論文

The Economic Impact of the Open Skies Agreement Between Singapore and U.S.A.

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미국과 싱가포르의 항공자유화 협정으로 인한 경제적 영향에 관한 연구

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목 차

Abstract

Recently, it appears that the major change in open skies agreement established the bilateral agreement and sub-regional multi-lateral agreement system with U.S.A. as the central figure. Specifically sub-regional multi-lateral air transportation cooperation is based on the bilateral agreement systems among the like minded countries. To develop the air transportation industry, Each country tries to come true free air transportation in bloc and deregulation in terms of market approach and traffic right. The purpose of this study is to look into the background of sub-regional air transportation cooperation and to expect the economic impact of the open skies agreement. We selected the Singapore in Asia-Pacific region as the subject of investigation. Even though Singapore is a small country in Asia-Pacific region. They have global competition power which is airport field as well as to airlines and tourism industry. Under this condition, we analyzed the economic impact of the open skies policy through the Input/Output analysis.

Key Words : Open skies policy(항공자유화정책), Open skies agreement(항공자유화협정), Input-output analysis(산업연관분석)

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<국문 요약>

최근 항공자유화의 주요 변화는 미국 중심의 양자간 항공자유화와 소지역적 다자간 협정 체제의 성립이다. 소지역적 다자간 항공운송협력은 서로 마음이 맞는 국가들간에 기존의 양자간 항공협정 체제에 근거하는 것이며 각국은 항공운송산업의 발전을 도모하기 위하여 시장접근 및 운수권에 대한 규제와 제한을 완화하고 역내의 자유로운 항공교통을 실현하기 위해 노력하고 있다. 본 연구에서는 지역적 항공운송협력의 배경과 실태를 살펴보고 항공자유화의 추진 결과 경제적으로 얻을 수 있는 효과를 예상하고자 아시아에 위치하면서 미국과 항공자유화 협정을 체결한 싱가포르를 대상으로 항공자유화 정책의 경제적 효과를 산업연관분석을 통하여 연구를 행하였다.

Ⅰ. Introduction

1.1 Background and Purpose

According to wide spread of the global open skies trend, the world air transport industry was propelled to sharp competition between airlines in terms of all aspect including, market entry and out, product amount, fares, the variety of services. In 1979, U.S announced external deregulation policy promoting the liberal competition between the international air transport sector, and ensured the global competitiveness after deregulation. They wanted to expand competitive agreement for their own national carriers in the bilateral agreement process with other countries.

The agreement contains the various transport methods including Hub & Spoke system, Codesharing, Change of Guage, which was acquired from deregulation within U.S.. Recently, the U.S. government is expanding the sings of Open Skies Agreement. As of July 2001, they have signed with 51 countries including agreement with Korea of June 1998 and with Singapore of April 8, 1997. Such U.S. aviation policy are no so successful to sign the agreements with Europe countries like England, France, Germany, therefore, they applied divide and rule method by singing agreements with Netherlands, Belgium, Luxemburg, Swiss, Austria whose domestic market volumes are no so big.

In other words, the U.S. developed more liberal Bilateral Agreement policy instead of removing specific bilateral agreement which have dominated international air transport order. The major changes of recent are liberalization of bilateral agreement initiated by U.S and establishment of sub-regional multilateral agreement, in particular, in recent 10 years. From all over the world heading from America, EU, Asia, Oceania, Middle-East and Africa appeared the regional air transport cooperation system. Each countries are getting to realize multilateral air liberalization gradually through this regional cooperative system. Regional air transport cooperation is established for the benefit of air transport industry and consumers between like mind-countries by mitigating the regulation and limitation to market access and transport right base on the existing bilateral agreement system. Therefore, in this study, on

the analysis to the meaning of open skies and the recent trend of open skies policy of each countries, I would like to suggest a political review on the background and actual conditions of sub-regional air transport cooperation. And to estimate economic effect coming from the propelling open skies, I selected and analyze Singapore with Input-Output Analysis, which completed open sky agreement with U.S. and have global competitiveness.

1.2 The scope and methodology of study

The economic effect is analyzed of Singapore. Singapore is a small country located at the Asia-Pacific region, however, it has global competitiveness in tour industry initiating from airlines as well as airport industry. The national economic profit is analyzed after signing the Open Skies Agreement with U.S. under such advantageous conditions comparing with other countries in the region. For this analysis, Input-Output Analysis is measured and applied. Considering the analysis target is limited and that the essential I/O table is of recent 1990, an measurement is made within the limited analysis cope, to make successful I/O analysis, considering. It is need to review mutual relationship in structural aspect, to make more deep analysis such as spreading structure analysis of national economy, future economic forecasting and planning after Singapore's signing open sky agreement with U.S. Namely, it is very important to find the final demand variation for a product of one industry will announce how much effect to each industry product activity. It is easy to find how much effect will be influenced to each part of industry after signing open sky policy and how will the employment and added value by each industry be different.

Ⅱ. Methodology to analysis economic effect by open skies policy

2.1 Introduction of Input- Output Analysis

Input-out analysis is a very useful tool in analyzing that when a sale increase is expected by national public policy and industry promotion policy, such policy will affect which influence on the total national economy. Singapore's open skies policy would influence the national air transport industry and the result would appear as the change of sale increase of a certain air-route. The industries within one country have mutual relationship and use commodities or services in an industry to produce other commodities or services of other industry. In other words, if the product of air industry is increase by 1 unit through air policy, it is followed that the product of related industry would increase . Such product increase amount of each industry would continuously influence to produce commodities and services of other industry which is related.

2.2 The system of Input-Output analysis table

2.2.1 Basic Structure

Input-output analysis table is a kind of general statistics table, record of all product and

disposal of commodities and services within GNP of one year followed by particular principles and types. Each industry part constituting national economy is an total sum of process of producing new commodities and services by purchasing interim material as raw material and energy from other industry part, and adding fundamental product factor as labor, capital, and sell the new product as interim product to other industry part or as commodities or capital to final consumer.

In input−output analysis table, the trade of commodities and services are classified into 3 categories. One is interim between mutual−related industry, the other is purchase part of fundamental product factor as labor capital of each industry part and the third is selling of product of each industry to final consumers. The diagram of input−out analysis table is like <Table 2−1>. In the diagram, the column direction means the input structure of product cost of each industry part and this input structures is constituted of added value such as interim input, labor or capital input. The row direction explains the sale volume of product of an industry to be sold to other industry part.

<Table 2−1> The basic structure of industry relationship

	Interim demand	final demand	total demand	income tax deduction	total product amount
interim input	I I line I row−−−sale of product I row purchase specification of	specificate allotment structure			
added value	Material as labor, etc. (input structure)	↓ →external part			
total input amount					

Namely, it is an assignment structure to industry segment and divided into two part, which are interim demand required to produce commodities and services and final demand sold as consuming commodities, capital commodities. The total demand is sum of interim demand and final demand from which deduct revenue is total product amount. The total product amount and total input amount are same in all industry segment. Input−output analysis table is largely divided into internal part and external part. The external part are

final demand part and added value part. The internal part are interim demand and interim input. The core of input-output analysis is that the change of external part would spreading affect which on the total national economy. .

2.3 Output of input coefficient

The input coefficient is acquired by dividing the total input amount with all raw material, fuel purchase from other industry to use for producing commodities and service of an industry, and explains the interim commodities unit required produce 1 unit of each industry segment. This explains the unit of added value which is produced by product 1 unit of each industry segment. Below <Table 2-2> shows the input coefficient producing process. In the table, the first column, namely, interim input specification of 1st industry, a_{11}, a_{21} … a_{n1}, is a share after dividing total input amount X_1 into X_{11} ,X_{12} …X_{1n} , becomes an input coefficient which denoting the volume of product of each industry segment required to produce 1 unit of 1st industry. Accordingly, if assuming V_1, a share after diving added value V_1 of 1st industry into total input amount X_1 , V_1 becomes the added value rate which explains the volume of added value acquired to produce 1 unit of 1st industry segment. Calculating from the 1 column to the n column to all industry segment and showing the shares into matrix type are below <Table 2-3>. Such produced input coefficient explains a production technical structure of each industry segment, namely, input and output functional relationship

Theologically, input-out analysis is ideally produced by product unit, however, it is not possible to produce such like that, it is produced by monetary amount.

<Table 2-2> Type of industry relationship Table

		Interim demand	final demand	income tax deduction	total product amount
		1 2 … n			
Interim input	1 2 · · · n	X_{11} X_{12} …X_{1n} X_{21} X_{22} ….X_{2n} · · .. · · · .. · · · .. · X_{31} X_{32} ….X_{3n}	Y_1 Y_2 · · · Y_n	M_1 M2 · · · M_n	X_1 X_2 · · · X_n
Added value		V_1 V_2 …….V_n			
Total input amount		X_1 X2 …… X_n			

<Table 2-3> Type of input coefficient

	1 2 · · · n
1 2 . . n	a_{11} a_{12} .……. a_{1n} a_{21} a_{22} .……. a_{2n} . . a_{n1} a_{n2} …… a_{nn}
Added value	v_1 v_2 · · · v_n
Sum	1 1 · · · 1

2.4 Methodology to output of product-inducing coefficient

2.4.1 $(I-A)^{-1}$ Type

The total product amount of each industry segment is acquired by multiplying the final demand(revenue after tax) with product inducing coefficient Table $(I-A)^{-1}$. To use this product inducing coefficient table, it should be given final demand vector(Y) and import vector(M) as external variants.

The input coefficient of each industry segment needed to produce product 1 unit of one industry means input amount of each output required. At the same time, produce new input amount for each industry, the product of other industry segment are constantly required. Classifying the industries into more specific categories, it is not possible to calculate the product spreading effect. In input-output analysis, the product-inducing coefficient is produced using inverse matrix. Deducting revenues from the sum of interim demand and final demand, the share corresponds with total output product amount. It is possible to make 3 equations as below.

$$\begin{aligned} &X_{11} + X_{12} + X_{13} + Y_1 - M_1 = X_1 \\ &X_{21} + X_{22} + X_{23} + Y_1 - M_2 = X_2 \\ &X_{31} + X_{32} + X_{33} + Y_3 - M_3 = X_3 \end{aligned} \quad \text{formula (1)}$$

Input coefficient is produced from dividing with each interim input amount, it is rewritable of above (1) using the input coefficient in <table 2-3> as above.

$$\begin{aligned} &a_{11}X_1 + a_{12}X_2 + a_{13}X_3 + Y_1 - M_1 = X_1 \\ &a_{21}X_1 + a_{22}X_2 + a_{23}X_3 + Y_2 - M_2 = X_2 \\ &a_{31}X_1 + a_{32}X_2 + a_{33}X_3 + Y_3 - M_3 = X_3 \end{aligned} \quad \text{formula (2)}$$

The equation (2) have system of simultaneous simple equations of 3 solutions which has 3 unknown quantity($X_1+X_2+X_3$) and can solve the solutions.

Namely, if given final demand minus revenue amount of each industry (Y_1-M_1, Y_2-M_2 ,Y_3-M_3) are given externally, it is possible to get the total product amount of each industry(X_1, X_2 ,X_3).

Simplifying the above (2) into matrix symbol is shown as below (3).

$$AX + Y - M = X \quad \text{---------- formula (3)}$$

If solving to X with developing numerical formula is like below.

$$X - AX = Y - M$$
$$(I - A)X = Y - M$$
$$X = (I - A)^{-1}(Y - M)$$

In here, $(I-A)^{-1}$ matrix is product-inducing coefficient. I notes the unit matrix whose main diagonal factors are all 1 and other factors are all 0. Using product-inducing, it is possible to get total output amount(X) derived directly or indirectly of each industry segment according to change of the final demand(Y) and revenue(M).

Product-inducing coefficient explains the level of product amount derived directly or indirectly from each industry segment to satisfy the increase of final demand by 1 unit.

A real number, a is $0<a<1$, $(1-a)^{-1}$, reciprocal number of $(1-a)$ can be expressed the sum of infinite geometric progression.

$$(1-a)^{-1} = \{1\} \text{ over } \{1-a\} = 1 + a + a^2 + a^3 + \cdots$$

Using above formula, $(I-A)^{-1}$ can be expressed below formula (4)

$$(I-A)^{-1} = I + A + A^2 + A^3 + A^4 + \cdots \quad \text{---------- formula (4)}$$

At the right side of formula, the unit matrix, I becomes a direct product effect of each industry segment to satisfying the 1 unit increase of final demand to product of each industry segment.

And also A becomes the interim input amount required to produce 1 unit product of industry segment, namely, the 1st product derivative effect. A^2 becomes the interim input amount required to produce product derived from 1st production spreading effect, namely, the 2nd product derivative effect. Accordingly, A^3 , A^4 , $\cdots$ mean continuously the 3rd, 4th product derivative effect. Finally, $(I-A)^{-1}$ means the product-inducing coefficient of sum of direct and indirect product derivative effects derived by 1 unit increase of final demand in one industry.

This product-inducing has a multiplier's nature expressing the derivative effect derived from final demand, is called multi-sector multiplier, distinguishing from Keynes' investment

multiplier.

Using $(I-A)^{-1}$ coefficient as product-inducing coefficient symbol, it is expressed below <Table 2-4>.

In <Table 2-4>, r_{11} , r_{21} , r_{31} of the 1st column express each product derivative effect derived directly or indirectly according to produce 1 unit final demand of 1st industry sector, and indirect derivative effect derived from 2nd and 3rd industry. The sum of the column means the direct and indirect product derivative effect derived from all industry segment by 1 unit final demand to 1st industry product.

When we see the product-inducing coefficient as the row matrix, r_{11} means the direct and indirect product derivative effect in 1st industry segment derived from 1 unit increase of final demand to 1st industry product. r_{12} means the indirect product derivative effect in 1st industry segment derived from 1 unit increase of final demand to 2nd industry product, and r_{13} means the indirect product derivative effect in 1st industry segment derived from 1 unit increase of final demand to 3rd industry product.

Therefore, the sum of the first row expresses the direct and indirect product derivative effect derived from the 1st industry in case of 1 unit final demand to product of each industry segment.

<Table 2-4> Product inducing coefficient

	Primary Industry	Secondary Industry	Third industry	row total
Primary Industry	r_{11}	r_{12}	r_{13}	S_1
Secondary Industry	r_{21}	r_{22}	r_{23}	S_2
Third industry	r_{31}	r_{32}	r_{33}	S_3
Row total	R_1	R_2	R_3	

Ⅲ. The impact analysis of open skies policy to Singapore economy

3.1. Analysis of Singapore economic effect

3.1.1 The era of economic effect birth of open skies policy

In the last decade, the passenger sale volume of Singapore Airlines in the north American route are constant increase, at the growth rate of annual average 7.5% from 1992 to 1997.

After the economic depression of Asia Pacific countries from 1998-1999, the growth rate remained as low as to 3.4%. After 1998, however, the region economy recovered its sales increase and have maintained high increase rate. Considering open sky agreement with U.S of 1997, economic depression of 1998 and the beginning of San Francisco route of 1999, it is reasonable to regard 1999-2000 period as emerging the effect by open skies policy

3.1.2 Preparation of Industry Relationship Table and GNP attributing rate

With assumption that, without open skies agreement with U.S, the average increase rate had gone on even after 1998, as same as the level of one before 1997. Extending the average increase trend of the past, applying the average annual increase rate from 1992−1997 which was before economic deflation to sale amount of 1998−2000, the sale volume is estimated as 1,747.5million Singapore dollars of 1999−2000 assuming that the open sky agreement had not been signed. The difference with 1,903 million Singapore dollars which amount of actual sale of 1999−2000 and 155.5million Singapore dollars is to be said of maximum increase effect of open sky agreement.

This is fundamentally a revenue increase effect of San−Francisco route opened 1999−2000. But is not denied it could be included sale increase effect by positive other external factor other than open sky agreement

If applying this product−inducing effect, 155.5 million Singapore dollars of sale increase, to total product−inducing effect acquired by input−output analysis of Singapore national economy. it is estimated it has maximum 188.9 million Singapore dollars increase.) This is about 0.12% of 1999 Singapore GNP, 153,468.9 S$M.) For the reference basis, such economic effect by Singapore open sky policy is via from 1998 which Singapore economy growth rate recorded −2.5% to 1999(.51%) and 2000(10.5%) which are the recovery period. In case of Singapore, Singapore Airlines and Changi International Airport is admitted as global first competitiveness, and more than 190 multilateral enterprises based their South−east business operation headquarter on Singapore

3.1.3 Sale increase analysis by open sky policy

3.1.3.1 Analysis of sale increase by open sky

Due to several reasons including the limitation of data, it is not easy to estimate the exact sale increase effect by open skies policy. In this study, it is estimated of sale increase effect by open sky agreement of 1997 with U.S. using of recent 10 year's trend of passenger revenue change of American route Singapore Airline, Singapore's national carrier. As in <Table 3−1>, last decade, the sale volume of american route of Singapore Airlines is in constant increase, showing average 7.5% annual increase rate from 1992 to 1997.

Though it recorded low increase rate as low as 3.4% during 1998 −1999, which happened the economic deflation of adjacent Asia countries, it recovered its sale increase after 1999 and maintained high growth rate. Considering of 1997 being the signing year to open sky agreement with U.S. and the economic deflation that 1998, it is estimated that the period to begin the effect by open skies during 1999−2000. In this study, it is assuming if it had not been for singing open skies agreement with U.S., the average annual increase growth would be continued after 1998.

Extending the average increase trend of the past from 1992 to 1997 before economic increase rate and applying them to 1998−1999 sale increase volume, it is estimated as 1.847.7

million Singapore dollars as of 1999-2000.

The difference between the actual sale increase of 1,903 million Singapore dollars and with this assumed 1,847.7 million Singapore dollars is 155.5million Singapore dollars. This amount can be said to be a maximum sale increase effect by open sky policy.

<Table 3-1> The trend of sales of American routes(Singapore Airlines)

Unit: mill. S$

	1991 -92	1992 -93	1993 -94	1994 -95	1995 -96	1996 -97	1997 -98	1998 -99	1999 -00	2000 -01
American routes	1,031.8	1,111.2	1,262.5	1,306.2	1,371.6	1,482.5	1,571.7	1,625.3	1,903.0	2,079.0
Increase rate to previous year	-	7.7%	13.6%	3.5%	5.0%	8.1%	6.0%	3.4%	17.1%	9.2%

3.1.4 Analysis of product inducing effect by open skies policy

At the end of 1997, Singapore and U.S.A., signed the Open Sky agreement, it is estimated to sale increase effect of 155.5 millions Singapore dollars in 1999-2000. This clause will analyze, such sale increase would affect which effect to whole national economy. The 1990 Singapore production inducing coefficient of air transport sector made by I/O Tables is like below <Table 3-2>. Singapore I/O Table is made on the basis of specific industrial classification which distinguish 175 industrial sector. Seen in the <Table 3-2>, excluding the industry which has zero product inducing coefficient with the air transport industry, the whole 93 industry has direct or indirect product inducing effect, by 1 unit sale increase of air transport. Direct production inducing effect means the product increase volume of air transport industry itself and indirect production inducing effect, product volume by each industry which are essential to produce services of air transport. At the review of product inducing effect by each industry, the product inducing coefficient stands 1.0214, and is the most highest. The product inducing coefficient of industry itself is always higher than 1 among the amount of calculated coefficient, 1 means the direct product inducing by 1 unit increase of the amount of sales. The rest 0.214 means the air service product volume which is 2ndly or 3rd required to produce other industry' product used to produce 1 unit of air service. Next, the industries production induced by sale increase of air transport services are Other Transport Services, Wholesale and Retail Trades, Aircraft industry sector. As below <Table 3-2>, as a result of product inducing effect estimating, the product inducing effect to whole Singapore whole economy by the increase at the volume of 155.5million Singapore dollars is estimated maximum 188.9 million Singapore dollars.

<Table 3-2> Production inducing effect by open skies policy

No	Industry Classification	Productivity inducing coefficient by air transport	spreading effect by industry (unit: thousand Singapore $)
1	Livestock	0.0001	16
2	Orchids & other flowers	0.0001	16
4	Aquarium fish	0.0001	16
8	Milk	0.0001	16
13	Wheat milling	0.0001	16
15	Bread & confectionery	0.0001	16
22	Other food preparations	0.0001	16
23	Animal feed & other milled products	0.0001	16
24	Soft drinks	0.0001	16
31	Other garments	0.0001	16
33	Tailoring & dressmaking	0.0006	93
34	Textile articles	0.0001	16
43	Paper, paperboard & paper articles	0.0002	31
44	Paper containers	0.0002	31
45	Newspapers	0.0013	202
46	Books & magazines	0.0009	140
47	Commercial & job printing	0.002	311
48	Other printing	0.0002	31
49	Industrial gases	0.0001	16
50	Basic industrial chemicals	0.0002	31
51	Paints	0.0001	16
54	Soaps, detergents & polishes	0.0001	16
56	Inks & carbon black	0.0001	16
58	Petroleum refining	0.0014	218
65	Plastic sheets, bags & articles	0.0001	16
66	Plastic industrial supplies	0.0001	16
67	Other plastic products	0.0001	16
71	Cement	0.0001	16
72	Concrete products	0.0002	31
75	Iron & steel rolling mills	0.0001	16
80	Metal doors & windows	0.0001	16
82	Other structural metal products	0.0001	16
88	Metal stampings	0.0001	16
89	Other metal products	0.0003	47
92	Lifting & hoisting machinery	0.0001	16
93	Refrigerators & air-conditioners	0.0001	16
94	Oilfield & gasfield machinery	0.0001	16
95	General engineering works	0.0002	31
96	Other industrial machinery & equipment	0.0002	31
98	Switchgear & switchboard apparatus	0.0001	16
99	Other electrical industrial apparatus	0.0001	16
103	Electronic tubes & semi-conductors	0.0001	16
104	Capacitors & resistors	0.0001	16
106	Other communication equipment	0.0001	16
110	Electrical wires & cables	0.0001	16

No	Industry Classification	Productivity inducing coefficient by air transport	spreading effect by industry (unit: thousand Singapore $)
116	Repairing of ships & boats	0.0001	16
117	Marine engines & ship parts	0.0001	16
120	Aircraft	0.0178	2768
127	Signs & displays	0.0001	16
128	Other manufactures	0.0001	16
129	Electricity	0.0063	980
131	Water	0.0011	171
132	Building construction	0.002	311
133	Other construction	0.0004	62
134	Wholesale & retail trades	0.022	3421
135	Restaurants	0.0031	482
136	Hotels	0.0053	824
137	Passenger transport by land	0.0026	404
138	Freight transport by land	0.0018	280
139	Water transport	0.0008	124
140	Port services	0.0012	187
141	Air transport	1.0214	158828
142	Forwarding & warehousing services	0.002	311
143	Other transport services	0.0282	4385
144	Crane & container services	0.0001	16
145	Communications	0.0121	1882
146	Life insurance	0.0033	513
147	General & other insurance	0.0052	809
148	Banking	0.0016	249
149	Finance companies	0.0005	78
150	Other financial services	0.0018	280
151	Real estate	0.0116	1804
152	Legal services	0.0013	202
153	Accounting & data processing	0.0017	264
154	Architectural & engineering services	0.0012	187
156	Employment & labour contracting	0.001	156
157	Advertising services	0.0046	715
158	Leasing of machinery & equipment	0.0008	124
159	Management consultants	0.0031	482
160	Other business & technical services	0.0032	498
161	Producers of government services	0.0045	700
162	Security services	0.0033	513
163	Education	0.0044	684
164	Medical & health services	0.001	156
165	Environmental health services	0.0013	202
166	Cinema services	0.0001	16
167	Broadcasting & entertainment services	0.0011	171
168	Other recreational services	0.0006	93
169	Personal & household services	0.0139	2161
170	Repairs of household goods	0.0003	47
171	Repairs of road transport equipment	0.0011	171
172	Domestic services & non-profit bodies	0.0015	233
	TOTAL	1.2147	188886

Ⅳ. Conclusion and Suggestion

The economic impact by open skies policy is, in case of Singapore, said to gain positive effect by maximum 0.12% ratio to GNP. To get, however the expected the industry associated analytic productivity inducing, on the assumption that the country competitiveness in the air transport part, is strong. Therefore, if the negotiation to separate passengers from cargo, to get the positive economic impact, in case of Korea, they can achieve the expected positive effect if propelling the cargo deregulation, because its national flag carriers have competitiveness in cargo transport sector than passenger.

As far as the open skies between Korea-U.S.A. is concerned, it contains the inter-modal transport. it is impossible to expect the positive effect in the short-term. Rather, it is judged that it is desirable to increase the inter-modal entity's competitiveness in the surface transport sector of domestic industry in the medium or long-term.

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