

Evaluation of Downtown Truck Access Restriction Policy in Seoul

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ABSTRACT

Park, Hyeon Kim, Soo-Jeong

This paper aims to evaluate downtown truck access restriction policy in Seoul. One of the long-standing debates in transportation policy addresses the extent to which the various users of transportation systems pay the full costs of the services they use. The underlying view of the debate is: when shippers and carriers pay the full costs (internal or external), they are likely to operate and use freight transportation efficiently, which is desirable from the points of efficiency and equity.

A part of costs (called external costs) of providing freight service is not borne by shippers and carriers themselves. Instead, they pay special taxes and fees to offset the costs they impose on government, other users of roads and the general public. To evaluate the truck access restriction policy, this study calculates four external costs of congestion, air pollution, accident, and road pavement and compares them with special taxes and fees for small-size trucks, medium-size trucks and passenger cars.

The calculation shows that all modes of transportation are more or less subsidized in providing their service in the order of medium-size trucks, small-size trucks, and passenger cars. However, this does not necessarily support the validity of truck access restriction policy. The reactions of shippers and carrier to the policy include increase in use of small-size trucks, change in transportation route, and shift in delivery time. All of these reactions increase logistics costs as well as social costs. These adverse side-effects are caused by direct access restriction scheme. Rather, indirect control schemes such as increase in special taxes or congestion tolls will be more effective to relieve external costs by trucks.

Eventually, the role of trucks in urban economy should be reexamined and we should put higher priority on trucks in urban transportation management.

* (1997), 「
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1.5	07:00 10:00		▪ .
1.5 3.5	07:00 10:00 18:00 21:00		, 07:00 10:00 12:00 15:00 ▪ .
3.5 10	07:00 22:00		▪ .
10	07:00 22:00		
	07:00 10:00	(I.C	▪ .
가	24		

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 07:00-10:00 가 , , , ,
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 交通混雜, 大型交通事故, 環
 境污染, 道路破損
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 1> . (Cordon-Line)
 가
 2
 가
 貨物輸送
 貨
 效率性 가 都市貨物車輛管理
 物車輛 都心通行制限政策 妥當性 效率性 衡平性 가 .

. 通行制限政策 評價

" 가?
 가
 ,

가 社會的 限界費用 接近方法 (SocialMarginal Cost Approach)

가 1 가 가
가 .
(non-excludability),
(non-rivalry) 公共財
가
(Congestible Public Goods) . 가 , 가 , ,
, , 가 . 가 運送事業者 荷主
(Internal Costs) , 가 外部費用
(External Costs) .
< 2>

가 가 가
가 가
가 .

	(A) /	(B)	(C)	(D)	(E)
	○				
	○		○		
	○		○		
			○	○	
	○	○	○		
	○	○	○	○	

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가 .
가 .

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가 .

< 2> (A)+(B)+(C)+(D) , 가 (A)+(E) .

, (1) .

(A)+(B)+(C)+(D)=(A)+(E).....(1)

(1) (A) (2)가 .

(B)+(C)+(D) = (E).....(2)

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가

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. , < 2> (E)

가 .

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가 .

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가

	*	()		
-	2.7	4.5	5,096	5,193
-	0.6	4	1,576	1,855
-	2.2	2	1,576	1,855
-	1.5	3.6	1,576	1,855

< 3 >

3)
: - - - -
()

(7 -8) (3
4)
가
가 가 가
가
1 : 1 1 가 1
2 : 1 5 가 5
3 : 5 1 가 5
4 : 가 1 가

1)
2 가
(1997), 「
」

. (1996) " (1994) , (1992) .
 , (1994) .
 1996 , 1996 1995 .

・費用算定

1. 外部費用 算定

(1)

$$^1) \quad , \quad \text{가},$$

1) 가
(Bureau of Public Roads)

```
{t_a}&=&{t_0} LEFT [ 1+0.15((x_a)/{c_a})^4 RIGHT ] #t_a#t_0#x_a#c_a
```

•

.) BPR ⁴
 ,) 가

$$\begin{aligned}
 &= \text{가} - \\
 &= 1 *
 \end{aligned}$$

(PCU: Passenger Car Unit)가 . (1992) 「 : 3
 」 (= 2; = 12; = 18) .
 가
 = (* * 가 *)
 = 1 * *

가

(1997) 「 」

	(1991) ¹⁾	(1995) ²⁾	3)		가 ⁴⁾		
	1,287,380	2,447,072	206	12,048	12,048	3,012	4,819
	845,300	1,626,457	206	7,911	7,911	1,978	3,164

: 1) , 「 」 , 1992

2) (1992) 1991

3) , 「 」 , 1996.

4) 100% , (1994)
 (가 /), (/)

5) 가 100%, 40%, 25% .

< 4> , 가 (:)

6) (1997), , pp.83 85 .

가 . < 4> . 가
 가
 < 5> .

가
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 ,) 가 가 .

5

가 < 5> .
 = (Lierkm) *
 가 = 가 * 가 + 가 * 가
 가 = (가 *)
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 . , 1 5 5 1 가
 5 1 가

		가			가	
1 1	624	56	680	1,200	105	1,305
1 5	3,126	281	3,407	5,482	527	6,008
5 1	975	93	1,069	1,968	175	2,143
1	487	46	534	983	88	1,071

< 5> (:)

(2)

가 (1996) 가 1% (1996) 가 (1996)

$$= \left(\frac{\text{g}}{\text{km}} \right) * \dots$$

	$(-5.2655 \cdot 10^{-5}) \cdot S^3 + 0.0056 \cdot S^2 - 0.20242 \cdot S + 3.5378$
	14.27
	14.79
	$(-4.00437 \cdot 10^{-5}) \cdot S^3 + 0.004705 \cdot S^2 - 0.1866 \cdot S + 3.51259$
	$(-7.13665 \cdot 10^{-5}) \cdot S^3 + 0.00635478 \cdot S^2 - 0.173834 \cdot S + 2.16327$

< 7> (1996), 「 가

- 7) 1994 2.44 ./g 가
8) (1993) "

1 1	21	25
1 5	103	127
5 1	272	275
1	12	13

< 8>

(:)

. < 8>

·

(1996)

2.64 /g⁶

.

가 = 가 -

= 가(g) * g

(3)

7

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가

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(The Gross Loss

of Output Approach)

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가

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가

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=

+

9) 3

가

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$$1 \quad , \quad \quad \quad 1$$

$$= (\quad + \quad + \quad) / 300 \quad *$$

$$* \quad$$

$$1$$

가

$$80\%$$

$$1$$

$$1 = 1 \quad * \quad 1 \quad + 1 \quad *$$

$$1$$

$$) 1$$

$$1 = \quad + \quad + \quad + \quad +$$

(Hartunian)

$$(1995) \quad$$

가

$$\{HCC^a_s\&=\& \text{SUM from } \{ a \} \text{to} \{ \}&\&Pa,\{s^{(n)}\}&\&Es^{(n)}\}&\&Y\{s^{(n)}\}&\&(\{1+T\} \text{over} \{1+r\})^{n-a}$$

$$HCCas : \quad (= s \quad , a \quad)$$

$$Pa, s(n): s \quad , a \quad n \quad$$

가

$$Es(n) : s \quad n$$

368,388,990	3,388,000	280,500	9,006,800	381,671,490

$$< \quad 9 > 1 \quad (\quad : \quad)$$

$$Ys(n) : s \quad n$$

$$T : \quad$$

가 , r :

35,133,687	1,698,400	280,500	401,500	287,100	37,801,187

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< 9> 1 .

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1 = + + + + +
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가
(*)
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= (*)
< 10> 1 .

< 10> 1 .

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1
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가 . ,
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		1	1		1	1	
1	4,134,634	382,434,560	0.005	2,413,678	38,312,357	0.063	1,720,956
5	7,356,672	382,434,560	0.006	4,980,606	38,312,357	0.130	2,376,066
	1,619,432	177,546,270	0.005	890,572	7,526,970	0.096	722,860

< 11> (: / .)

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1 , 1
< 11> .
1 = 1 (+) * 1

$$\frac{+1}{1} \quad (\quad + \quad) * \quad 1$$

, 가가
 가
 . 가 .

) 1
 1 = 1 (+)
 1 = { (- 가가) } over { }
) 1
 70%
 100% 가 가 .
 1 = 1 (+)
 1 = { CDOT (1- { 가가 } over { }) } over { }
 , = (-) +

107

)
 < 12> .

가	가	가
	()	
1	662,914	155,416
5	674,282	507,497
	326,263	229,117
		97,146

< 12> (:)
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 (1995) 가 .
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(1995)가
가

)
(1995)

가
가 가

< 13>

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9 (: 0.0636, : 0.101)

(4) 10

1 1	229	37	266	462	75	537
1 5	1,150	184	1,334	2,,325	373	2,698
5 1	408	37	445	824	75	899
1	89	18	107	180	36	216

< 13>

10) (1996) 「
11) (1990) 「 ()」
12) 1989 306.3 /km 5 /km

ESAL	($\times 10^6/\text{km}$) ¹⁾	ESAL/ ²⁾	(/ESAL-km) ³⁾
ESAL	1.34	111,167	16.84

1), 2) : , 「 ()」, 1990.

3) (1990) 가 .

< 14> ESALS ESAL · km

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1 5 1

가

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(Life Cycle Pavement Cost)

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(SN : Structural Number)

가 4 ¹², ESAL · km < 14> 16.84 .
(1 , 5)

< 15> .

= \times ESALF \times (5.9km)¹³

13) .

SN = a1D1 + a2D2 + a3D3

a1, a2, a3 = a1=0.145, a2=0.11, a3=0.034(, 「 , p.85,

1992)

D1, D2, D3 =

D1 () = 5cm, D2 () = 20cm, D3 () = 30cm(,

「 ()」, p256 , 1992)

SN 4 .

14) .

1 1	680	21	266	0.4	966
1 5	3,407	103	1,334	2	4,846
5 1	1,069	272	445	61	1,846
1	534	12	107	0	653
1 1	1,305	25	537	0.4	1,868
1 5	6,008	127	2,698	2	8,835
5 1	2,143	275	899	61	3,378
1	1,071	13	217	0	1,301

< 16> (:)

ESALF

. 가 () ESALF
61 .

	(ESAL-km)	ESALF(가) ¹⁾	/
	16.84	0.004	0.4
	16.84	0.613	61
			0

1) , 「 (

< 15>

(5)

< 16> , ,
1 5 5 1 1 1 가 1
. 1 5 5 1 263 . 1 1 가
1 3 0 0
가 .
가 ,
가 5 1 1 5 ,
5 1 1 5 . 5
가 가 .

2. 使用者負擔金 算定

，
，
가 1,5 가

(1)

가 1,5 가
1,500cc
6 14
30%
가 30%

(2)

，
() 1996
= × × 3 30% × 26 가 70%
× (가) 가 65%

(3)

， 가가 ，

(4)

15) ，「 」， 1996. 11

< 18>

(1 0.63) (1 0.41)

가

가

가 . < 19> ,

. 1 1,985 1,605 124

. 5 3,212 2

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547 , 1

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	()					()					(A)/(B)
					(A)					(B)	
1	82	345	170	11	608	680	21	266	0.4	966	0.63
1 5	410	1,725	850	53	3,038	3,407	103	1,334	2.0	4,846	0.63
5	173	620	170	19	982	1,069	272	445	61	1,846	0.53
	186	261	290	0	738	534	12	107	0	653	1.13
	()					()					(A)/(B)
					(A)					(B)	
1	105	439	212	14	770	1,305	25	537	0.4	1,867	0.41
1 5	525	2,195	1,060	68	3,323	6,008	127	2,698	2.0	8,835	0.43
5	220	789	212	24	1,245	2,143	275	899	61	3,378	0.38
	237	332	330	0	899	1,071	13	217	0	1,301	0.69

< 18>

	()					()					(A)/(B)
					(A)					(B)	
1	187	784	382	24	1,377	1,985	46	803	0.8	2,835	0.49
1 5	935	3,920	1,910	121	6,886	9,415	230	4,032	4.0	13,681	0.50
5	393	1,409	382	43	2,227	3,212	547	1,344	122	5,225	0.43
	423	593	620	0	1,636	1,605	25	324	0	1,954	0.84

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 (5,225) 1 5 (13,681) 1/3 .
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LA 3 (8) , 12m (GVM 16
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(Cordon)

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가

가 . ,

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() 가

(G r e n z e b a c k

(1990)). , 가

가, 가 .

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參考文獻

1. , 「 () 」, 1990. 8.
2. , " , 「 」,
- 3 3 , pp51 72, 1996.
3. , 「 」, 1987.
4. , 「 」, 1992.
5. , 「 」, 1993.
6. , 「 」, 1996.
7. , , 1996.
8. , 「 가 」, 1996.
9. , 「 」, 1997.
10. , 「 」, 1997.
11. , 「 」, 1994.
12. , 「1996 」, 1996.
13. , 「95 」, 1995.
14. , " , 「21 」, 가
 , 1996.
15. , 「 」, 1992.
16. , " , , 1995.
17. () , 「 」, 1997.
18. , 「 」, 1996.
19. , 「 」, 1996.
20. , 「1995 」, 1996.
21. , 「 : 3 」, 1992.
22. , , 1988. 3.
23. , , 1981.
24. , 「 」, 1996.
25. , 「 」, 1996.
26. Grenzeback, L.R., W.R. Reilly, P.O. Roberts and J.R. Stowers, "Urban Freeway Gridlock Study: Peak- Period Urban Freeway Congestion," 「Transportation Research Record,

1256」, pp 16-26, 1990.

26. Keady A.T. Inc., 「Goods Movement Demonstration Project Design: Final Report on Phases I and II」, Urban Mass Transportation Administration, Washington D.C., 1976.

27. Ogden, K.W. 「Urban Goods Movement」, 1991.

28. Transportation Research Board & National Research Council, 「Paying our Way」, 1996.