Break Even Analysis of China Europe (Xiamen) Class

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Abstract: This paper starts from the current operation situation of China Europe (Xiamen) class trains, through the calculation of breakeven point of China Europe (Xiamen, Chengdu and Europe) trains, to get the price without government subsidies in China under the condition of the operation of pricing, then to expand the supply of relevant value, and ultimately to achieve full market-oriented operation to provide the relevant cost basis.

Key words: The Belt and Road Initiative, central (Xiamen) train, logistics channel, profit and loss balance

1 Introduction

On 16th August, 2015, two international railway freight trains from Xiamen to Europe and Central Asia(China Europe (Xiamen) Train) started operating officially. These were the very first two China-Europe, China-Central Asia Trains set off from Free Trade Area in China, which brought about the seamless connection with The Belt and Road Initiative strategies, opened up new international logistics channels to Taiwan, ASEAN, Europe and Asia, established a new platform connecting Eurasian continent, accelerating the pace of "go out" and "bring in", provided refined supporting services for the trade between Asia and Europe, plays an important role of bridge and tie in terms of international cooperation on production capacity, also makes Xiamen become the only land sea hub city achieved connecting "one belt" and "one road" seamlessly.[7]

Like the other China Europe trains, China Europe (Xiamen) Train is currently in a market cultivation period. There are up to ten million yuan subsidies from city, district and government. In order to accomplish the "self hematopoiesis" of China Europe (Xiamen) Train, reduce gradually so far as to disengage from the government subsidies, eventually reach the balance of profit and loss then involve and capture the market, building a westward fully-market-oriented operating logistics channel which traverses from China to Europe has become a serious issue for Xiamen city government, Haicang District and Xiamen Haitou Group.

This paper starts from the current operating situation of China Europe (Xiamen) Train, through the calculation of break even point of China Europe (Xiamen, Chengdu and Europe) Train, to get the cost of operation without government subsidies. By comparing to the cost of other forms of transportation(sea, air) to expand the supply of relevant value, and ultimately to achieve fully-market-oriented operation to provide the relevant cost basis.

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2 Current operating situation of China Europe (Xiamen) Train

2.1 Summary of China Europe (Xiamen) Train

China Europe (Xiamen) Train, China Central Asia Train start from Free Trade Area Xiamen, through Chengdu and depart from Alataw Pass Xinjiang, via Kazakhstan, Russia and end in Lodz Poland. The total distance is 12,043 kilometers, consist of 5,324 kilometers internal part and 6,719 kilometers external part. Whole journey takes 14 days, increased from 1 train to 2 trains per week. China Central Asia Train takes 7 days, contains 5,310 kilometer within the country and 878 kilometers abroad, runs once per week.

Until May 2022, there were1 147 trains ran from Xiamen via Chengdu to Europe, 47399 40-feet containers totally, added up to a value of 27.711 billion RMB. Among them, 2026 TEUs have been converted and shipped through sea rail combined transport, with the carrying value exceeding 1 billion RMB.

Since March 2022, affected by the conflict between Russia and Ukraine, the traditional sea transportation from Taiwan and Southeast Asian countries to Russia has been limited. The sea rail intermodal logistics channel from Taiwan to Russia through Xiamen has provided a new logistics shortcut for the goods from the above regions to Russia. It is estimated that shipping from Taiwan to Xiamen and then taking the China Europe train to Russia saves nearly half of the transportation time compared with the whole shipping. At present, the China Europe (Xiamen) train has stably operated three main lines: Xiamen Hamburg, Xiamen Central Asia and Xiamen Russia. By constantly giving play to the superposition advantages of the free trade zone and the comprehensive insurance zone, the China Europe (Xiamen) train has provided stable and high-quality logistics solutions and services for the goods in Southeast Asia, Taiwan and other regions to connect the hinterland of Europe and Asia, and combined the sea rail intermodal transport mode to realize the seamless connection between the "sea silk" and "land silk". It helps build a new development pattern of the "the Belt and Road" and the "double cycle".

2.2 Main source of goods for China Europe (Xiamen) Train

At present, the major export goods from the economic zone on the western coast of the Taiwan Straits centered in Xiamen to Central Asia, Europe including big size LCDs, panels, SSD, clothes, shoes, hats, food and light industrial machinery, etc.[2] Among China Europe(Xiamen) trains Admiral Oversea Corporation has 1 to 2 special trains per week, mainly shipping big size electrical products such as case, cover and box. As for inside parts of general mobile phones or computers, for example, parts like chips are rather small and high-valued, 1 cubic meter of goods worth hundreds of thousands or even millions of dollars, therefore this kind of goods are mostly shipped by flights. Trains are loaded with goods such as meat, milk, alcohol, fittings, mechanical and electrical products, import vehicles and fashion clothes, etc. when returns from Europe.

Owing to the certain limitation of varieties of the shipping goods' source for China Europe (Xiamen) Train, there are several influencing factors. For instance, in the coming five years, the government might reduce or even cancel the subsidies, COSCO shipping group's tactic of introducing Piraeus as port of call for China Europe course, products' traffic volume, features

of the products and delivery period of LC, etc. All these factors will have a great impact on the source of goods for China Europe (Xiamen) Train. Thus we need to calculate the break even point to obtain the cost of operating China Europe (Xiamen) Train, then by comparing with cost of other means of transportation to gain an exact range of value.

3 Calculation and analysis of break even point of China Europe (Xiamen) Train operation

Being in a market cultivation period currently, like the other trains, China Europe (Xiamen) Train also has existing problems relating to the government subsidies. In order to accomplish the "self hematopoiesis" of China Europe (Xiamen) Train, and build a fully-market-oriented operating logistics channel without government subsidies which traverses from China to Europe, we will begin with analyse and calculate the break even point pricing, thereby reach the total operating cost, ultimately provide a cost basis for searching suitable source of goods.

3.1 Break even point calculation

Equation of break even point calculation BEP=Cf/(p-cu-tu)

Remarks: BEP-- The volume of production and sales(Q) when reach the break even point

Cf--Constant cost

P--Unit product sales price

Cu--Unit product variable cost(China Europe (Xiamen) Train doesn't have variable cost currently)

Tu--Unit product business tax and added value(Tu neglected)

Thus Q*P=Cf

The operation pricing when reach the break even point is P=Cf/Q

3.2 Calculation of constant cost of China Europe (Xiamen) Train

So far there are 2 forms of trains from Xiamen China to Europe, one is via Chengdu using trailers to central Europe--Lodz Poland(Xiamen, Chengdu and Europe), the other one runs directly to Hamburg German. We will take China Europe (Xiamen, Chengdu and Europe) Train as an example to analyse and calculate the break even point.

Calculation of constant cost of China Europe (Xiamen, Chengdu and Europe) Train is in accordance with "Third, Calculation of Train supporting standards" from "*The Calculating method and instruction of China Europe (Xiamen, Chengdu and Europe) Train outward trains subsidies* "Xiamen development of modern logistics industry coordination office[2015] No. 18.

3.2.1 Cost of Container Yard to Container Yard(CY-CY)

Table 1 Cost of CY-CY Unit: Container(Carriage)

No.	Cost Category	Item	Price(RMB)	Convert into USD	Remarks
1	Chengdu to Europe	Freight(Chengdu to Alataw)	17,284	2,788	
		Freight(Abroad)	29,636	4,780	Current actual exercise price
	Chengdu to Europe		46,920	7,568	
2	Container	Container Charge	7,500	1,210	Remark 1
3	Agency Service	Agency Service Charge	1,500	2,42	Remark 2
4	Xiamen to Chengdu	Freight from Xiamen to Chengdu(Including CY charge)	15,460	2,494	Remark 3
Total			71,380	11,514	

Data source: "Third, Calculation of Train supporting standards" from "*The Calculating method and instruction of China Europe (Xiamen, Chengdu and Europe) Train outward trains subsidies* "Xiamen development of modern logistics industry coordination office[2015] No. 18.

Remark 1：Container Charge

Currently trains are using one-way empty container allocation, place of return is Lodz Poland center station, therefore except charge of container, charge of return also needs to be taken into consideration.

Haitou Group Xiamen Chengdu and Europe Train Company is taking bid inviting and many other ways to subscribe more places of return both here and abroad as to cut down the cost of container.

Remark 2: Agency Service Charge

Agency Service Charge is regarded as a reasonable compensate for cost of labour and customer service offered by the train companies and agents. At the initial stage of operation, considering the volume of railway transportation is rather small(compared with sea transportation) with a higher average service cost, thus the agency service charge costs more than sea transportation's.

Remark 3: Freight from Xiamen to Chengdu

Already handed in application to railway department which requires a 15% decline of freight from Xiamen to Chengdu. If the applicaiton had been approved, there will be 2,315 RMB reduction from the total cost of 15,460 RMB, namely 13,145 RMB.

3.2.2 Freight from initial station to door to station

Table 2 Freight from initial station to door to station(based on average freight mileage:240 kilometer, unit price: 10 yuan/kilometer.)

No.	Cost Category	Item	Price (RMB)	Convert into USD	Remarks
1	Freight	Initial station to door to station	2,400	388	

3.2.3 Freight cost of whole journey(DOOR-CY)

Table 3 Freight cost of whole journey

No.	Cost Category	Item	Price (RMB)	Convert into USD	Remarks
1	Freight	Initial station to terminal	71,380	11,514	
2	Freight	Initial station to door to station	2,400	388	
Total			73,780	11,902	

3.3 Analysis of profit and loss balance from Xiamen to Lodz Poland

3.3.1 Calculation Instructions

(1) Constant cost, other taxes and added value

For China Europe(Xiamen, Chengdu and Europe) Train Express Company, China Europe(Xiamen, Chengdu and Europe) Train is taking a whole-train-charter way of shipping, similar to the situation of Non-Vessel Operation Common Carrier in sea transportation, rent automobile transportation on land or “full cabin full ULD” concerning air shipping. Hence, regrading China Europe Train, there is constant cost only, no variable cost and with zero business tax and added value.

(2) Pricing standards and rates

Standard international train normally contains 41 carriages, valued by container(40ft or FEU) rather than weight. Valuation of empty containers varies from loaded ones, the rates of empty containers usually have a 30% off based on loaded containers’. Rates of trains will discount according to the number of operations during the whole year, the more trains operate, the more margin of preference will be offered, up to 28% off.

(3) Return cargo

Owing to the distinctiveness of railway transportation(carriages and locomotive are allocated uniformly by the internal system of railway company), therefore returning trains can be called off if there is no return cargo, outward trains only, in other words, “one-way, no return”. Trains can be operated separately, section by section.

Presently, there are 2 trains set off from Xiamen every week, 90% full-loaded ratio. In addition, there are 41 carriages, equally 41 containers per train. 100 trains operated during 2016, and it is expected to reach 2,000 until 2020.

3.3.2 Calculation of unit price of freight at break even point

In terms of "*The Calculating method and instruction of China Europe (Xiamen, Chengdu and Europe) Train outward trains subsidies* ", the constant cost of operation from Xiamen to Lodz(CY-CY) is as follows:

Constant cost when operating under full-loaded condition(every container): 11,514USD/FEU

Constant cost of empty containers: 11,514*70%=8,059.8USD/FEU

There were 100 trains running from Xiamen via Chengdu to Europe in 2016, every train contains 41 carriages(equally 41 FEU), on the basis of 2 trains per week and 90% full-loaded ratio with no return cargo:

Yearly constant cost:

11,514USD/FEU*41*100*90%+8,059.8*41*100*10%=45,791,178USD

According to the equation, unit price of freight when reach the balance of profit and loss will be : P=Cf/Q=11,168.58 USD/FEU

Exchange rate 1 dollar to 6.5 yuan: P=72,595.77 RMB/FEU

Time of transport: 14-16 days

4 Conclusion

We have gained the logistics cost of main channel on land from Xiamen to Europe through calculating the break even point of China Europe (Xiamen) Train. [1.Gu.2015]Also a market research regarding the transportation cost and timeliness of main logistics channels (sea and air) from Xiamen to Europe (Lodz) had been undertaken specifically, some local harbour boat logistics companies engaging in the transportation using the above channels such as Superchain, Evergreen Marine, CTS Global Logistics, etc. had been reached out, eventually we figured out the transportation cost (lump-sum cost) and time of 3 logistics channels from Xiamen to Europe (Lodz Poland). Results are shown in table 4.

Table 4 Transportation cost of three channels

Channel Name	Route	Price (USD/FEU)	Time (Day)	Remarks
Integration of sea and land	Xiamen- Gdynia-Lodz	2,391.38	47	Offered by Evergreen
		2,391.38		Offered by Superchain
	Xiamen-Hamburg- Lodz	2,687	33	Offered by Evergreen
Train	Xiamen-Chengdu- Lodz	11,168.58	14-16	Calculation based on analysis of profit and loss balance of Xiamen Chengdu and Europe Train
Integration of land and air	Xiamen- Warsaw-Lodz	40,788.46	8-11	Offered by CTS Global Logistics

Remark: When running the comparative analysis between 3 ways of transport, the weight of each container is 15t.

Establish a mathematical model - a mathematical model in which the difference between the sea freight rate and the China-EU train freight rate should be compensated by the capital time cost of the value of the goods.[3.Shao.2018]

Table 5 Calculation table of time cost substitution relationship of goods value capital

1. At present the market is in a downturn and the sea freight is low		Value of goods		
		Km=1.25%	Km=2.5%	Km=3%
The cost difference between sea and land transportation, namely the time cost of goods capital (unit: USD/FEU)	8718.58	836983.68USD That ia 837 thousand USD Or 5.440 million RMB	418491.84USD That is 419 thousand USD Or 2.7235 million RMB	348743.2USD That ia 349 thousand USD Or 2.2685 million RMB
The difference between air and land transportation costs, i.e. the time cost of goods capital (unit: USD/FEU)	29619.42	2843464.32USD That is 284 thousand USD Or 18.486 million RMB	1421732.16USD That is 1422 thousand USD Or 9.243 million RMB	1184776.8USD That is 1185 thousand USD Or 7.670 million RMB
2. When the market situation changes, that is, the sea freight rate increases				
When the sea freight rate increases by 1000USD, the difference between the sea freight rate and the land freight rate	7818.58	751 thousand USD Or 4.8815 million RMB	375 thousand USD Or 2.4375 million RMB	313 thoushand USD or 2.030 million RBM
When the sea freight rate increases by 2000 USD, the difference between the sea freight rate and the land freight rate	6818.58	655 thousand USD Or 4.2575 million RMB	327 thousand USD Or 2.1255 million RMB	273 thousand USD Or 1.7745 million RMB
When the sea freight rate increases by 3000USD, the difference between the sea freight rate and the land freight rate	5818.58	559 thousand USD Or 3.6335 million RMB	279 thousand USD Or 1.8135 million RMB	233 thousand USD Or 1.5145 million RMB
3. If the future maritime transport market is still sluggish, but with the increase of the number of trains running, the freight rate will decline				

Up to 28%, the difference between sea and land freight rates	6261.50	601 thousan USD Or 3.9065 million RMB	301 thousan USD Or 1.9565 million RMB	250 thousand USD Or 1.625 million RMB

remarks:
(1) K is the current annual interest rate of private capital lending, K is 15% - 30% - 36%, then the monthly interest rate is Km=1.25% - 2.5% - 3%. So, it is generally difficult for enterprises to obtain short-term financing from banks or other financial institutions. It often needs short-term borrowing of private capital to achieve this, so the monthly interest rate is relatively high, basically between 1.25% and 3%.
(2) Value of goods, time cost of capital=Sino-Europe train freight rate - sea freight rate=value of goods × Km × Transportation days difference/month days.
(3) It is priced at US $1=RMB 6.5.

The difference between transportation costs can be compensated by the capital time cost of the value of goods. The model that the difference between the sea freight rate (air freight rate) and the China-EU train freight rate should be compensated by the capital time cost of the goods value. Then calculate which goods can bear goods that are relatively higher than the sea freight, but shorter than the sea transportation time; Or it can afford the goods with longer transportation time but lower transportation cost compared with air transportation. The calculation of their goods value substitution relationship is shown in Table 5.

So, by comparing the transportation cost and time of the mentioned 3 ways, using "*the time cost of the value of goods make up the difference of transportation cost*" method[3] and mathematical model, we ran a series of relating calculation on the value of suitable goods for China Europe (Xiamen) Train, and finally obtain a result of such goods' value should be ranged from 1.5 to 5.44 million yuan. Based on the analysis of the data published by Custom concerning the volume of import and export from Xiamen to Europe in 2015, we can learn that mechanical and electrical products, optical products, clocks and watches, medical equipment are the major cargo of China Europe (Xiamen) Train. Among them, unit price ranged from 1.5 to 5.44 million yuan are mostly mechanical and electrical products. In conclusion, mechanical and electrical products is the kind of high quality cargo that China Europe (Xiamen) Train should put priority to acquire.

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