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Sectoral and Environmentally Friendly Growth Potential in Uganda

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Austrian Institute of Economic Research

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This study identifies environmentally friendly growth potential of selected sectors in Uganda. An innovative survey of owners and top managers of firms in sectoral value chains in Uganda enables a ranking of economic growth prospects, on the one hand, and aspects of sustainability, on the other hand. The results reveal employment, investment and export growth potential at the sector level. The findings suggest a double dividend related to green growth. The sustainability ranking has identified other priority sectors than the economic growth ranking. Hence, the lever for green growth policies (e.g., green finance) appears to be higher in the sectors that also exhibit bigger growth potential. In addition, green growth requires supporting industrial sectors, more sustainable business practices and resolving issues related to the public administration's enforcement of environmental regulations.

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Executive Summary

The aim of this study is to identify environmentally friendly growth potential of selected sectors in Uganda. The starting point of the analysis is Uganda's hardly diversified export portfolio, which has lost competitiveness in recent years. To explore sectoral diversification and growth potential, we study data from an innovative survey of owners and top managers of firms in sectoral value chains. The analysis enables a ranking of economic growth prospects, on the one hand, and aspects of sustainability or green growth respectively, on the other hand. The findings allow us to draw the following conclusions:

- The analysis suggests that growth potential is high in the sectors floriculture and horticulture, beverages and dairy. These reveal employment, investment and export growth potential. These sectors rely on agricultural products. Given path dependence, an upgrading of the sectors is likely to benefit from the establishment of industrial ecosystems related to agro-processing
- Sectors with lower growth prospects are construction and building materials, which are largely non-tradable sectors, and pharmaceuticals, where international competition is fierce.
- Yet, there are environmental concerns if these sectors realize their growth potential. The sustainability ranking identified other priority sectors than the economic growth ranking. Hence, one can draw the conclusion that the lever for green growth policies (e.g., green finance) appears to be higher in the sectors that also exhibit bigger growth potential.
- Growth should be environmentally friendly, which should be facilitated by policies and regulations. In Uganda, current environmental regulations and their enforcement appear to be weak. Hence, the public administration should address challenges related to the enforcement of environmental regulations.
- Environmental and climate change issues already affect the business operations of almost three quarters of the surveyed firms. At the same time, the administration of environmental regulations seems to be weak and firms' investment priorities are centered around machinery and equipment as well as skills only. Sustainable investments in renewable energies or waste management strategies play still a minor role.
- Green growth requires structural change and therefore the development of supporting sectors and new business models. For instance, in-house waste treatment is likely to cause local and global pollution and should therefore be mitigated. This implies a strengthening of the waste management industry. Specific policy recommendations following this implication require further analytical work, however.

1. Introduction

Uganda's post COVID-19 development will depend on successful sectoral diversification. Before the COVID-19 pandemic struck, there was a reduction in the total workforce employed in agriculture. While the manufacturing sector was growing, the vast majority of Ugandans continue to be employed in low-productivity agriculture.[1] To resume economic growth after COVID-19 and, at least partly, accommodate Uganda's fast growing labor supply, it is evident that new growth opportunities are required. There may be opportunities within existing structures. Yet, a broadening of the firm base is desirable to not only render the economy more resilient against shocks such as rising fossil fuel prices or climate change impacts but also to ensure the sustainability of growth, moreover green growth.

This study identifies sectoral value chains which exhibit environmentally sustainable growth potential. The findings are based on a survey of 150 firms in Uganda. The objective is to balance economic growth prospects with environmentally friendly growth conditions. The aim of this short study is to identify the growth potential of selected value chains in Uganda. Against the backdrop of climate change increasingly affecting development, it is common sense that economic growth is required to be environmentally friendly. This not only implies that sectors operating basically with unsustainable technologies and practices are *ex ante* excluded from the sampling (e.g., oil), but also that green growth is *per se* regarded as a development opportunity. Hence, this study contributes to policy efforts to foster prospective growth in emerging sectors.

Only a tiny fraction of the sampled firms actively seeks to break-up path dependence. From a policy perspective, there is a longstanding debate about how to break up "path dependence" (Reinstaller & Reschenhofer, 2019), especially when the firm base is lacking, i.e., when existing firms are not able to instigate a self-sustaining growth and diversification process. When regions could escape path-dependence, this has typically been facilitated by FDI and local policies that promote the establishments of a firm base with enhanced capabilities (Friesenbichler, 2018). At the firm level, diversification can be captured by a change in a firm's business model. Most firms in the present sample have not altered their business model at all in the past (68%) and do not intend to do so in the future (61%). While some firms report minor adjustments to their business model, a mere three percent of the firms in the sample can be classified as a "diversifier", i.e., a firm that seeks to implement totally new models, be it in the future or in the past. By international standards (Friesenbichler & Reinstaller, 2022), this share is remarkably low.

Uganda has committed to policy targets under the UNFCCC. This includes the Paris Climate Agreement to avoid dangerous climate change by limiting global warming to well below 2°C compared to pre-industrial levels. Uganda has also committed itself to the UN Sustainable Development Goals (SDG). By joining as first African country the National Determined Contribution

[1] See https://www.worldbank.org/en/country/uganda/overview (accessed on August 4, 2022)

(NDC) Partnership Plan for Climate Action in Africa, Uganda has shown ambition for climate mitigation: '*Uganda's NDC emphasizes adaptation actions, and the commitment to reduce emissions by 22% by 2030 relative to a business-as-usual scenario through actions related to energy, forestry and wetlands.*'[2] To achieve these priorities, the plan identifies 49 activities for the next three years, including: enacting a legal framework for climate action, developing a pipeline of investment-ready projects for funding, and establishing and strengthening climate funding mechanisms etc.

While having committed to environmental targets, survey data indicate institutional challenges related to the implementation of environmental regulations. The survey raises the question whether firms have been fined for breaching environmental regulations by a regulatory agency. All firms provided negative responses, which suggests institutional challenges in the public administration of environmental targets. It is yet highly likely that not all firms adhere to the environmental rules and regulations. Hence, the de facto implementation of Ugandan environmental law seems to be lacking.

1.1 Uganda's export performance from a diversification perspective

Uganda's reliance on primary sector exports is high. Growth potential lies in diversification and technological upgrade of its export portfolio. The tradable sector is a long-run driver of productivity growth (Friesenbichler & Glocker, 2019; Herrendorf et al., 2013), even though natural resources play an ambiguous role, potentially inhibiting the long-run growth potential and the institutional development (Gylfason & Zoega, 2006; Ross, 1999). This implies that a small, open economy should seek to promote its external sector and help firms in their efforts to achieve a productivity level required to compete internationally in their respective niche (Andersson et al., 2008), which has also been argued for Uganda (Shepherd, 2016).

The analysis of this subsection compares Uganda's export performance with Kenya and Tanzania as reference countries. Both countries are part of the East African Community and are included in the African Great Lakes region. Uganda's GDP per capita in 2020, the survey and hence reference year, amounted to 822 US$ in current US$. Kenya's GDP per capita was 1,879 US$, and Tanzania's 1,077 US$. The countries also differ in population size. In 2020, Uganda's population amounted to 45.7 million, Tanzania's was 59.7 million and Kenya's population was 53.8 million.[3]

The trade analysis draws on harmonized trade data to ensure comparability of the information used. To mitigate issues with trade data due to double counting, the analysis draws on harmonized trade data (BACI) provided by CEPII, the French center for research and expertise on the world economy (see Box for a data description).

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[2] See http://sdg.iisd.org/news/uganda-releases-first-ndc-partnership-plan-for-climate-action-in-africa/ (accessed on April 6, 2022).

[3] See https://data.worldbank.org/indicator/ (accessed on April 6, 2022).

Harmonized trade data: BACI by CEPII

The trade analysis is based on BACI data,[4] which provides disaggregated data on bilateral trade flows for more than 5000 products and 200 countries. The database is built from product-level data directly reported by each country to the United Nations Statistical Division (Comtrade). Products are defined as items from the Harmonized System nomenclature (HS), at the 6-digit level.

The cleaning procedure reconciles the declarations of the exporter and the importer. Since countries report both imports and exports to the United Nations, the raw data may contain duplicates flows: Trade from country *i* to country *j* may be reported by *i* as an export to *j* and by *j* as an import from *i*. The reported values should match, but in practice are virtually never identical, for two reasons. First, import values are reported CIF (cost, insurance and freight) while exports are reported FOB (free on board). Second, errors may occur due to the uncertainty related to the final export destination, discrepancies in the classification of a given product, etc.

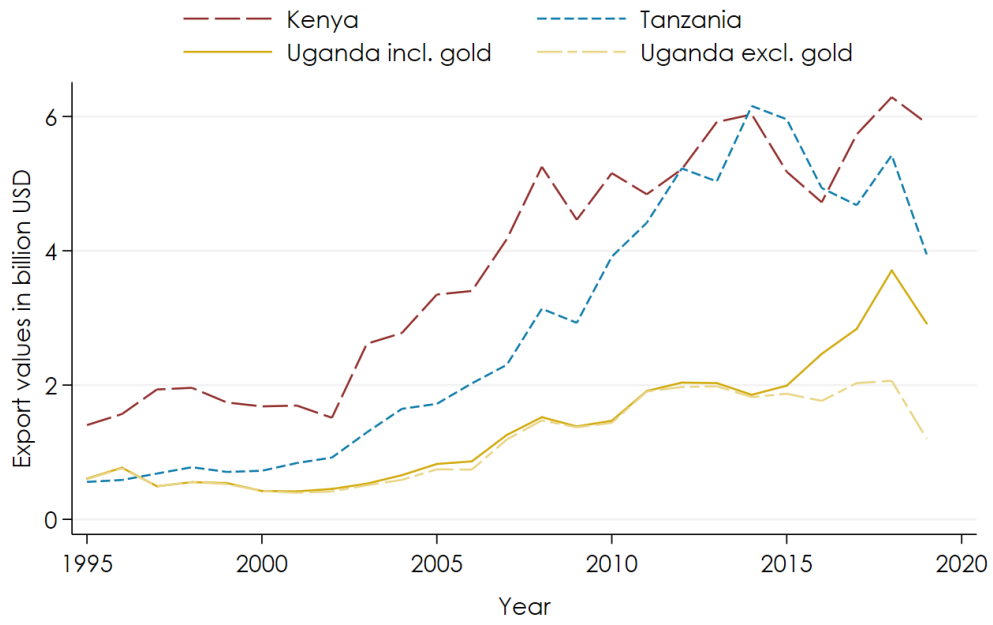
BACI provides a unique, reconciled trade flow by implementing a harmonization procedure. CIF costs are estimated and removed from import values to compute FOB import values. In addition, the reliability of each country as a reporter of trade data is assessed. If a reporter tends to provide data that differ fundamentally from the ones of its trading partners, the entry is considered as unreliable and will be assigned a lower weight in the determination of the reconciled trade flow value.

Uganda's total exports have evolved in unison with the comparison countries, even though at a lower level. Export growth after 2015 was driven by gold. The exported values of all comparison countries show an upward trend, even though Uganda's export performance dropped in the last years of the period analyzed. The export levels differ markedly, however. Uganda's overall exports are smaller than the quantities (i.e., tons of exported goods) of comparison countries, indicating that its export production structures are less developed. From 2015 onwards, Uganda's export growth was driven by natural resources, almost exclusively consisting of gold. Excluding gold from export data leads to a stagnation of the export dynamics (see Figure 1).

Uganda's aggregate export portfolio has suffered from declining prices since 2010, which was only partly offset by increases in the gold price. Using export prices of product groups, a Fisher price index is computed. The index is defined as the geometric mean of the Laspeyres Price Index and the Paasche Price Index. This price index corrects the positive price bias in the Laspeyres (quantity weighted) index and the negative price bias in the Paasche (price weighted) index. The Fisher price index indicates that the prices of Uganda's total export portfolio are lower than the prices of the comparison countries. The price increases of gold have hardly compensated the decrease in the rest of the export portfolio (see Figure 2).

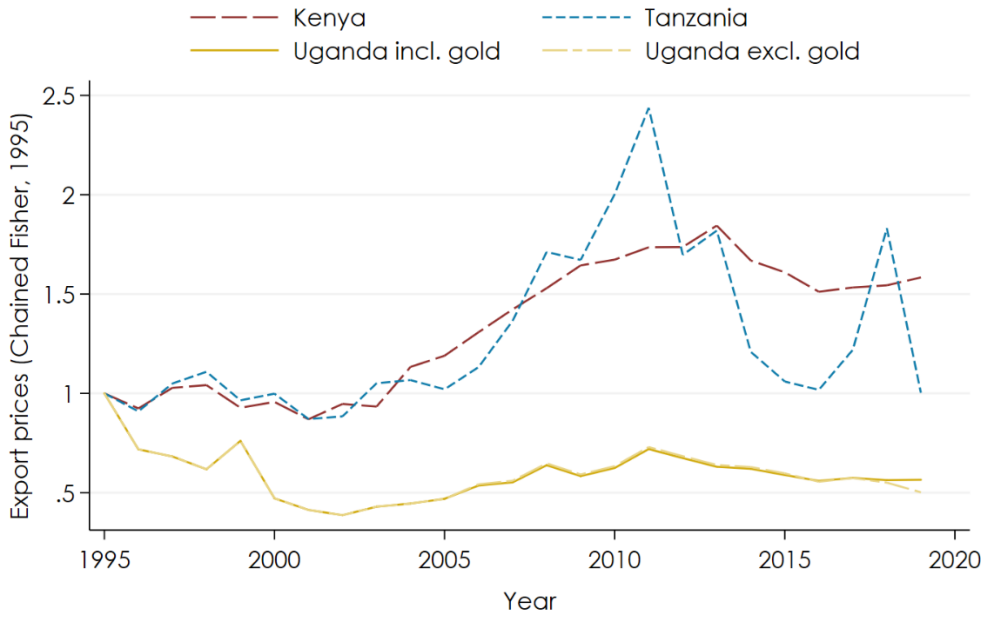
[4] See http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=37 (accessed on April 6, 2022).

Figure 1: **Nominal export values**



Source: BACI data, WIFO illustration.

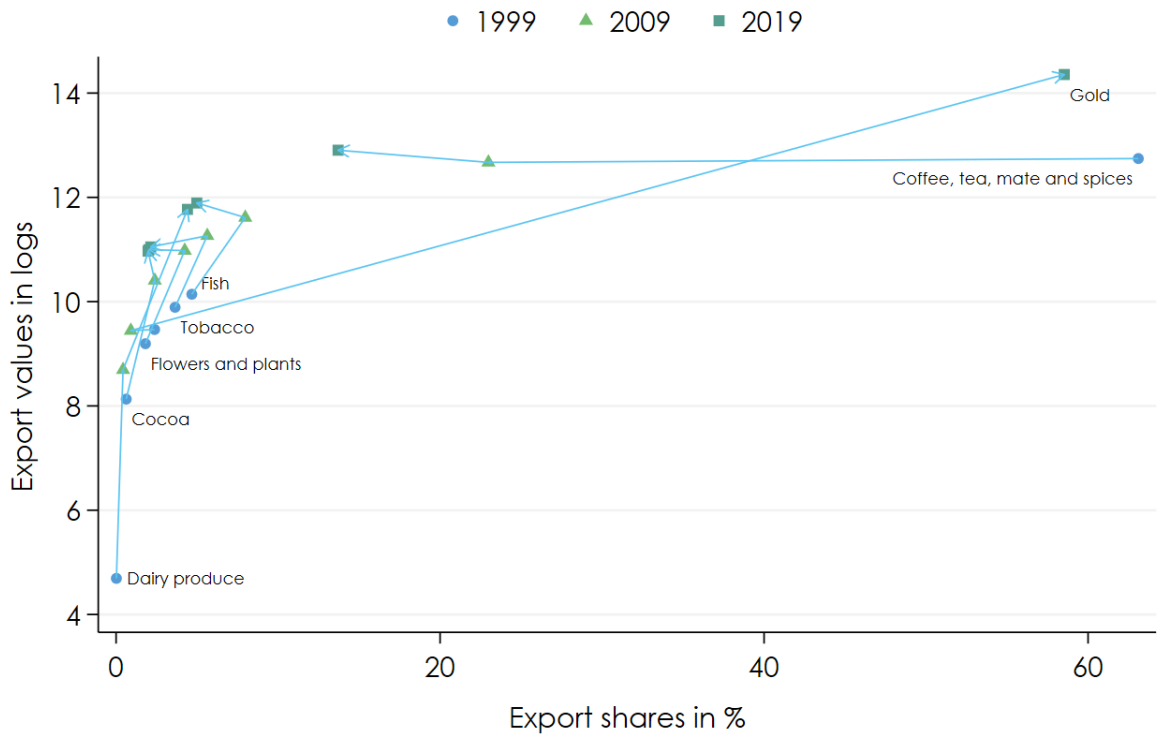
Figure 2: **Export prices**



Source: BACI data, WIFO illustration.

The overall export portfolio is dominated by gold, which has gained shares in the long run. Coffee has lost some of its prominence but remains an important export good. Uganda's export portfolio relies strongly on few product groups, mirroring a poorly diversified portfolio which has hardly changed over time. In 1999, the five most exported goods made for 85.2% of the total exports. In 2019, this figure remained almost unchanged (83.8%), even though the most traded product group has changed significantly. In other words, the export portfolio has changed quite significantly in the long run, even though the strong concentration on single products remains. In 1999, the coffee exports (HS02 09 "Coffee, tea, mate and spices") accounted for 63.1% of total exports. This share dropped to 13.7% by 2019. The relative position has been swapped with gold, which accounted for 2.37% of total exports in 1999 and for 58.5% in 2019. Other export goods with a notable share in the total export portfolio of 2019 were "Dairy produce" (4.4%), "Tobacco" (2.14%), "Cocoa" (1.97%) and "Fruits and grains" (1.35%) (see Figure 3).

Figure 3: Uganda **long run export dynamics at the product group level**



Source: BACI data, WIFO illustration.
Note: The nominal values are in logarithmic terms.

Agricultural products dominate Uganda's export portfolio, after excluding gold and coffee from the analysis. Since gold and coffee are the most important export goods, we compute a basket that is "purged" from these product groups. In addition, we shorten the period analyzed to facilitate the interpretation, which now covers the years between 2009 and 2019. The emerging picture based on the subsample shows that exports of "Dairy produce" (2009: below 1%; 2019: 15%) and "Wood" (2009: 0%; 2019: 5%) have emerged. Also "Fish" exports have increased (2009: 12%; 2019: 20%). Manufactured products have disappeared almost completely from the export portfolio, including "Machinery", "Electrical machinery" or "Vehicles, railway stock". Also exports of "Animal originated products" had become negligible.

Diversification of products or target markets increases resilience to adverse shocks. Less concentrated markets indicate higher levels of competition. A more diversified export portfolio at the product or the destination level tends to increase the economic resilience to adverse shocks, in particular if demand for the specific exported product varieties is uncorrelated, or regional demand dynamics are independent of each other, respectively. The third dimension analyzed is the concentration of international suppliers at the product level. A lower market concentration of suppliers is a broad measure of a higher degree of competition.

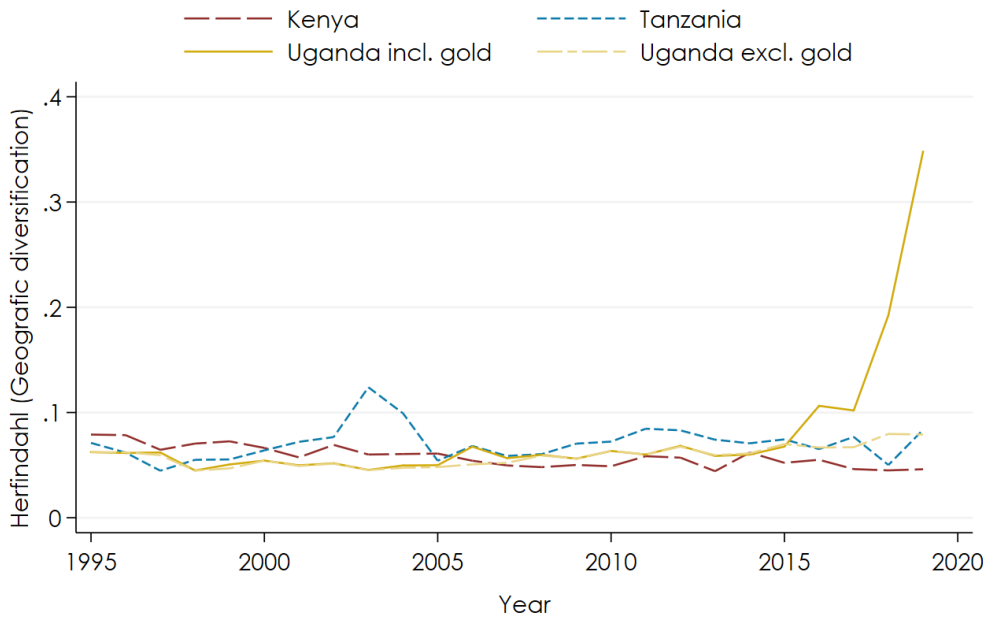
Three dimensions of the diversification of Uganda's export portfolio are computed:

- *geographical target markets* as a proxy for geographical resilience,
- export *product portfolio* diversification as a proxy for product resilience, and
- the *supplier concentration on target markets* as a proxy of competition.

To quantify these dimensions of diversification, Herfindahl-Hirschman indices are completed. These are calculated by squaring the market share of each unit of observation and then summing the results. The first dimension examined is geography, the second the product portfolio.

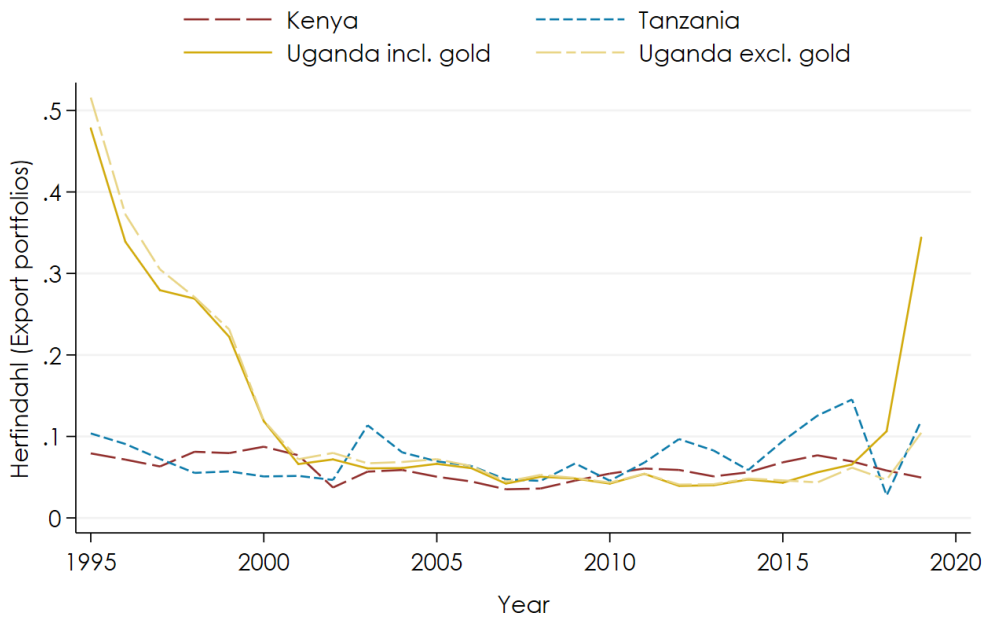
Since 2016, the export portfolio has become less diversified and more geographically concentrated. Uganda's exports have become less diversified with respect to both its geographical target markets and its product portfolio. This development is driven by the prominent role of gold (HS02 72: Natural/cultured pearls, metals etc.) that is heavily exported to especially the United Arab Emirates (and to a much smaller degree Belgium) (see Appendix). In contrast, the comparison countries have hardly changed their degree of diversification of export destinations of their product diversification (see Figure 4 and Figure 5).

Figure 4: **Diversification of the geographic export destination**



Source: BACI data, WIFO illustration.

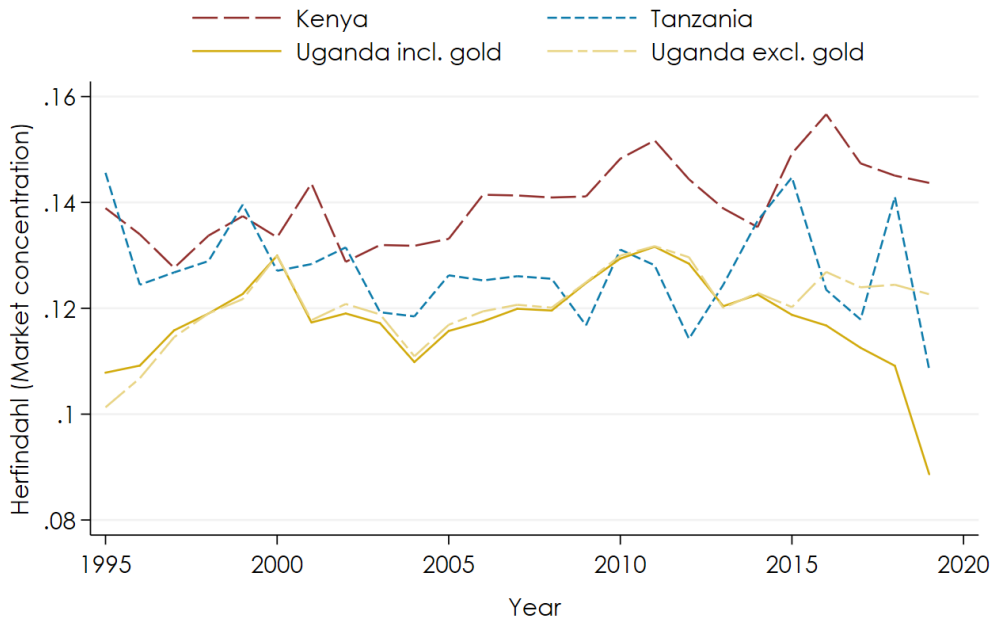
Figure 5: **Diversification of the exported product portfolio**



Source: BACI data, WIFO illustration.

Uganda's export portfolio has shifted towards more competitive markets. Another perspective offers diversification is related to the concentration of export markets. First, export shares of the product groups that Uganda exports are computed. Second, the degrees of market concentration are calculated for each product group. In other words, a Herfindahl-Hirschman index based on global trade data is computed for each product group. Third, the market concentration indices are weighted by Uganda's export share. Fourth, the sum of the weighted product is calculated as a proxy for competition. Interpreting the indicator against the backdrop of international competitiveness implies that an export portfolio with higher degrees of market concentration is to be preferred over lower market concentration. The lower the market concentration is the more dispersed the market shares are, which suggests higher levels of competition. Uganda's export portfolio has shifted towards more competitive markets, which is driven by gold (see Figure 6).

Figure 6: **Export market concentration**



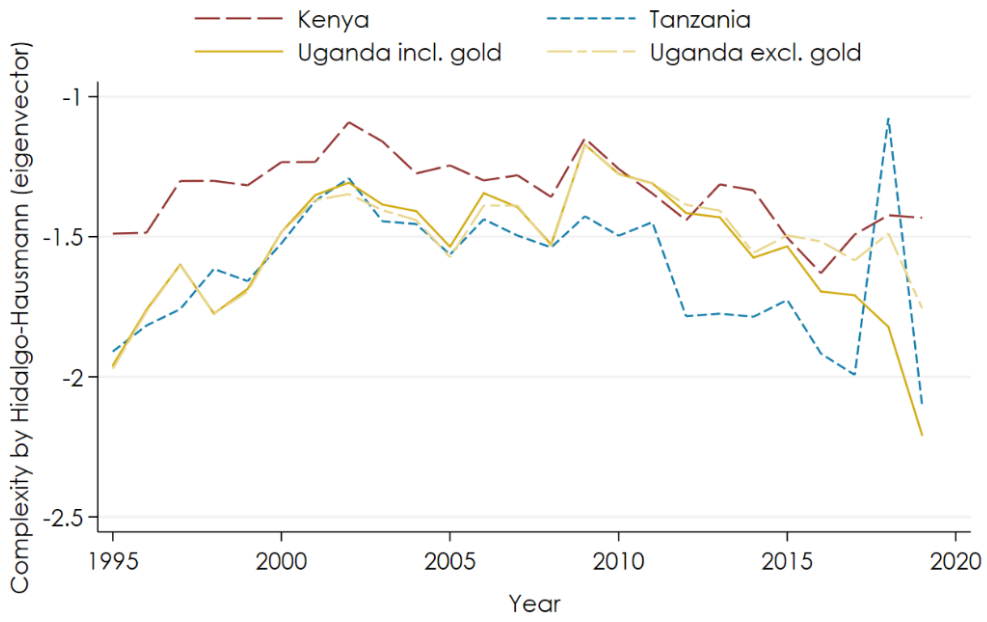
Source: BACI data, WIFO illustration.

The technology content of the export portfolio is quantified by indicators from recent developments in the literature on the measurement of economic complexity. We use a measure of sophistication of a sector's products based on "complexity scores" (Hidalgo & Hausmann, 2009). These approximate the sophistication of a product line by recovering latent information from a bipartite network linking product lines to exporting countries. A higher score indicates that the country is exporting a specific product line with comparative advantage and/or only

few other countries are capable of exporting the same product line. Hence, the complexity score may be interpreted as reflecting the breadth and the depth of the knowledge base required to become a significant exporter (Klimek et al., 2012; Reinstaller & Reschenhofer, 2019)(see Annex for computational details).

Uganda has experienced a decline in the technological content of its export portfolio. The complexity scores of Uganda's export portfolio have been decreasing steadily since 2010. This indicates a loss in the technological competitiveness. The comparison countries have shown a sideways movement, perhaps with the exception of Tanzania, whose technological position seems to be more volatile and also declining. Notably, the indicator is provided in standard deviation of the international mean. Hence, a decline indicates a loss in a country's relative position compared to the global performance. The comparative perspective is for instance mirrored by the negative values indicating that all comparison countries are yet developing.

Figure 7: **Complexity scores**



Source: BACI data, WIFO illustration.

1.2 Diversification potential: A survey of firms in sectoral value chains

This study relies on an innovative survey among firms about the functioning of sectoral value chains. Methodologically, this part of the analysis draws on data from an innovative survey of 150 firms in a range of sectoral value chains in Uganda. The methodology of the World Bank's Enterprise Survey Unit was followed in the survey design and implementation.[5] The survey instrument was designed by WIFO in close collaboration with the World Bank, which was fielding the survey in collaboration with local consultants. The respondents were business owners and top managers, which were in larger establishments sometimes supported by company accountants and human resource managers to answer questions about *inter alia* the financial performance and labor. Census data of Uganda Bureau Of Statistics was screened, yet not used due to issues with firms' industry affiliation. Hence, the sampling universe was obtained from member registries of industry associations. The response rate was 53%. Drawing on stylized value chains (Ponte & Sturgeon, 2014), the sampling considers a small number of firms assigned to each stage of the chain. Most of the identified value chains are dominated by few large firms. These were considered in the sampling. This phenomenon is also observable for other countries in the region such as Tanzania (Sutton & Olomi, 2012).

Multiple information sources were considered when choosing the value chains with presumed growth potential. Discussing sectoral growth potential requires an ex ante selection of sectors that are subsequently analyzed. The sector choice follows a stepwise procedure:

- The aim of policies is to diversify the economy to higher value activities, which is why commodities and agriculture-based industries have been largely excluded from the analysis.
- Value chains which operate technologies that are regarded as strongly polluting and thus not sustainable were excluded. For instance, this relates to emission-intensive industries such as oil and gas.
- Another objective is to upgrade the export base. Hence, sectors proposed in a study published by the International Growth Centre (IGC) which are classified as mid-tech have been chosen to be addressed in the survey (Shepherd, 2016).
- Qualitative information was used to validate the preliminary list. Valuable insights were obtained from a high-level round table discussion in Kampala on 28th May 2018 under the World Bank's "Competitive Industry and Innovation Program".

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[5] For instance, Private contractors conducted survey on behalf of the World Bank. Confidentiality of the survey respondents and the sensitive information they provide is necessary to ensure the greatest degree of survey participation, integrity and confidence in the quality of the data. See https://www.enterprisesurveys.org/en/methodology (accessed on April 8, 2021)

- The sector choice has been extended by two cross-cutting sectors which are enablers of a "circular economy" and contributing to climate mitigation. These are power generation using renewable energy sources and waste management.

The survey data enables the analysis of six sectoral value chains, whose firms were surveyed during the COVID-19 pandemic. The survey was fielded in 2020 during the COVID-19 pandemic, which has slowed down the survey implementation and led to a drop in response rates in some value chains originally considered in the sampling. The survey was answered by business owners and top managers. Sometimes the survey respondent called company accountants or human resource managers into the interview to answer questions about productivity and labor. The overall sample size is 150. Due to the low number of observations, the present analysis cannot consider Fish and frozen fish, Transport equipment, Power generation from renewable energy sources, and Waste management. The analysis focuses on six sectors (the respective subsample size is provided in paratheses):

- Beverages (17)
- Building materials (19)
- Construction (13)
- Dairy (14)
- Floriculture and horticulture (42)[6]
- Pharmaceuticals (28)

2. Economic growth potential across sectoral value chains

The questionnaire contains questions targeting at the growth potential. The development of the survey instrument was leaning on the Enterprise Survey methodology. The content of the questionnaire covers aspects which allow for the analysis of sector growth. It *inter alia* contained the following aspects which are explored in this study: (i) Employment growth potential, (ii) Export demand and export structure, and (iii) Market structures – price taker and international competition.

2.1 Employment growth potential

Generating employment opportunities is a key policy objective. Uganda seeks to create opportunities for absorbing excess labor into more productive employment in industry and services. To keep up with growth in the labor force, the economy needs to create at least 700,000 jobs per year, which far exceeds the 75,000 jobs that are currently created each year.[7]

[6] Horticulture is the art of cultivating plants in gardens to produce food and medicinal ingredients, or for comfort and ornamental purposes (see https://en.wikipedia.org/wiki/Horticulture; accessed on April 6, 2022).

[7] See https://www.worldbank.org/en/country/uganda/overview#; accessed on April 4, 2022)

The survey gives an indication of employment growth opportunities across sectoral value chains. A survey question asks, 'How many first-time formal workers of the following categories would you hire?' This information is in a second step weighted by the number of employees to obtain a hypothetical growth rate, which would be realized if firms hired the amount of people that they indicated. The corresponding question is, 'At the end of the last fiscal year, how many permanent, full-time individuals worked in this establishment? Please include all employees and managers.' Especially firms in the sectoral value chains of beverages, dairy, and flori- and horticulture report employment increases. The reported growth intentions are positive, but lower in pharmaceuticals, construction and building materials.

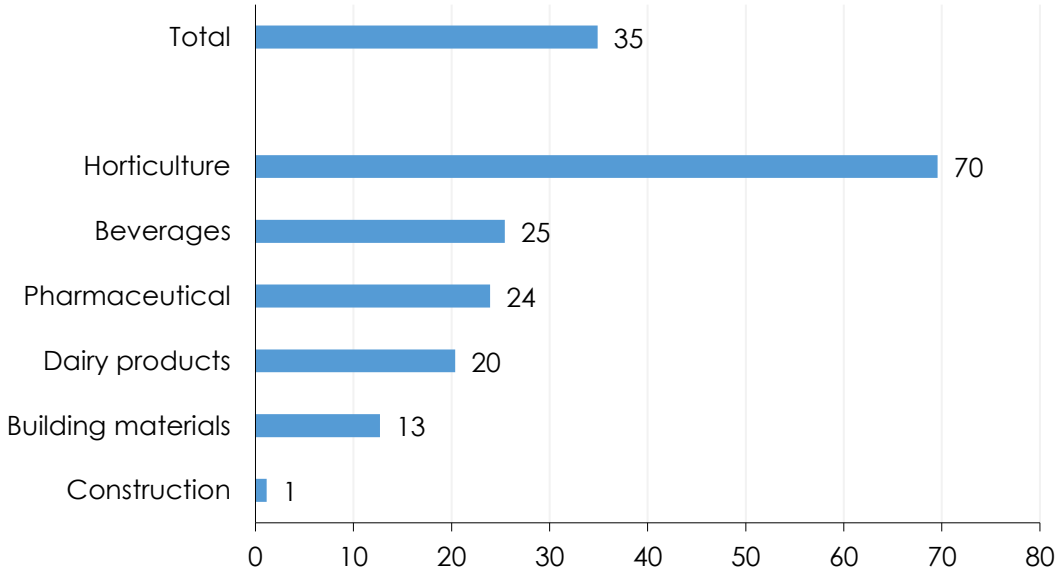
The sample consists of firms and sectors with great growth potential. The sampling strategy introduced an upward bias. The selected sectors exhibit growth potential, and the surveyed firms within the sectors are likely to be successful firms. This explains the large growth rates obtained from a rather small sample.

2.2 Export demand

The sectors analyzed can contribute to the diversification of Uganda's export portfolio. Uganda's export portfolio is dominated by gold and agricultural goods such as coffee and cocoa beans. Gems and precious metals make for 43.9% of total exports, coffee, tea, and spices for 14.5%. Given the rather weak home market, foreign demand is not only a likely growth driver, but also a source of foreign currency.

The export share differs vastly across sectors. The first indicator used is the percentage of the firms' revenue that is generated from exports. The highest export share report firms in flori- and horticulture (70%). On the other end of the distribution is construction (1%), a sector that is typically classified as being nontradable (see Figure 8).

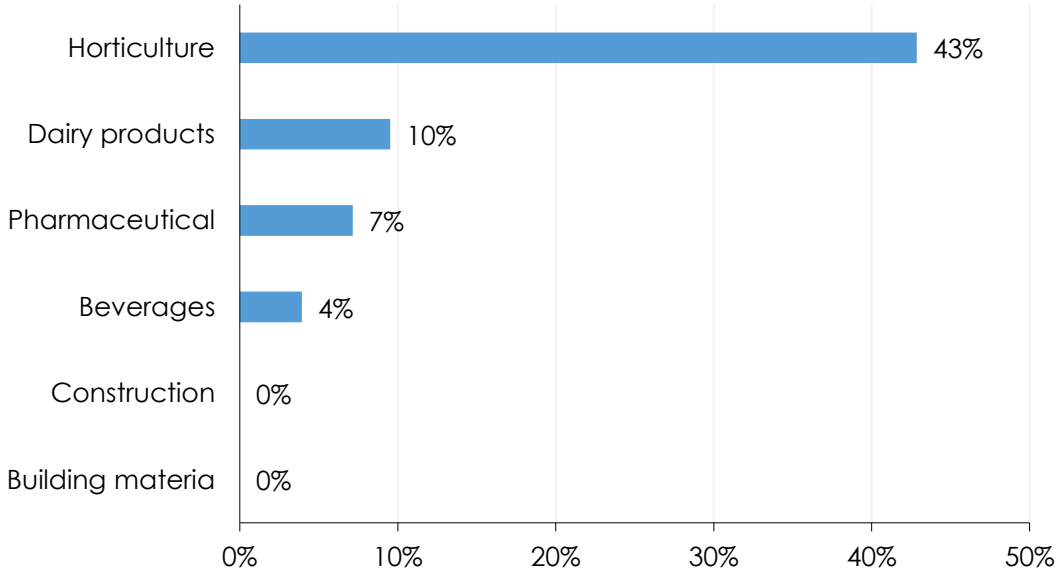
Figure 8: **Export shares across sectors in percent**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "What percentage of your firm's revenue is generated from exports?"

In addition to the export share, the purchasing power of potential export destinations was considered in the ranking. Respondents were asked to assess in what export destinations they see the biggest market potential. The following regions were provided: East Africa (Tanzania, Rwanda, Kenya), Rest of Africa, China, Middle East, Other emerging economies (e.g., Brazil, Russia, India, South Africa), and Developed countries (e.g., EU, USA, Japan). The Middle East, emerging economies, and developed countries are regarded as export destinations for which bigger growth potential is assumed due to their higher purchasing power (see Figure 9).

Figure 9: **Export potential in the Middle East, other emerging and developed economies (mean)**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "In what of the following export destinations do you see the biggest market potential?"

The bulk of exports are destined to East Africa. There is substantial sectoral variance across destinations. Most exports of the surveyed firms are destined to East Africa. Especially firms in construction (92%) and building materials (89%) are sold to the regions. The Rest of Africa takes prominent roles for pharmaceuticals (61%) and beverages (59%). Exports to China are only reported by firms in horticulture (14%) and the dairy sector (7%)(see Table 1).

The African Continental Free Trade Area (ACFTA) is expected to increase sales revenues. 84% of the surveyed firms expect that the implementation of the African Continental Free Trade Agreement (ACFTA) will affect their business. 89% out of this subsample report that ACFTA will positively affect the sales revenues.

Table 1: **Export destinations**

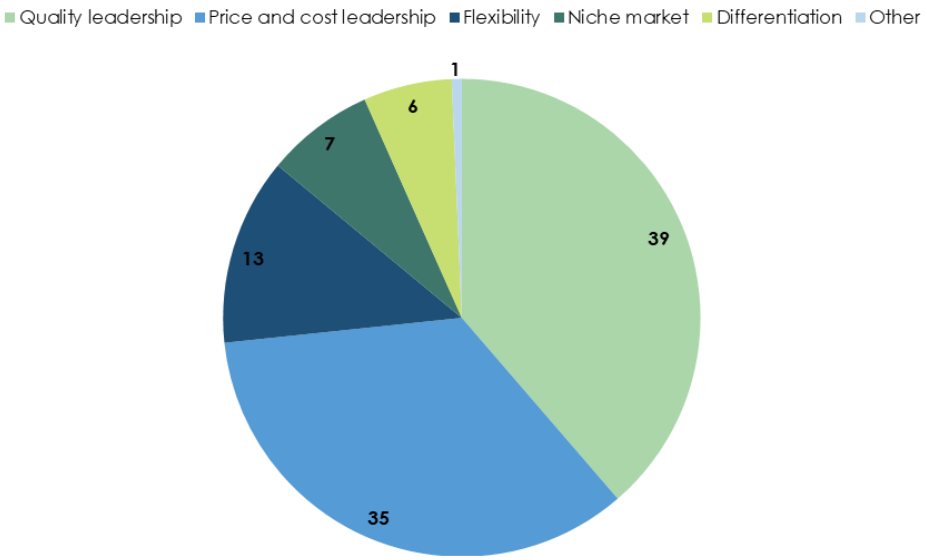
	East Africa	Rest of Africa	China	Middle East	Emerging Economies	Developed Economies
Building materials	89%	26%	0%	0%	0%	0%
Construction	92%	8%	0%	0%	0%	0%
Beverages	71%	59%	0%	6%	6%	0%
Pharmaceutical	68%	61%	0%	18%	0%	4%
Dairy	50%	21%	7%	21%	7%	0%
Horticulture	26%	19%	14%	38%	26%	64%
Total	59%	33%	5%	19%	10%	21%

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "In what of the following export destinations do you see the biggest market potential?"; multiple answers are possible.

2.3 Strategic orientation

Sectoral growth hinges on firms' strategic orientation. Respondents were asked to describe the strategic orientation (i.e., the positioning in the market) of the firm. 39% of the surveyed firms seek quality leadership, 35% pursue a price and cost leadership strategy, and 13% implement a flexible approach with respect to their market positioning. Relatively fewer firms implement a niche market (7%) and differentiation (6%) strategy (see Figure 10).

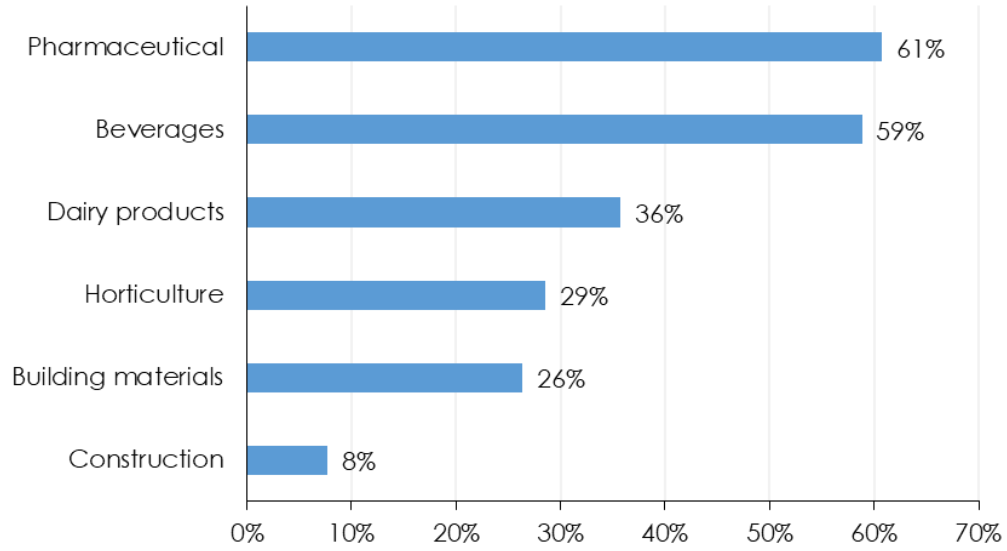
Figure 10: **Strategic orientation**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "How would you describe the strategic orientation (the positioning in the market) of your firm?"

Changing Uganda' growth pattern to more innovation and quality requires a transformation of the firm base, away from low-cost firms. We assign a negative weight to sectors with a higher share of firms pursuing a price and cost leadership strategy. Especially firms in pharmaceuticals (61%) and the dairy value chain (36%) implement such a strategy, while cost leaders are relatively rare in construction (8%) (see Figure 11).

Figure 11: **Price and cost leadership across sectors**



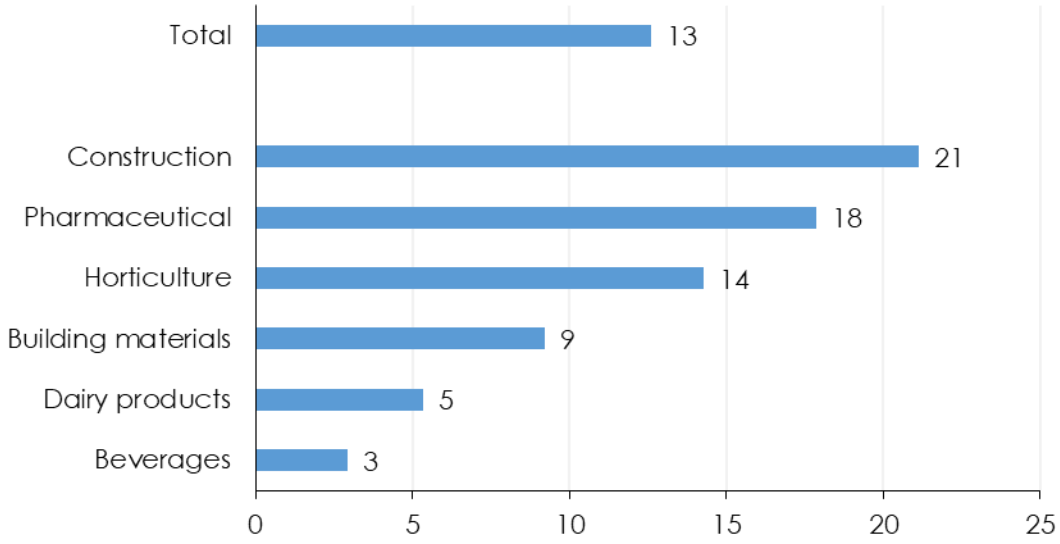
Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "How would you describe the strategic orientation (the positioning in the market) of your firm?"

2.4 International competition

Fierce international competition might hamper growth. Since the value chains studied are either emerging or in early stages of their development, fierce international competitors may pose a growth hampering factor. Respondents were asked to list the country (or region) of origin of their company's main competitors. A maximum of three answers was allowed. China, Middle East, Other emerging economies, and Developed countries were assumed to exert fierce international competition. The other categories are Uganda as the home market, East Africa (Tanzania, Rwanda, Kenya), and the Rest of Africa.

The share of firms reporting competitors from technologically more advanced regions varies across sectors. Especially respondents in the value chains construction (21%), pharmaceuticals (18%) and flori- and horticulture (14%) report competitors from technologically more advanced regions. Then again, the share of firms reporting international competitors from advanced economies are lower in the beverages (4%), dairy (5%) or building materials sector (9%) (see Figure 12).

Figure 12: **Competitors from BRICS, Middle East or developed countries**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Please list the country of origin of your main competitors", "Please tick a maximum of three"

Most firms report that competitors are from Uganda or East Africa. Firms face Chinese competitors in the construction sector. The geographical distance explains the origin of competitors. Most firms (79%) report competitors from Uganda, followed by East Africa, and the Rest of Africa. Regions outside Africa play a lesser role. The data reveals a remarkable pattern for the construction sector. 85% of the firms face competitors from Uganda. Yet approximately every second respondent in construction reports competition from Chinese companies (see Table 2).

Table 2: **Geographic origin of main competitors**

	Uganda	East Africa	Rest of Africa	China	Middle East	BRICS (ex. China)	Developed Countries
Beverages	88%	82%	35%	6%	0%	0%	6%
Dairy	86%	64%	14%	0%	7%	0%	14%
Building materials	84%	47%	11%	21%	5%	0%	11%
Horticulture	74%	62%	21%	5%	12%	24%	17%
Pharmaceutical	71%	64%	29%	14%	36%	18%	4%
Construction	85%	15%	0%	54%	8%	15%	8%
Total	79%	59%	20%	14%	14%	13%	11%

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Please list the country of origin of your main competitors", "Please tick a maximum of three"; China was considered as a stand-alone category, even though it is part of the BRICS group, because the country is a prominent investor in Uganda.

3. Sustainability features of the sectoral value chains

Growth must be environmentally friendly. Economic growth involves transforming the natural world, affecting the environmental quality and related ecosystem services. Against the backdrop of climate change, Uganda's commitments to the policy targets under the UNFCCC, and growing local environmental issues, this study requires growth to be environmentally-friendly. A second ranking was compiled which complements the previous ranking of the growth prospects. Multiple environmental dimensions are analyzed:

- The share of firms reporting that environmental aspects do not hamper operations
- The share of firms reporting investments into sustainability measures
- Issues of waste management

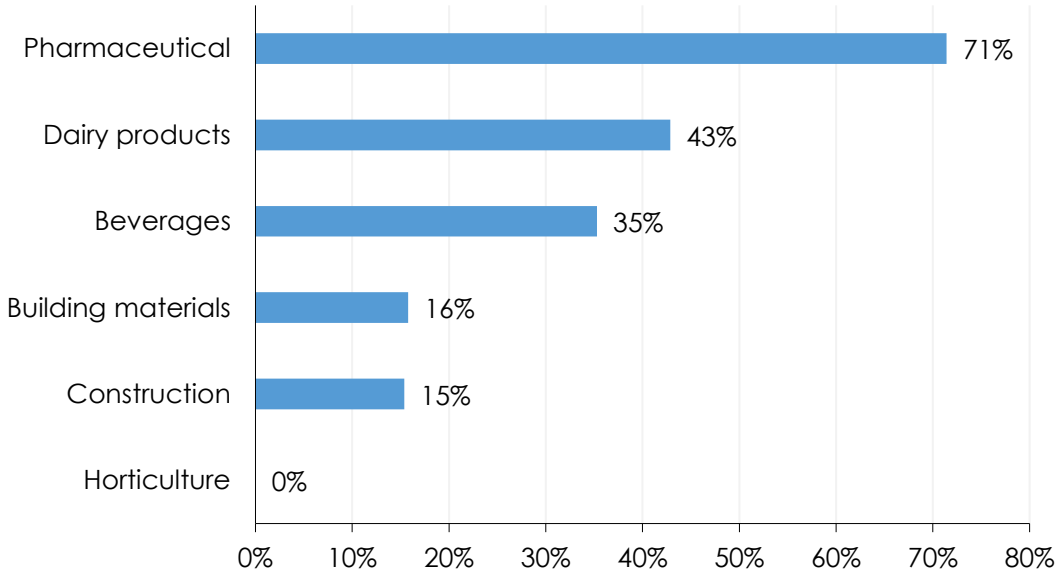
3.1 Environmental issues hampering operations

Environmental issues are expected to aggravate in a business-as-usual world. The sustainability ranking proposed here considers the absence of environmental issues in their current operations. Environmental challenges are likely to aggravate and potentially affect future business operations. The survey draws on a question asking respondents whether a given set of environmental issues has hampered the enterprise's operations in the past three years. The questionnaire offered the answer category "Environmental issues do not hamper operations", which is used to study the sectoral exposure or risks to production from climate change impacts (e.g. drought, flooding), air or water pollution.

Environmental issues already affect operations, but differently across sectors. Only 28% of the entire sample report environmental issues to be absent. All firms in flori- and horticulture report environmental impacts. With 71% of the respondents not reporting environmental issues, pharmaceuticals are the least affected among the sectors examined (see Figure 13). Hence, in

sectors that are directly exposed to, or even dependent on the natural environment and their ecosystem services, the share of respondents reporting environmental impacts hampers business operations is naturally higher than is sectors that operate in more technical environments such as industrial buildings.

Figure 13: **Share of firms with no environmental issues hampering operations across sectors**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Has any of the following environmental issues hampered your enterprise's operations in the past three years?", "Environmental issues do not hamper operations"

3.2 Lack of sustainable investments

The investment priorities are centered around machinery and equipment and skills. Sustainable investments play a minor role. Almost all surveyed firms (96%) plan to invest into physical equipment, skills, organizational development in the next three years. The answers to the follow-up question about the fields of investments reveals clear patterns: 60% report investments into machinery and equipment, 56% into the general skills development, and 45% each into the recruitment of new skills, and into management training. There are no reports of planned investments into (renewable) power generation. Investments into waste and sewage management (16%) and into energy efficiency (technological efficiency in buildings, machinery, transport etc.) (15%) also play a lesser role.

A ranking of investment priorities indicates that especially the sectors building materials and construction consider sustainability measures. Next, sustainable investments are defined as investments into (i) Waste and sewage management, (ii) Energy efficiency (technological

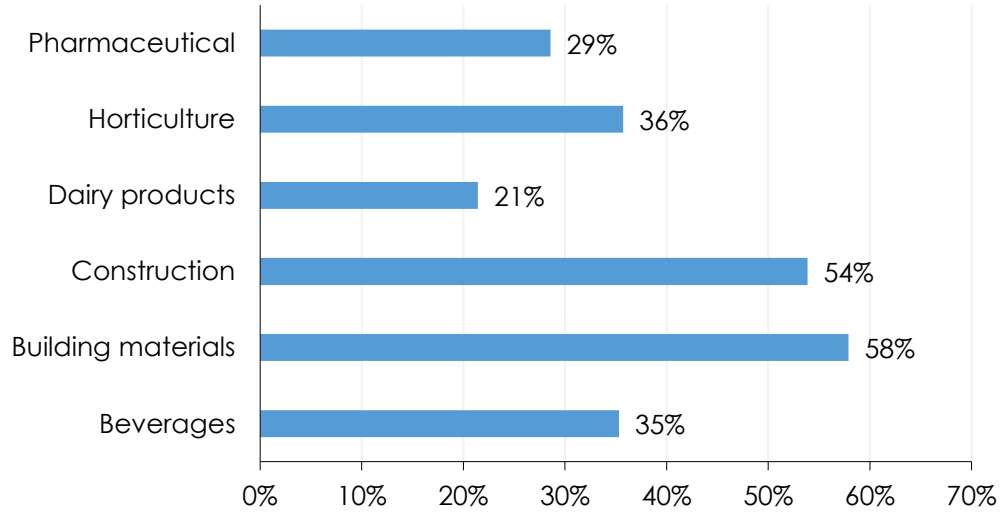
efficiency in buildings, machinery, transport etc.), and (iii) Efficiency of material use in production. A dichotomous variable is constructed taking on the value of one if a firm reports one of these investment priorities, and zero otherwise. The data reveal that especially firms in building materials (58%) and construction (54%) consider sustainable investments, i.e. firms' investments in those value chains can be classified as sustainable. This result is driven by the efficiency of material use in production, which in these sectors is a key determinant of price competitiveness (see Figure 14).

Table 3: **Investment priorities**

Field of investment	**Share**
Machinery and equipment	60%
General skills development	56%
Recruitment of new skills	45%
Management training	45%
Land, buildings	39%
Marketing, sales networks	39%
Information and Communication Technology	38%
Vehicles, logistics	28%
Efficiency of material use in production	22%
Waste and sewage management	16%
Energy efficiency (technological efficiency in buildings, machinery, transport etc.)	15%
Power generation	0%

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Does your establishment plan to invest into physical equipment, skills, organizational development during the years?", "If yes, in what field(s) will this planned investment be?". The term for "Efficiency of material use in production" which is commonly used in the literature is "Resource efficiency" but was adapted to render the questionnaire more accessible to respondents.

Figure 14: **Share of firms planning sustainable investments across sectors**

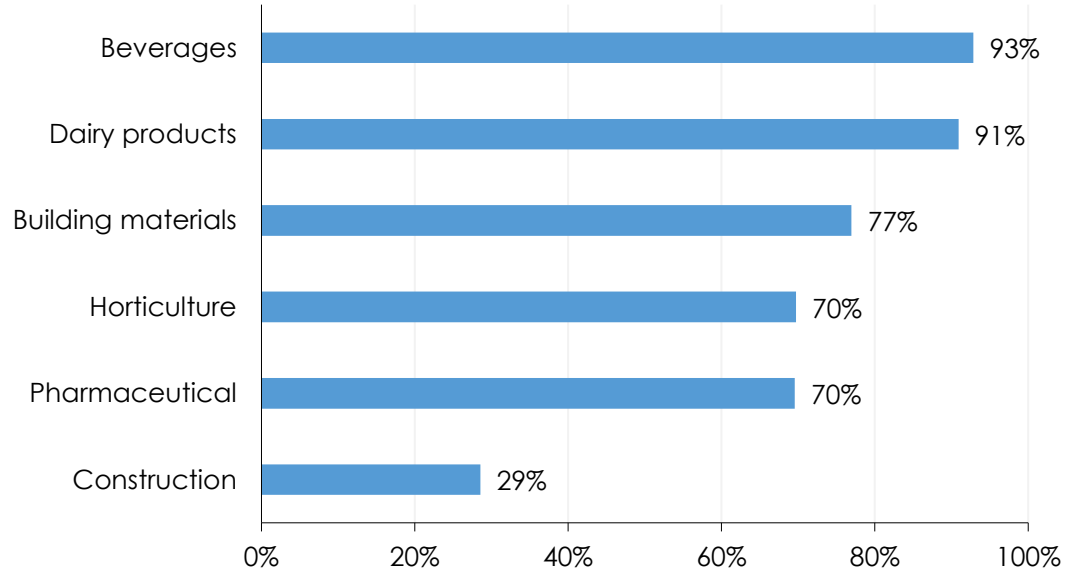


Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Does your establishment plan to invest into physical equipment, skills, organizational development during the years?", "If yes, in what field(s) will this planned investment be?"

3.3 Waste management

Waste management practices indicate great potential for improvement across all sectors. The respondents were asked how their residues and waste materials were treated or disposed. Four answer categories were offered: (i) Waste disposal is handled in house (e.g. burnt), (ii) by the municipality / state, (iii) by an informal company, (iv) by a formal company. If waste is disposed internally, it is likely that it is burnt or used as landfill. A higher score is assumed to indicate a less environmentally friendly waste treatment or disposal. In the entire sample, 73% report in-house waste management, it is most common in beverages (93%) and firms in the dairy value chain (91%) and least common in construction (29%) (see Figure 15).

Figure 15: **Share of firms with in-house waste disposal across sectors**



Source: WB Survey on Sectoral Value Chains in Uganda, WIFO illustration.
Note: "Any business produces residues and waste materials. How is the disposal currently managed in your firm?

4. Scoring and Results

The analysis allows a scoring of sectoral value chains. The analyzed dimensions capturing the economic growth potential enable a straightforward scoring. Due to the different dimensionalities of the underlying indicators, a straightforward ranking is implemented. Low scores indicate a higher growth potential (e.g., due to high employment growth aspirations), whereas higher scores indicate lower growth potential (e.g., due to more frequent reports of competitors from emerging or developed economies). Five dimensions are considered: (i) employment growth; (ii) export orientation; (iii) the value of export destinations; (iv) the fraction of firms considering themselves cost or price leaders; and (v) international competition from emerging or developed economies.

The overall ranking assigns the greatest growth potential to flori- and horticulture, beverages and the dairy industry. Drawing on the unweighted mean of the rank scores allows identifying the relative growth potential across sectors. Given the considered aspects of prospective growth, the ranking splits the sample in two rather distinct categories. The sectoral value chains with the biggest growth potential are flori- and horticulture, beverages and the dairy industry. A relatively lower growth potential exhibit pharmaceuticals – mainly because many firms pursue a price and cost leadership strategy, and because competition is fierce, construction and building materials – mainly because they are nontradable industries and, in the case of construction, firms face international competition (see Table 4).

Table 4: **A scoring of the economic growth potential across sectors in Uganda**

	Employment growth	Export orientation	Higher value export destination	Price leadership	Competition from emerging or industrialized economies	Mean Ranking
Horticulture	3	1	1	3	4	2.4
Beverages	1	2	4	5	1	2.6
Dairy	2	4	2	4	2	2.8
Building material	6	5	5	2	3	4.2
Pharmaceutical	4	3	3	6	5	4.2
Construction	5	6	5	1	6	4.6

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO.

The growth ranking is complemented by a sectoral scoring of sustainability. A sustainability analysis is implemented in an analogous manner to complement the growth ranking with the aim to enable growth to be environmentally friendly (see Table 5). Three dimensions have been considered: (i) the lack of environmental issues hampering business operations, (ii) a consideration of sustainable investments, and (iii) in-house waste management as polluting factor. Other aspects, such as investments into renewable energy, were not considered because investments into power generation were not planned (see Table 3). A lower ranking indicates a relative advantage of the sector over the other compared sectors.

Table 5: **A scoring of sustainability growth potential across sectors**

	Environmental issues do not hamper operations	Sustainability an investment priority	In-house waste disposal	Mean Ranking
Construction	5	2	1	2.7
Pharmaceutical	1	5	2	2.7
Building material	4	1	4	3.0
Horticulture	6	3	3	4.0
Beverages	3	4	6	4.3
Dairy	2	6	5	4.3

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO.

The sustainability ranking suggests that building materials, construction and pharmaceuticals are the value chains with relatively more environmentally friendly production. Yet, these are not the sectors that scored best in the growth prospect rankings. Drawing on the unweighted mean of the rank scores again allows identifying the relative performance of firms in sectoral value chains with respect to sustainability. The ranking again splits the sectoral value chains into two distinct categories. However, these reflect the grouping of the growth prospects with reversed signs. The sectoral value chains that the ranking classifies as the most sustainable ones are building materials, construction and pharmaceuticals, while the less sustainable sectors are flori- and horticulture, beverages and the dairy industry, these are, at the same time, the sectors with the highest growth potentials (see Table 6).

Table 6: **The sectoral growth and environmental rankings**

	Environmental ranking	Economic growth ranking
Construction	1	6
Pharmaceutical	2	5
Building materials	3	4
Horticulture	4	1
Beverages	5	2
Dairy products	6	3

Source: WB Survey on Sectoral Value Chains in Uganda, WIFO.

5. Conclusions

The starting point of this study was Uganda's lackluster export performance and its weak industrial diversification. Due to the growth of gold exports, the technological content has decreased from an already low level, and the portfolio shifted towards more competitive markets. The export portfolio is dominated by primary, often agricultural products. Given path dependence, an upgrading of the export portfolio is likely to benefit from the establishment of industrial ecosystems specializing in agro-processing.

To explore Uganda's economic diversification potential, this study draws on an innovative survey fielded in 2000. The findings reveal export and employment growth potential in Uganda, whose realization requires substantial investments. Policies seeking to stimulate sectoral economic growth should focus on the floriculture and horticulture, beverages and dairy. Their growth prospects are higher than in construction, building materials and pharmaceuticals, which were also included in the analysis.

Yet, Uganda's industrial development also raises environmental concerns. The nature of economic growth should be environmentally friendly to avoid costly clean-up measures due to aggravating climate change, and the establishment of environmentally unsustainable structures, and thus costly lock-in effects in a decarbonizing world. The survey data suggest that the sectors with the highest economic growth potential rank low in sustainability scores. This implies that the lever for green growth policies (e.g., green finance) is relatively high in these sectors if economic growth is designed to be achieved in an environmentally sound fashion from the outset.

The call for green growth is echoed by the status quo which shows environmental impacts already hamper the operations of the surveyed firms, and pressures of human-made climate change are likely to increase. Hence, green growth is an indispensable condition for potential and resilient growth strategies.

The enforcement of environmental regulation appears to be weak. No firm has reported fines for environmentally harmful conduct. While the absence of such illicit behavior is possible, it seems implausible. This strongly suggests challenges in the public administration and institutions related to the enforcement of environmental regulations, which green growth strategies should address.

Green growth includes investments into climate mitigation measures, in particular shifting investments from fossil fuels to renewable energy technologies, investments into resource- and energy efficiency as well as the waste management sector. In addition, policies should support technologies seeking to cope with the existing and future impacts of climate change, which are likely to be sector-specific (e.g., water management issues in flori- and horticulture could be addressed by irrigation measures). Such highly specific policy conclusions are beyond the scope of this study and require further analytical work.

Green growth requires supporting industrial sectors and a change of business practices. For instance, in-house waste treatment or disposal is likely to cause (especially local) pollution and

should therefore be reduced or be managed with state-of-the-art technology, implying a strengthening of the waste management sector. Again, this implication suggests policy recommendations, which cannot be drawn from the present data and require further work.

The findings provide an ex-ante baseline for policies facilitating the environmentally friendly developments of value chains. The indicators presented may serve as a baseline that can be used in monitoring and evaluation (M&E) frameworks.

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Appendix

The computation of complexity scores

Hidalgo - Hausmann (2009) have developed a procedure in which information about unobservable technological capabilities, or production factors, is obtained by analyzing the co-export patterns of products across countries. The rationale is that different technological capabilities are reflected in the export specializations of countries. If several countries systematically export the same products with a comparative advantage, it can be assumed that similar resources and production factors such as technical know-how or management skills are incorporated into the product. A high degree of specialization in these areas is indicated by a low number of exporting countries of a given product. These countries are likely to have developed unique selling propositions. The indicator maps the breadth and depth of the knowledge base required to produce an exported product.

To calculate the indicator, a matrix M x $M_{c,p}$ is formed, which for each country (c) shows the value 1 for the products that the country exports with a comparative advantage (i.e., RCA>1). It takes the value of zero otherwise. The sum over the products (p) of each country therefore provides a measure of the export diversification of that country

$$k_{c,0} = \sum_{p} M_{c,p} \cdots \text{Diversification} \quad (1)$$

The sum over all countries (c) exporting a product (p) is a measure of the distribution of a product in the export baskets of the exporting countries

$$k_{p,0} = \sum_{c} M_{c,p} \cdots \text{Ubiquity} \quad (2)$$

Since $M_{c,}$ represents a network, the information of all countries with a similar product portfolio and the information of all products exported by similar countries can be included in the output indicators. This is done by recursive substitution, from which a measure is obtained that shows how widespread the products exported by a country are,

$$\rightarrow k_{c,n} = \frac{1}{k_{c,0}} \sum_{p} M_{c,p}\, k_{p,n-1} \ldots \text{für } n \geq 1, \quad (3)$$

This also indicates the average diversification of countries exporting a given product.

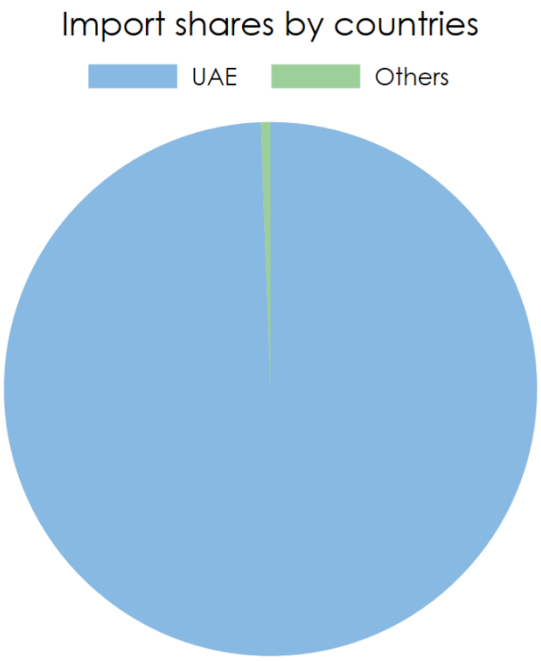
$$\rightarrow k_{p,n} = \frac{1}{k_{p,0}} \sum_{c} M_{c,p}\, k_{c,n-1} \ldots \text{für } n \geq 1. \quad (4)$$

The substitution procedure is repeated until the algorithm converges. However, this algorithm exhibits problematic convergence properties. Klimek et al. (2012) propose an alternative calculation especially for (4). Here, the eigenvector associated with the second largest eigenvalue of matrix is computed.

$$M_{pq} = \sum_{c} \frac{M_{c,p} M_{c,q}}{k_{c,0} k_{p,0}},$$

These are used as a ranking of the product complexity. However, the two methods lead to almost identical results. Since the analyzed network changes from year to year, and thus the calculated complexity values are directly comparable, this study reports standardized values rather than values directly calculated. Hence, the complexity values used are standard deviations from the international mean. For example, a product complexity value of 1.5 means that the calculated technology content of the product is 1.5 standard deviations above the international mean (of zero) in a given year. If the value were 1.5, the determined technology content of the product would be 1.5 standard deviations below the mean value. Since this mean value also changes from year to year, product complexity indicates the relative position of a group of goods relative to the mean value of all goods in a specific year.

Figure 16: **Export destinations of Ugandan gold from 2015 onwards**



Source: BACI data, WIFO illustration.