Policy paper

International Growth Centre

Identifying realistic export opportunities for Rwanda based on the TRADE-DSM approach

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Executive summary

Stimulating new exports is one of the most efficient ways that policymakers can drive structural transformation, by transferring resources from traditional activities to these new ones with the aim of uplifting and advancing the overall economy.

Key aspects for a national export strategy to consider include which new markets to target, what such market demand looks like in the medium-term, and how accessible such markets are given a country's trading and tariff conditions. Similarly, this strategy should also consider which new products to produce with new technologies. Understanding the underlying employment, skill and technology requirement of producing new export markets should also be a key consideration. Policy-makers further need to use the right tool for the right policy question, since policies aimed at diversifying export products differ significantly from diversifying destination markets.

The main objective of this study was to identify new opportunities for exporting Rwandan goods and services using a 'Decision Support Model' (DSM) approach, endorsed by the World Trade Organisation. The DSM was specifically designed to assist with the selection of export markets for a given country to assist in planning and assessing export promotion activities. For the purpose of informing this study a purpose-built DSM for Rwanda was developed. The purpose of this paper is not to be exhaustive nor authoritative, but rather to illustrate how the outcomes from the DSM approach can be applied for economic planning in Rwanda.

Outcomes from the analysis based on the DSM model for Rwanda indicates that more than 80 percent of the identified potential in terms of *value* of market-product line combinations are contained (in descending order of potential value) in Western Europe, Eastern Asia, Northern America, Southern Europe, South-Eastern Asia and Northern Europe – not within the direct geographic vicinity of Rwanda. As a relative share of export opportunities, Rwanda's regional markets in Central, Eastern and Southern Africa offer a relatively small size of export value (1.4%) and a low number of Rwanda's overall export product opportunities (7.7%).

A "portfolio" of focus products and markets was created, which offer a range of options that are widely in line with Rwanda's National Export Strategy, including processed agricultural products, foods, beverages and agrochemicals, specialised textiles and garments, and construction materials, metal and wood products. The added-value of the DSM approach here is that for each target product, it provides a detailed overview of *which markets* currently demand such goods, and *what Rwanda's additional export potential is* (taking into consideration factors such as trade cost and import tariffs). This offers an important evidence-based complement to Rwanda's existing National Export Strategy.

The analysis also offers new, unexplored areas of export diversification including aeronautic maintenance, mining and drilling maintenance, and manufacturing of plastics. These further highlight the innovative nature of this approach. To further inform strategic decisions, more detailed investigation and evaluation of each of the opportunities identified for Rwanda by the DSM

approach is required. However, the current outcomes help point the way in which policy makers could focus.

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Glossary of selected key concepts

***Ad valorem* equivalent tariff**: An *ad valorem* equivalent tariff is used to express tariffs not defined in percentage form (so e.g. a tariff expressed in dollars per ton) through an estimated percentage of the price. This estimated percentage is then referred to as the *ad valorem* equivalent tariff.

African Growth and Opportunity Act (AGOA): The act has the objective of expanding United States of America's trade and investment with sub-Sahara Africa. AGOA provides duty-free market access to the United States for qualifying Sub-Saharan African beneficiary countries by extending duty-free preferences previously available under the US Generalised System of Preferences. Rwanda was declared AGOA eligible on 2 October 2000 and wearing apparel provisions were also included on 4 March 2003.

Cost, insurance, freight (CIF): Refers to the valuation of imported goods, i.e., including international transport and insurance costs.

Common Market for Eastern and Southern Africa (COMESA): A free trade area with twenty member states: Burundi, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libyan Arab Jamahiriya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia , Zimbabwe.

Digits or digit-level (for tariffs): A reference to the codes used to identify products. Categories of products are subdivided by adding digits. See Harmonized System below.

East African Community (EAC): A regional intergovernmental organisation of 6 Partner States: the Republics of Burundi, Kenya, Rwanda, South Sudan, the United Republic of Tanzania, and the Republic of Uganda, with its headquarters in Arusha, Tanzania.

Free on board (FOB): Refers to the valuation of exported goods, i.e. excluding international transport and insurance costs.

Free Trade Agreement (FTA): Free trade agreements involve cooperation between at least two countries to reduce bilateral trade barriers – import quotas and tariffs – for the purpose to increase trade of goods and services with each other.

General Agreement on Tariffs and Trade (GATT): A legal agreement between many countries, whose overall purpose was to promote international trade by reducing or eliminating trade barriers such as tariffs or quotas. For more information see https://www.wto.org/english/docs_e/legal_e/06-gatt_e.htm.

Generalized System of Preferences (GSPs): A preferential tariff system which provides for a formal system of exemption from the more general rules of the World Trade Organization (WTO).

Harmonized Commodity Description and Coding System (HS): An internationally standardized system of names and numbers to classify traded products that came into effect for the first time in 1988. It has since been developed and maintained by the World Customs Organization (WCO) (formerly the Customs Co-operation Council), an independent intergovernmental organization based in Brussels, Belgium, with over 200 member countries. The lowest level of internationally consistent

codes applied according to the system is at the HS 6-digit product level, however individual countries may extend the coding system as required. Some countries such as the United States of America applies a 10-digit classification for products.

Most-favoured-nation (MFN) tariff: Normal non-discriminatory tariff charged on imports (excludes preferential tariffs under free trade agreements and other schemes or tariffs charged inside quotas)

Preferential trade agreement (PTA): A preferential trade agreement typically applies to a trading bloc that gives preferential access to certain products from the participating countries. This is done by reducing tariffs but not by abolishing them completely.

Revealed comparative advantage (RCA): The RCA index is often used as an indicator of relative export advantage or proxy for export competitiveness of a country for a specific product relative to the world as a comparator. The literature suggests that an RCA of at least 1 indicates that a country is specialised in producing and exporting a particular product. One can therefore consider it a proxy for export production capability and capacity of the exporting country if considered in combination with the RTA (see below).

Realistic export opportunities (REOs): A realistic export opportunity based on the TRADE-DSM methodology is defined as an opportunity (a HS[1] 6-digit product line-country combination) for which demonstrated historical import demand exists in a given importing country (irrespective of the supplying country(ies) for such imports); and which also meet the requirement of not being too concentrated from a supplying trade partner perspective; while also being relatively (to other possible choices) accessibly from the home market into the target market based on aspects such as international transportation, border import costs and import tariffs applied on such products by the target market or country; and for which the home market (exporting country) exhibits a revealed comparative trade advantage (RCA – see above) of greater than 1 as well as an RTA (see below) of greater than zero.

Revealed trade advantage (RTA): While the RCA index (see above) is often used as an indicator of relative export advantage or competitiveness, it only accounts for exports without consideration of imports. The RTA index however accounts for exports and imports simultaneously and is used as an indicator of product-level competitiveness and productive capacity. An RTA>0 reveals positive comparative trade advantage or trade competitiveness. It can be assumed that an RTA>0 implies that the majority of the product exported is locally produced as it corrects for re-exports.

Standard International Trade Classification Revision 4 (SITC4): A classification of goods used to classify the exports and imports of a country to enable comparing different countries and years managed and maintained by the United Nations. The current classification that was promulgated in 2006 is at revision 4.

Tariff line: A product, as defined by a system of code numbers for tariffs.

[1] See glossary item on Harmonized Commodity Description and Coding System (HS).

1. Introduction

1.1 Key aspects to consider in developing a focused national export strategy

Expanding exports has become an urgent government priority in Rwanda in order to reduce a growing trade imbalance, ensure non-farm job creation, and improve economic growth. This is also reflected in Rwanda's strategic plans, with the national export strategy for 2015-18 proposing a 20 percent annual rate of export growth (MINICOM, 2015, p.6). Providing an evidence-based approach to identify and stimulate export opportunities is thus a key concern for Rwanda's policy makers.

Key aspects for a national export strategy to consider include which new markets to target, what such market demand looks like in the medium-term, and how accessible such markets are given a country's trading and tariff conditions. Similarly, this strategy should also consider which new products to produce with new technologies. Understanding the underlying employment, skill and technology requirement of producing new export markets should also be a key consideration. Policy-makers further need to use the right tool for the right policy question, since policies aimed at diversifying export products differ significantly from diversifying destination markets. Most importantly, evidence-based approaches should be at the heart of any national export strategy to inform such concerns.

1.2 Two Approaches to Defining Export Strategies

The Product-Space Approach

A first foundation for export strategies can be found in Hausmann *et al*. (2015). This conducted an analysis based on the product space approach to inform on possible export diversification paths for Rwanda. This firstly found that Rwanda's high transportation costs and limited productive knowledge have held back greater export development and have resulted in excessive rural density. Three basic commodities – coffee, tea, and tin – traditionally made up more than 80 percent of the country's exports and still drive the bulk of export growth today. The purpose of their analysis was to identify new, scalable activities in urban areas that Rwanda could pursue in its strategy drive to enhance economic development. To do so, they used a 'product space approach' to inform possible export diversification paths for Rwanda. They identified more than 100 tradable products that lie at Rwanda's knowledge frontier while at the same time not being intensive in Rwanda's scarce resources, and economise on transportation costs. Three main areas were highlighted with greatest potential to develop Rwanda's global exports, namely:

1) Processed agricultural products, foods, beverages and agrochemicals
2) Specialised textiles and garments, and
3) Construction materials, metal and wood products.

From a regional perspective the analysis identified the following broad product groups to focus on for supply to regional (Burundi, the Democratic Republic of the Congo, Kenya, Tanzania and Uganda) import demand, namely:

1) Machinery and Electronics,
2) Construction Materials, Metal and Wood products, and
3) Chemical products.

A Complimentary Approach: The 'Decision Support Model'

The Hausmann *et al.* (2015) analytical approach and study outcomes provide a robust platform to inform economic development and more specifically export diversification for Rwanda. However, since the approach is predominantly informed from the *supply-side* as the starting point, the need was identified to compliment this work with more focus from a *demand-side perspective*. The main objective of this study (see Cameron and Viviers 2017) is thus to identify new opportunities for exporting Rwandan goods and services using the 'Decision Support Model' (DSM) approach, also endorsed by the WTO. This approach aims to map out relatively easier-to-access markets with lower barriers to entry that exhibit demonstrated import demand and are not too concentrated from an import supply perspective. This provides a scientific approach to also take into consideration more specific aspects of the target market and product(s) in question. The DSM was specifically designed to assist with the selection of the most promising markets for a given exporting country in order to assist export promotion organisations in planning and assessing their export promotion activities.

2. The Decision Support Model (Methodology)

2.1 DSM Filters

The DSM is an analytical tool, incorporating a screening process that facilitates systematic export market selection through identification of 'Realistic Export Opportunities' (REOs) for firms wanting to expand their sales reach into foreign markets. It also offers alternatives to exporters where they are facing saturation and/or declining growth in their traditional markets. The DSM considers all possible worldwide product-country combinations and, using four filters, progressively eliminates less promising markets until those with the greatest prospects of success are revealed:

- **Filter 1** of the DSM assesses countries from the point of view of their political and commercial risk, and macroeconomic size and growth performance.
- **Filter 2** assesses the market potential of the various product groups for the remaining countries, as determined by the size and growth of import demand.
- **Filter 3** examines the accessibility of the remaining countries in terms of their different barriers to entry (including shipping time and cost, logistical efficiency, and tariffs and non-tariff barriers) and degree of market concentration.
- **Filter 4** categorises the potential export markets according to the "home" market's (in this case Rwanda) current export performance in these markets, compared to the performance of the top six competitors in each market. This measure provides a relative indication of the potential "additional" size of different export opportunities relative to one another from the perspective of the "home" market relative to its existing exports to the target market.

This approach provides a realistic indication of the potential market value that the "home" market could "target" to obtain, in addition to its existing exports to the target market. Obviously, this still requires that the "home" market needs to 'win away' market share[2] from the group of other countries already supplying this product into the target market in question.

[2] Note that this refers to market share at a country level and not on a company level and that this measure does not consider existing supply or production capacity in the "home" market – hence referred to as "unconstrained".

2.2 Understanding implications for skill and technology requirements

To inform export strategies, policy makers also have to be aware of "*what*" specifically the economy produces and "*how*" it produces those goods (UNDESA, 2010, Hausmann et al, 2007). The manner in which exports benefit human capital accumulation also has profound implications (Blanchard and Olney, 2017). Higher levels of skill- and technology-intensive manufactures helps increase GDP per capita in developing countries, while growth in less skill-intensive exports depresses average educational attainment (Basu and Das, 2011; Blanchard et al, 2017).

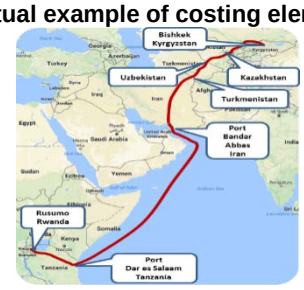
To assist in understanding this dimension of opportunities identified with the DSM methodology, the same approach of mapping skill- and technology intensive export products based on the initial work[3] by Basu *et al.* (2011) is applied as an additional dimension. The classification considers the mix of different skill, technology, capital and scale requirements at the final product stage. Based on this approach, the Harmonized System (HS) trade data[4] is mapped to identify products in terms of six different levels: Non-fuel primary commodities (A), Resource-intensive manufactures (B), Low skill- and technology-intensive manufactures (C), Medium skill- and technology intensive manufactures (D), High skill- and technology intensive manufactures (E) and Mineral fuels (F). All industries in the Agricultural sector are classified as "Non-fuel primary commodities", and no separate more- or less-skill-intensive agricultural exports are indicated. This is a potential area for future refinement.

2.3 Incorporating trade barriers

The DSM approach attempts to include all aspects such as tariffs, trade costs, trade time, infrastructure and logistics as part of the filtering process to identify the most realistic opportunities.

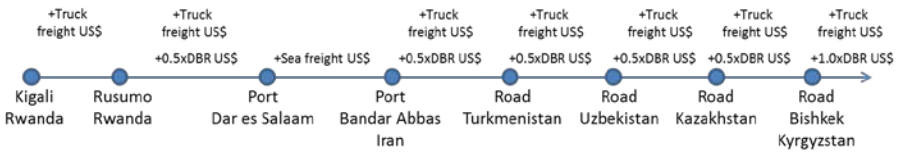
Transport Costs. Due to the importance of transport costs for Rwanda, the DSM approach compiled detailed routing tables and mode switches (maritime versus road trucking) to all major country destinations, including border crossings. Figure 1 and Figure 2 demonstrate the approach that was applied to construct detailed routing, time, border crossing and mode switches. These have the effect of creating a relative cost index that not only considers the international (maritime) shipping cost and domestic cost to import, but also voyage and transit duration and cost implications.

Figure 1: Actual example of costing elements applied



Source: Google Maps, Searates.com, author annotations

Figure 2: Logistics routing chain for costing example



Source: Authors

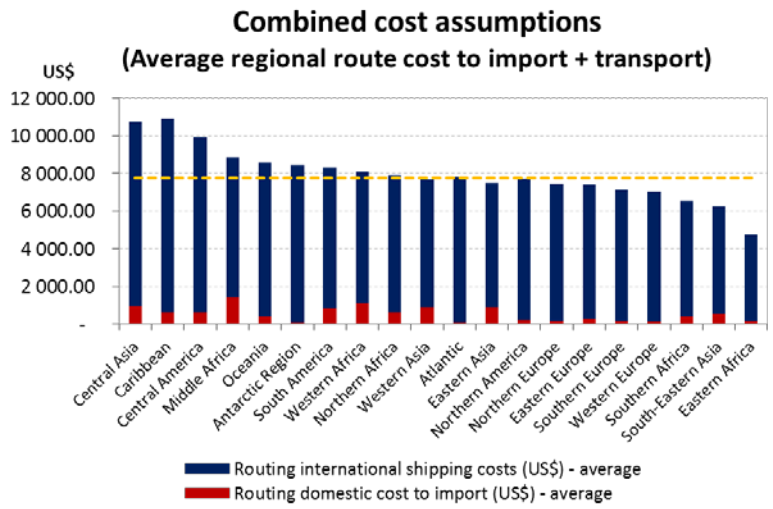
[3] Also available from the World Bank (see http://mec.worldbank.org).
[4] Data obtained from the International Trade Centre Trade Map online data at http://www.trademap.org.

Evident from Figure 2 the routing from Kigali in Rwanda to Bishkek in Kyrgyzstan transits 5 countries through 7 border entries/exits, 3 transport mode switches (from road to maritime and back to maritime). For import costs into Kyrgyzstan, figures are used from the Doing Business Report (2016).

Other Trade Costs. As a measure of trade barriers, the approach further includes (i) tariffs, (ii) international shipping cost, domestic and international transit times, and transit country border cost approximations and (iii) the domestic cost to import. These are calculated as *ad valorem* equivalent on value of goods and added together to arrive at the total ad valorem equivalent of trade cost per product-country combination.

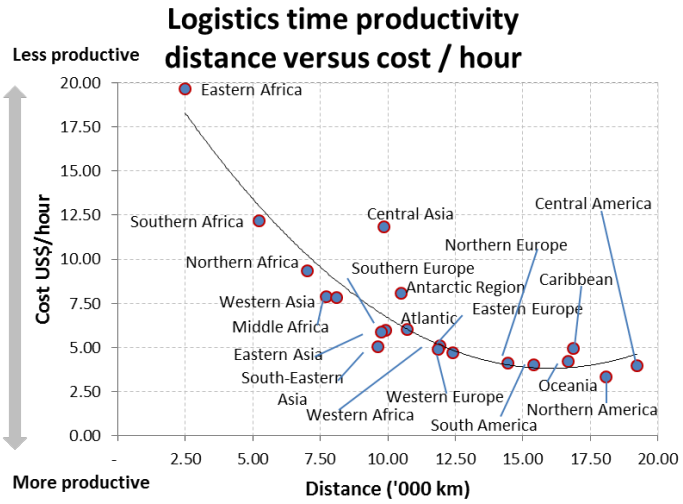
The outcomes averaged by region for the *ad valorem* equivalent international shipping cost for home market (Rwanda) into target markets split by international and domestic components are shown in Figure 3. Evident is that Eastern Africa on average in absolute terms exhibits the lowest overall cost component for the index due to geographic proximity to Rwanda. To provide a different perspective the relative relationship in terms of cost per hour and distance is illustrated in Figure 4.

Figure 3: Average overall cost outcomes by region



Source: Authors's calculations

Figure 4: Overall logistics average time productivity by region



Source: Authors's calculations

The implication of the relationships demonstrated in Figure 3 and Figure 4 is that while the absolute average route cost for a shipment from Kigali into the East African region is the lowest overall, in terms of distance covered versus time and cost spent, the East Africa region in relative terms is the most expensive to export to (around 19.67 US$ per hour).

On the opposite end of the scale, while the Central American region, North America and the Caribbean are some of the furthest regions from Rwanda, the relatively lower rates of logistics services in these areas plus lower import costs and time delays yield the cheapest or most productive shipments in terms of relative costs (around 3.94 US$ per hour).

2.4 Distinguishing between intensive and extensive margins

Policy-makers also need to use the right tool for the right policy question, since policies aimed at diversifying export products differ from those aimed at diversifying destination markets (Carrere *et al*. 2011). Distinguishing between intensive and extensive margins therefore is an important dimension for export and investment policy formulation. To this effect, Brenton and Newfarmer (2007) defines expansion of existing products in existing markets as growth at the intensive margin, while introduction of "new" products and new geographic markets as growth at the extensive margins. These concepts are an important dimension of the TRADE-DSM approach, as depicted in Figure 5. Here, 'Realistic Export Opportunities' (REOs) are plotted along two dimensions.

- The X-axis focuses on the *market*-dimension, with the opportunities for *new*[5] markets on the left-hand side, and *existing* markets on the right-hand side.
- The Y-axis relates to the *product*-dimension, with the opportunities for *new*[6] (less mature) products on the top-half, and *mature* products on the bottom-half.
- The bubble size represents the market potential per product, aggregated across markets.

The outcome therefore positions the various REOs in one of the four quadrants, namely:

Q1: 'Brown fields' (top-right) representing mature export products with growth potential in markets already well-serviced by the exporting country;

Q2: 'Green (new) pastures' (top-left) representing mature products with growth potential in new markets;

Q3: 'Blue sky' (bottom-left) representing less mature export products with growth potential in new markets;

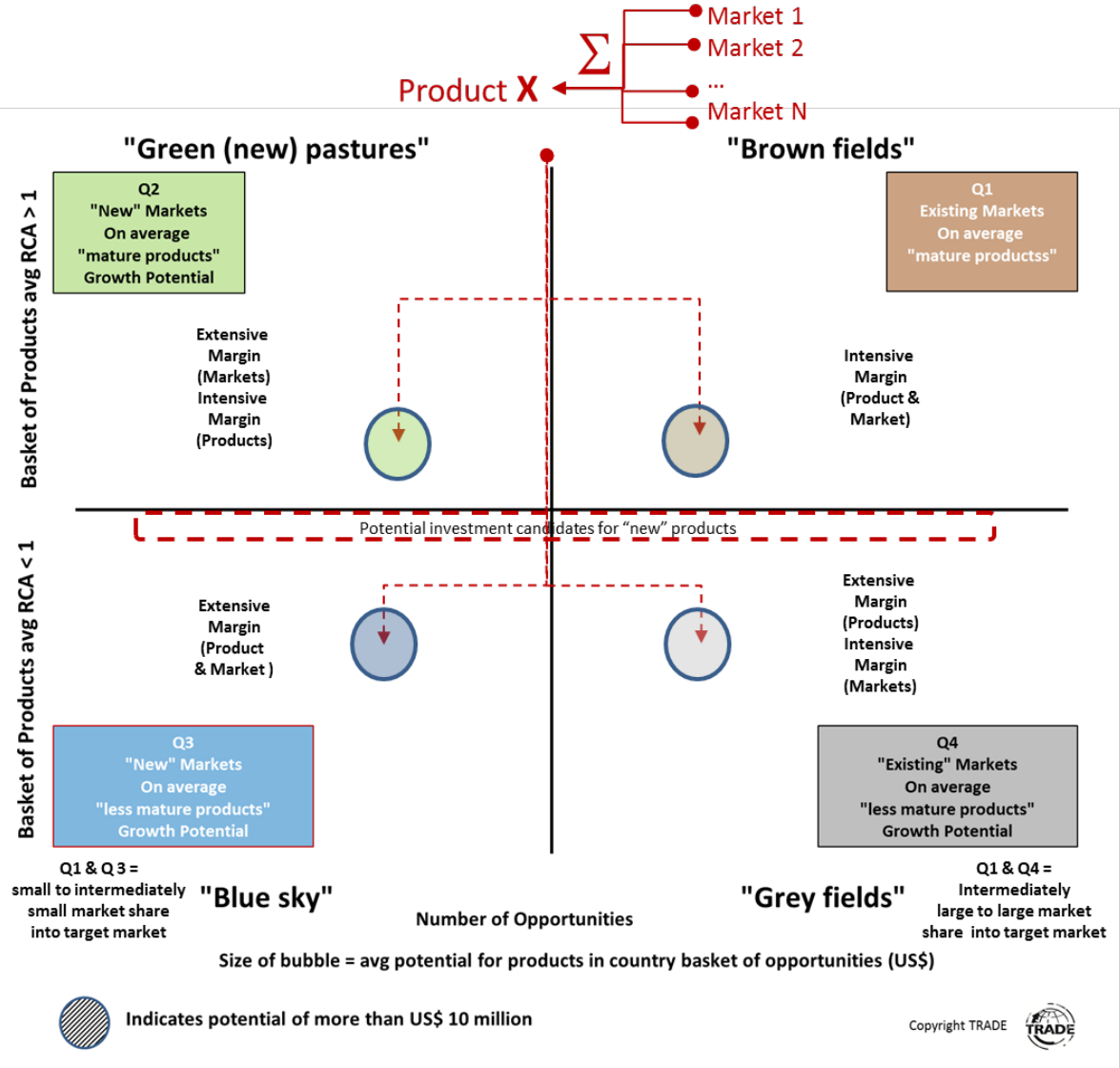
Q4: 'Grey fields' (bottom-right) representing less mature products with growth potential in markets already well-serviced by the exporting country.

Figure 5 illustrates both the elegance and power of the TRADE-DSM methodology - elegance in that it allows for a quick visual inspection and comparison of high-ranking REOs, and power in that it

[5] New versus Existing Markets are defined based on the overall relative size of current exports to this market.
[6] New versus Mature Products are defined based on the Revealed Comparative Advantage (the relative share of a country's product exports, divided by the proportion of world product exports). Mature export products have an RCA of greater than or equal to 1 (RCA=>1), while new products have an RCA of less than 1 (RCA<1).

points to where, with additional investment and/or support, promising export opportunities could become true winners.

Figure 5: REO export maturity, market share, and growth and diversification conceptual model



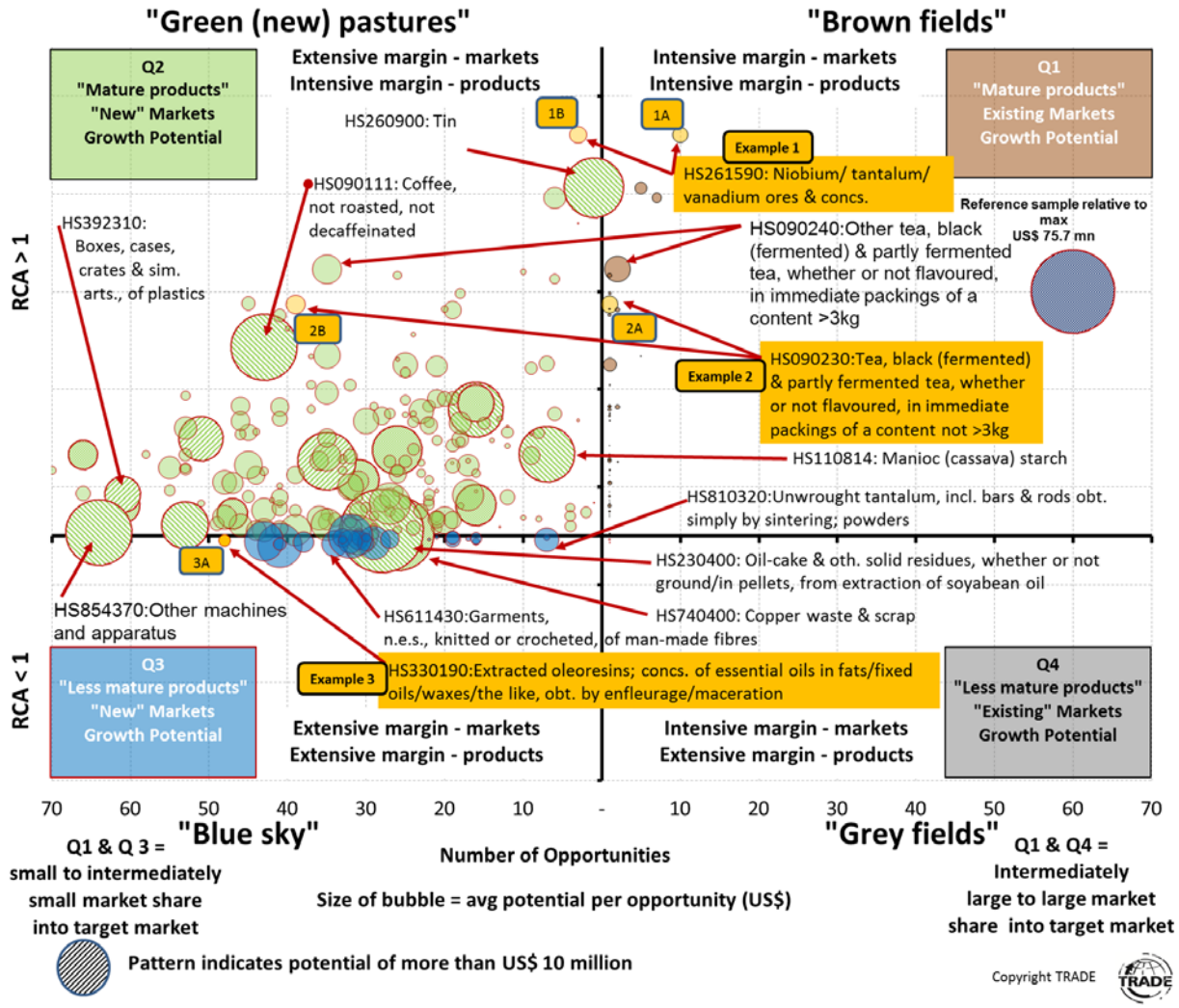
Source: Adapted from Cameron and Viviers (2015)

3. Export Opportunities by Product Type

3.1 Export Opportunities by HS 6-digit product level

The DSM approach provides outcomes at the HS 6-digit product level for all country-product combinations. Figure 6 provides a representation of what this matrix looks like when populated with the outcomes as obtained for the Rwanda case. This shows that there are many different types of export opportunities. The purpose of this section is therefore not to provide a complete overview. Instead, it is to illustrate the functionality of the DSM approach. If found useful, the full details can then be considered in more detail in electronic format, using the TRADE-DSM Navigator.

Figure 6: Overall DSM export maturity, market share, and growth and diversification matrix for Rwanda



Source: Authors, TRADE-DSM

3.2 Three Examples of High-Potential Export Products

Here we will take three examples are highlighted to facilitate interpretation.

Example 1: Niobium, tantalum and vanadium.

The first [**Example 1** in Figure 6] is '*HS2615.90: Niobium/tantalum/vanadium ores and concentrates*'. This has an extremely high Revealed Comparative Advantage (thus exhibiting a high relative export

share from Rwanda). This product is exported to existing markets such as China, the USA, Hong Kong etc. and therefore is placed in Q1 [**1A** in Figure 6] – "brown fields", which implies that the strategy around these markets for this product should be informed around the intensive margin from both a product and market perspective. The number of existing markets (10) is indicated on the horizontal (X) axis. The size of the bubble represents the average potential (average of the US$ 23.2 million therefore is US$ 2.3 million per market). More details regarding the trade with these existing markets are provided in Table 1.

At the same time, the DSM approach identifies that there are 3 potential "new" (from Rwanda's perspective) markets for the same product as indicated in Q2 [**1B** in Figure 6]. These are Thailand, Germany and Spain – details provided in Table 2. Spain is the only real "new" potential market, while the share of Rwanda's exports to Thailand and Germany is much lower than that of the more mature markets indicated in Q1. These markets could be developed more from Rwanda's perspective.

Table 1: Major existing export markets for Niobium, Tantalum and Vanadium (HS 2615.90) supplied from Rwanda in Q1

Item	Country	[A] = B + D + E Target Market(s) Total Imports	[B] RWA Current Exports to Target Market(s)	[C] RWA Additional Export Potential to Target Market(s)	[D] Target Market(s) Imports from top 6 competitors (Excl. RWA)	[E] Target Market(s) Imports REST OF WORLD (Excl. RWA & top 6 competitors)
		`000 US$	`000 US$	`000 US$	`000 US$	`000 US$
		296 528.09	**115 910.49**	**23 284.71**	**139 657.26**	**40 960.35**
1	China	135 809.16	32 480.21	11 339.68	68 038.06	35 290.88
2	United States of America	60 079.96	12 900.42	7 371.79	44 230.71	2 948.83
3	Hong Kong (SARC)	28 214.74	11 443.73	2 427.25	14 563.47	2 207.54
4	Kazakhstan	21 498.46	11 330.67	1 617.72	9 706.29	461.51
5	Japan	3 416.98	913.17	416.32	2 497.93	5.88
6	Belgium-Luxembourg	3 597.00	3 192.17	59.85	359.13	45.71
7	Australia	239.46	49.04	38.08	190.42	0
8	Czech Republic	100.77	44.59	11.24	56.18	0
9	Switzerland	10 958.99	10 945.60	2.23	13.39	0
10	Tanzania	32 612.55	32 610.89	0.55	1.66	0

Source: Authors, TRADE-DSM

Table 2: Major potential new export markets for Niobium, Tantalum and Vanadium (HS 2615.90) to be supplied from Rwanda in Q2

Item	Country	[A] = B + D + E Target Market(s) Total Imports	[B] RWA Current Exports to Target Market(s)	[C] RWA Additional Export Potential to Target Market(s)	[D] Target Market(s) Imports from top 6 competitors (Excl. RWA)	[E] Target Market(s) Imports REST OF WORLD (Excl. RWA & top 6 competitors)
		`000 US$	`000 US$	`000 US$	`000 US$	`000 US$
		67 290.69	**10 745.20**	**8 937.70**	**53 626.18**	**2 919.31**
1	Thailand	55 266.31	9 395.45	7 183.27	43 099.65	2 771.21
2	Germany	10 119.42	1 349.75	1 437.29	8 623.73	145.94
3	Spain	1 904.96	0	317.13	1 902.80	2.16

Source: Authors, TRADE-DSM

Example 2: Tea

Another example [**Example 2** in Figure 6] is that of *HS090230: Tea, black (fermented) & partly fermented tea, whether or not flavoured, in immediate packings of a content not >3kg.* This product

has a high RCA and therefore is a relatively "mature" export product from Rwanda's perspective, hence appears in Q1 [**2A** in Figure 6] – but only for a single target market, namely Kenya (see Table 3). It is possible that the formal statistics do not capture trade in tea accurately as anecdotal evidence suggests that products are sold in border areas and "informally" exported (small transactions) by a large number of small traders (Development Alternatives Incorporated, 2016).

According to the DSM approach however there are another 39 potential "new" or "lesser served" markets from Rwanda's perspective for the same product as indicated in Q2 [**2B** in Figure 6] – "green pastures". Major potential markets include Saudi Arabia, United States of America, Russian Federation, Australia and France – details for the top 15 markets from a potential perspective is provided in Table 4. As an example, while this product line is not eligible under the African Growth and Opportunity Act (AGOA), it has free access under Generalized System of Preferences (GSPs) to the United States and this fact should be capitalised upon by Rwanda to export directly to this market.

Saudi Arabia, the United States of America, Japan and Italy demonstrate some historical imports from Rwanda, but in relative terms these markets are extremely small. Again, in line with intensive margins thinking, these markets could be developed more for this product from Rwanda's perspective.

Table 3: Major existing export markets for Tea (HS 0902.30) supplied from Rwanda in Q1

Item	Country	[A] = B + D + E Target Market(s) Total Imports	[B] RWA Current Exports to Target Market(s)	[C] RWA Additional Export Potential to Target Market(s)	[D] Target Market(s) Imports from top 6 competitors (Excl. RWA)	[E] Target Market(s) Imports REST OF WORLD (Excl. RWA & top 6 competitors)
		`000 US$	`000 US$	`000 US$	`000 US$	`000 US$
		32 113.18	**14 354.07**	**2 949.02**	**17 694.13**	**64.98**
1	Kenya	32 113.18	14 354.07	2 949.02	17 694.13	64.98

Source: Authors, TRADE-DSM

Table 4: Major potential new export markets for Tea (HS 0902.30) to be supplied from Rwanda in Q2

Item	Country	[A] = B + D + E Target Market(s) Total Imports	[B] RWA Current Exports to Target Market(s)	[C] RWA Additional Export Potential to Target Market(s)	[D] Target Market(s) Imports from top 6 competitors (Excl. RWA)	[E] Target Market(s) Imports REST OF WORLD (Excl. RWA & top 6 competitors)
		`000 US$	`000 US$	`000 US$	`000 US$	`000 US$
		1 014 387.94	**475.01**	**148 078.42**	**888 470.50**	**125 442.44**
1	United States of America	163 674.52	453.76	25 358.90	152 153.39	11 067.37
2	Saudi Arabia	122 719.92	13.22	17 100.51	102 603.08	20 103.62
3	Russian Federation	95 969.16	0.00	14 551.93	87 311.55	8 657.61
4	Australia	85 013.05	0.00	13 008.06	78 048.37	6 964.68
5	France	80 835.11	0.00	11 001.84	66 011.06	14 824.05
6	Netherlands	52 092.77	0.00	7 311.32	43 867.94	8 224.83
7	United Kingdom	50 849.47	0.00	7 118.69	42 712.15	8 137.33
8	Ukraine	41 060.57	0.00	6 652.64	39 915.83	1 144.74
9	Japan	43 943.98	1.01	6 219.66	37 317.97	6 625.01
10	Belgium-Luxembourg	37 994.92	0.00	5 713.78	34 282.68	3 712.24
11	Italy	37 435.51	7.02	5 651.03	33 906.17	3 522.32
12	Germany	40 112.03	0.00	4 596.80	27 580.81	12 531.22
13	Hong Kong (SARC)	29 777.04	0.00	4 362.14	26 172.82	3 604.23
14	Jordan	24 877.33	0.00	4 093.49	24 560.92	316.41

15	China	24 880.72	0.00	3 739.81	22 438.87	2 441.84
	Rest (24)	83 151.84	0.00	11 597.82	69 586.90	13 564.95

Source: Authors, TRADE-DSM

Example 3: Essential Oils

The last example [**Example 3** in Figure 6] involves a product located in Q3 [**3A** in Figure 6] (and thus represents a "blue sky" good, which is less mature, serving new markets). The product is *HS330190: Extracted oleoresins; concentrates of essential oils in fats/fixed oils/waxes/the like, obtained by enfleurage/maceration*. While this specific product has a low RCA, there are 48 potential markets that would be accessible to Rwanda's exports of this product, which should be further investigated. The only markets where some of the product shows existing but extremely small trade is Democratic Republic of the Congo and Kenya, but these do not feature in the top markets from a potential perspective. Again only the top 15 results are provided in Table 5.

Table 5: Major potential new export markets for HS 3301.90 to be supplied from Rwanda in Q2

Item	Country	[A] = B + D + E Target Market(s) Total Imports `000 US$	[B] RWA Current Exports to Target Market(s) `000 US$	[C] RWA Additional Export Potential to Target Market(s) `000 US$	[D] Target Market(s) Imports from top 6 competitors (Excl. RWA) `000 US$	[E] Target Market(s) Imports REST OF WORLD (Excl. RWA & top 6 competitors) `000 US$
		537 432.33	**0.29**	**72 124.63**	**432 747.78**	**104 684.26**
1	United States of America	126 276.88	0.00	17 951.24	107 707.47	18 569.41
2	India	40 281.04	0.00	6 113.62	36 681.74	3 599.30
3	China	40 530.24	0.00	5 652.61	33 915.63	6 614.61
4	United Kingdom	41 658.00	0.00	5 301.97	31 811.81	9 846.18
5	Germany	43 311.21	0.00	5 117.20	30 703.18	12 608.03
6	France	44 075.30	0.00	5 032.04	30 192.22	13 883.08
7	Japan	25 760.13	0.00	3 363.96	20 183.75	5 576.38
8	Spain	20 833.92	0.00	2 813.05	16 878.30	3 955.61
9	Belgium-Luxembourg	19 908.00	0.00	2 758.71	16 552.26	3 355.74
10	Netherlands	22 039.23	0.00	2 536.28	15 217.67	6 821.56
11	Australia	12 139.80	0.00	1 779.82	10 678.90	1 460.90
12	Hong Kong (SARC)	12 439.37	0.00	1 677.47	10 064.83	2 374.54
13	Saudi Arabia	12 267.03	0.00	1 558.96	9 353.75	2 913.28
14	Singapore	12 463.03	0.00	1 523.90	9 143.42	3 319.61
15	Austria	11 056.37	0.00	1 489.90	8 939.39	2 116.98
	Rest (33)	52 392.80	0.29	7 453.91	44 723.46	7 669.04

Source: Authors, TRADE-DSM

3.3 General Conclusion on Realistic Opportunities for Export Products

This discussion based on the DSM export maturity, market share, and growth and diversification matrix representation for Rwanda clearly demonstrates that mature products from Rwanda (exhibiting RCAs > 1) have a number of potential untapped, or not yet sufficiently opportunities in new markets. Yet, Figure 6 similarly shows that Rwanda can follow new product opportunities in 'green pastures' (Q2) and 'blue skies' (Q3) that could potentially become comparatively competitive with focused assistance from government and other support programmes. Both these approaches should however also consider the move up the value chain in terms of skills- and technology intensity and add this dimension to prioritisation drives from both a market as well as a product perspective.

The added-value of the DSM approach is thus that for each target product, it provides a detailed overview of *which markets* currently demand such goods, and *what Rwanda's additional export potential is* (taking into consideration factors such as trade cost and import tariffs). This thus offers an important evidence-based complement to Rwanda's existing National Export Strategy.

4. A Portfolio of Focus Products and Markets

4.1 Export Opportunities by Region

In terms of broad geographic areas, more than 80 percent of the identified potential in terms of *value* of market-product line combinations[7] is contained in the 6 geographic regions (in descending order of potential value) of Western Europe, Eastern Asia, Northern America, Southern Europe, South-Eastern Asia and Northern Europe (all not within the direct geographic vicinity of Rwanda). In terms of the *number* of opportunities, in addition to the first 6 regions, Western Asia, Eastern Europe and Western Africa contributes to reaching the 80 percent mark.

The single market of the United States of America should be investigated in more depth, as this market is indicated to have the most potential in value terms (more than US$ 5 billion excluding petroleum and gold), while also presenting the second most opportunity based on *number* of product lines, 82 of which qualify for duty free access to this market under the current AGOA applicable to Rwanda.

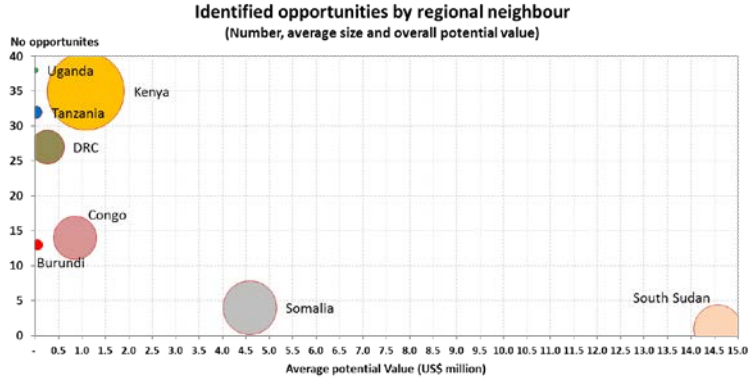
In the short to medium term, close (to Rwanda) regional sub-Saharan markets in Middle Africa, Eastern Africa and Southern Africa do not pose large (relatively speaking) opportunities in either value or number of product lines, with the combined markets in these regions accounting for only 1.4 percent of the potential and 7.7 percent of the number of opportunities.

4.2 Export Opportunities for Neighbouring Markets

Direct neighbours to Rwanda are Burundi, the Democratic Republic of the Congo (DRC), Tanzania and Uganda. The Congo (Brazzaville), Kenya, Somalia and South Sudan are not directly bordering Rwanda but of regional interest. The outcomes in relative terms are shown in Figure 7. Evident is that while South Sudan and Somalia have relatively large (size of bubble) opportunities, these are only few in number (vertical axis) and these are very much focused on humanitarian food aid type of products (wheat and corn flour). Kenya provides a large set (35) of higher value (average potential around US$ 1 million per opportunity) and diverse opportunities compared to that of Uganda (38) and Tanzania (32) with much lower per opportunity averages, while the DRC (27) and Congo (14) has fewer but also on average larger potential than Uganda and Tanzania. Therefore, Kenya, the DRC and Congo provide the best balance between diversity and value of opportunities out of the set of focus countries.

[7] For purposes of this analysis large dominating energy and minerals such as petroleum and gold are excluded.

Figure 7: Comparison of regional neighbours - potential and number of opportunities



Source: Authors's calculations from TRADE-DSM

4.3 A Portfolio of Focus Products and Markets

To create a "portfolio" of focus products and markets, the outcomes obtained from the more detailed analysis on a country level for the focus countries was combined with that of higher level aggregate rest of the world outcomes in each quadrant. By taking the top 10 (based on average potential) for each HS 6-digit line (so 8 countries plus 4 quadrants times 10 product lines) and rationalising the set of outcomes a set of 25 HS 6-digit lines are identified that meets the focus countries as well as global opportunities requirement. The outcomes are grouped by sectors[8] and arranged in descending order based on **average size** of sectors across all markets and **total** potential between sectors.

The results are provided in a summarised format in Table 6. For the individual countries the range of potential in monetary value terms are indicated based on the ranges indicated in the key, while for the rest of the world the number of opportunities (excluding the focus countries) are indicated, followed by the total average potential value across all potential markets.

Based on a more detailed analysis on a country level for the focus countries, combined with opportunities for the rest of the world the following SITC sectors (2 digit SITC chapter indicated) exhibits the most opportunity (arranged in descending order based on the average size of potential across all markets):

- S11: Beverages (81 potential markets valued at potential of US$ 115.2 mn)
- S02: Dairy products and birds' eggs (77 potential markets valued at US$ 59.7 mn)
- S04: Cereals and cereal preparations (69 potential markets valued at US$ 30.9 mn)
- S05: Vegetables and fruit (67 potential markets valued at US$ 17.3 mn)
- S28: Metalliferous ores and metal scrap (5 potential markets valued at US$ 11.4 mn)
- S71: Power-generating machinery and equipment (30 potential markets valued at US$ 9.0 mn)
- S89: Miscellaneous manufactured articles, n.e.s. (93 potential markets valued at US$ 8.2 mn)
- S00: Live animals other than animals of division 03 (1 potential markets valued at US$ 7.7 mn)
- S72: Machinery specialized for particular industries (53 potential markets valued at US$ 6.8 mn)
- S73: Metalworking machinery (70 potential markets valued at US$ 6.2 mn)
- S08: Feeding stuff for animals - not including unmilled cereals (26 potential markets valued at US$ 6.1 mn)
- S21: Hides, skins and furskins, raw (2 potential markets valued at US$ 6.1 mn)
- S07: Coffee, tea, cocoa, spices, and manufactures thereof (3 potential markets valued at US$ 4.1 mn)
- S55: Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations
- S09: Miscellaneous edible products and preparations (3 potential markets valued at US$ 0.7 mn)
- S57: Plastics in primary forms (29 potential markets valued at US$ 0.5 mn)

4.3 Comparison of Export Portfolio with Hausmann study

In comparison with the major outcomes from the Hausmann (2015) study, this analysis confirms the main observation with regards to processed agricultural products, foods, beverages and agrochemicals but with more specifics in terms of actual markets and size of potential. In terms of the second observation from the Hausmann (2015) study regarding specialized textiles and garments, the export opportunity analysis does not support these products on a portfolio level – with the exception of some woven polyester fabrics to be exported to Uganda.

[8] Sectors are defined by 2-digit Standard International Trade Classification (SITC) chapters

Table 6: Summarised outcomes across focus countries and global opportunities

For focus countries value ranges of potential are indicated by colour of the cell: <= US$ 0.5 mn | < US$ 0.5 mn <= US$ 1 mn | > US$ 1 mn

SITC Rev 4 Sector	Skill & Technology intensity	HS-6 digit	Description	Regional focus countries								Rest of World				Total No	Tot Average Potential (Mn US$)
				Burundi	Congo	DRC	Kenya	Somalia	South Sudan	Tanzania	Uganda	Global Q1	Global Q2	Global Q3	Global Q4		
S11:Beverages	Non-fuel primary commodities	HS220300	Beer made from malt	1	1	1	-	-	-	1	-	-	31	-	-	35	38.47
		HS220210	Waters, incl. min. waters & aerated waters, cont. added sugar/oth. sweetening matter/flavoured	-	-	-	-	-	-	-	1	-	-	42	-	43	16.42
		HS220110	Mineral waters (nat./art.) & aerated waters, not cont. added sugar/oth. sweetening matter/flavoured	-	1	1	-	-	-	-	1	-	-	-	-	3	4.77
			Sub-total (number, total potential value)	**1**	**2**	**2**	**-**	**-**	**-**	**1**	**2**	**-**	**31**	**42**	**-**	**81**	**115.2**
S02:Dairy products and birds' eggs	Non-fuel primary commodities	HS040700	Birds' eggs, in shell, fresh/presvd./cooked	-	1	-	1	1	-	-	1	-	39	-	-	43	58.69
		HS040210	Milk in powder/granules/oth. solid form, fat content by wt. not >1.5%	-	-	1	1	-	-	-	1	-	-	-	-	3	31.29
		HS040291	Milk & cream, concentrated (excl. in powder), unsweetened	-	-	1	-	-	-	-	-	-	-	30	-	31	25.25
			Sub-total (number, total potential value)	**-**	**1**	**2**	**2**	**1**	**-**	**-**	**2**		**39**	**30**	**-**	**77**	**59.7**
S04:Cereals and cereal preparations	Non-fuel primary commodities	HS190531	Sweet biscuits	1	-	-	1	-	-	1	-	-	63	-	-	66	14.74
		HS100640	Broken rice	-	-	1	-	-	-	-	-	-	-	-	-	1	6.07
		HS110220	Maize (corn) flour	-	-	1	-	1	-	-	-	-	-	-	-	2	10.11
			Sub-total (number, total potential value)	**1**	**-**	**2**	**1**	**-**	**1**	**1**	**-**		**63**	**-**	**-**	**69**	**30.9**
S05:Vegetables and fruit	Non-fuel primary commodities	HS200290	Tomatoes, prepd./presvd. othw. than by vinegar/acetic acid, other than whole/in pieces	-	1	-	1	-	-	-	-	-	34	-	-	36	13.22
		HS071310	Peas (Pisum sativum), dried, shelled, whether or not skinned/split	-	-	-	1	-	-	1	1	-	28	-	-	31	4.04
			Sub-total (number, total potential value)	**-**	**1**	**-**	**2**	**-**	**-**	**1**	**1**		**62**	**-**	**-**	**67**	**17.3**
S28:Metalliferous ores and metal scrap	Non-fuel primary commodities	HS260900	Tin ores & concs.	-	-	-	-	-	-	-	-	5	-	-	-	5	6.16
			Sub-total (number, total potential value)														**11.4**
S71:Power-generating machinery and equipment	Medium skill- and technology intensive manufactures	HS840710	Spark-ignition recip./rotary int. comb. piston engines for aircraft	-	-	-	1	-	-	1	1	-	27	-	-	30	4.42
			Sub-total (number, total potential value)														**9.0**
S89:Miscellaneous manufactured articles, n.e.s.	Medium skill- and technology intensive manufactures	HS392310	Boxes, cases, crates & sim. arts., of plastics	-	-	-	1	1	-	-	1	-	58	-	-	61	8.98
	Resource-intensive manufactures	HS711790	Imitation jewellery other than of base metal	-	1	-	-	-	-	1	-	-	-	30	-	32	3.78
			Sub-total (number, total potential value)	**-**	**1**	**-**	**1**	**1**	**-**	**1**	**1**	**-**	**58**	**30**	**-**	**93**	**8.2**

S00:Live animals other than animals of division 03	Non-fuel primary commodities	HS010290	Live bovine animals other than pure-bred breeding animals	-	-	1	-	-	-	-	-	-	-	-	-	1	6.14
			Sub-total (number, total potential value)														**7.7**
S72:Machinery specialized for particular industries	Medium skill- and technology intensive manufactures	HS843143	Parts suit. for use solely/princ. with the boring/sinking mach. of 8430.41/8430.49	1	1	-	-	-	-	-	-	-	51	-	-	53	0.73
			Sub-total (number, total potential value)														**6.8**
S73:Metalworking machinery	Medium skill- and technology intensive manufactures	HS845929	Drilling machines other than way-type unit head machines, op. by removing metal, other than numerically controlled	1	1	-	-	-	-	-	1	-	67	-	-	70	3.41
			Sub-total (number, total potential value)														**6.2**
S08:Feeding stuff for animals (not including unmilled cereals)	Non-fuel primary commodities	HS230400	Oil-cake & oth. solid residues, whether or not ground/in pellets, from extraction of soyabean oil	1	-	-	1	-	-	1	-	-	23	-	-	26	7.71
			Sub-total (number, total potential value)														**6.1**
S21:Hides, skins and furskins, raw	Non-fuel primary commodities	HS410120	Whole bovine (incl. buffalo)/equine hides & skins, wt. per skin not >8kg (simply dried)/10kg (dry-salted)/16kg (fresh/wet-salted/othw. presvd.)	-	-	-	1	-	-	-	1	-	-	-	-	2	0.48
			Sub-total (number, total potential value)														**6.1**
S07:Coffee, tea, cocoa, spices, and manufactures thereof	Non-fuel primary commodities	HS090230	Tea, black (fermented) & partly fermented tea, whether or not flavoured, in immediate packings of a content not >3kg	-	-	-	1	-	-	-	-	-	-	-	-	1	11.38
		HS090240	Other tea, black (fermented) & other partly fermented tea, whether or not flavoured, in immediate packings of a content >3kg	-	-	-	1	-	-	-	1	-	-	-	-	2	3.04
			Sub-total (number, total potential value)	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**4.1**
S55:Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations	High skill- and technology intensive manufactures	HS340540	Scouring pastes & powders & oth. scouring preps.	1	1	-	-	-	-	-	-	-	49	-	-	51	6.76
			Sub-total (number, total potential value)														**3.0**
S09:Miscellaneous edible products and preparations	Non-fuel primary commodities	HS210320	Tomato ketchup & oth. tomato sauces	1	-	1	-	-	-	-	1	-	-	-	-	3	0.67
			Sub-total (number, total potential value)														**0.7**
S57:Plastics in primary forms	High skill- and technology intensive manufactures	HS391590	Waste, parings & scrap, of plastics n.e.s. in 39.15	-	-	-	-	-	-	-	1	-	-	28	-	29	6.07
			Sub-total (number, total potential value)														**0.5**
			Total	**7**	**8**	**8**	**12**	**2**	**1**	**6**	**11**	**5**	**470**	**102**	**-**	**632**	**298**

Source: Authors, TRADE-DSM

With regards to the last major grouping from the Hausmann (2015) study named construction materials, metal and wood products; in the DSM analysis metal products are found in the portfolio (S28) but not wood and other construction material.

While the product space approach mainly informs from a production perspective, the DSM approach focuses more on demand and incorporates more trade and transportation elements. As a result the approach indicates various additional potential products and SITC sectors over and above the "traditional" products that would be informed from a historical production perspective. These opportunities are associated with:

- S71: Power-generating machinery and equipment,
- S89: Miscellaneous manufactured articles, n.e.s. (plastic boxes, crates, cases etc. as well as imitation jewellery not made of base metals),
- S57: Plastics in primary forms (mainly waste, parings and scrap of plastics),
- S55: Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations,
- S72: Machinery specialized for particular industries, and
- S73: Metalworking machinery.

4.4 Unexplored Export Opportunities

Besides the usual suspects, this research also opens up three 'unexplored' export opportunities: **aeronautic maintenance and repairs**, **mining and drilling maintenance and repairs** and **manufacturing of plastics**.

Given the relatively large travel distances, combined with relatively weak transport infrastructure, the region does seem to have some aerospace[9] activity requiring maintenance, refurbishment and support services. Rwanda's central location, nearby regional demand (e.g. from eastern DRC) combined with its aspiration to become a logistics hub[10] makes such a focus worth exploring further. The analysis points to Germany as a potential key partner for the region in the aerospace related maintenance, refurbishment and support services. The fact that Volkswagen has also in recent times committed to developing automotive assembly and distribution in Rwanda also signals a potential for ambitious export diversification.

Similar to the automotive and aerospace sectors, the region also has major mining and exploration[11] activities that require similar products and services. The DSM indicates that it may make sense to approach the global major mining equipment producers in a similar fashion to explore potential options that could be beneficial to all parties.

The manufacture of plastics and related industries (including the recycling and repurposing of waste plastics into required plastic products such as water tanks, cases and boxes) should also be further investigated. These are associated with higher skill- and technology intensive production processes, a high employment requirement, and the region does have a demonstrated need and import demand for such products.

[9] Demonstrated by trade for HS840710 Spark-ignition recip./rotary int. comb. piston engines for aircraft.
[10] This observation is also previously and independently expressed in Steenbergen and Javorcik, 2016.
[11] Demonstrated by trade for HS843143 Parts suit. for use solely/princ. with the boring/sinking mach. of 8430.41/8430.49.

5. Summary Observations and Policy Recommendations

In terms of the results and the background work that had to be conducted in order to inform on the question for identification of realistic export opportunities based on the DSM approach for Rwanda the following summary of observations may be relevant to policy making for Rwanda:

1. **While regional economic integration and development is important, in the short to medium term the potential demand from neighbouring markets (with the exception of Kenya, the DRC and Congo) are extremely small. Therefore, a dual strategy should be followed in which regional market development is pursued in combination with developing relationships and enabling trade on the rest of the continent as well as further away international markets.**

2. **Different strategies will be required for different market and product combinations and further detailed analysis around these dimensions need to form the basis for fact-based export and investment promotion activities.**

3. **From an industry development perspective it would be prudent to further investigate some of the identified "non-traditional" products and sectors such as aeronautic maintenance and repairs and related services, mining and drilling maintenance and repairs and related services.**

4. **Potentially, the manufacture of plastics and related industries (including the recycling and repurposing of waste plastics into required plastic products such as water tanks, cases and boxes) should be further investigated. These are associated with higher skill- and technology intensive production processes, a high employment requirement, and the region does have a demonstrated need and import demand for such products.**

The purpose of this paper is not to be exhaustive nor authoritative, but rather illustrative of how the outcomes from the DSM approach can be applied for decision making with specific relevance to Rwanda's policy makers in their journey of planning and building the country's economy. While an advantage is that the outcomes are provided at a highly detailed (HS6-digit) product line, it can also pose a challenge since data quality and frequency of reporting at this level can be problematic for lesser developed countries as well as lesser traded products.

In conclusion, Rwanda should continue to focus on interventions that help build systems, create networks, develop institutions and align strategic priorities. As an immediate priority it would be useful to cross-check key assumptions and possibly deepen the analysis of current findings to ensure robustness. Thereafter, to sensibly and responsibly inform strategic decisions, more detailed investigation and evaluation of each of the opportunities identified for Rwanda by the DSM approach is required. However, the current outcomes help point the way in which policy makers could focus.

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