

International Logistics costs, the case of Djibouti – Addis Ababa corridor

World Conference on Transport Research - WCTR 2019 Mumbai, May 26-31 2019

Seifu H. D.^a, Kebede A.^b, Mohammed R. A.^c, Teklu B.^a, Gebresenbet G.^b

^a Addis Ababa Institute of Technology, Addis Ababa University, Box 385 Addis Ababa, Ethiopia

^b Swedish University of Agricultural Sciences, Box 7032; 750 07 Uppsala, Sweden

^c Delft University of Technology, Delft 2628 BX, Netherlands

Abstract

There is a strong linkage between economic development of a country and the efficiency of its logistics system. Ethiopia is one of the sixteen landlocked countries in Africa. This has made the country both physically and economically remote from major world markets and according to the African Development Bank, it has contributed to high trade costs. Hence, Ethiopia's logistics system needs to be designed and operated in a manner to effectively reduce the overall process cost and time taken for operations. Understanding the logistics cost, therefore, can be taken as an important step in identifying areas of inefficiency and ease the decision making to reduce the barriers of trade operations and optimize the whole system. The main purpose of this study was to analyse and estimate the baseline port and road transport costs in the supply chain of three selected products (cereals, fertilizers and steel) from the Djibouti Port and along the Ethiopia-Djibouti road transport corridor.

The study considered only the import segment of the trade activities due to its dominance of cargo load over the export segment. Data was collected from different actors involved in the port and road transport operations. In addition, surveys were conducted at the Port of Djibouti and Addis Ababa-Djibouti Road Corridor (main import-export corridor of Ethiopia). The analysis approach taken was from users' perspective in which the cost elements are the payments made by the service receivers. The cost structure of the analysis has three elements (fixed, variable and hidden costs) to establish the unit cost of the selected commodities and then combine with the total cargo imported.

The estimated total unit cost of the port operations were 27.50, 25.32 and 21.44 USD per ton for fertilizers, cereals, and steel cargos respectively while the road transport costs were 34.30, 32.70 and 34.20 USD. The variable cost element contributed more than 90% of the total cost for both port operations and road transport. The main cost drivers in the variable cost element were handling charges and cargo demurrage for port operations, and fuel and tire & tube for road transport. The costs under both segments were found to be more expensive when compared to similar African countries. It can therefore be recommended that the government and involved actors need to devise proper cost reduction measures and implement them to facilitate trade in the country.

Keywords: Road transport cost; Port operation cost; logistics cost; import-export corridor

1. Introduction

The Ethiopian government has a goal of increasing trade and economic development as stated out in the latest Growth and Transformation Plan (GTP II) of the country. As per the GTP-II, the government envisages to sustain an average 11% GDP growth for the fiscal years 2015/16 to 2019/20 (National Planning Commission, 2016). On the other hand, various researches show the strong linkage of trade and economic development to the efficiency of the logistics system. In other word the logistics system efficiency can be the main challenge to trade and economic development. The logistics system plays important role in connecting different industries and markets. Different industries need raw materials for production and, then the final product has to be transported to the market through the logistics system. Hence, the GTP-

It plans to improve the logistics index of the country to 3.07 from its current 2.38.

Ethiopia is one of the sixteen landlocked countries in Africa, making the country both physically and economically more remote from major world markets and resulted to the high trade costs. It is these high trade costs that isolate land locked countries (LLC) and prevent them from reaping the benefits of globalization, as their exports become less competitive and imports more expensive (ADB, 2010). In Ethiopia, the import volume is four times higher than the export volume with the main import products being cereals, fertilizers, petroleum, durable goods and consumer goods (Nathan, 2012).

According to the African Development Bank Report (ADB, 2012) the four factors contributing to poor trade logistics in Africa are higher inland travel costs, higher port and terminal handling fees, higher customs clearance and technical control fees, and higher costs to prepare documents and letters of credit. Moreover, the study by Nathan (2013) identified that the major source of inefficiencies and higher costs in the sub-region of West and Central Africa across the trade corridors are listed as follows:

- No effective competition in the process of transit transport price determination (except Ghana)
- Inefficiency in fleet management and the whole road transport industry (except Ghana and Côte d'Ivoire)
- Port/customs bribery related to delays and weak information systems (except Abidjan)
- High delays in port including container stripping impacts in some ports (all ports except Abidjan)
- Cargo allocation problems and delay in gateway processes (all ports except Abidjan and Tema)
- Excessive border crossing delays in most corridors and delays in inland terminal in some countries
- Trade corridor and performance information are not developed enough to fully pinpoint inefficiencies

As the report by PWC (2013) outlines, it is common sense that high-performance transport and logistics systems are a key factor for a country or a region in terms of economic stability and attraction of foreign direct investment. There are a wide range of factors that go into smooth shipment of goods. The World Bank's logistics performance index (LPI) includes six main component indicators: infrastructure, international shipments, logistics competence, tracking and tracing, customs and timeliness.

ADB (2012) points out long dwell times of import containers are a major problem for most of Africa's ports. When ports work efficiently, containers only face two or three days delay between the time they're unloaded and when they exit the port. The Sub-Saharan Africa average is 14 days and the Ethiopian average is 25 days according to recent World Bank estimates. Poor connections to the hinterland and red tape at customs are at play, but there are other reasons too, like collusion. Terminal operators may earn large revenues from storage, giving them little incentive to improve.

Trade cannot sustain growth if the transport logistics, especially the bottlenecks in the maritime nexus of many African countries are not improved. Trade performance is not uniform across Africa, with some countries performing markedly better than others. From a sub-regional perspective, North Africa, East Africa, and Southern Africa enjoy higher trade volumes than West and Central Africa. There are a number of reasons for this disparity; the Central Africa sub-region is largely landlocked, which increases transport costs and therefore overall trade costs particularly with overseas markets (ADB, 2010).

The logistics system need to be designed and operate in a manner to effectively reduce the overall process cost and overall time taken for operations. The cost and time inefficiency finally reflect on the overall GDP of the country. The barriers on the logistics process needs to be improved so as their effect on the economy of the country.

Specifically the logistics practice in Ethiopia has been hindered by various problems including poor existing infrastructure and lack of basic infrastructures, inefficient and ineffective freight vehicles, and long and repetitive custom checking points (Amentea T., 2015). Ayenew S. (2015) also tried to address the challenges of the freight transport vehicles trip frequency along the Ethio-Djibouti corridor. The finding indicated that the frequency of trucks were affected by both internal and external challenges such as customs underperformance at check points, narrow road infrastructures, lack of integration among stakeholders, old age of vehicles, and lack of trained man power.

Knowing the logistics cost can be taken as a main important step to identify the areas of inefficiency and ease the decision making to reduce the barriers of trade operations and optimize the whole system. The main aim of the study is quantify the baseline logistics costs from port to final destinations with the two segments, Port Segments (Djibouti Port) and Road Transport Segment (Ethio-Djibouti road transport corridor).

The important cost components under port segment are variable cost components as the fixed cost components are related to the cost of port development which was carried out by another country (Djibouti) and it is believed that these costs are being compensated indirectly with service revenue. But the documentation and declaration fixed costs are insignificant when compared to cost sets in other categories and ignored in the analysis. The variable cost components include the port due cost, cargo handling at the port/port handling and port cargo demurrage. Hidden costs include the marine discharge cost related to the cargo vessels. The road segment cost includes the variable cost, the fixed cost and hidden costs related with time.

The paper is organized as follows: methodology and approach (2), results and discussion (3) followed with the conclusion (4).

2. Methodology and Approach

The study area was the Ethio-Djibouti corridor and the port at Djibouti. Data were gathered separately for port and road sections. Data were collected from different actors related to the operations and the survey was on the truck drivers and transport operators.

2.1. Data for port segment

The data sets at the port segment are directly linked with the process set up operations by specifying respective data components involving particular parameters. Before the detail data collection, it was tried to put a link between actual operation and cost analysis components. The primary data for the port side was done with survey of actors and an observational visit. Secondary data were gathered from stakeholders who directly or indirectly involve in the operation. The detail description of the variables presented in the parts below.

Port due costs

The port due costs include the charges paid for the service at the port. The calculation of cost is based on the unit costs on the tariff book.

Port handling/Cargo handling at port

The port handling activity involves transfer of cargos from ships to the port storage or direct to trucks and from port storage to trucks. It also includes bagging activity for bulk cargos of fertilizer and cereal.

Port cargo demurrage

The costs under these category are related to the cargos storage time at the port. It is related to the tonnage amount and time of stay at the port. The analysis for break bulk cargo (steel) and bulk cargo (fertilizer and cereals) have different unit costs, since the storage for steel is at open yard but cereals and fertilizers are stored in silo. The demurrage time for fertilizer and cereals were considered as the time between start of vessel berthing and the last silo off take or the total operation time. But for steel cargo the storage time is the difference of the arrival rate of the import cargo at each month and the monthly average discharge/transfer to trucks. Then demurrage charge will be analyzed based on this storage time value and applicable unit rate of port cargo demurrage as given in the table 3 below.

Marine charges

The marine charges are the costs that are paid by the vessel companies to the port service due to their access to the facility. The charges include the operations of anchorage time, berthing time, pilotage, towing and mooring. The cost calculations of the marine charges includes the direct volumes of vessels.

2.2. Data for road segment

Road segment cost data is mainly collected through questionnaires surveys and interviews on February 2018. The target groups were drivers of truck and officials of transport operators/companies. The road segment cost includes the variable cost, the fixed cost and hidden costs related with time. Two final destinations were selected based on the warehouse location for the selected cargo types, Cereals and fertilizers are unloaded at Adama (city 110 kilometers east of the capital city Addis Ababa) and Addis Ababa as for Steel.

Variable costs

The variable cost comprises two components, direct costs and overhead costs. The elements under direct costs include fuel cost, tire cost, minor maintenance costs, washing and vehicle lubrication expenses, port due expenses, crane service expenses, custom clearance expenses and other related ones. Under overhead costs the only components considered were the salary and per diem allowance for the drivers and the support crew. The variable cost components were collected from drivers, transport companies and transport associations. Transport companies own freight trucks and hire drivers to operate the trucks. On the other hand transport associations are formed by groups of truck owners forming an administrative board to facilitate the loading between the importers and the member truck owners. The reliability of the data collected from freight truck drivers was cross checked with the data sets collected from transport companies and associations.

Even though three different types of cargo were considered, majority of the cost components have the same cost to all of the three types except on the fuel cost, due to two reasons. The first one is the destination for steel was selected as Addis Ababa while cereals and fertilizers are unloaded at Adama. This difference in length of the segment may affect the fuel consumption rate. The second reason may be the non-uniform loading pattern of steel that resulted from the bundles nature of the steel cargo. The loading in bundles may create under or over loading in different axle configuration of the truck and further may result in different fuel consumption pattern.

Majority of the variable cost components were collected directly per trip basis except tire cost. Tire cost was collected in terms of utilization per year. The utilization time was used to estimate the number of tire required per year. For instance, if a tire serves 6 months, the service rate will be 2 tires/year. The target trucks have six-axles with a total of 22 tires. Assuming half of the tires to be replaced per a year, a total of 2*11 tires will be utilized at the end of the year. These were converted into cost by unite tire cost of 340.70 USD. Then the annual value was converted into a single trip based on the total annual number of trips.

Fixed costs and Hidden costs

Fixed costs include costs which are incurred per annum basis. These cost components include insurance cost, drivers' insurance, provident fund/pension, uniforms and out fits, annual vehicle license renewal and maintenance costs. Annual costs are converted to per trip cost considering three trips per month. On the other hand, hidden costs include the accident and delay costs. However these costs were not available as quantified costs. Total road transport unit cost was calculated only from the variable cost and fixed cost.

2.3. Limitation of the study

The main challenges from the port side were the absence of detailed data to make comprehensive analysis. Because of the weak link between the actors and the port operators, the level of detail of the data was limited. For road transport side, due to unexpected reasons the samples size has not been met. It was able to observe as the responses are less statistical and thus the costs were determined from the available data.

3. Results

3.1. Port operation cost

Total cost of port operation was determined as the total sum of the port operation cost components. Each cost component was determined by multiplying unit cost of each parameter with the total imported tonnage. The distribution of tonnage for the selected study cargos over the year 2017 is shown in figure 1. The tonnage distribution showing that import load of fertilizer and cereal were peak in the first six months of the year, between January and June, but for steel the peak time was the second half of the year between June and December. Re-distribution of load throughout the year has a potential benefit to organize the port operations and better plan the trucks allocation for picking up the loads from the port.

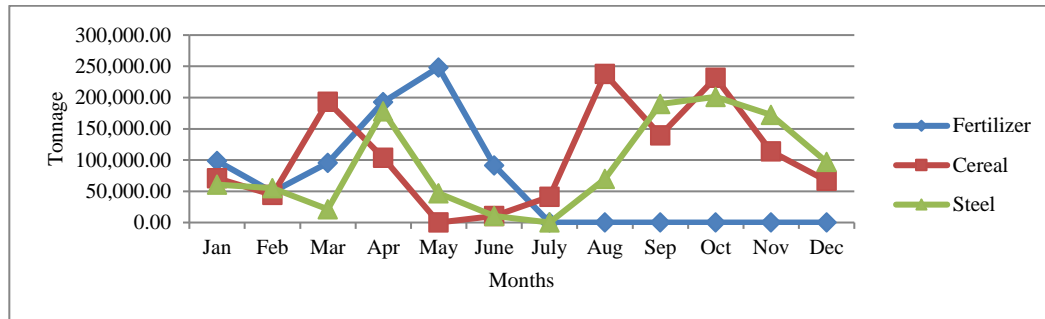


Figure 1. Import tonnage distribution for the selected cargo types, 2017 (Source: EMAA)

The unit costs for all components under each categories were adopted from tariff book (2008) of the Djibouti Port administration. The details of these unit costs are presented in the parts below.

Port due costs

Table 1 shows the list of unit costs applicable to our study case. The port due cost is determined by directly multiplying the unit costs with total import tonnage amount of the cargo.

Table 1. Unit cost for port due (in US Dollars (USD))

All tariffs are levied against 1 Metric Ton or 1 Freight Ton whichever is the greater.		
Cargo Type	Unit	Transit Import (USD)
1.0 Solid Bulk		
1.1 Fertilizer	Wton	1.10
1.2 Grains & other bulk	Wton	2.75
2. ISPS (Security Charges)		
2.1 Un-containerized cargo	Frton	0.25
2.2 Containers	Cont.	6.00
3.0 Quay cleaning		
3.1 Conventional	Frton	0.30
3.2 Containers	Frton	0.15

(Source: Tariff book of Port of Djibouti)

Port handling/Cargo handling at port

The unit costs applicable were taken from the tariff book and are detailed in the table 2 below.

Table 2. Unit rates applicable for cargo handling at the port operations

General Cargo Handling	Below are the charges against 1 Fr ton or 1 M. ton, whichever is greater	
A. BREAK BULK Handling Charges	Stevedoring (USD)	Cargo Shore handling (USD)
Steel	2.80	14.97
B – BULK Cargo Handling		
Grains	Inbound	18.75
Fertilizer	Inbound	18.75

(Source: *Tariff book of Port of Djibouti*)

Port cargo demurrage

The unit costs applicable were taken from the tariff book and are detailed in the table 3 below.

Table 3. Unit rates applicable for port storage charges

A.1. OPEN YARD STORAGE		
Break-bulk	Unit	Import
Grace Period	Days	8
Tariff (per day)	1000 Kg/ 1 CBM	0.05 USD
A.2. Port Warehouse Storage		
Tariff (per day)	Days	8
1000 Kg/ 1 CBM	1000 Kg/ 1 CBM	0.20 USD
B – STORAGE CHARGES FOR BULK CARGO		
Storage of grains & fertilizer in silo:	- First 20 days storage at 0.20 USD per day per metric ton or part thereof.	
	- Thereafter 0.30\$ per day per metric ton or part thereof.	

(Source: *Tariff book of Port of Djibouti*)

Marine charges

The vessel volumes are calculated based on the net registered tonnage (NRT). The gross registered tonnage (GRT) is the ships total volume expressed in registered tons each of which is equal to 100 cubic feet (2.83 m³). The GRT uses the total permanently enclosed capacity of the vessel as its basis for volume. The net registered tonnage (NRT) subtracts the volume of spaces not available for carrying cargo, such as fuel tanks, engine room and crew quarters from the gross registered tonnage. For our case, the NRT taken is directly equal to the tonnage carried by the ships and changed to the equivalent volume using the factor that 1 ton is equivalent to 2.83 m³. The NRT taken to estimate the vessel volume is equal to the carried tonnage by the vessels during their dispatch at the port and then multiplied by the 2.83 factor to get the final vessel volume. The applicable unit costs of marine charged are detailed in table 4.

Table 4. Applicable unit cost for marine charges

Details	Vessel volume expressed in m3, Tariff in USD per 1000 m3.				
	Less than 10,000	10,001 - 25,000 m3	25,001 - 50,000 m3	50,001 - 100,000m3	Over 100,000 m3
2. ANCHORAGE – in USD per 1000 m3					
Per period of 12 hours indivisible (1) & (3)					
2.1. first and second period	6.65	6.3	6	5.25	4.5
Fixed Charges	-	66.05	160.7	310.7	570
2.2. from 3rd to 6 th	6	5.75	5.45	4.8	4.25
Fixed Charges	-	60	145.65	280.7	520
2.3. 7th and over	5.25	5.1	0.8	4.25	3.75
Fixed Charges	-	52.6	129.2	249.2	450
Berth waiting time due to Port congestion	Free	free	free	free	free
3.1. first and second period	13.9	13.25	12.5	11.95	11.95
Fixed Charges	-	138.15	336.5	648.55	1240
3.2. from 3rd to 6 th	12.5	11.95	11.3	10.7	10.7
Fixed Charges	-	124.5	302.55	584.7	1120
3.3. 7th and over	11.15	10.55	10.15	9.5	9.5
Fixed Charges	-	110.95	268.8	520.75	990
4. PILOTAGE in USD per 1000 m3 (with minimum 1000 m3) Per movement (1) (4) & (5)					
Fixed Charges	-	90.45	226.15	452.3	900
Non-self-propelled vessel	0.5	0.5	0.5	0.5	0.5
5. TOWING in USD per 1000 m3 (with minimum 1000 m3) Per movement (1) (4) & (5)					
Fixed Charges	-	123.65	309.05	618.1	1230
Non-self-propelled vessel	0.5	0.5	0.5	0.5	0.5
6. MOORING in USD with minimum of 1000 m3 Per movement (1) & (5)					
Fixed Charges	-	37.7	94.25	188.45	375

(Source: *Tariff book of Port of Djibouti*)

The port operation components costs calculated by multiplying the total tonnage with the respective unit costs are shown in table 5 and the percentage contribution of each component in figure 3.

The total unit costs for both road transport and port operation were calculated as the sum of the corresponding cost components. The port operation part included only variable and hidden cost components as the fixed costs are insignificant. The total unit costs under the port operation for cereal, fertilizers and steel are found as 25.32, 27.50 and 21.28 USD per ton, respectively.

Table 5. Estimated details of total cost for port operation (in USD)

2017							
Item	Total Imported (tonnage)	Variable Costs			Hidden Cost	Summary of Costs (USD)	Unit Cost (USD per ton)
		Port Dues	Port Handling	Port Cargo Demurrage	Marine Charges		
Fertilizer	775,499.45	1,046,924.26	14,540,614.69	4,839,935.30	901,551.54	21,329,025.78	27.50
Cereal	1,253,816.35	3,761,449.05	23,509,056.58	3,015,665.47	1,457,615.55	31,743,786.65	25.32
Steel	1,161,929.00	3,834,365.70	17,394,077.13	2,218,376.54	1,278,650.60	24,725,469.97	21.28

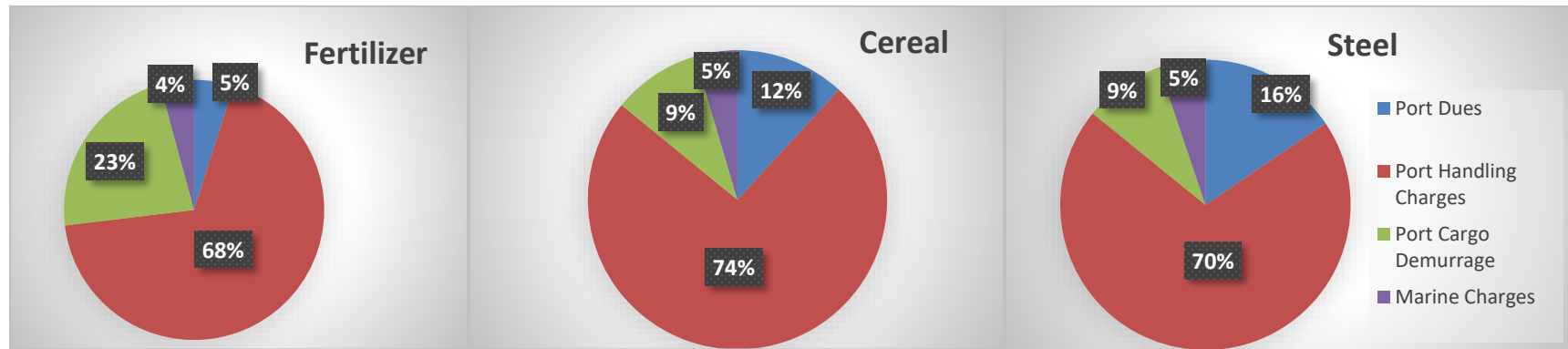


Figure 3. Contribution of cost elements on the port segment for selected items

3.2. Road transport cost

The total road unit cost includes the variable costs and the fixed cost. The variable cost is collected from both the drivers and the transport operators. The average of the two values was taken for the variable cost. The fixed cost on the other hand was collected only from the transport operators, transport companies and associations. The total road transport cost is the sum total of the fixed cost and the variable cost. The comparison of the variable cost components as collected from the drivers and the transport operators is shown in figure 4 below, and the costs are overlapping to show the credibility of the data.

Table 6: Fixed costs for road transport

Fixed costs components	Fixed Cost (USD/year)
Insurance	1397.48
insurance for drivers	151.77
Provident fund/Pension	250.82
Uniforms & Out fits	111.75
Rope, Canvas & Steel wire	608.70
Annual Vehicle License Renewal	508.74
Repair & Maintenance Internal	2242.17
Repair & Maintenance External	1059.72
Total fixed costs	6331.14

Table 7: Variable costs for road transport

Variable costs	Cost (USD/trip) ¹	
	Cereal/Fertilizer	Steel
Fuel	556.66	633.92
Tire & tube	128.67	128.67
Spare part	91.28	91.28
Oil & Lubricants	17.50	17.50
Canvas, Rope & Steel Wire	40.03	40.03
Minor Repair and Maintenance	69.78	69.78
Washing & Grease	12.87	12.87
Loading, Unloading & Car/L	32.76	32.76
Port Due Expense	47.93	47.93
Parking and Overnight stay	7.24	7.24
Check point fees	5.27	5.27
Crane expenses	5.13	5.13
Others	18.43	18.43
Salary of Driver	56.82	56.82
Salary of support crew	13.74	13.74
Travel & Overnight Stay Per Diem for Driver	50.29	50.29
Travel & Overnight Stay Per Diem for Support crew	38.37	38.37
Per diem due to Down Time for Support Crew	12.58	12.58
Total	1,205.33	1282.59

¹ A trip is 780km for cereal/fertilizer and 890km for steel

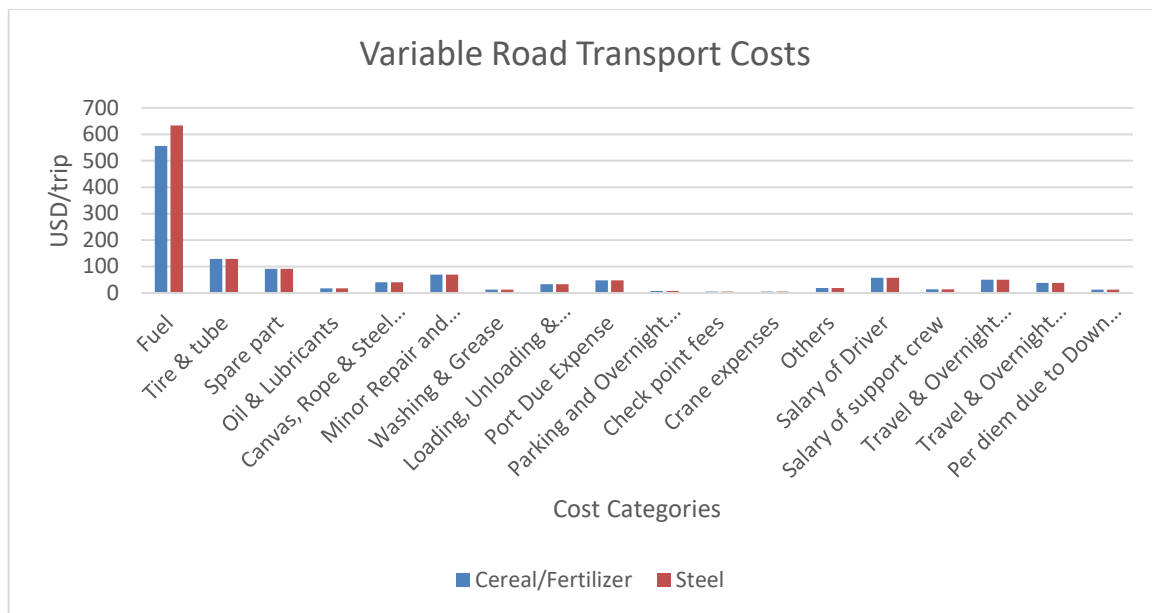


Figure 4. Variable road transport costs

The total unit costs for both road transport and port operation were calculated as the sum of the corresponding cost components. The road transport cost includes variable and fixed cost components. Accordingly the estimated total unit costs for road transport for cereals, fertilizers and steel are 34.30, 32.70 and 34.20 USD/ton, respectively. Table 8 presents the total estimated unit cost for road transport between the Port of Djibouti and the associated destination for each commodity.

Table 5: Estimated details of total road transport cost

Cargo type	Destination	Variable cost (USD/km)	Fixed cost (USD/day)	Average tonnage	Unit Cost (USD/ton.km)	Unit cost (USD/ton)
Cereals	Adama	1.47	19.19	40.6	0.042	34.3
Fertilizer	Adama	1.47	19.33	41.7	0.04	32.7
Steel	Addis Ababa	1.38	19.19	42.5	0.037	34.2

Table 9: Comparison of port operation costs of different African countries

Region/Country	General cargo (over-the-quay per metric ton), USD
<i>our case (Ethiopia - Djibouti)</i> <i>(average value)</i>	17.49
East Africa	6-15
Southern Africa	11-15
West Africa	8-15
Rest of the World	7-9

(Source: the values taken from the study conducted by Ocean Shipping Consultants in 2008)

Table 10: Comparison of road freight transport costs of different African countries

Corridor	Route Gateway/destination	Variable cost (USD/km)	Fixed cost (USD/day)
<i>East Africa (Ethiopia and Djibouti)</i>	<i>Port Djibouti-Addis Ababa</i>	1.44	19.23
West African (Burkina Faso and Ghana)	Accra-Ouagadougou	1.51	30
Central Africa (Cameroon and Chad)	Douala-N'Djamena	1.31	49
East Africa (Uganda and Kenya)	Mombassa-Kampala	0.98	61
Southern Africa (South Africa and Zambia)	Lusaka-Johannesburg	1.54	55

(Source of data: Transport prices and costs in Africa: a review of the main international corridors/ by Supee Teravaninthorn, Gäël Raballand, 2009)

4. Conclusion

The baseline logistics cost can be calculated using the classification fixed, variable and hidden costs. For the port part fixed cost have been found to be insignificant and can be included in the service costs. Hidden costs under the road transport part are delay and accident, which are not quantified in monetary terms. The main cost drivers for under the port part are the port handling charge, which takes the first place, followed by port cargo demurrage cost. Marine cost was found to contribute the least. On the road transport side, the fuel cost has the largest share followed by the tire and tube cost.

The estimated total unit cost (in USD) for the port part (only variable and hidden costs) for fertilizer, cereals and steel were 27.5, 25.32 and 21.28 respectively. The estimated total unit cost for road part (only fixed and variable costs) for cereal fertilizer and steel were 34.3, 32.7 and 34.2 respectively. The variable costs contributed more than 90% of the total cost for both the port segment and the road transport segments.

The port handling cost of the analysis result which referred as the main cost driver in the port segment contributing around 70% of the total cost was also the most expensive when compared to other different African regions and the rest of the world. But the road freight transport is more competitive with other African regions (gateway corridor between two African countries) showing less fixed cost and higher values in the variables cost. The costs under both segments were found to be on the higher level when compared to other countries. It can be recommended that there needs implementation of proper measures taken by all the actors involved in the operations and different level contributions from the Ethiopian government.

Reference

African Development Report, 2010. Trade and Trade Costs in Africa: An Overview

African Development Report, 2012, yearly report 2012

Amentae, T., 2015, Towards Intermodal Freight Transport System in Ethiopia: Evaluation of Ethiopian Shipping and Logistics Service Enterprise Multimodal Freight Transport Performance by Customers and Employees, SLU, Uppsala, Sweden

Ayeneu, S., 2015, Challenges of Freight Transport Vehicles Trip Frequency in Ethiopia Addis Ababa-Djibouti Corridor, Ethiopian Civil Service University

National Planning Commission, 2016, Federal Democratic Republic of Ethiopia: Growth and Transformation Plan II (GTP II) (2015/16-2019/20), Addis Ababa

Nathan Associates, 2013. Logistics Cost Study of Transport Corridors in Central and West Africa: Final Report

Nathan and Associates, 2012, Development of a National Logistics Strategy for Ethiopia Volume 2: Diagnostic Analysis of the Current Logistics System; Technical Report, UNDP

Ocean Shipping Consultants, 2008, Africa Infrastructure Country Diagnostic beyond the bottlenecks: Ports in Sub-Saharan Africa, June 2008

PWC, 2013. Future prospects in Africa for the transportation & logistics industry: Africa Gearing up

Teravaninthorn S, Gaël Raballand, 2009: Transport prices and costs in Africa: a review of the main international corridors, The World Bank