportunities exist, such product diversification based on relatively small jumps into new similar products would lead towards structural change in only 16 out of 54 assessed African countries. This finding highlights that on one side, small jumps in the export basket are often not sufficient to drive structural change, and on the other side, there must be a strategically coordinated production to allow the least-diversified and disadvantaged countries to leverage the AfCFTA to exploit their export diversification opportunities and promote structural change.

While acknowledging that the discussed sector case study on Machinery (Section 3) provides a highly ambitious perspective, also due to presence of re-exports that overestimate countries' real current export capacity, it showcases the potential of leveraging regional value chains to provide parts and components within the continent.

Despite its limitation due to the quality of officially reported export data for African countries, the paper is a crucial first step to inform necessary diversification initiatives and to guide a continentally coordinated industrial strategy. The results presented in this paper must be complemented by country and region-specific case studies to implement diversification policies.

Future research at the continental level should also include sustainability considerations in the product space assessment such as social and environmental criteria. Similar approaches already exist. For instance, Mealy and Teytelboym (2020) assess countries' green future diversification opportunities; Hartmann et al. (2017) introduce the Product Gini Index in the product space assessment as a proxy for inequalities; Bam and de Bruyne (2022) combine the input-output-product-space assessment with a list of green products and the Product Gini Index. The importance of green production opportunities has recently been addressed by UNCTAD's Technology and Innovation Report 2023. While including all these indicators is beyond the scope of this paper, it provides a base for new avenues of research.

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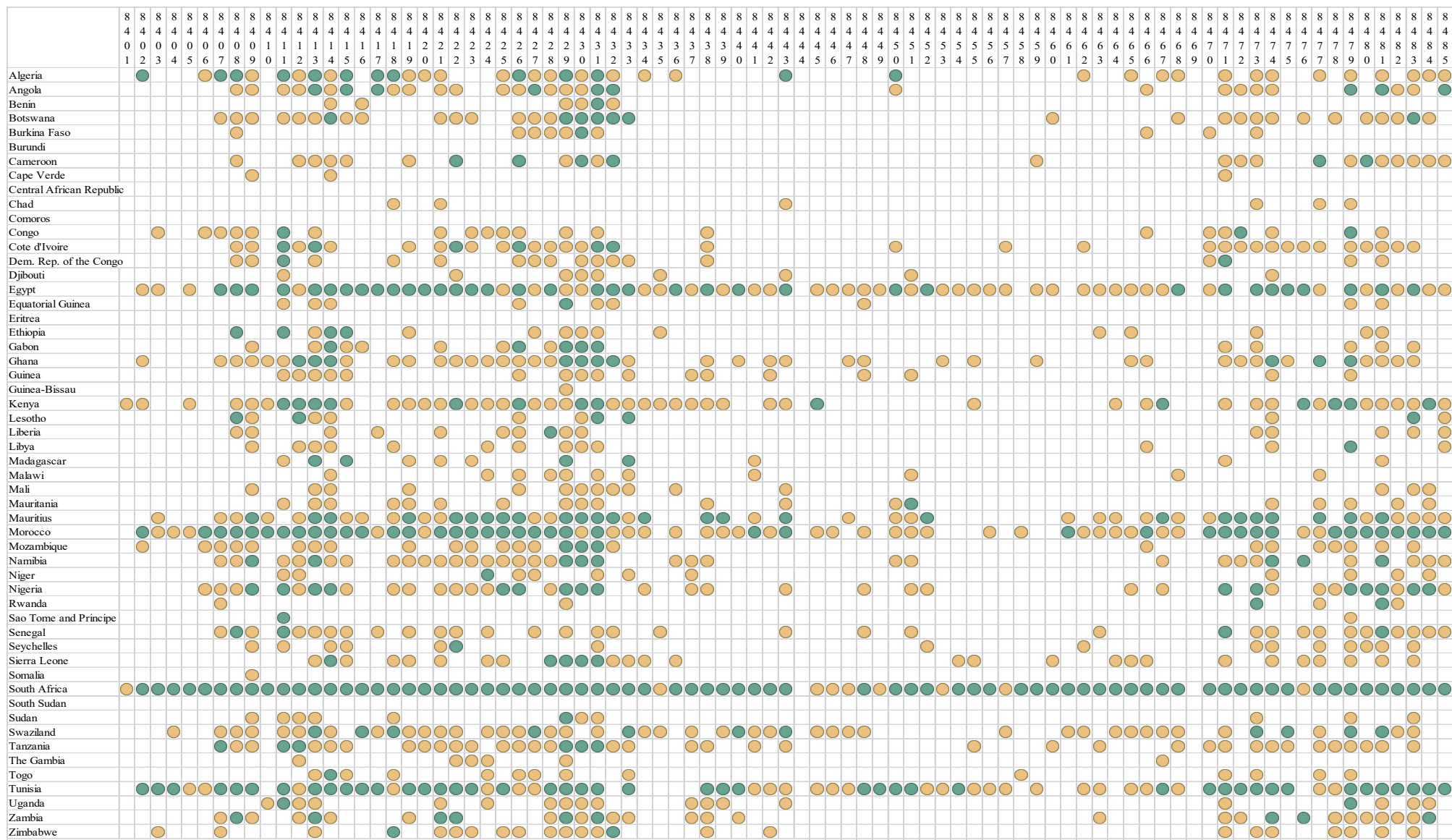
Appendix

Table 3: African countries' product diversification export opportunities to Africa, value and top 3 sectors (at HS 2-digit level), based on 2018-2019 exports

Country	Number of existing products (including unit value)	Share of new products that are above average complexity	Intra-African diversification opportunities					
			Market value (in million \$)	Number of "new" products (including unit value)	Number of new 6-digit HS products	Top 1	Top 2	Top 3
Eritrea	263	22%	8809	1548	1283	39	73	84
Equatorial Guinea	418	23%	9032	1618	1324	39	73	84
Guinea-Bissau	210	23%	12053	1284	1006	39	10	73
South Sudan	307	24%	11335	1835	1455	39	73	84
Somalia	515	25%	10657	1911	1507	39	84	73
Comoros	322	28%	10545	1866	1432	39	73	84
Lesotho	1736	28%	10693	2404	1857	84	73	72
Sao Tome and Principe	511	30%	12149	2454	1827	84	39	73
Burundi	543	30%	11592	1982	1502	39	73	84
Chad	458	30%	11023	1955	1495	39	84	73
Central African Rep.	439	31%	11985	2486	1865	39	84	85
Gambia	581	32%	11161	2293	1734	39	84	73
Libya	660	32%	11970	2269	1724	39	84	73
Cabo Verde	684	34%	13339	2537	1865	39	84	73
Malawi	1311	35%	12623	2834	2038	84	73	39
Djibouti	576	35%	13783	2717	1982	39	84	73
Sudan	1096	37%	14884	2885	2076	84	39	73
Madagascar	3234	38%	11086	2685	2007	84	87	72
Seychelles	1130	39%	12542	2926	2111	84	39	73
Zambia	3679	40%	10494	2966	2168	84	72	87
Niger	1435	40%	13298	3130	2198	84	73	72
Congo	1681	41%	13459	2926	2143	84	39	73
Rwanda	1409	42%	12375	2589	1898	84	39	73
Zimbabwe	2431	42%	12887	2924	2109	84	72	73
Botswana	3150	42%	11814	3049	2206	84	72	73
Mali	1724	43%	13217	2930	2122	84	72	39
Burkina Faso	1414	43%	14187	3006	2141	84	39	72
Guinea	1312	43%	14786	3168	2235	39	84	73
Uganda	3400	44%	12486	3124	2247	84	87	72
Angola	2296	44%	14342	3059	2174	84	72	39
Gabon	1450	45%	14972	3004	2135	84	39	72
Mauritania	1174	45%	13744	2618	1921	39	84	73
Liberia	989	45%	13683	2953	2096	84	39	73
Sierra Leone	2216	46%	14515	3254	2270	84	72	39

Mozambique	2409	47%	12153	2987	2169	84	72	39
Dem. Rep. of the Congo	2070	48%	13442	2886	2073	84	39	73
Eswatini	3912	49%	11753	3069	2209	84	72	87
Togo	2102	49%	13327	2980	2182	84	39	72
Tunisia	7534	53%	8268	2364	1792	87	84	72
Benin	1401	53%	15235	3045	2174	84	39	73
Algeria	2535	54%	13904	3181	2256	84	72	39
Ethiopia	2851	54%	14798	3084	2169	84	87	72
Côte d'Ivoire	3357	56%	13567	3283	2321	84	87	72
Mauritius	6000	58%	9874	2733	2042	72	84	87
Kenya	6713	59%	7073	2689	2049	84	72	87
Namibia	4749	60%	10597	2928	2185	84	72	85
Ghana	4498	62%	11855	2978	2154	84	87	72
Tanzania	4616	64%	11169	2990	2184	84	72	87
Senegal	3668	64%	13164	3125	2250	84	72	87
Cameroon	3031	65%	16185	3292	2295	84	72	39
Egypt	8762	67%	6179	2272	1757	84	87	29
Morocco	8868	67%	7025	2223	1716	72	84	29
Nigeria	6050	68%	10569	2965	2140	84	87	72
South Africa	17925	74%	555	577	540	84	85	55

Table 4: Existing export capacity in Machinery (HS 84), by African country, 2018-2019 average



Source: Authors

