

Air Cargo Constraints and the U.S. Export Supply Chain from Sub-Saharan Africa

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ABSTRACT

This paper analyzes some of the issues associated with air cargo as a mode of transport in the export supply chain from Sub-Saharan Africa (SSA), with emphasis on the U.S. market. Despite the current financial crisis, transportation experts are forecasting an increased role for air transport to and from SSA, as well as for other developing countries. Currently, U.S. imports via air from SSA have a much lower share relative to imports from other countries. Given the importance of air freight in overcoming the long shipping times associated with ocean freight, it is useful to examine the possible role of air freight in SSA's export supply chain. Important issues and constraints include air freight cost relative to other transport modes, the lack of direct flights to the United States, specialized handling and infrastructure requirements, and the need to develop low-weight and high-valued products that are economical to transport via air.

Keywords: *Sub-Saharan Africa, international trade, air freight, economic development, competitiveness, export supply chain.*

INTRODUCTION

It is well known that the availability of infrastructure services in Sub-Saharan Africa (SSA) is generally lower than in many other regions of the world (U.S. International Trade Commission [USITC], 2009; World Economic Forum, 2009).¹ The *Africa Competitiveness Report 2009* of the World Economic Forum highlights the role of inadequate transport as a major factor which has held back African development and significantly raised the cost of exports. The USITC (2009) showed that, on average, it takes 35 days to export a shipping container from SSA, compared to 20 days for Latin America and 23 days for East Asia and the Pacific. Moreover, the cost to export amounted to \$1,879 per shipping container in 2008, more than double the cost to export a container from East Asia and 50 percent more than the cost to export from Latin America. As Africa is a huge continent, with a low ratio of roads per square kilometer, the large distances involved in getting products to foreign markets is an important obstacle to SSA's competitiveness.

In addition to roads and ports, air cargo, to a lesser extent, is an important component of SSA's export supply chain. This paper examines the role of air cargo in SSA's exports to the United States to highlight export constraints and how improvements might benefit SSA. In 2008, air cargo accounted for 35 percent of the value of U.S. imports from SSA excluding petroleum, but only 6 percent excluding both petroleum and precious metals and stones. Targeted investments in air transport infrastructure and non-resource intensive export sectors might help to diversify and increase the competitiveness of SSA exports to the United States.

¹ SSA refers to the following 48 countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Republic of the Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. In some instances data are only available for the continent (Africa) and such data are noted.

ROLE OF AIR CARGO IN DEVELOPING COUNTRIES'S EXPORTS

Air shipping costs have dropped an order of magnitude since the 1950s, with the result that air trade has grown rapidly and international shipment times have decreased (Hummels, 2007). According to Hummels, air tonnage grew at 7.4 percent per year between 1975 and 2004, much faster than both the rate of increase in ocean tonnage and in the value of world trade in manufactures. Hummels ascribes the increase in air cargo to declines in both the relative cost of air versus ocean shipping, and in the weight-to-value ratio as trade has expanded to encompass a larger range of products. Air cargo has increased as timeliness and reliability have become more critical to international trade. Hummels (2009) notes that the benefits of air freight are more pronounced over longer routes.

The *World Air Cargo Forecast* (WACF, Boeing, 2009) projects that, despite current financial sector stresses, declining world trade, and higher jet fuel prices in 2007 and 2008, air cargo traffic will expand at an average annual rate of 5.8 percent for the next two decades, tripling current traffic levels. Moreover, the WACF notes that the rate of increase in connecting developing countries to developed economies through air cargo will either approximate or exceed average world growth. According to Boeing's forecasts, economic activity, as measured by world GDP, is the primary driver for air cargo, and air cargo has been expanding in Africa in line with its economic growth. In addition, inefficient ground and water transport in SSA also make air transport more attractive in SSA. According to Campell (2009), the SSA air freight sector is already showing some recovery from the current financial crisis, in contrast to other parts of the world. A recent article in *Air Cargo World* (2009) notes that a number of air lines have launched or increased flights to Africa in recent months or established partnerships with regional carriers.

Due to close proximity, the European Union (EU) is SSA's largest air freight partner. SSA's air freight with Europe is dominated by exports of perishable agricultural products, such as cut flowers, fish, fruits and vegetables, products for which air cargo is particularly important in expediting shipment. Air transport to the EU largely developed from the tourist economy, which reduced costs and increased the availability of passenger, as well as freight capacity (FAO, 2004).

The United States is behind the EU in SSA air freight for a variety of reasons, the most prominent having to do with the longer flying distances relative to the EU. U.S. imports from SSA via air include perishable agricultural products as well as apparel products, for which demand and fashion tend to fluctuate rapidly. Air trade between SSA and Asia has also been expanding rapidly, with exports to Asia, largely China, up 200 percent in the last five years (WACF, 2009). However, air trade flows are imbalanced, with much more cargo entering SSA from Asia than the reverse.

The air cargo capacities of SSA countries are diverse. South Africa, Mauritius, and Kenya have well-developed international air cargo shipment capabilities. Other resource rich countries, such as Nigeria and Angola, have sufficient air freight capacities, but utilize them disproportionately for inbound freight (WACF, 2009). These countries import oil-extraction machinery and other high technology equipment by air while utilizing ocean transport for exports. Most other SSA countries are characterized as having underdeveloped air shipment capacities.

SSA EXPORTS TO THE UNITED STATES

SSA exports to the United States are dominated by petroleum. In 2008, the United States imported \$86.1 billion of goods from SSA, of which \$71.8 billion, or 83.5 percent, involved petroleum and related products. In 2008, SSA provided approximately 4.0 percent of U.S. imports, but excluding oil, this share fell to 1.0 percent (Figure 1). U.S. imports of non-oil goods from SSA are heavily concentrated in extractive industries. Minerals and metals accounted for \$6.4 billion of the \$14.3 billion in non-oil U.S. imports from SSA in 2008. Precious stones and metals (HS chapter 71) accounted for 33 percent of SSA's non-oil exports to the United States in 2008.

The African Growth and Opportunity Act (AGOA), enacted by the United States at the end of 2000, has provided some impetus for export diversification. The AGOA allowed for an additional 1,800 items to enter the United States duty-free from eligible SSA countries.² The AGOA granted duty-free and quota-free access to the U.S. market for most apparel products, provided that the fabric (or yarn or thread) came from the United States, an AGOA country, or a third country, subject to various rules. Frazer and van Biesebroeck (2007) found that imports of apparel products increased on average by 53 percent following the AGOA, while imports of other eligible products increased by 13 percent. Tadesse and Fayissa (2008) also found that AGOA has contributed to increased imports from SSA countries, including some new products.

Reflecting the importance of petroleum in U.S. imports from SSA, Nigeria and Angola are the largest exporters, followed by South Africa, the region's largest diversified economy. Excluding petroleum, South Africa accounted for 69 percent of U.S. imports from SSA in 2008, followed by the Cote d'Ivoire, Lesotho, and Kenya.

ROLE OF AIR CARGO IN THE SSA-U.S. SUPPLY CHAIN

² There are currently 40 countries in SSA eligible for AGOA (USITC, 2009)

Air cargo accounted for 6 percent of U.S. imports from SSA countries in 2008, far less than the 26.5 percent of imports from other non-NAFTA countries, excluding petroleum and imports of precious stones and metals (Figure 2).³ U.S. imports from SSA are also more heavily weighted toward non-containerized vessels relative to other countries due to SSA's high concentration in bulk agricultural, mineral, and metal products. The U.S. import data for other countries include manufactured products from China which are more likely to be shipped in containerized vessels.

For certain countries, air freight is the primary transport mode for shipping to the United States (Table 1). These countries include small countries such as Djibouti, Gambia, Seychelles, Eritrea, Senegal and Sao Tome that have relatively good air transport facilities relative to their capacity for ocean shipping. In addition, much of the air freight in SSA is linked to the tourist trade, with air carriers bringing in tourists and leaving with products destined for foreign markets. Some landlocked countries, such as Burkina and Uganda also tend to use air cargo for a relatively large percentage of their exports to the United States. For South Africa, the most diversified exporter in SSA, air cargo shipments are less than 6 percent of U.S. imports from that country, reflecting its relatively good ocean shipping infrastructure. Air shipments represented 12 percent of U.S. imports in 2008 from Kenya, another country with a well-developed air cargo sector.

The relative importance of air shipments by product from SSA indicates that air cargo may play a key role in export diversification (Table 2 and Figure 3). The use of air cargo is highly dependent on the product exported. Air cargo plays a relatively large role in the supply chain for perishable agricultural products, such as flowers, plants, and fish, as well as works of art and miscellaneous

³ The data exclude petroleum, which is largely transported by tanker vessel, and precious stones and metals, which are largely transported by air by most countries. Also excluded are imports from Canada and Mexico. These countries share a border with the United States and U.S. imports from these countries are more heavily weighted toward rail and truck.

manufactured products. The rate of utilization of air cargo for SSA textile and apparel products is lower than for U.S. imports of like products from other regions. Apparel exports from non-SSA countries may gain a competitive edge by having a diversity of shipping modes, particularly for products in which shipping time is important.

FACTORS AFFECTING AIR TRANSPORT

One-Way Trade

The WACF (2009) identified unequal directionality in air cargo flows in countries such as Angola and Nigeria as a factor hindering the development of profitable round trip air routes and resulting in nearly-empty outbound cargo flights to the EU. Fatokun (2005) found that Nigeria's dependence on oil exports has stunted Nigerian diversification into agricultural and textile sectors and discouraged the development of air export capacity. Fatokun suggests that one solution could be for neighboring countries to export textiles and agricultural products to Nigeria for export abroad, thereby using excess outbound capacity. Ichès (2005) found that directional imbalances can be a catalyst for development of new export industries, as illustrated by Kenya's diversification into cut flowers. This industry developed after airlines offered attractive prices for outbound hold cargo, jump starting open-air flower production in the mid 1980s and greenhouse production in the 1990s.

Regional Hub and Handling Requirements

Regional air shipment is one way of facilitating shipments from local regions to larger air-export hubs, but Ichès (2005) notes that smaller or isolated communities face constraints that limit their capabilities. For example, Eldoret International airport in Kenya was built to facilitate the export of fresh produce, but (in part because Eldoret does not allow full-load operations due to altitude) trucking products to Nairobi is considered more economical. Thus, Eldoret faces a situation of low-volume domestic cargo flights and no international service. In a similar example, Mwanza airport in Tanzania has only short runways, limiting the size of airplanes, and its smaller-sized aircraft cannot fly to the EU due to noise restrictions. As a consequence, exports of local fish from Lake Victoria are trucked to Nairobi and then flown worldwide, which adds delivery timing risk.

Bofinger (2006) points out that the role and efficiency of terminals and hubs is just as important as capacity volume. He cites overcapacity in Dar es Salaam, Tanzania and Uganda's plan for a new terminal in questioning just how many new air-hubs are needed. The critical point, he feels, is weighing operating cost structures vis-à-vis the actual value of the items being exported.

Even in countries with well-developed air cargo infrastructure, air freight for certain products may be limited by the need for further investment to meet handling requirements of various products (Turney, 2004). For example, in 2004 EU airlines increased capacity to supply auto parts for South Africa's growing auto, technology equipment and electronics industries, but found it difficult to fill EU-bound planes with fish, fruits, and vegetables due to specialized handling requirements. The nearly empty outbound freighters suggested that investment in both handling and infrastructure could expand air cargo exports in this case.

Routing to the United States

The *Africa Air Cargo Transport Report* (2003), prepared by various private and public sector officials for the AGOA Forum in Mauritius, identified the lack of direct air cargo service from SSA to the United States as a barrier to U.S.-SSA trade reaching its fullest potential. Direct flights would reduce the costs of having to ship goods to the United States through the EU. The report noted that direct air cargo service from SSA to the United States could be financially competitive with ocean shipping given the expected increase in volume and the additional costs of money, time, security and insurance when comparing 24 hours by air to five weeks by sea.

Interest in direct U.S.-SSA flights appears to be increasing, but expansion faces hurdles. For example, Delta Airlines postponed its plans to institute direct flights between Atlanta and Nairobi, in June 2009, due to security concerns expressed by the U.S. Department of Homeland Security (*allAfrica.com*, 2009). However, Delta began a twice-weekly service between Abuja, Nigeria, and New York, in June 2009. The new flights will offer air cargo opportunities.

Air Transport Cost

Although historical air freight costs have fallen, more recent Bureau of Labor Statistics (BLS) data indicate that such costs rose by about a third from 2000 to 2008, largely based on the increased cost of fuel (Hummels, 2008). U.S. air shipping costs may also have increased due to 9-11. The World Bank (2006) compared air freight costs to the United States and the EU across a number of SSA countries and found that such rates are lowest from South Africa and Kenya, reflecting the relatively good infrastructure and number of flights from those countries.

The cost of alternative shipping modes is also important in determining air freight competitiveness, even for a country such as Kenya. Jaffee (2003) analyzed the comparative cost of shipping green beans and Asian vegetables from Kenya and its competitors to the EU market. Kenya's air freight costs ranged from \$1.50 to \$1.60 per kg while ocean shipping costs for competitors (Morocco, Egypt, and Senegal) were much lower, ranging from US\$0.75/kg to as low as US\$0.20/kg for sea shipment ex-Egypt. However, it should be noted that countries with higher freight costs can still remain competitive, provided that other costs in the supply chain are competitive. For example, both Colombia and Chile face much higher freight costs transporting produce to the EU than do African countries exporting to the same destination (FAO, 2004).

The weight-to-value ratio also appears to be of critical importance in the competitiveness of air freight, with air freight being reserved for higher valued products. A comparison of shipping modes for selected U.S. imports of apparel from South Africa shows that, in this example, air-freighted apparel has a higher import customs unit value compared to the same products imported by vessel or containerized ship (Figure 4). This indicates that, in addition to timeliness, exported products often need a higher value to justify the cost of shipping by air.

Liberalization of the air sector has been occurring since 1999 with the signing of the Memorandum of Understanding on the Yamoussoukro Decision by African Ministers. This has generally led to an increase in air traffic as shipment rates have been reduced through competition (*Air Transport Report*, 2003). However, there are been some negative aspects to privatization. In East Africa for example, fluctuating shipment rates (previously regulated) have added to fluctuating selling prices in export markets, thus increasing the risk associated with exports (Iches, 2005). Liberalization has also discouraged the subsidizing of smaller trunk and feeder routes that

might be justifiable under monopolistic state control. Fares on these smaller routes have increased, adversely affecting the feasibility of air shipment from isolated regions.

CONCLUSIONS

This paper has analyzed some of the issues associated with using air cargo as a mode of transport in SSA export supply chains, with emphasis on the U.S. market. Despite the current financial crisis and decline in world trade, transportation experts are forecasting an increased role for air transport to and from SSA, along with other developing countries. Currently, a low percentage of U.S. imports from SSA, excluding oil and precious metals and stones, are shipped by air. The higher relative share of U.S. imports via air from other countries suggests that it would be useful for development experts and businesses looking to invest in SSA to examine how increased air freight can benefit SSA and raise the level of exports and trade with these countries.

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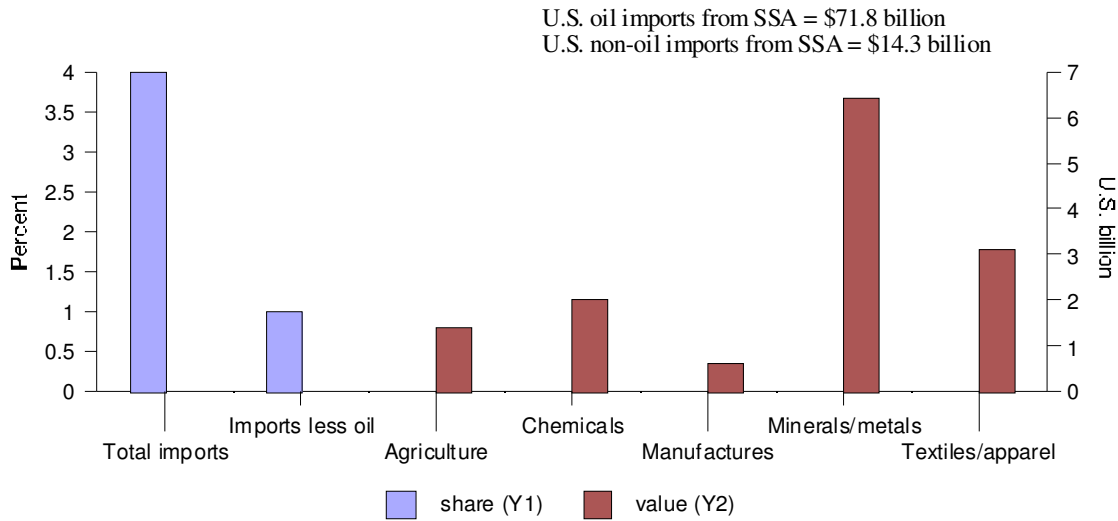
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APPENDIXES

Table 1: Share of U.S. non-oil, non precious stones imports from SSA countries via air, 2008	
≥ 80%	Guinea-Bissau, Seychelles, Eritrea, Djibouti, Gambia
60-79%	Mauritania, Uganda*, Burkina*, Angola
30-59%	Senegal, Sao Tome, Congo (Kinshasa), Mali*
20-29%	Congo (Brazzaville), Somalia, Mauritius, Cape Verde, Niger*
7-19%	Ethiopia, Ghana, Tanzania, Kenya, Rwanda*, Central African Republic*, Nigeria, Madagascar
4-6 %	Togo, South Africa, Swaziland*, Lesotho*, Chad*, Cameroon, Botswana*, Sierra Leone
less than 4 %	Zimbabwe*, Comoros, Mozambique, Gabon, Burundi*, Guinea, Benin, Zambia*, Cote d'Ivoire, Liberia, Malawi*, Equatorial Guinea, Sudan, Namibia
Source: Authors' calculations from DOC, Bureau of the Census trade data. Note: * indicates landlocked	

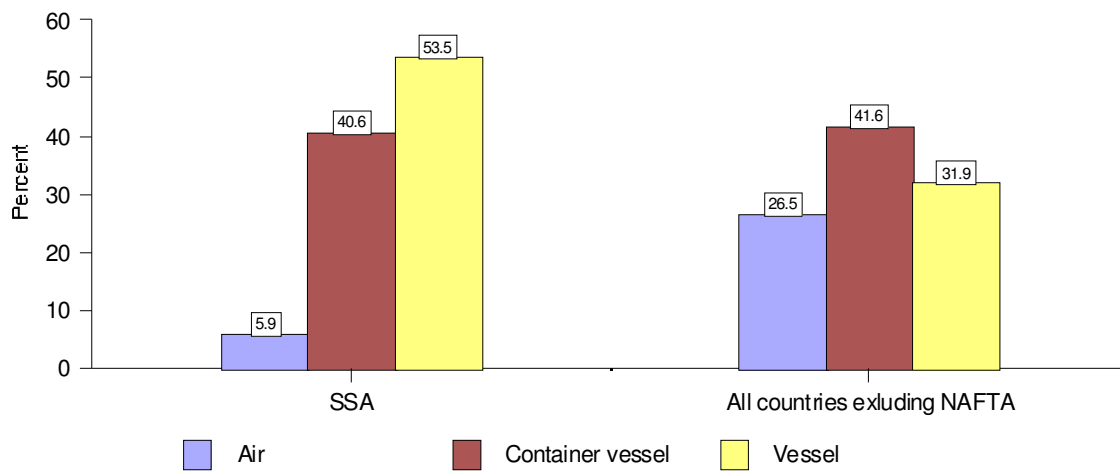
Table 2: Sector export value and share of U.S. non-oil imports from SSA and all countries by air, 2008			
Commodity sector	SSA export value	SSA Share	All countries share
	\$ '000	Percent	
Pearls, precious stones	4,661,594.5	98.9	83.5
Machinery	87,661.4	17.5	37.9
Textiles, apparel, footwear	84,589.3	7.1	12.6
Miscellaneous manufactures	43,518.3	48.1	30.4
Miscellaneous chemicals	37,832.8	3.6	35.1
Works of art	36,147.9	92.9	86.4
Hides, leather, fur skins	26,289.9	94.4	47.2
Fish, crustaceans	20,381.0	37.7	13.2
Live animals	17,575.4	100.0	13.2
Vehicles and parts	15,887.0	0.8	1.1
Miscellaneous agriculture	11,8920.3	6.1	3.5
Plastics	10,675.4	31.9	5.5
Flowers, bulbs, plants	7,597.7	76.7	61.0
Tools and cutlery	6,318.1	50.8	25.4
Ceramic products	1,818.2	34.4	6.6
Source: Compiled by the authors from DOC, Census data. Miscellaneous agriculture includes fruits, vegetables, lacs, gums, and other edible food products.			

Figure 1 SSA: U.S. import share and non-oil import values, 2008



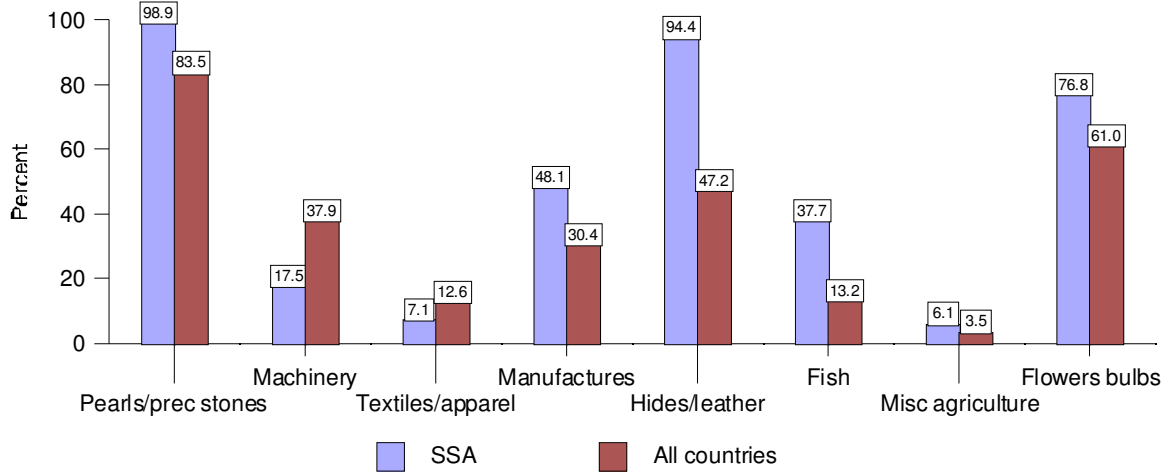
Source: DOC, Bureau of the Census

Figure 2 U.S. import shares, by mode of transport: SSA and other countries, 2008



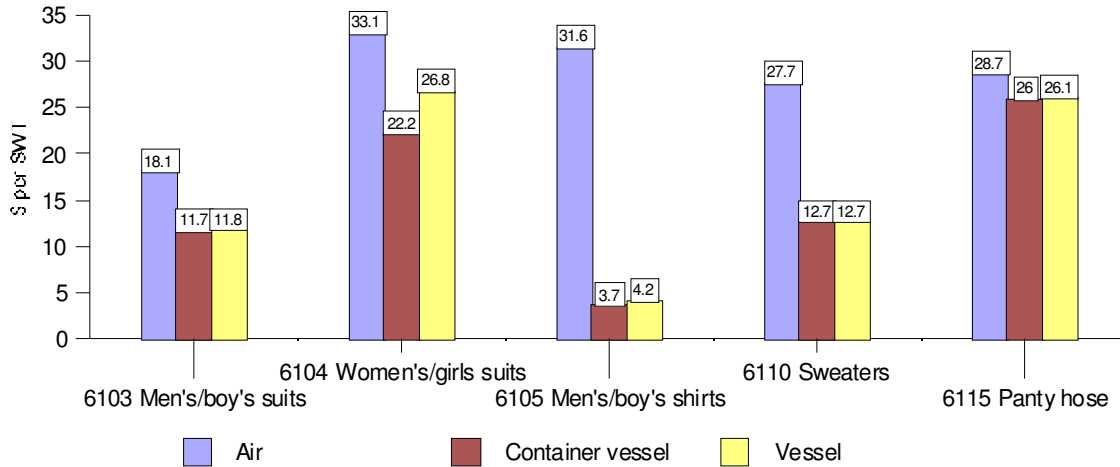
Source: DOC, Bureau of the Census. Note: U.S. import data exclude HS chapters 27 (minerals fuels) and 71 pearls and precious stones

Figure 3 U.S. import shares by air transport: SSA and all countries, selected commodities, 2008



Source: DOC, Bureau of the Census

Figure 4 Select customs values for U.S. apparel imports from SSA by mode of transport, 2008



Source: DOC, Bureau of the Census