

Local Firms in Madagascar's Apparel Export Sector

Technological Capabilities and Participation in Global Value Chains

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Local Firms in
Madagascar's
Apparel Export
Sector: Technological
Capabilities and
Participation in Global
Value Chains

Lindsay Whitfield and
Cornelia Staritz



CAE Working Paper 2018: 3

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ABSTRACT

Structural transformation involves moving the economy away from a set of assets based on primary products exploited by unskilled labor toward knowledge-based assets exploited by skilled labor. The term technological capabilities refers to these knowledge-based assets—the technical, organizational and managerial skills necessary to achieve international levels of efficiency and quality. The objective of this working paper is to measure and assess the technological capabilities of local firms in the apparel export industry in Madagascar, as a first step before analyzing and explaining how firms have achieved these capabilities. In doing so, it uses original data generated from a firm-level survey specifically designed to measure technological capabilities based on strategically selected indicators across different categories of capabilities in apparel exports. Despite difficult country-specific conditions, particularly related to political instability, local apparel exporting firms have built significant levels of technological capabilities - but segmented along ethnic and product lines. The specific types of international linkages played an important role in capability building, particularly the specific niche and higher value product specialization that comes with a particular set of buyers and related global value chain dynamics as well as the more embedded types of foreign investment due to diaspora linkages with local firms and regional production strategies.

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Local Firms in Madagascar's Apparel Export Sector: Technological Capabilities and Participation in Global Value Chains

Introduction

Structural transformation involves a process of attracting human and physical capital out of unproductive and subsistence economic activities into more productive activities and enterprises. Thus many development economists define structural transformation as moving from low to high productivity economic activities (Lin 2012; Page 2012). However, this definition does not focus on the underlying processes that drive and sustain productivity growth. Another set of development economists, such as Alice Amsden (2001), argued that structural change involves moving the economy away from being a set of assets based on primary products exploited by unskilled labor toward an economy built on knowledge-based assets exploited by skilled labor. The term technological capabilities is used by other scholars to refer to these knowledge-based assets—the technical, organizational, and managerial skills necessary to achieve international levels of efficiency and quality.

For structural transformation to be sustainable, it cannot be driven entirely by foreign firms, but needs to also involve locally owned firms building their technological capabilities. Ownership matters. Foreign firms can leave when conditions internal and external to the host country change; whereas local firm owners are compelled to upgrade or shift into new activities and sectors. The higher technological capabilities locally owned firms have, the greater their ability to sustain national income growth by moving into higher value economic activities as well as responding flexibly to changes in domestic and international competition. Hence, if industrialization is pioneered by, and composed of largely or only foreign firms, then industries and hence structural transformation will not be sustainable, and there will be few backward and forward linkages within the economy, which generate further jobs and spread the wealth generated from export sectors.

This working paper analyzes the nature and level of technological capabilities among local firms in the Madagascar apparel export industry and their positions within apparel global value chains. African countries have very limited manufacturing experience historically compared to other parts of the world and for this reason face greater challenges in achieving structural transformation (Amsden 2008; Whitfield et al. 2015: 90-95). The apparel export industry is typically one of the first export sectors for less developed countries, especially in manufacturing, because it is labor-intensive and the technology in apparel assembly is mature and standardized. Thus, apparel is often perceived as an easy export sector to enter, but in the context of late-late industrialization which African countries face, it is still rather complex. First, preferential market access is still important for less developed countries to enter apparel exporting but its role as a competitive advantage has declined given the Multi-Fiber Arrangement quota phase out end of 2004 and the ongoing process of tariff preference erosion,

as more and more countries enjoy tariff preferences in the context of trade agreements (Bair 2008; Staritz 2011). Second, the requirements of global buyers that are the lead firms in apparel global value chains have become more stringent, leading to small margins for error for their supplier firms. As lead firms focus on core competencies such as design, marketing, and retailing, they demand more functions from their suppliers: not just manufacturing but also other processes such as input sourcing, stock holding, financing, logistics, and product development (Abernathy et al. 1999; Gereffi 1999; Palpacuer et al. 2005; Staritz 2011). In this context, global buyers also aim to have direct relationships with their suppliers, cutting out middlemen such as agents, which demands further functions from supplier firms. Third, there is tough international competition as many less income countries are integrated or aim to integrate in the apparel sector. Supplier firms in Asian but also from regional supplier countries - Central and Eastern Europe and North Africa for Europe and Central America for the United States (US) - are competitive, which includes offering broader capabilities that buyers increasingly demand (Frederick and Staritz 2011).

In a previous working paper, we identified what technological capabilities firms are required to have in the apparel global value chain at varying levels of functions and complexity (Staritz and Whitfield 2017). The conceptualization and operationalization of technological capabilities within apparel global value chains is further developed in this paper in order to measure and analyze local firms' capabilities, taking into account different firm trajectories. The first section provides an overview of the emergence of the apparel export sector in Madagascar in general and the local apparel exporting firms in particular. The second section explains how we collected data on the technological capabilities of local firms and how it was analyzed in order to calculate technological capability scores for each firm. The third section presents the results and discusses what these scores tell us about the challenges that local firms face in building technological capabilities. Firm names have been anonymized; thus, throughout the article, and in Tables 1 and 2, we refer to A-Firm, B-Firm, and so on.

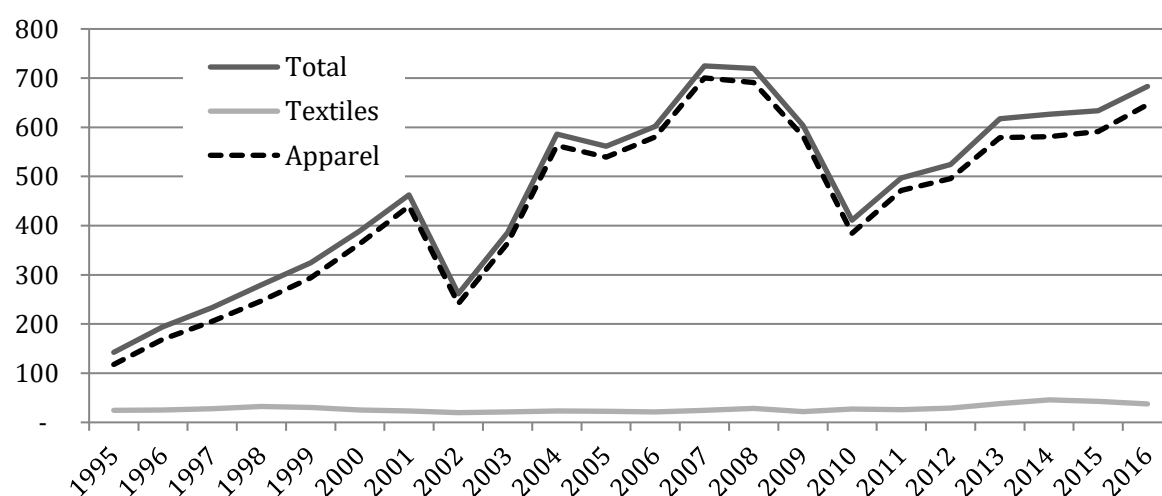
The analysis shows that the overall technological capabilities scores of local firms in Madagascar's apparel export sector are generally medium. These results are particularly determined by the specific product specialization of local firms in niche and higher value products and related buyers, end-markets and global value chain dynamics. Technological capabilities overall scores are correlated with the different types of local ownership. Firms with the highest technological capability scores are European-diaspora firms, and firms with medium range technological capabilities scores are more likely to be Indian-origin Malagasy firms; whereas, indigenous Malagasy firms' scores are generally low. Indigenous Malagasy firms faced the highest challenges in building technological capabilities. Despite difficult country-specific conditions, particularly related to political instability, local apparel exporting firms have built significant levels of technological capabilities - but segmented along ethnic and product lines. The specific types of international linkages played an important role in capability building, particularly the specific niche and higher value product specialization that comes with a particular set of buyers and related global value chain dynamics as well as the more embedded types of foreign investment due to diaspora linkages with local firms and regional production strategies.

Emergence and evolution of Madagascar's apparel export industry

The development of an apparel export industry in Madagascar was driven by several factors. In general, the key factors were relatively low labor costs and the Export Processing Zone (EPZ) law and incentives given to export firms, as well as foreign direct investment looking to take advantage of Multi-Fibre Arrangement (MFA) quotas and preferential market access to the European Union (EU) under the Lomé Convention and later the Everything But Arms initiative and to the US under the African Growth and Opportunity Act (AGOA) (Morris and Staritz 2014). However, the key driving factor in the emergence of the industry was French and Mauritian foreign direct investment seeking new low-cost alternatives, but driven by cultural affinities and geographic proximity. Later on, Asian investment driven by MFA quota hopping and AGOA trade preferences became important in the industry's growth, but this kind of foreign direct investment was volatile, as it was dependent on preferential access to the US market. The Madagascar apparel export industry was sustained by French and Mauritian firms as well as locally owned firms that predominantly supplied the EU market.

Figure 1 shows the takeoff of apparel exports in Madagascar from the 1990s, the dip caused by the 2002 political crisis and then a rebound by 2004 at a higher value than before the crisis, but then another big dip due between 2008 and 2010 due to the global financial crisis and Eurozone crisis compounded by another political crisis in Madagascar which led to the loss of AGOA trade preferences in 2010. The sector began a rebound in 2011 as EU exports expanded and new markets were sought, especially in South Africa. Exports plateaued in 2014 and started to rise again after 2016 as Madagascar was reinstated as a member of AGOA, and thus exports to the US started again, and several Mauritian firms returned to Madagascar to restart and expand their factories.

Figure 1. Total apparel and textile exports from Madagascar (in USD millions)



Source: UN COMTRADE 2018. Apparel represents HS92 61+62; textile represents HS92 50-60+63; exports represent partners' imports.

Inception and early development of the industry

Madagascar had a limited foundation of textile production due to import-substitution industrialization policies in the 1960s and 1970s, similar to many African countries. Textile was one of the largest industries in the country, with six textile firms producing for the domestic market, which included state-owned, semi-public owned and some private companies. Growth of the textile industry was driven by local cotton production and processing. However, during the 1990s, the locally owned textile industry was decimated, again like in many African countries, as local firms struggled to stay competitive in the context of trade liberalization and the massive importation of apparel products combined with state-owned companies' financial difficulties and high levels of debt due to mismanagement. The share of textile products on the domestic market by local companies fell from 66 percent in 1993 to 18 percent in 2002, with a large part of the domestic market captured by imported secondhand clothing (Maminirinarivo 2006: 185). At the same time that local firms lost the domestic market to imports, a new export sector in manufacturing apparel products was emerging, which was driven by foreign direct investment initially but local firms were present from the beginning and over time constituted a significant share of apparel exporting firms.

The Malagasy government established an EPZ in 1989 – called *zone franche* in Madagascar – as a way to attract foreign direct investment and boost exports (Fukunishi and Ramiarison 2012). The EPZ law was initiated by the Malagasy government as part of the structural adjustment economic reforms pushed by the World Bank in the late 1980s, which sought to reorient African economies outward through trade liberalization, reduced state intervention in the domestic economy, and the promotion of exports as opposed to import-substitution industrialization policies. The idea behind the *zone franche* status was to attract foreign exchange and create jobs, and the incentive package was modelled on the Mauritian EPZ. To support the nascent apparel export industry, the French Caisse Centrale de Cooperation Economique (now Agence Française de Développement) provided funding for a training center that was established by some of the first EPZ apparel firms, which included several French firms.¹

In the EPZ law, firms were not required to locate in a specific EPZ industrial park, but rather granted an EPZ status and had to export at least 95 percent of their production; companies supplying services and inputs to EPZ companies also benefited from the scheme. Qualifying firms were exempt from duties on exports and imports, from excise taxes, and from profit tax for a grace period of two to four years followed by a fixed rate of 10 percent. However, they had to pay value-added tax on imported inputs, which was introduced in 1997 in order to curb tax evasion and to prevent companies supplying the domestic market from setting up as EPZ companies. The value-added tax is supposed to be refunded with a proof of exporting. EPZ firms were also eligible for profit tax breaks equal to 75 percent of the cost of new investments, and were granted special access to foreign currency and freedom to expatriate profits.

¹ Interview with the founder of a French-diaspora firm, which was one of the first apparel export firms and part of the training center, Antananarivo, 24 October 2016.

The policy was successful, and by 2001, there were 213 firms with EPZ status, with apparel firms accounting for the majority of firms and capital investment, and EPZ firms contributed 10 percent of GDP (Maminirinarivo 2006: 179; Fukunishi and Ramiarison 2012). The share of EPZ firms in total exports rose to 42 percent by 2001, which Jean-Pierre Cling and colleagues (2005) note was a performance not matched by any other less developed country at that time. The EPZ was more successful than in other African countries not only in terms of number of firms but also in the sense that it spearheaded the apparel export industry and developed linkages with the local economy, rather than becoming an economic enclave, only exploiting low wages and preferential market access. It was a success because the emergence of the apparel export industry was driven by a specific kind of foreign direct investment and particular contextual factors, including geographic proximity to Mauritius and diaspora connections with France. The main foreign investors in export apparel firms in the 1990s were French, followed by Mauritian investors (Maminirinarivo 2006; Cling et al. 2005).

French apparel corporations chose Madagascar to offshore their labor-intensive apparel assembly, not only because of the country's preferential market access to the EU, EPZ incentives, and low labor costs, but also because of the language and the large French diaspora community. Mauritian apparel firms were squeezed between rising wages and the shrinking pool of labor in Mauritius by the early 1990s. They saw its neighboring island with a large population as a logical site for its most labor-intensive products such as knitted sweaters, but also for basic products with low unit prices, and factories could be set up with old machines as they upgraded machinery and moved into higher value apparel products and textile production in their firms in Mauritius (Gibbon 2000). This 'delocalization' of the Mauritian apparel industry created a form of triangular manufacturing in the region. Mauritian firms produced fabric in Mauritius and then exported it to Madagascar for use in apparel assembly, and in the case of woven fabric, Mauritian firms often bought fabric from Cotona, the only Malagasy textile mill, which aided its revival following the collapse of its production for the domestic market. Additionally, Madagascar shared language and cultural affinities with Mauritius, which facilitated investments by the Franco-Mauritian and Indian-origin owners of Mauritian apparel firms.

From 2000/01, AGOA provided preferential market access to lesser-developed countries in Sub-Saharan Africa on the basis of a single-stage rule: requiring only assembly in the country of origin. These countries could use fabric originating from anywhere in the world. This Third Country Fabric derogation rule was extended four times, to 2007, 2012, 2015, and most recently to 2025. Countries that do not qualify as lesser-developed countries such as Mauritius and South Africa could only enjoy preferential market access through a three-stage rule, which required yarn spinning, fabric weaving or knitting, and assembly to take place in the country of origin. Hong Kong firms that already had factories in Mauritius anticipated the implementation of AGOA under the Clinton presidency by 2000, and started investing in

factories in Madagascar from 1997/98 (Gibbon 2003).² In 2001 when Madagascar actually became eligible for AGOA, another flow of foreign investment was initiated by the Gulf states and by transnational producers from China and Sri Lanka. In the context of AGOA, some US buyers and agents established sourcing offices in Madagascar (Morris and Staritz 2014: 10).

Contractions of the industry in the 2000s

A major post-election political crisis and civil unrest in 2002³ led most Asian and Mauritian firms to leave the country and resulted in a sharp contraction in apparel exports that fell by almost 50 percent. The number of apparel firms declined to around 84 in 2002 (Morris and Staritz 2014). Firms that stayed in operation could not import or exports goods through the main port, and thus many of them missed contract deadlines, unless they used airfreight (Morris and Sedowski 2006). Global buyers often cancelled orders (Cling et al. 2005) and the sourcing offices for MAST, Li & Fung, Eddie Bauer, Gap, Dockers, and Levi's closed. There was a nationwide strike, and many firms closed their factories, with 80 percent of firms laying off workers and halting production for more than six months during the crisis.

The industry rebounded rather quickly after the political crisis ended, with exports not only returning to the pre-crisis levels but also exceeding them. Exports to the EU did not rebound as quickly because some Mauritian firms did not come back, and some Hong Kong firms left permanently (Gibbon 2003; Cling et al. 2005; interview notes). As Cling and colleagues point out, the parent companies of Mauritian firms had become multinational, with factories in other parts of the world and thus were able to choose between production in Madagascar and production in other countries such as India, Bangladesh, and China (Cling et al. 2005: fn 8). French investment sustained exports to the EU, because French firms were either the subsidiaries of small firms in France, or were owned by French nationals living in Madagascar. These firms had no choice but to hold out through the crisis, and often had to start over with new buyers.

EU exports did not decline around the MFA phase out end of 2004 whereas apparel exports to the US did. Many Asian-owned firms in Madagascar closed after the end of the MFA. This is

² The Mauritian apparel export sector originally emerged as the result of foreign direct investment from Hong Kong and European firms in the 1980s, combined with local Mauritian investors shifting out of the sugar industry and diversifying from the import trade.

³ The December 2001 presidential election led to a half-year stand-off between the incumbent president Didier Ratsiraka and Antananarivo's mayor Marc Ravalomanana, who contested the election (Ploch and Cook 2012). Official results of the election showed that Ravalomanana did not pass the necessary 50 percent threshold to avoid a run-off election. Ravalomanana refused to participate in a run-off election, citing electoral irregularities and claiming that he had won based on the first round. In February 2002, he declared himself the winner of the election, and the Malagasy High Constitutional Court agreed that a run-off was not necessary. Ravalomanana was sworn into office in May, but Ratsiraka continued to reject the election results. The two sides organized their supporters and engaged in limited armed confrontations: Ravalomanana based in the capital city and Ratsiraka with a parallel government based in Toamasina, a coastal city in eastern Madagascar where the main port is located. Ratsiraka's followers cut communications, roads, and bridges, leaving the capital city with no access to the sea or to basic supplies. The conflict ended in July 2002, when Ratsiraka fled to France.

because foreign direct investment by Asian transnational producers was driven largely by ‘quota hopping’, seeking out low cost production locations that had not used up their quotas to the US market. Now they would be free to locate in countries previously restrained by quotas, most importantly China, which had higher labor productivity and efficiency. In contrast, French corporate and Mauritian firms, as well as locally owned firms, supplying the EU market did not leave. However, also not all Asian-owned firms left; it depended on their product line and type of buyer. Asian-firms producing basic denim and T-shirts were reducing their production in Madagascar, as they had been hit by intense international competition forcing down prices, while the outlook for Asian firms producing other products and producing for the EU market was stable, largely due to an increase in knit exports, especially jerseys and pullovers (Morris and Sedowski 2006). Furthermore, the decline in apparel exports after the MFA phase out was also lower than expected due to the significant depreciation of the Malagasy currency against the US dollar and Euro in 2004, which stimulated exports and reduced the costs of production just before the end of the MFA (Morris and Sedowski 2006: 7).

Between 2004 and 2008, manufactured exports (mostly apparel) overtook primary commodities as the largest source of export earnings, accounting for 74 percent in 2008 (Fukunishi and Ramiarison 2012). In 2007, apparel exports reached their highest level accounting for US\$ 725. The number of EPZ apparel firms rebounded to 131 in 2008, providing jobs to around 100,000 workers. The apparel export industry has an important social impact, providing jobs to workers who had not completed primary education, and paying wages that were substantially higher than that offered by the informal sector (Glick and Roubaud 2006; Fukunishi and Ramiarison 2014).

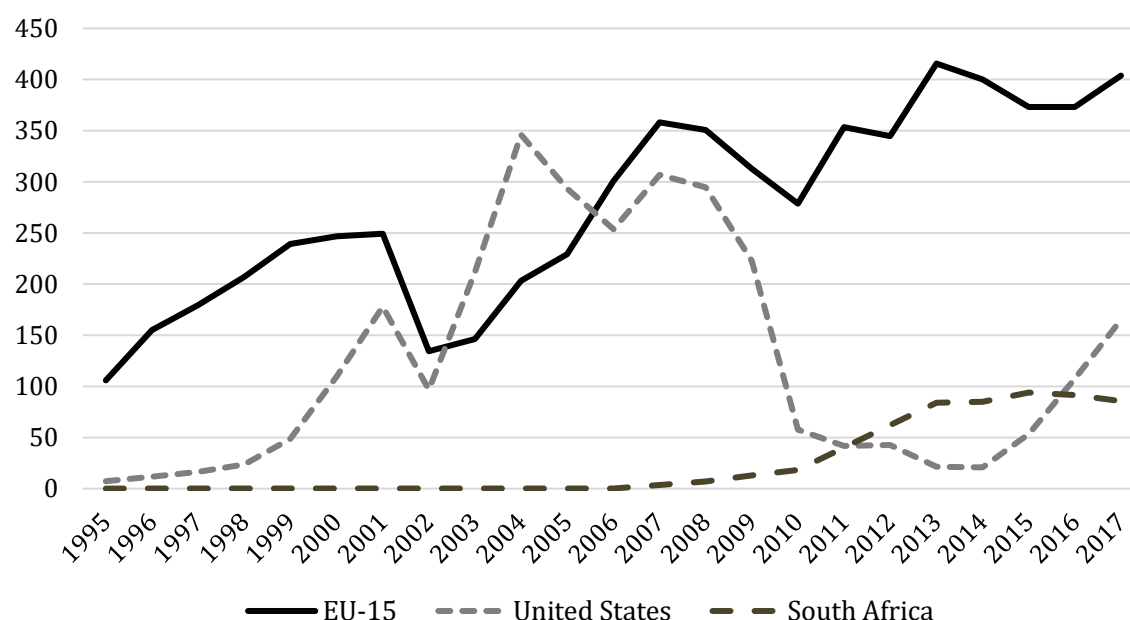
The industry’s growth was disrupted again between 2008 and 2010 due to effects of the global financial crisis and the subsequent Eurozone crisis, and more importantly the political crisis and coup in 2009, which led the US to suspend the country’s AGOA status in 2010.⁴ Apparel exports to both the US and EU markets declined dramatically in 2009, and continued to decline after 2010 with the loss of the AGOA status. The share of the US market in total exports decreased from 43 percent in 2008 to 15 percent in 2010. By early 2012, the number of apparel export firms fell to an estimated 60 to 70 firms and around 55,000 employees (Morris and Staritz 2014). The massive closure of firms supplying the US market indicates that most firms preferred to switch production locations rather than switch markets, but some firms did survive by switching to other markets (Fukunishi 2013). Based on our interviews with foreign firms in

⁴ Conflict between President Ravalomanana and Andry Rajoelina, who won the December 2007 election for mayor of Antananarivo, the only major political position not held by Ravalomanana’s political party, simmered throughout 2008 and erupted in early 2009. Rajoelina became a rallying point for the opposition political parties (Ploch and Cook 2012). Amidst growing public protests and violence between supporters of the two sides, Rajoelina attacked and occupied the presidential palace in March 2009, with support from the military. This attack resulted in the resignation of President Ravalomanana and the emergence of Rajoelina as head of a transitional government. The US, the African Union, and many other countries did not recognize the new president, as the leadership change occurred outside of democratic elections. The US suspended AGOA imports from Madagascar in 2010, because insignificant progress was made towards holding elections (Fukunishi 2013).

2017, we found that only one Asian firm switched from the US to the EU market after the loss of AGOA, and it only produced at low capacity in order to cover overhead costs; once AGOA status returned in 2015, it began producing for the US market again. A few Asian firms did not leave the country but rather closed the factory down; they owned the land and building (rather than renting a shed in an industrial zone) and did not want to sell in a ‘down’ market, and decided to wait for the return of AGOA.

The remaining foreign and local firms focused on the EU market and on accessing new end-markets such as South Africa, as shown in Figure 2. The elimination of duties within the Southern African Development Community (SADC) combined with the South African government implementation of quotas on Chinese apparel imports between 2007 and 2008 sent South African buyers looking for regional suppliers in Mauritius, Lesotho, Swaziland, and Madagascar (Morris et al. 2016). The increase in exports to South Africa reflects the increase in Mauritian apparel exports to South Africa, and Mauritian-owned factories in Madagascar following suit. Locally owned firms also tried the South African market, but many indicated in our survey interviews that they had stopped supplying South African buyers because the prices were too low.

Figure 2. Exports from Madagascar to the US, EU-15, and South Africa (in USD millions)



Source: UN COMTRADE 2018, EUROSTAT 2018. Apparel represents HS92 61+62; exports represent partners' imports. Data for EU-15 for the year 2017 are derived from EUROSTAT and converted in USD.

There were no industrial policies in the apparel export sector during the 2000s. Morris and Sedowski (2006: 7) note that firms repeatedly mentioned the government's lack of interest in

the apparel export industry despite its employment and revenue generation importance for the country. Political elites were embroiled in conflict that could not be contained within the political institutions, and the country was on the brink of civil war twice. Nevertheless, despite important contradictions, the apparel export industry continued to grow. One of the main attractions of the country was the low wage costs and an abundant supply of labor, and over time, a pool of labor with experience working in apparel factories and thus an increasingly productive workforce. The infrastructural situation in Madagascar was not particularly competitive, as firms faced problems with customs, inland and sea transport, electricity costs and reliability, telecommunications, and rent increases (Morris and Sedowski 2006). The other main attraction for foreign direct investment was preferential market access, which shaped the flows of foreign direct investment with the increased international competition due to the MFA phase out, and the loss of preferential access to the US market under AGOA being most important.

Recent rebound of the industry

By 2016, Madagascar was again the second largest apparel exporter among Sub-Saharan African countries, after Mauritius. Two factors were key to the rebound of the Madagascar apparel export industry. The first was the return of AGOA in 2015, and the second involved Mauritian investment. Madagascar was reinstated as a member of AGOA in June 2014, following democratic elections in the country in late 2013. According to firms interviewed, exporting with AGOA preferences only became operational in February 2016, and firms have begun to search for US buyers. Thus, there is potential for growth in apparel exports to the US market and exports increased already from a low of USD 20 million in 2014 to USD 165 million in 2017 (UN COMTRADE 2018). However, it is unlikely that foreign firms will return to Madagascar on the scale previously seen, as Madagascar is still a risky bet and Ethiopia provides a new opportunity for Asian firms looking to produce in Africa in order to benefit from AGOA. By the end of 2017, we identified only five new (or returning) Asian firms producing for the US market.

In 2016, Mauritian firms that previously had investments in Madagascar returned, such as Compagnie Mauricienne de Textile—the largest firm in Mauritius, and other Mauritian firms expanded their existing activities in Madagascar by opening new factories. These developments were linked to both the perceived political stability and the return of AGOA as well as the general strategies of Mauritian firms in the region.

In the late 2000s, in response to the MFA phase out and continued labor shortages and increased costs in Mauritius, large and medium-sized Mauritian firms adopted new strategies. They specialized in product design and offering services linked to fast fashion and smaller orders, while at the same time they kept basic products in order to balance their product portfolio and developed brands and retail shops in the domestic market. This strategy accelerated in recent years, as the European buyers of Mauritian firms want smaller orders of many different styles and colors. Therefore, the large Mauritian firms with investments in Madagascar retained a

headquarters in Mauritius focused on design and marketing and factories concentrated on fast fashion products along with fabric mills, and used factories in Madagascar to sew long run, basic products using fabric produced in Mauritius. Buyers allow longer lead times when it comes to long run, basic products, and thus factories in Madagascar could be competitive, despite requiring more time for transporting materials in and out of factories. The largest Mauritian firms are vertically integrated with their own fabric production, as a result of strategies pursued in the 1990s to make them more competitive given the distant location of Mauritius. This provided a means for small and medium Mauritian firms to survive by buying fabric locally. These fabric mills also supplied their companies' apparel factories in Madagascar, as well as other firms located in Madagascar, especially locally owned firms, reducing their costs of sourcing fabric abroad.

Apparel firms in Mauritius found it increasingly difficult to operate there, as very few people wanted to work in factories, and thus Mauritian firms increasingly moved their assembly production to Madagascar, and a few even moved textile production. They kept factories in Mauritius that produced fast fashion items and specialized in fabric development and product design, while their factories in Madagascar produced basic products, which were not affected by the longer lead time in Madagascar due to poor infrastructure and more limited port facilities.

Another important change in Mauritian firms' strategies that affected the development of the Madagascar apparel export industry was the shift to the South African market and development of regional production networks. The global financial crisis and the Eurozone crisis led to falling European demand and prices, due to currency depreciation, for apparel products produced by Mauritian firms. In response, Mauritian firms sought new markets, of which the most successful was South Africa. South African retailers were previously sourcing from Asia, but Mauritian firms received an advantage with the introduction of duty-free access under SADC and the quotas on Chinese apparel imports between 2007 and 2008. Mauritius firms are able to meet the double transformation rules of origin requirements in order to benefit from SADC trade preferences because there is significant fabric production in Mauritius. Hence, the South African market increased its share in total Mauritian apparel exports from barely 1 percent in 2005 to 15 percent in 2016, but still remained behind the EU-15 (43 percent) and the US (28 percent) (see Table 1). In the case of Madagascar, apparel exports to South Africa also increased from 0 percent in 2005 to 14 percent in 2016, which was largely driven by Mauritian-owned firms. The EU-15 market accounted for 58 percent and the US market rebounded from 4 percent in 2014 to 17 percent in 2016 (see Table 2).

Table 1. Mauritius' end-markets of apparel exports (in USD million, and in %)

Year	2000	05	10	14	15	16		2000	05	10	14	15	16
<i>World</i>	1,017	851	791	876	811	728							
EU-15	729	642	506	391	366	316		71.7	75.4	63.9	44.6	45.1	43.4
United States	245	175	126	230	222	203		24.1	20.6	15.9	26.3	27.3	27.9
South Africa	1	9	69	130	113	109		0.1	1.0	8.7	14.9	13.9	14.9
Australia	1	0	6	10	13	13		0.1	0.0	0.7	1.1	1.6	1.8
Czech Republic	0	2	18	22	17	13		0.0	0.2	2.2	2.6	2.2	1.7
TOP 5								95.9	97.3	91.6	89.4	90.1	89.7

Source: UN COMTRADE 2018; apparel represents HS92 61+62; exports represent partners' imports.

Table 2. Madagascar's end-markets of apparel exports (in USD million, and in %)

Year	2000	05	10	14	15	16		2000	05	10	14	15	16
<i>World</i>	364	539	384	581	591	646							
EU-15	247	229	279	400	373	373		67.8	42.5	72.6	68.9	63.1	57.8
United States	110	293	58	21	53	107		30.1	54.4	15.0	3.6	9.0	16.6
South Africa	0	0	18	85	94	92		0.0	0.0	4.7	14.6	15.9	14.2
Canada	1	7	6	8	8	8		0.3	1.4	1.7	1.4	1.4	1.2
China	0	0	2	6	8	7		0.0	0.0	0.6	1.0	1.3	1.1
TOP 5								95.9	97.3	91.6	89.4	90.1	89.7

Source: UN COMTRADE 2018; apparel represents HS92 61+62; exports represent partners' imports.

Regional integration goes even further as it does not only involve the end-market side but also input sourcing. Mauritian firms source most of their cotton from Sub-Saharan African countries and then spin, weave, or knit in Mauritius, and sell to apparel firms in Mauritius and Madagascar. As Table 3 regarding imports of cotton, yarn and fabric in Mauritius shows, 9 out of the top 10 cotton exporters to Mauritius are Sub-Saharan African countries. The number one exporter is India accounting for 25 percent of imports in 2017, followed by Mozambique (21 percent), Zambia (12 percent) and Madagascar (9 percent). For yarn and fabric imports, there are no Sub-Saharan African exporters in the top 10, which makes sense as Mauritius has the most developed spinning and knitting/weaving facilities in Sub-Saharan Africa. The dominant exporters of yarn and fabric to Mauritius are China and India. For yarn imports in 2017, India accounted for 58 percent and China for 13 percent; whereas, for fabric imports, China accounted for 63 percent and India for 12 percent. For Madagascar, Mauritius ranked second for yarn and fabric imports in 2016, accounting for 18 percent for yarn and 15 percent for fabric imports, as shown in Table 4. Yarn imports accounted for less than a quarter of fabric imports given the limited existence of fabric mills in Madagascar.

Table 3. Mauritius' imports of cotton, yarn, and fabrics (in USD million, and in %)

Year	2000	05	10	14	15	16	17		2000	05	10	14	15	16	17
COTTON															
<i>World</i>	20	25	35	44	47	34	48								
India	1	10	7	2	0	1	12		4.0	37.7	20.0	3.6	0.9	3.9	24.8
Mozambique	0	1	3	12	17	10	10		0.0	5.3	7.6	26.7	35.4	29.7	20.9
Zambia	0	7	6	3	0	5	6		0.0	26.8	16.8	7.4	0.0	16.1	12.4
Madagascar	0	0	0	9	10	4	4		0.0	1.1	1.0	21.2	22.1	10.6	9.3
Tanzania	1	0	3	6	4	2	3		3.2	0.0	8.9	12.6	9.2	7.0	7.4
TOP 5									7.2	70.9	54.2	71.5	67.6	67.3	74.7
YARN															
<i>World</i>	164	104	77	73	59	60	72								
India	94	57	44	34	31	31	42		57.1	55.2	57.1	46.7	52.5	51.8	58.4
China	16	8	9	13	9	8	9		10.0	7.7	11.7	17.2	15.1	13.9	12.5
Pakistan	11	9	3	10	6	2	5		7.0	9.1	4.2	13.4	10.0	3.4	7.5
EU-15	20	11	6	6	4	4	5		12.2	10.3	8.0	8.3	6.6	7.2	7.1
Vietnam	0	0	1	2	2	4	4		0.0	0.0	0.7	2.4	3.4	5.9	4.9
TOP 5									86.2	82.4	81.6	88.1	87.7	82.3	90.4
FABRICS															
<i>World</i>	232	127	137	164	149	139	132								
China	77	60	80	108	101	90	82		33.3	47.7	58.3	65.4	67.8	65.2	62.5
EU-15	42	27	25	23	17	18	18		18.1	21.7	18.3	14.1	11.4	12.7	13.6
India	18	9	13	16	14	15	15		7.6	7.4	9.3	10.0	9.4	10.9	11.7
Hong Kong, China	32	5	3	3	3	2	2		13.8	4.0	2.5	1.7	2.2	1.7	1.6
Bahrain	0	0	0	0	1	2	2		0.0	0.0	0.0	0.2	0.6	1.4	1.4
TOP 5									72.8	80.8	88.5	91.4	91.3	91.8	90.8

Source: UN COMTRADE 2018; textile represents HS92 50-60+63.

Table 4. Madagascar's imports of yarn and fabrics (in USD million, and in %)

Year	2000	05	10	14	15	16		2000	05	10	14	15	16
YARN													
<i>World</i>	74	67	97	65	57	61							
China	45	55	44	24	23	26		61.4	81.3	45.7	36.3	39.8	41.9
EU-15	10	5	16	13	10	11		14.1	7.5	16.2	19.4	17.3	17.6
India	2	1	3	11	8	9		2.1	2.1	3.0	16.7	14.5	14.8
Hong Kong, China	10	2	9	7	7	7		13.3	3.1	9.3	10.3	12.5	11.1
Bahrain	1	0	1	4	3	3		1.2	0.7	1.1	6.4	4.7	5.7
TOP 5								92.0	94.6	75.2	89.1	88.8	91.2
FABRICS													
<i>World</i>	116	179	120	257	237	261							
Unspecified	24	20	10	110	88	78		20.6	11.1	8.3	42.7	37.1	29.8
China	16	67	14	45	50	76		13.9	37.5	11.9	17.5	20.9	29.1
Mauritius	31	17	21	47	42	40		26.7	9.5	17.5	18.1	17.7	15.4
EU-15	18	17	56	24	26	26		15.5	9.5	46.3	9.2	11.1	10.1
Pakistan	2	5	5	14	13	13		1.5	2.9	4.0	5.3	5.5	5.1
TOP 5								78.3	70.6	88.1	92.9	92.4	89.5

Source: UN COMTRADE 2018; textile represents HS92 50-60+63.

Characteristics of local apparel exporting firms

In 2017, there were 68 apparel firms in Madagascar producing for export directly, or indirectly through subcontracting, meaning that they have no direct buyer relationships but work for another apparel firm based in Madagascar.⁵ Only four firms were integrated, meaning that they produced textile and apparel. Of the 68 firms, almost half were locally owned. Among the 32 local firms, twelve exported mainly through subcontracting for other firms. There is one locally owned integrated firm producing woven fabric for its own apparel production and for supplying other firms, mostly local firms. As shown in Table 5, Mauritian firms constitute the majority of foreign firms, followed by Asian and European firms (the majority of which are French). There was one US firm, which was formerly a French and French-diaspora owned firm but recently a US corporation bought the majority share owned by the French firm. There was also one South African firm, which recently bought a Mauritian firm. The Mauritian firms (and the one South African firm) were more embedded and had more local decision-making power given their regional proximity and regional triangular manufacturing. Most of the Mauritian investors did not have global investment and sourcing strategies and their investments were taking place in the context of a regional integration and increasingly regional replacement strategy.

Table 5. Overview of firms in the apparel export sector, 2017

Ownership	Total	Integrated	Apparel	Subcontracting
<i>Local firms</i>	32	1	19	12
<i>Foreign firms</i>	36	3	26	7
Mauritian	16	1	10	5
European	6		6	
Asian	10		8	2
US	3	1	2	
South African	1	1		
Total	68			

Source: Data collected by the authors.

In addition to the textile and apparel firms, there are twelve input supplier and service provider firms, and two firms importing machinery for the Madagascar apparel export industry. Many input and service supplier firms relocated from Mauritius to Madagascar in the 1990s, following on the heels of the Mauritian apparel firms that were opening factories in Madagascar. By 2016, only a modest number of these firms remained, and they existed alongside locally owned firms and some other foreign firms that emerged to provide services to apparel export firms. The sector has several firms providing accessories, labels, and thread. For example, Tanacrex was established in 1983 in Mauritius and established a factory in

⁵ It was difficult to confirm all operational apparel firms in Madagascar, because the government agencies and industry associations did not have complete lists. These numbers are based on contacting all the firms on lists acquired from the Economic Development Board of Madagascar, combined with asking firms about the list and about firms they knew existed that were not on the list. We hence realize that this list may not be complete. It is particularly likely that there were more subcontracting firms, because some firms mentioned that they subcontracted work but would not identify to whom and whether they were registered firms.

Madagascar in 1994, to produce buttons, labels, and other accessories for apparel firms. Another example is Coats, the world's largest industrial thread producer and second largest supplier of zippers, which established a factory in Madagascar. Other input supplier firms are just sourcing firms, but buy in bulk and sell to apparel firms for which it would be difficult to source directly. There are several firms providing printing, dyeing, and embroidery services, some of which are locally owned, including by indigenous Malagasy. Thus, firms located in Madagascar have the option of outsourcing these services rather than having to provide them all in-house. There are also local providers of polybags and carton boxes, which are used by the locally owned apparel export firms.

The EPZ law aimed initially at attracting foreign direct investment, and thus apparel EPZ firms were foreign-owned at the beginning (Fukunishi and Ramiarison 2012). But Malagasy firms started investing as EPZ firms as well and accounted for 11 percent of total EPZ firms in 1997, with no data on how many of these firms were in apparel. Fukunishi and Ramiarison (2012) report that in 2008, 23 percent of EPZ firms had Malagasy owners. Morris and Staritz (2014) estimated that there were 50-60 apparel firms with EPZ status in 2009, which they categorized into four types of firms based on ownership. They noted that 10 percent of the apparel firms had Asian ownership, 23 percent were Mauritian, 45 percent were European/French diaspora, and 15 percent were indigenous Malagasy, with the remaining firms owned by other nationalities such as American and Canadian.

Types of local ownership

Our definition of local firms in Madagascar includes indigenous Malagasy, Indian-origin Malagasy, and European-French diaspora.⁶ This definition emphasizes locally embedded entrepreneurs and their firms, which remained in Madagascar even when internal and external shocks caused foreign firms to close down their factories and leave the country. Of the 32 local firms, 15 are indigenous Malagasy firms, 9 are European-French diaspora, 7 are Indian-origin, and 1 is identified as Chinese-origin Malagasy.⁷

French foreign direct investment was crucial to the emergence of the Madagascar apparel export industry, but French investments took different forms. Some French investments became locally embedded with decision-making residing in Madagascar and others were locally embedded from the beginning through investment by the French-diaspora living in Madagascar. There is also French investment that continued to have headquarters and decision-making abroad in France, which includes four French corporate firms in 2017. In the 1990s, 11 percent of investment in apparel export firms came from local residents, many of whom had French nationality or some kind of French connections, and aimed to export to the European

⁶ Hence, we expand the categorization by Morris and Staritz (2014) differentiating between French corporate firms, which are considered foreign firms, and French/European-diaspora firms, which are considered local firms, and identifying a third local firm category, Indian-origin Malagasy firms.

⁷ This last firm (U-Firm) did not consent to participate in the survey, so we could not confirm the background of the owner, but we were told by other firms. There is a very small group of Chinese-origin Malagasy in Madagascar.

market, especially France (Cling et al. 2005). These French investors (and a few other European nationalities) resided in Madagascar with their families often initially having partners in France, but over time becoming the majority owners and the firms becoming locally embedded. French-diaspora investors developed linkages with French and Mauritian investors through joint ventures, working in their firms, buying out these firms, or through subcontracting. Partnerships and subcontracting were facilitated by language and cultural affinities. Some French-diaspora investors initially had help from contacts in France to find buyers, and accessed investment capital from French-diaspora friends in Madagascar that owned businesses in other sectors or from European banks or minority partners based in European countries.

Indian-origin Malagasy also had strong French connections, as most have French citizenship for reasons specific to the nature of decolonization in Madagascar. The Indian-origin community dominated the economy prior to independence, despite being a very small part of the population, and continued to dominate afterwards, owning some of the largest diversified business groups in trading, real estate, telecommunications, and banking.⁸ The independence government was reluctant to give the minority Indian community Malagasy citizenship. As a result, some Indian-origin Malagasy have French citizenship, which they were given during colonial rule, and this is the case for most of the Indian-origin Malagasy that own apparel firms. The Indian-origin investors in apparel exports typically were part of families that had diversified business groups, and as a result, they do not have problems accessing capital as other businesses can be used as collateral with the banks when applying for investment loans. The only locally owned textile mill, Cotona, belongs to an Indian-Malagasy family that now has one of the largest diversified business groups in Madagascar.

In contrast to the other two groups, the owners of indigenous Malagasy firms find it much more difficult to access investment and working capital finance, and therefore, they typically started out by subcontracting for other firms. Their owners tend to be from the Malayo-Indonesian ethnic group, which dominates in the highland areas, including the capital city Antananarivo and the neighboring city of Antsirabe. All of the apparel exports firms are located in these two cities due to the availability of infrastructure, better-educated workers, and proximity to the airport (Morris and Sedodwski 2006).

Characteristics of local firms

Table 6 provides a summary of the key characteristics of local firms in terms of ownership category, firm's age (year it started exporting), size (number of employees), main products

⁸ Records show that Indians came to Madagascar as traders at least from the late eighteenth century, and they continued to migrate during French colonial rule in the first half of the twentieth century. They were traditionally traders, carrying Indian textiles to exchange for other goods, particularly gold, and they started distribution systems within the interior. Indian merchants eventually came to monopolize trade in Madagascar. For this reason, the Indian-origin community played a dominant role in the Madagascar economy post-independence, despite being a small part of the population.

exported, main end-markets, and function within the global value chain. Several of the local firms have been exporting since the 1990s, including firms across all types of ownership but predominantly European-diaspora firms. Most of the remaining firms that directly export have been doing so since the early 2000s. Notably, the firms that are more recent in age are all indigenous Malagasy firms that are subcontracting for other firms, and almost all of them were started by people with previous experience working in foreign firms or also local apparel exporting firms (but mostly European-diaspora owned local firms). Notably, indigenous Malagasy firms are smaller in size compared to the other two categories of local firms, employing on average 98 workers compared to 847 for the European diaspora firms and 611 for the Indian-origin firms.⁹

Local firms generally produced niche products and higher value products compared to most other less developed apparel exporter countries, and compared to the Mauritian, European, and Asian owned foreign firms in Madagascar, which mainly produced basic products on a large scale (basic knitwear, woven trousers, medical uniforms) and intermediate products (casual and formal shirts, sportswear, lingerie). The main categories of products among local firms include: (1) children's clothes (14 firms); (2) high-end workwear and corporate wear (8 firms); (3) knitted pullovers (3 firms); and (4) casual and high-value fashion clothes (4 firms). Only three local firms produced basic apparel products.

⁹ We excluded the largest Indian-origin firm, which is an integrated textile and apparel firm with 7244 employees, as it is an outlier.

Table 6. Overview of the local apparel export firms in Madagascar, 2017

Firm	Year started exporting	Employees	Ownership	Main products	Main end markets	Function
A-Firm	2001	3000	ED	Knitted pullovers	EU, US, SA	FOB. Dye/knitting.
B-Firm	2003	550	IOM	Sleepwear, children's wear	EU, SA	FOB
C-Firm*	1998	1200	ED	High fashion	EU	CMT, some FOB
D-Firm	2008**	600	ED	Women's fashion	EU	FOB, some ODM
E-Firm*	(1990s)	447	ED	Children's wear	EU	FOB
F-Firm	2000**	400	ED	Children's wear	EU	FOB, some ODM
G-Firm	1992	200	ED	Workwear	EU	FOB, CMT
H-Firm*	2008	7244	IOM	Woven fabric, fashion clothes	EU	FOB-textile, FOB
I-Firm	1998	900	ED	Knitted pullovers	EU, US, SA	FOB. Dye/knitting.
J-Firm	1996	400	IOM	Children's wear	EU	FOB
K-Firm	2012 subcon 2014 tried direct	600	IOM	Sportswear, T-shirts	Trying for US, SA, and Réunion markets	Mostly CMT-sub, no stable direct buyers yet
L-Firm	1996	700	IOM	Children's clothes	EU	FOB
M-Firm	1996	520	IOM	Children's clothes	EU	CMT, FOB
N-Firm	2003	100-120	IM	Children's clothes	EU	Mostly CMT-sub
O-Firm	1994 subcon 1999 direct	300	IM	Winter jackets, Sub con: children's clothes	EU, Australia	FOB, CMT
P-Firm	2003	200	IM	Children's clothes	US, EU, Australia	CMT. Some design.
Q-Firm**	2010	500	ED	Workwear	EU	CMT, FOB
R-Firm	1994	50	IM	Children's clothes, luxury	EU, US, Japan	CMT, FOB, design
S-Firm	2001	63	IM	Children's clothes, luxury	EU	CMT, FOB
T-Firm	1998	40	IM	Children's clothes, luxury	EU mostly	CMT, FOB, design
U-Firm*	2009	112	COM	Shirts & shorts, bed linen	Réunion, SA, EU	CMT, FOB
V-Firm*			IM	Knitwear	--	CMT, FOB
W-Firm	2011	50	IM	Mostly children's wear	--	CMT-sub
X-Firm	2003	190	IM	Mostly children's wear	--	CMT-sub
Y-Firm	2014	160	IM	Workwear	--	CMT-sub
Z-Firm*	2014		IM	Workwear	--	CMT-sub
AA-Firm*	2016	23	IM	Workwear	--	CMT-sub
BB-Firm*	2016		IM	Workwear	--	CMT-sub
CC-Firm	2014	50	IM	Workwear	--	CMT-sub
DD-Firm	2016	150-259	IM	Pullovers, knitwear	--	CMT-sub
EE-Firm*	2007	1500	IOM	Military uniforms	--	CMT-sub
FF-Firm*	2017**	150	ED	Children's wear	--	CMT-sub

Source: Data collected by the authors.

Notes: *Firms that declined to participate in the survey. ** This firm bought an existing factory.

European diaspora= ED; Indian-origin Malagasy= IOM; Chinese-origin Malagasy=COM; Indigenous-Malagasy= IM

The main end-market is the EU, which 13 firms out of the 21 firms (for which we have information on end-markets¹⁰) solely supply. Another 7 firms supply the EU together with other end-markets including the US, South Africa, and to a lesser extent Australia, Japan, and Réunion (a French island). Most firms are involved in FOB production with an important share doing FOB and CMT depending on the type of product and the related buyers. Few firms provide design and hence also supply partly on an ODM basis and, in addition to the knitting firms that have to do fabric and apparel production jointly, only one firm is involved in FOB-textile. An important share of indigenous firms does CMT-subcontracting for other local and foreign firms.

Measuring the technological capabilities of local firms in apparel exports

We developed a technological capabilities matrix specified for the apparel global value chain, which we then used as the basis for designing a survey questionnaire to capture information on the categories of capabilities.¹¹ We administered the questionnaire to 23 of the 32 local export firms through face-to-face interviews between November 2016 and November 2017. The remaining nine firms declined to participate in the survey. We scored the local firms on the function they perform within the apparel global value chain as well as on indicators of four categories of capabilities: product, production process, end-market, and linkages. Of the many indicators we included in the matrix and the questionnaire, we selected only a few indicators for the technological capability scoring exercise, in order to make it comparable among the firms. The selected indicators for product, production process, end-market, and linkages categories include both quantitative and qualitative data. Furthermore, we tried to balance indicators that measure quantity with indicators that measure quality within each category of capabilities. Table 7 presents the technological capabilities scores of the 23 local exporting firms. It shows the score on each indicator, the sum score for each category of capabilities, and an aggregate score for overall technological capabilities. Before we get to Table 7, we explain the scoring method on each indicator. The method generally follows the method used to score local firms in the Ethiopian apparel export sector, also to make the two cases comparable (see Staritz and Whitfield 2018).

The first column in Table 7 indicates the score based on function within the apparel global value chain. In Madagascar, local firms were involved in CMT-subcontracting, CMT, FOB, ODM, and FOB-textile which means FOB with firms' own textile. CMT-subcontracting scores 1, CMT scores 2, and FOB scores 3. Knitting firms (producing pullovers and other knitted products such as hats and gloves) were scored as FOB-textile because knitting and sewing the knitted parts together are still two production steps, and knitting firms have dyeing facilities that are normally found at vertically integrated firms or textile mills. We gave one integral for each additional function – hence, there are firms that produce on a FOB basis and also provide

¹⁰ 10 of the 11 firms where we have no end-market information are subcontracting firms.

¹¹ The matrix is presented and discussed in Staritz and Whitfield (2017). The survey questionnaire is available in the appendix of the first working paper analyzing the survey results from the Ethiopia apparel case study, see Whitfield and Staritz (2017).

design (ODM) which scores 4, but there are also firms which produce on a FOB basis using their own textile (FOB-textile) which scores 4 as well. If a firm provides design and uses its own textiles in apparel exports it scores 5. Some local firms carry out more than one function, as indicated in Table 6 above. We scored a firm based on the dominant function. If a firm carries out two or more functions of equal importance, the scores were averaged. In the overall score on function, we assessed scores of 1 or 2 as low, as subcontracting requires CMT production but importantly differs from CMT in the end-market capabilities category; a score of 3 is medium; and a score of 4 and 5 is high. For scores less than a whole integer, we round up as even being partly involved in for example FOB, ODM, or textile production means that firms have invested in and fulfill the related capabilities.

The second category of capabilities is product, which captures the complexity of products that a firm produces and the variety of products. The main products of local firms were assessed as basic, intermediate, or complex. To capture complexity we used a combination of what firms reported on complexity, the firms' main types of products, and the products' unit values. The type of product alone cannot be directly related to complexity, as there can be, for example, women's trousers that are simple and women's trousers that are intermediate. If firms exported more than one main product, we did the scoring for each of them and then calculated the average score. As local export firms specialize in different product segments (children's clothes with smock and embroidery; high-end workwear and corporate wear; knitted pullovers; casual and high-value fashion clothes), a direct comparison is difficult. Therefore, we first ranked firms within the different product segments and then aligned the scores between the different types of products as much as possible. Children's clothes with a high smock and embroidery content were for instance scored as complex as this involves very delicate handiwork. Intermediate products with limited handiwork were however kept as intermediate. Knitted pullovers were also generally scored higher than other product types given their more complicated production process.

The number of different products that a firm exports indicates a firm's ability in dealing with more types of products, which requires specific knowledge about each product and skills to manage different product requirements. This is also linked to buyers' preference for firms that can produce a variety of products and hence may ensure stability in buyer relationships. Product variety also reduces risk, as the supplier firm does not put all its effort into one product and finding buyers for only this product. There is no global industry standard on variety of products. We assessed firms with only one export product as low and gave them a score of 1. Firms exporting two to three products scored 2, as the step from one to two products is particularly important, as this requires already managing different requirements. Firms with four or more export products scored 3, as this requires substantially more management coordination and capabilities. Very similar products were counted as one product.

In the third category, production capabilities include labor productivity (costs), not on time delivery (reliability), and internal reject rate (quality). We do not directly cover working capital or inventories, lead or throughput time, labor turnover and absenteeism rates, and training expenditure, for reasons discussed in Staritz and Whitfield (2018). Labor productivity is

measured in terms of how long it takes a firm to make its main product(s) in relation to the international standard, which varies according to the work content, number of operations, length of seams, fabric types, stitching accuracy needed, sewing technology to be used, and so on. Firms were scored using the international standard of benchmarking with China, where we defined low as below 60 percent of the international standard, medium as 60 to 75 percent, and high as above 75 percent. A problem with scoring productivity is that it varies considerably within firms as the result of low volumes, changing products and styles frequently, and changing buyers. Hence, we asked firms to provide an average. Even a larger problem in the case of Madagascar was that firms specialized in different product segments for which a direct comparison of labor productivity is not possible. As for the case of product complexity, we first ranked firms within the different product segments and then aligned the scores between the different types of products as much as possible. Subcontracting firms were ranked on productivity based on assessments of the firms for which they subcontract.

On-time delivery captures the percentage of products delivered on-time and in-full to customers with no defects and with the right documentation. Meeting the delivery deadlines set by buyers is a larger challenge for FOB firms that are in charge of and responsible for input sourcing, in contrast to CMT firms where buyers are responsible. If local firms were late on delivery, or later than a maximum amount of days past the delivery deadline that the buyer allows, then buyers generally reject the order and local firms lose the payment, and even lose the buyer. Not on time delivery was scored as a percentage of all deliveries. Taking into account the global industry standards, ‘often’ was defined as 5 percent of deliveries or more and scored 1, ‘sometimes’ as between 2-4 percent and scored 2, and ‘hardly ever’ as 1 percent or less and scored as 3.

There is a difference between customer return rates and internal reject, rework, and scrap rates. Customer returns reveal quality satisfaction of buyers but offer an insufficient indication of internal quality performance. Firms may have poor internal production systems, but provide quality products by following stringent checks at the end of the process, which is costly. Hence, firms also need to reduce their internal reject rates in order to provide sustainable and efficient quality performance. The internal reject rate was measured as the share of internally rejected products. These products can then be reworked, if possible, or scrapped. For scoring, we considered the global industry standards. A 5 percent and above reject rate was scored as 1, between 2-4 percent reject rate as 2, and 1 percent and below reject rate as 3.

The fourth category of end-market capabilities refers to firms’ ability to manage relationships with buyers, which involves, among other things, marketing, communication, account management, negotiations and audits, focusing on the number of buyers, and the stability of the relationships. Subcontracting firms were not scored on these indicators as it focuses on relationships with actual buyers, including intermediaries such as agents, and not to other firms based in Madagascar. While we acknowledge that developing subcontracting relationships with other locally based firms also requires certain capabilities, they are considerable lower compared to establishing and maintaining direct buyer relationships. It is assumed that the higher the number of direct buyers that the firm has, the higher the capability of the firm.

Having more buyers reduces risk, allows a better bargaining position, and shows that the firm is able to manage more buyer relationships. We scored a firm 1 if it depended on one to two buyers, scored 2 if it depended on three or four buyers, and scored 3 if it had five or more buyers. Many firms in Madagascar have significantly more buyers but we stayed with this scoring as it should also capture firms and countries entering apparel global value chains, which typically have less buyers than in the case of Ethiopia. Through number of buyers, we also took into account how many end-markets firms are supplying. Firms were asked to rate their relations with their main direct buyers as stable, somewhat stable or ad-hoc. If they rated their relations as ‘stable’ or ‘somewhat stable’, we crosschecked this rating with what firms reported as their history with buyers. We also took into account how many buyers were lost by firms. Hence, a subjective assessment was applied in assessing firms’ buyer relations as unstable/ad hoc (scoring 1), somewhat stable (scoring 2), or stable (scoring 3).

The final category of technological capabilities is linkages. This category refers to a firm’s ability to leverage linkages with actors and institutions outside the firm in order to access knowledge and resources with which to improve the performance of the firm. Public institutions are important, as they often provide access to finance at below market rate, subsidize the costs of learning, and are important in generating skilled labor. Other firms – foreign and local firms – and foreign experts are an importance source of tacit knowledge for local firms, especially in export industries. This is especially the case in countries and industries where there is no pro-active industrial policy supporting the export sector or where public institutions do not have the knowledge and experience to support local export firms. Linkages between local firms can be facilitated by a strong industry association. The scoring on each of these indicators was based on several qualitative and quantitative questions, on the basis of which a subjective assessment was made of low linkages (scored 1), medium (scored 2), or high (scored 3).

For the links with other firms and experts indicator, we assessed a firm’s direct interaction and cooperation with other local and foreign apparel firms (including subcontracting relations) and participation in collaborative schemes during their development. The assessment took into account past as well as present interactions, and includes whether a firm was pro-active in acquiring knowledge through visiting factories in other countries, attending trade fairs regularly, and sourcing and paying for foreign experts on their own. For the links with public institutions indicator, we assessed a firm’s interactions with public sector institutions in terms of being able to react to policy changes or influence policies and being able to access and take advantage of various public support programs.

Table 7: Scores of local firms' technological capabilities in Madagascar

Firm	Function	Product		Sum*	Production			Sum**	End-market		Sum*	Linkages		Sum*	Aggregate Score	Summary Aggregate Score
		Completeness of main products	Variety of products		Labor productivity	Not on time delivery	Internal reject rate		Nr. & dominance of buyers	Stability of buyer relations		Links with other firms & experts	Link with public sector institutions			
A-Firm	4H	3	3	6H	2	3	2	7M	3	3	6H	3	1	4M	HHMHM	HIGH-MED
I-Firm	5H	3	3	6H	2	3	2	7M	3	3	6H	3	1	4M	HHMHM	HIGH-MED
D-Firm	4H	2	3	5M	1	3	2	6M	3	3	6H	3	1	4M	HMMHM	MED-HIGH
F-Firm	3M	3	3	6H	2	3	2	7M	3	3	6H	3	1	4M	MHMHM	MED-HIGH
G-Firm	2.5M	3	3	6H	3	3	2	8H	3	3	6H	3	1	4M	MHHHM	HIGH-MED
J-Firm	3M	3	3	6H	1	3	3	7M	3	3	6H	3	1	4M	MHMHM	MED-HIGH
B-Firm	3M	2	2	4M	1	3	2	6M	3	3	6H	2	1	3L	MMMHL	MIXED
M-Firm	2.5M	2	2	4M	2	3	2	7M	3	3	6H	3	1	4M	MMMHM	MED
L-Firm	3M	3	2	5M	1	3	2	6M	3	3	6H	3	1	4M	MMMHM	MED
K-Firm	1.5L	2	2	4M	1	3	2	6M	N/A	N/A	L	3	1	4M	LMMLM	MED-LOW
Q-Firm	2.5M	1	2	3L	2	3	1	6M	1	3	4M	2	1	3L	MLMML	MED-LOW
O-Firm	2.5M	2	2	4M	1	3	2	6M	2	2	4M	3	1	4M	MMMMM	MED
N-Firm	1L	2	2	4M	1	1	1	3L	N/A	N/A	L	2	1	3L	LMLLL	LOW
P-Firm	2L	3	2	5M	1	3	1	5L	2	3	5M	2	1	3L	LMLML	LOW-MED
R-Firm	3M	3	2	5M	1	3	3	7M	3	2	5M	2	1	3L	MMMML	MED
T-Firm	3M	3	2	5M	1	3	3	7M	3	3	6H	2	1	3L	MMMHL	MIXED
S-Firm	2L	3	2	5M	1	3	3	7M	3	3	6H	2	1	3L	LMMHL	MIXED
DD-Firm	1L	2	1	3L	1	3	2	6M	N/A	N/A	L	3	1	4M	LLMLM	LOW-MED
X-Firm	1L	2	2	4M	2	1	2	5L	N/A	N/A	L	2	1	3L	LMLLL	LOW
Y-Firm	1L	2	2	4M	2	3	2	7M	N/A	N/A	L	3	1	4M	LMMLM	MED-LOW
CC-Firm	1L	2	1	3L	2	3	2	7M	N/A	N/A	L	3	1	4M	LLMLM	LOW-MED
Z-Firm	1L	2	1	3L	2	3	2	7M	N/A	N/A	L	3	1	4M	LLMLM	LOW-MED
W-Firm	1L	2	1	3L	1	1	1	3L	N/A	N/A	L	2	1	3L	LLLLL	LOW

Key to sum scoring: Function: High= 4-5, Medium= 3, Low=1-2; *Sum: High=6, Medium= 5-4, Low=2-3; **Sum: High= 8-9, Medium=6-7, Low=3-5.

Analyzing the technological capabilities of local apparel exporting firms

The technological capabilities scores of the 23 local exporting firms presented in Table 7 show that there is variation in the overall capability scores from low to high-medium. Three firms score high-medium, three firms medium-high, four firms medium, three firms medium-low, four firms low-medium, and three firms low, while three firms have mixed scores. The label ‘mixed’ refers to the fact that a firm’s sum scores on the different categories of capabilities ranged from low to high, and thus did not indicate an overall trend. In this section, we discuss firms’ performance and trends within each category of technological capability, before analyzing overall trends within the aggregate capability scores.

Analysis of scores within capability categories

Local firms varied significantly in terms of the functions they perform within the apparel global value chain. One firm provided FOB-textile and design functions (I-Firm), and hence it is the firm with the highest score on the function capabilities. This is because it is a knitting firm and hence produced textile and apparel as well as performed design for the knitted fabric. The other knitting firm (A-Firm) also scored high because it has to do textile and apparel production jointly. There is only one other firm that is involved in FOB-textile, the only vertically integrated firm producing woven textile used for their own apparel exports and also selling to other firms in Madagascar (H-Firm), but it was not willing to participate in the survey. Altogether, three local firms are involved in FOB-textile, but notably they are involved in different types of textile production compared to the three vertically-integrated foreign firms which are all producing knit fabric.

In addition to I-Firm, three other firms carried out design functions for their apparel products, developing their own seasonal collections (D-, R-, and T-Firms). D-Firm does FOB production with design for women’s casual clothes with light fabrics sourced regionally from Mauritius. R- and T-Firm do largely CMT with design in children’s clothes with smock and embroidery, selling luxury children’s clothes, mostly for small French boutiques. R-Firm is even the designer for one specific brand and has a share in that brand label. The two CMT-firms (P- and S-Firms) are also in the higher end children’s clothes segment, selling to luxury boutiques in the EU and the US, for which they require luxury fabric that has to be imported and for which they have not the financial means to do the sourcing. These two firms do small elements of design as well, but largely only CMT. So, they are very similar to the other two CMT firms but only differ in their degree of design involvement. It seems, however, that all these CMT firms also do FOB for a smaller share of their exports if they can source local fabric from the locally owned woven textile mill; if they have to import fabric they do CMT.

In addition to D-Firm, there are four other firms that are 100 percent producing on a FOB basis (F-, J-, B-, and L-Firms), all of which are producing children’s clothes of intermediate to high complexity for the European market. This would seem to conform to the trend that European buyers prefer suppliers to work on a FOB basis. There are four firms that do FOB and CMT

(G-, M-, O-, and Q-Firms), but there is no clear trend as to why. G-Firm, the workwear firm that is among the highest performing, has several European buyers, some of which prefer FOB basis and some of which prefer CMT; in addition, one of its long-term buyers recently bought the shares of one of the local shareholders and became a majority shareholder, making it logical for the firm to switch to supplying on a CMT basis. With M-Firm, half of its production is for one European buyer, which uses fabric from a firm in Mauritius, but even then, the buyer pays for the fabric 20 percent of the time. Rather than seeing CMT as a 'lower' function, it is a risk-balancing strategy, as prices are higher with FOB but there is also higher risk with sourcing and storing the fabric. Q-Firm, the other workwear firm, has only two buyers, both European, but one prefers FOB and the other CMT. The remaining firm, O-Firm, is the only indigenous Malagasy firm in this category. For high-end products with expensive fabrics, the buyer sends the fabric; when the fabric is less expensive, the firm sources itself or negotiates part of the payment for the product in advance in order to finance the fabric.

There are eight firms that are involved in subcontracting and hence scored 1 on function capabilities; only K-Firm scored 1.5 as it was in the process of negotiations with direct buyers, and it was the only subcontracting firm that was actively seeking direct export buyers. Subcontracting is important in Madagascar given the interest of some larger local firms as well as a few foreign firms to subcontract parts of their production to other firms to deal with high and flexible volumes without taking on board the costs and risks of expanding in-house capacity. For the subcontracting firms it is a possibility to start exporting without having to establish and maintain direct relationships with buyers and therefore being able to focus solely on production. However, subcontracting is challenging as margins are very low and product types and specifications change with each order, which requires important adaptations and reduces productivity. Even though subcontractors do not actively search for direct buyers, with the exception of one firm, CMT-subcontracting is not perceived as a longer-term position. Nevertheless, developing direct relationships with buyers is challenging, particularly as most buyers demand FOB suppliers.

Among the subcontracting firms, three firms (N, Z, and W-Firms) produce children's clothes for local and foreign firms, and one firm (DD-Firm) produces knitted sweaters for foreign firms (largely Mauritian). This is not surprising given the large number of firms in these product segments. A very interesting case is one firm (G-Firm) that encouraged and supported a few of its employees to establish their own firms to do subcontracting work for the firm at which they remained employees (Y, Z, and CC-Firms). This strategy benefited both sides. G-Firm pursued subcontracting as a way to expand without running into diseconomies of scale within its firm. But it also wanted to ensure quality and on-time delivery, and thus sought to support managerial staff who had worked in G-Firm and understood its production practices and had a loyalty to the firm. On the other side, the five indigenous firms benefited from the direct assistance from the owners of G-Firm in handling the logistics and financing of setting up an apparel export firm as well as from constant advice and a flow of information regarding product and production capabilities. Thus, all eight subcontracting firms are producing largely for local firms and Mauritian firms, and for EU end-markets. The exception is K-firm, which

subcontracts also for Asian firms and seeks to enter the US and South African end-markets, and produces more basic, non-niche products such as sportswear and T-shirts as well.

All local firms produce intermediate or complex products except for Q-Firm, which produces basic workwear, and to some extent K-firm (which had a slightly higher score because in subcontracting it produced a variety of products, but it is negotiating to supply more basic products with direct buyers). Local subcontracting firms largely produce for other local firms, which make intermediate products. Complex products are in luxury children's clothes and pullovers with a large degree of handiwork (smock, embroidery, pleats) as well as high-end workwear and luxury women's apparel. The variety of products is more mixed, with some firms scoring high but most firms scoring medium, which means they produced two or three different types of products. Most larger firms score high and produce around five to six main types of products. All of the firms that scored low on variety of products are subcontracting firms. Most firms had a sum score of medium or high on product capabilities; four out of the five firms that scored low are subcontracting firms. Q-Firm, the other firm to score low, produces a limited range of basic workwear. The subcontracting firm K-Firm is trying to find direct export buyers in basic sportswear products, but it was largely carrying out subcontracting production of a medium range of intermediate goods at the time of the survey.

Sum scores on production capabilities were lower than on product capabilities with only one firm scoring an overall high (G-Firm), eighteen firms scoring an overall medium, and four firms scoring an overall low, including the three lowest performing subcontracting firms but also P-Firm. Most firms were better on not on time delivery and internal reject rate compared to labor productivity. On productivity, the production of children's clothes with a large smock and embroidery content is very labor-intensive and the most luxurious products are produced in firms that resemble artisanal production (which is the case of R, T, and S-Firms). There are few ways to increase labor productivity on apparel with a large degree of handiwork, in contrast to apparel products that travel down an assembly line from sewing machine to sewing machine. The knitting firms, A-Firm and I-Firm, have fully or partially automated knitted machines, which leads to high labor productivity, compared to hand-flat knitting machines, but the looping section where panels are put together into pullovers is very labor-intensive and it is difficult to increase labor productivity there given the difficult nature of the task. G-Firm, the only firm to score high on labor productivity, does not produce products with handiwork and it is the only firm that uses the lean production system, which it also helped its subcontracting firms to implement in their production processes.

Most firms scored high in terms of always meeting their delivery deadlines, with the exception of the lowest performing subcontracting firms. Four firms generally use airfreight for their exports, including the three firms that do small orders of luxury children's clothes (R-, T-, and S-Firms) and P-Firm (also children's clothes with light weight). The other firms ship by sea. The firms involved in intermediate children's clothes (M, L, J, F, and B-Firms) only do summer and winter seasons and seem to have some room for negotiation on delivery time as they are important suppliers for the same group of buyers. The high scores on delivery deadlines for knitting firms are explained by the fact that they do not have to purchase fabric (only yarn),

have automated production, and outsource hand flat production. Several firms also source fabric from the one local textile mill. Furthermore, mills in Mauritius and accessories are locally available, which reduces lead times as well as delays and uncertainty regarding delivery time. The larger firms that have repeated orders of the same products and are not involved in fashion keep a large inventory of fabric (G-Firm). The quality of production, indicated by internal reject rates, was generally medium; with only the three firms producing luxury children's clothes (R-, S-, and T-Firms) and J-Firm performing high. Four firms scored low, which included two of the lowest performing subcontracting firms but also two direct exporting firms, one of which (P-Firm) recently opened a new, larger factory and was struggling to get good production processes in place.

On end-market capabilities, subcontracting firms were not scored since they do not have any direct export buyers and were hence given a low sum score on end-market capabilities. These eight firms were the only ones with low overall end-market capabilities scores. Among the direct exporting firms, most firms had a high sum score (eleven firms), indicating that they had stable relationships with a large number of buyers. Some local firms had 30 to 40 buyers and produced a range of products for them in terms of complexity. Often the high-performing firms would produce a large volume of basic to intermediate products with low unit prices for a few buyers, and then produce intermediate to very complex products in small orders with higher unit prices for numerous other buyers. They also had strong buyer stability, having produced for several 'core' buyers for many years. For example, G-firm had had its four core buyers for ten years at the time of the interview. The firms producing luxury children's clothes often have many buyers for whom they produce small quantities with very high unit prices. S and T-Firms produce for luxury brands sold in France, but are not able to disclose that information due to the nature of contracts with buyers.

Of the four firms with medium end-market capabilities, three of them had fewer buyers (Q-, O-, and P-Firms), and R-Firm and O-Firm had less stable relations with its buyers. R-Firm is somewhat of an outlier, in that the firm has grown and contracted (in size and number of buyers) several times as a result of the political crises, thus its stability of buyer relations received a lower score. But R-Firm produces for high-end buyers such as Ralph Lauren (US) and Baby Dior (EU), as well as Vichey and Cie, Kidiwi, Cala Coin in Europe, and Tiny Pyxis in Japan. All local firms were affected by the political crises, but this firm particularly as it was the only indigenous firm in luxury children's clothes that had a large firm doing big volumes. Other indigenous firms were small, and stayed small with the exception of P-Firm, which however only grew recently.

Regarding end-markets, ten firms solely supplied the EU market. The other six firms supplied the EU market plus one or two other markets, which included the US, South Africa, Australia, and Japan. The South African end-market is only supplied by three local firms, and always in addition to the EU market, confirming that Mauritian firms are driving the increase in exports to South Africa. Hence, there is a clear focus on the EU as an end-market and within the EU also on France, leading to important end-market concentration. A caveat has, however, to be made regarding the US market, as most firms were not producing for the US because of the

loss of AGOA. With the renewal of Madagascar's AGOA status in 2015, which only became operational in early 2016, firms were beginning to seek US buyers again when we did the interviews. Only the two pullover firms (A and I-Firms) were already producing for the US again. P-Firm never dropped its US buyer that it supplied through an agent. R-Firm did not completely lose its US buyer as it continued to do small orders sent by air. In this segment we can also see the trend that EU buyers require expensive yarn, US buyers acrylic yarn (synthetic) with higher volumes and lower prices, and South African buyers cheaper yarns and more basic products. No other firms were selling to the US at the time of interview.

Local firms generally score lower on linkage capabilities than the other categories of capabilities, because all firms score low on links with public sector institutions. The government does not have any industrial policy targeting the apparel export sector and generally is not interested in supporting the sector. Therefore, it is difficult for firms, or their industry associations, to influence government policy, and there were no public support programs from which firms could benefit. The only policies that were stated by firms as helpful were the EPZ regulation and exchange rate policies that support exporting. Further, there are a few policies in place that generally facilitate exporting in the context of the EPZ law – for example, the possibility to import inputs for apparel production duty-free and to get the value-added tax on these imports refunded. However, the government often takes a long time, sometimes several years, to refund the value-added tax on imported inputs used in apparel exports. Scores of 1 on links with public institutions meant it was not possible to score higher than medium (and doing so required a high score on links with other firms and experts).

In contrast, firms had stronger links with each other and with foreign firms and experts, but these generally did not occur through formal organizations such as industry associations but rather through personal networks and relations. There is no single industry association, but rather several types of business associations in which local firms participated. There was an export association linked to the EPZ status, but firms were not automatically members but had to pay rather high membership fees that were not adapted to firms' size, which meant that most of the small firms were not members. The export association had a permanent secretariat, but its main objectives were to liaise with the government on policies affecting EPZ firms, and not to link firms to each other and as a means to share information. Therefore, many of the medium and small-size firms were a member of the French or US chamber of commerce, depending on their end-markets, which provided marketing advice and information. Some of the firms, largely European diaspora firms, established an industry association called Textile Made in 1998 to provide a platform for knowledge sharing and collaborative schemes among firms and to support smaller firms, especially indigenous Malagasy firms. It was the idea of the EU Development Fund, which advocated the cluster system and provided consultants to set it up, and the French aid agency financed it. It largely provided training for operators and managers at the smaller firms and financed attendance at trade fairs. However, when these external actors stopped supporting Textile Mada in 2011, it largely stopped functioning. None of the firm owners had the time to work as executive in the organization, so they tried paying for an administrator, but it seems that the firms lost interest after a few years and stopped financing the activities of Textile Mada.

Rather, the strong links among firms have occurred through three types of informal relations: ethnic-based networks, networks among firms that produce similar types of products, and subcontracting. There is no formal organization among the different types of owners, but collaborative schemes and information sharing tend to take place among firms whose owners come from the same ownership type: European-diaspora, Indian-origin Malagasy, and indigenous Malagasy. Firms also collaborate more closely with firms that produce the same types of products, but this tends to reinforce the ethnic networks. For example, Indian-origin Malagasy firms producing children's wear tend to have closer relations and support each other. But there are also links across ownership type, for example in the supportive relations between C-Firm and O-Firm, the only firms producing high-end fashion products. The other type of link is subcontracting relations, which have provided an important channel for indigenous-Malagasy investors to enter the sector. Notably, some indigenous-Malagasy firms have gone on to grow into medium-sized firms with a few direct buyers, while others remain in the subcontracting function. In this case, it seems to matter which firms indigenous-Malagasy investors link up with, as some provide active support in helping the subcontracting firm learn and grow, while others provide none.

In addition to these relations, most firms have benefited from links to Mauritian expertise. In particular, many firms have Mauritian production managers, who tend to circulate among the firms. Proximity to Mauritius and the contraction of the Mauritian apparel export sector meant that many Mauritians came to Madagascar looking for managerial level jobs. Some of these experts also came with Mauritian foreign firms and later left these firms and worked for local firms. The absence of apparel-specific training and education institutions in Madagascar made access to experienced Mauritian managers very important.

Analysis of overall capability scores and trends

In terms of the aggregate technological capability scores, we identify three main trends that are based on the importance of product types and ethnicity in understanding dynamics among local firms in Madagascar's apparel export sector. The first trend is that the specialization of local firms in niche and higher value products, and the specific types of products, are related to specific buyers and end-markets, and they also determine function in global value chain and production processes. Therefore, to an important extent, product types drive capabilities in the other capability categories. The most important product specialization is in children's wear, in which 44 percent of the local firms are involved, and workwear in which 25 percent of local firms are involved. Additionally, 12 percent of firms are involved in casual and high-end fashion products, and 9 percent in knitted pullovers with only 9 percent in basic, non-niche products (see Table 8 below).

The specialization in children's clothes is of particular importance. It involves products with intermediary and high levels of complexity, including for an important sub-set of firms, luxury products with a high content of smock and embroidery. Smock can be produced with machines,

but in Madagascar it is hand-made and it is the only country besides Vietnam that exports hand-made smock products. Therefore, competition is largely within Madagascar, not with China or Bangladesh. The focus on children's clothes with smock and embroidery is the result of an artisanal tradition in Madagascar, which is speculated to have emerged during the French colonial period. Many firms have capitalized on this local skill and tradition, supplying European buyers and especially the French market and also small boutique buyers. European buyers supported several firms to enter this product category in order to have more suppliers from which to choose. Hence, this product specialization brings with it certain labor-intensive and quality-focused production processes and the necessity to be at least partly involved in design as firms often contribute their own design element by providing prototypes or even offering collections to buyers. It also means that textile inputs are of high value and hence expensive which makes it difficult for small local firms and particularly indigenous ones to finance importing these inputs. Several of the smaller indigenous children's wear firms are only involved in CMT and only where fabric can be sourced locally in FOB – but in combination with an involvement in the design process.

Specializing in high-end workwear and corporate wear has been a good strategy for G-Firm. The founder of the firm established a relationship with a French buyer early on, and when the 2002 political crisis hit, this buyer remained loyal when the fast-fashion buyers stopped sourcing from Madagascar. As a result, the firm turned to specializing in workwear and sought additional buyers in this product segment, and initially buyers such as Decathlon that would allow it to source woven fabric from the local textile mill. The advantage of this product segment is that the orders are regular and use the same materials, so the firm can have a large inventory of fabric and work constantly, and also by producing the same kinds of products in constant orders, can increase its productivity. For example, this firm also produces children's yellow raincoats for Petit Bateau, and is the sole supplier of this product for the buyer. Q-Firm, the other workwear firm, has a different set of buyers in low-end workwear, but it seems that G-Firm may be introducing it to its buyers and helping to shift its product portfolio.

The specialization in knitted pullovers is largely the result of Hong Kong firms, many of which previously operated in Mauritius before moving to Madagascar. Knitted pullover on handflat knitting machines (as opposed to the new automated ones) are the most labor-intensive apparel to produce, and thus were the first product to be offshored from Mauritius to Madagascar, creating a lot of experienced workers. For knitted pullovers a specific production process is required that demands that fabric and apparel is produced jointly leading to vertical integration of these firms and the import of yarn. Many firms are also involved in design at the knitting stage. The owners of A and I-Firms actually had experience working in Hong Kong and Mauritian firms producing in Madagascar before they left to start their own firms.

There is a strong focus among local firms on the EU market which is linked to the type of products but also to other path dependencies, linked to French foreign direct investment, French-diaspora, and several crises in which firms closed down that were geared towards the US market including the MFA phase out that was more important for US-focused firms and most importantly the AGOA loss. Currently, some local firms are in the process of trying to

find new US buyers. Some firms are also seeking new markets in Australia and Japan, and several local firms tried the South African market, but said that prices are too low and products too basic, and that this is not what local firms do. So the South African market only covers a very small percentage of local firms' exports. Rather, local firms specialize in intermediate and complex products in specific product segments with higher prices. For these types of products the EU market is better suited and particularly for high value added or luxury children's wear with smock and embroidery for which the largest market is even only in France. Market segmentation not only covers types of products but also specific requirements: the EU buyers present in Madagascar generally demanded smaller orders and high quality which comes along with higher prices, the US buyers wanted synthetic products and large volumes, and the South African buyers sought basic, cheap products at low prices. Some local firms pursued market diversification strategies and created a diversified portfolio, but this involved only the larger and higher capability firms. The other firms largely remained focused on the EU market and specific market segments therein related to their types of products.

Given that firms do intermediate to complex products with many different types of fabrics, vertical integration reaches its limits and would require a large fabric mill that is able to produce different types of fabric. The local woven textile mill is a large fabric mill with high capabilities for different types of fabrics. Its specialization in light woven fabrics created some path dependencies as local firms specialize in products that can be made with light woven fabrics, or the woven fabrics from textile mills in Mauritius (from which only two local children's wear firms mentioned sourcing). Local firms did however not source knit fabric from Mauritius, in contrast to Mauritian firms that do that for value added T-shirts with two even setting up knit textile mills in Madagascar. This might be related to path dependency as local firms initially entered into children's wear or workwear based on woven fabric.

The second trend is that ethnicity among local firms plays an important role, and there is a correlation between ethnicity of the firm owners and product and related buyers and end-markets. Table 8 maps firms according to ownership type and product type.

Table 8. Mapping of local firms by product type and ownership type

	Total number of firms & share (%)	European/French diaspora	Indian-origin Malagasy	Indigenous Malagasy
Pullovers	3 firms (9%)	A-Firm, I-Firm	--	DD-Firm
Children's wear	14 firms (44%)	F-Firm, E-Firm, FF-Firm	B-Firm, J-Firm, L-Firm, M-Firm	N- Firm, P-Firm, R-Firm, S-Firm, T-Firm, W- Firm, X-Firm
Workwear	8 firms (25%)	G-Firm, Q-Firm	EE-Firm	Y- Firm, Z-Firm, AA-Firm, BB-Firm, CC-Firm
High-end fashion	2 firms (6%)	C-Firm	--	O-Firm
Casual, fashion	2 firms (6%)	D-Firm	H-Firm	--
Basic/non-niche	3 firms (9%)	--	K-Firm	U-Firm, V-Firm*

Note: * Neither of these two firms participated in the survey, so this is based on information gathered from other sources and thus only partial data.

Most European-diaspora and Indian-origin local firms specialized in children's wear producing intermediate products and selling to the same group of French buyers; they somewhat compete with each other, but also specialize in different aspects of children's wear. These firms also outsource a large amount of hand embroidery and smock work to groups of workers on a piece rate basis. The indigenous Malagasy firms are even more strongly focused on the children's wear segment, and particularly, the higher value added children's wear with smock and a lot of handiwork. These indigenous firms fall into two categories. The first group produces on a subcontract basis for other local firms (X, N, and W-Firms). The second group produces luxury children's wear (P, R, T, and S-Firms), which has a higher content of labor-intensive smock and embroidery using original designs, in small volumes for high-end large buyers or small buyers with boutique shops in Europe and to some extent the US. The high value of luxury children's clothes with smock and embroidery, with high labor-intensity and original design, allowed indigenous Malagasy firms to export. However, the majority of them are very small firms run more like a family business than an industrial production and are based on small orders that can be shipped by air. Only one indigenous Malagasy firm (P-Firm) succeeded in scaling up.

The two European-diaspora pullover firms produce a range of products for top European brands, and use automated knitting machines with electronic design elements. There is only one indigenous Malagasy firm producing pullovers and this is on a subcontracting basis for Mauritian firms because the yarn must be imported and can be expensive to finance, especially in luxury materials. That is also why the two European-diaspora firms and foreign firms that produce pullovers engage in subcontracting, and others rely on buyers to finance the yarn. For the former, it seems that the large local firms and the foreign firms perform a kind of financing function for smaller firms doing a kind of CMT activity – handflat weaving instead of assembly. For these firms, it is more expensive to hire more workers than to outsource. So they provide handflat machines largely to groups of women that are generally not registered as firms and ask them to produce the basic parts.

The two European-diaspora firms in workwear produce different types of products. One produces complex products for top European brands, and subcontracts to the five indigenous Malagasy firms that it helped to create in the mid-2010s (G-Firm), and the other produces intermediate products. Hence, the indigenous Malagasy firm producing workwear is a special case where G-Firm actively supported some of its own managerial staff to start apparel firms that subcontract from it. There are two European-diaspora firms specializing in fashion products – one in high-value ladies fashion products for top European brands and the other in casual ladies' summer fashion clothes with a large element of own design. The one Indian-origin Malagasy firm in casual fashion wear is the vertically integrated firm. There is also one indigenous Malagasy firm producing high-value fashion. Notably, this indigenous firm also had initial relations with G-Firm, which helped the owner to start subcontracting for French foreign firms in the late 1990s and eventually to export directly. The indigenous firm produced some high-end fashion products, as a result of path dependencies stemming from its first buyer, but it struggles to get more orders in high-end fashion and thus fills its capacity with subcontracting or producing for new end-markets in Réunion and Australia.

There were three firms in basic, non-niche products (one Indian-origin Malagasy and two indigenous) which are outliers – one of which was in the process of securing direct buyers and the other two were not available for interviews, so we cannot assess whether they are succeeding or not.

Taking the first two trends into account, it is useful to look at trends across firms in terms of the aggregate technological capability scores by grouping them according to product type and ethnicity or local ownership type. Table 9 does this by adapting Table 6 to include the aggregate capability scores. Based on this, the third trend that is apparent from Table 7 is that aggregate technological capability scores correlate with ethnicity, but not entirely.

Table 9. Local firms’ aggregate TC scores organized by product and ownership types

	European/French diaspora	Indian-origin Malagasy	Indigenous Malagasy
Pullovers	A-Firm: High-Med I-Firm: High-Med	--	DD-Firm: Low-Med
Children’s wear	F-Firm: Med-High (E-Firm is sister company of D-Firm, so likely Med-High) (FF-Firm is subcon and in the lower end)	B-Firm: Mixed J-Firm: Med-High L-Firm: Med M-Firm: Med	S-Firm: Mixed T-Firm: Mixed R-Firm: Med P-Firm: Low-Med W-Firm: Low X-Firm: Low N-Firm: Low
Workwear	G-Firm: High-Med Q-Firm: Med-Low	(EE-Firm not in survey, but subcon and in the lower end)	Y-Firm: Med-Low Z-Firm: Low-Med CC-Firm: Low-Med (AA-Firm and BB-Firm not in survey, but similar to Z-Firm: Low-Med)
High-end fashion	(C-Firm not in survey, but likely Med-High or High-Med)	--	O-Firm: Med
Casual, fashion	D-Firm: Med-High	(H-Firm not complete data in survey, but likely High-Med)	--
Basic/non-niche	--	K-Firm: Med-Low	(U-Firm and V-Firm not in survey, not enough data to say)

Firms with the highest aggregate technological capabilities scores are all owned by European-diaspora, except for H-Firm, which is Indian-origin Malagasy. H-Firm is not included in the formal scoring because the survey data was incomplete, due to reservations from the firm owner to answer some questions. However, we visited the firm, which is the only locally owned vertically integrated woven textile and apparel firm in Madagascar, and observed production processes and products. Based on this information, we put the firm in the category of high-medium. Among the European diaspora firms, only FF-Firm and Q-Firm have lower capabilities. Firms with medium range technological capabilities are more likely to be owned

by Indian-origin Malagasy, with the exception of two indigenous Malagasy firms (O-Firm and R-Firm) that score medium and one indigenous firm that scores medium-low (Y-Firm). All low capability firms are indigenous Malagasy firms, although not all indigenous Malagasy firms scored low, particularly the three medium or medium-low firms mentioned above.

There are three firms with what we call ‘mixed’ scores. The absence of a clear trend can be explained with a greater discussion of the firms’ backgrounds. B-Firm, an Indian-origin Malagasy firm, used to produce predominantly basic women’s casual wear, such as pajamas, but lost much of that production around 2013 to suppliers in China and Bangladesh, and shifted to specialize in children’s and babywear that is more complex. The firm is part of a large family-diversified business group, and the owner seems to struggle somewhat in FOB exports (as opposed to its import businesses) but it still has high end-market capabilities. It does not have strong linkages with other firms or experts. S-Firm and T-Firm are indigenous Malagasy firms producing luxury children’s clothes with smock and embroidery on a CMT basis, and in the case of T-Firm, with own designed collections, and they scored high on end-markets due to a significant number of quite stable buyers. They also do not have strong linkages with other firms or experts.

Interestingly, there is important networking among local firms – and between local and particularly Mauritian and European foreign firms – and local networks are also linked to ethnicity and product types as networking is largely confined within ethnic and product groups. However, the indigenous firms that are directly exporting used to have relations with some European-diaspora firms in the context of Textile Mada and still do within certain product types. The indigenous subcontracting firms also have links to particularly European-diaspora firms which is most pronounced for the workwear segment. Directly exporting indigenous firms tend to also regularly attend trade fairs in their niche products and do seem to be actively seeking information.

Conclusion

The overall technological capabilities scores of local firms in Madagascar’s apparel export sector are largely medium (ten firms), with three firms having higher capabilities and seven firms lower capabilities. Six of the firms with lower overall capabilities are subcontracting firms, but it also includes one CMT firm, and two subcontracting firms have medium overall capabilities. Local firms score particularly high on the product capabilities category given the higher value and niche product specialization that most local firms have. Only three local firms are in the basic, non-niche segment, and some of the others even specialize in luxury products, particularly in the children’s wear segment. This specialization explains high product complexity and to some extent, it also explains high product variety. The production capability category is largely medium, given high scores on not on time delivery and (to a lesser extent) high scores on internal reject rate but lower scores on labor productivity. The latter is also related to the type of products, as products with a high content of handiwork have limitations concerning labor productivity compared to products with only classic assembly activities. End-

market capabilities are largely high due to the large number of buyers per firm as well as buyer stability, particularly for the larger firms. The exception is the seven subcontracting firms that score low on end-market capabilities. Linkages capabilities are medium or low, owing to the low linkages with public institutions for all local firms, as there is practically no sector-specific industrial policy by the Malagasy government, and the relatively high linkages with other firms and experts. On function, there is large variation: from subcontracting and CMT to FOB to FOB-textile and ODM, with many of the direct exporting firms pursuing different functions depending on the product and the buyer.

Notably, these results are determined by the specific product specialization of local firms and related buyers, end-markets and global value chain dynamics. In particular, the specialization in children's wear of intermediate and high value, and the high content of hand-made smock work, which only one other country produces, give local firms a special position. Additionally, the specialization in knitted pullovers and higher-value workwear, and to a lesser extent high-value fashion wear, brings with it special buyers that differ in several aspects to the typical global buyers sourcing long-run basic products from a large number of suppliers in low-income countries. It is difficult to assess end-market concentration, given that the country recently reacquired its AGOA status and some firms are in the process of trying to find new US buyers. Nevertheless, for most local firms the EU market is still the more logical market given their product specialization, and for some specific products, local firms supply mainly the French market. Some local firms tried the South African market but realized that this market does not fit their type of products given the low prices offered by South African buyers. The specialization in certain product types demands that local supplier firms fulfill certain functions such as fabric production for knitted pullover firms and design involvement for higher value and fashion products, particularly in the luxury segment. What is demanded in terms of production processes and what can be achieved is also related to product specialization.

Dynamics in the Malagasy apparel sector cannot be understood without taking into account different ownership categories. This involves foreign firms, given the large share of more locally embedded foreign direct investment related to Mauritian regional triangular manufacturing strategies and European, particularly French, investors that have links to the European-diaspora community in Madagascar (Morris and Staritz 2014). Regarding local firms, it involves the different characteristics, opportunities, and challenges of European-diaspora, Indian-origin Malagasy, and indigenous Malagasy firms. Overall technological capabilities are correlated with these different ethnic groups. Firms with the highest technological capability scores are European-diaspora firms, firms with medium range technological capabilities are more likely to be Indian-origin Malagasy firms, and all low capability firms are indigenous Malagasy firms, although three indigenous Malagasy firms scored medium.

What explains these different experiences in technological capability building? Access to finance was important. In the absence of industrial policy, European-diaspora and Indian-origin firms could access finance through foreign banks, through financiers in other sectors of the Malagasy economy, or through owning or being part of families with other businesses. In

contrast, the owners of indigenous Malagasy firms found it much more difficult to access investment and working capital finance. But more important than access to finance was getting access to and building production knowledge that ensured high productivity, quality, and meeting delivery times. In developing such technological capabilities, partnerships with foreign firms were initially crucial, in the form of joint ventures and subcontracting relations between largely Mauritian and European corporate investors on the one side and European-diaspora and Indian-origin firms on the other side. These two types of local firms could also use their cultural affinity and connections to France to access buyers and maintain relationships with them. The specific product niche markets also explain the learning that took place within these local firms, due to the more limited competition, higher unit value and particularly larger margin for error in these products.

Indigenous Malagasy firms faced the highest challenges in building technological capabilities and learning. Learning was facilitated through their linkages with other apparel-exporting firms, either through working at them or through subcontracting relations, or both. Subcontracting for other firms played an important role for indigenous firms, and subcontracting opportunities were available because of the existence of more embedded foreign firms from France and Mauritius and of more developed local firms. Of the fifteen indigenous Malagasy firms, nine were subcontracting. Furthermore, for the six direct exporting indigenous Malagasy firms involved in CMT and FOB, and some also in design, subcontracting played an important role in starting their business and developing capabilities. The subcontracting relationships allowed indigenous Malagasy firms not only to learn export production but also to enter exporting through only learning production capabilities first, which involves lower costs and lower risks than establishing direct buyer relationships. This was critical as indigenous firms typically faced particular difficulties in making contact and maintaining relationships with buyers and had more limited access to finance compared to European-diaspora or Indian-origin investors, which affected their ability to finance fabric imports, for example. Remaining in such subcontracting relations is problematic as unit prices are low, requirements varying, and relationships often unstable. However, there seem to be some subcontracting firms that have established quite stable subcontracting relationships to European-diaspora firms based on certain product specialization and mutual benefits, particularly in the children's wear and workwear segments.

While the apparel side is quite developed, there is no local textile sector of any scale and thus limited capabilities in that regard. There is only one locally owned textile mill producing a variety of light weight woven fabrics, which also sells to other firms. There are a few other vertically integrated firms producing knit, but they do not sell fabric to other firms. Interestingly, regional sourcing has increased in importance in Madagascar, but the import of yarn and particularly fabric from Mauritius was not driven by local firms. Only very few local firms sourced woven fabric from Mauritius and none sourced knit fabric. On the end-market side, the increasing apparel exports to South Africa were not driven by local firms, with only few firms having tried to export and mostly finding prices too low. Rather, these regional production networks were based on the strategies of Mauritian-owned firms that use their home country based textile mills and design teams for their apparel firms in Madagascar and have

further built a rather strong presence in the South African apparel market that they supply from Mauritius and Madagascar. In contrast, regional experts and managerial staff from Mauritius played an important role also for local firms. Due to the proximity to Mauritius, and the declining apparel industry there, a large pool of experienced managers in production and marketing with knowledge of the region was available in Madagascar. Hence, local firm owners without experience could relatively easily ‘buy in’ production knowledge compared to other African countries such as Ethiopia.

On the surface, Madagascar is an unlikely country to have developed an apparel export sector given the difficult country-specific conditions related to physical and bureaucratic infrastructure, the non-existence of sector-specific industrial policy, and most crucially repeated political instability and crises that led to foreign firms and buyers leaving the country. Nevertheless, it has developed one, and more importantly, one that includes local firms with significant levels of technological capabilities, even though the capability building processes were segmented along ethnic and product lines. In these learning processes, the specific types of international linkages played an important role. This is firstly related to the specific niche and higher value product specialization that comes with a particular set of buyers and their global value chain dynamics where competition is more limited, relationships are closer and margins for error higher. Secondly, this is related to the type of foreign direct investment, which was more embedded due to diaspora linkages with local firms and regional production strategies.

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