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THE TRANSIT-ORIENTED MEGALOPOLIS:
RAIL TRANSIT TECHNOLOGIES, URBAN REGENERATION PROGRAMS & LAND VALUE REDISTRIBUTIONS IN TOKYO

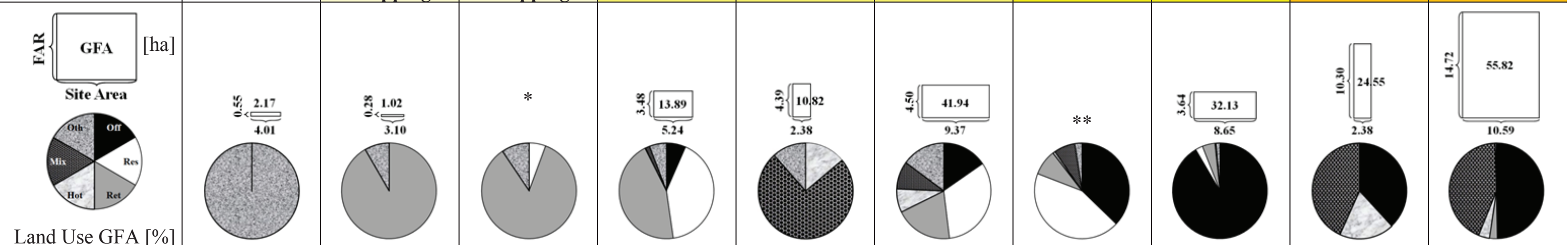
INTRODUCTION

In the global economy, post-industrialized mega-city regions have called for upgrading rail transit systems and updating land development regulations to sustain urban densities, facilitate face-to-face communications, and amplify knowledge spillovers among innovative firms and creative professionals. Given the increasing demand for mega-transit investments and land-use deregulations, neoliberal city-states have been playing a critical role in attracting global capital flows, shaping knowledge-based business clusters, and stimulating local economic development around regional transit centers through public-private partnerships. Especially today's Tokyo is one of the most advanced cases of **the transit-oriented megalopolis model**. This paper estimates the capitalization effects of rail transit investments and joint development arrangements in the Tokyo Megalopolis Region, with special attention to:

- **the ability of rail transit investments with joint development arrangements to regenerate local economic development in post-industrialized mega-city regions;**
- **the potential of value capture practices to recover the capital costs of mega-transit investments from the agglomeration benefits of joint development arrangements; &**
- **the redistribution of economic advantages caused by mega-transit investments and joint development arrangements within a mega-territory.**

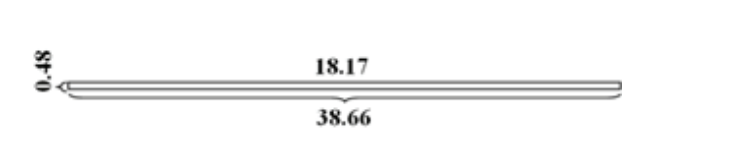
JOINT DEVELOPMENT TYPOLOGY

Cluster Analysis: Joint Development Types and Statistical Mean Statistics for Key Clustering Variables

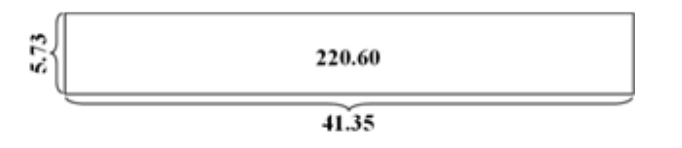


Joint Development Types / Variables	SP: Small-scale Public	SS: Small-scale Shopping	LS: Large-scale Shopping	MR: Mid-scale Residential	MM: Mid-scale Mixed	LM: Large-scale Mixed	LW: Large-scale Waterfront	LO: Large-scale Office	HC: High-rise Commercial	LC: Large-scale Commercial
Land Use GFA [%]										
Office	0.0	0.0	0.0	6.6	10.8	15.4	37.2	91.5	38.1	49.7
Residential	0.0	0.0	5.7	41.1	1.9	32.6	43.7	2.5	0.0	0.0
Retail	0.0	91.6	84.9	44.8	1.2	19.7	8.7	4.3	0.0	2.7
Hotel	0.0	0.0	0.0	0.1	0.0	7.9	0.8	0.3	18.7	3.8
Mixed	0.0	0.0	0.0	1.5	74.5	9.4	7.2	0.0	43.2	43.3
Others	100.0	8.4	9.5	5.9	11.6	14.9	2.5	1.4	0.0	0.5
Mixture [0~1]	0.000	0.089	0.234	0.239	0.300	0.788	0.612	0.156	0.583	0.536
Parking Lots/GFA [ha]	291	961	401	109	78	85	39	140	34	28
# of Strategic Development Areas	3	4	2	34	6	2	2	7	1	1

*LS:



**LW:

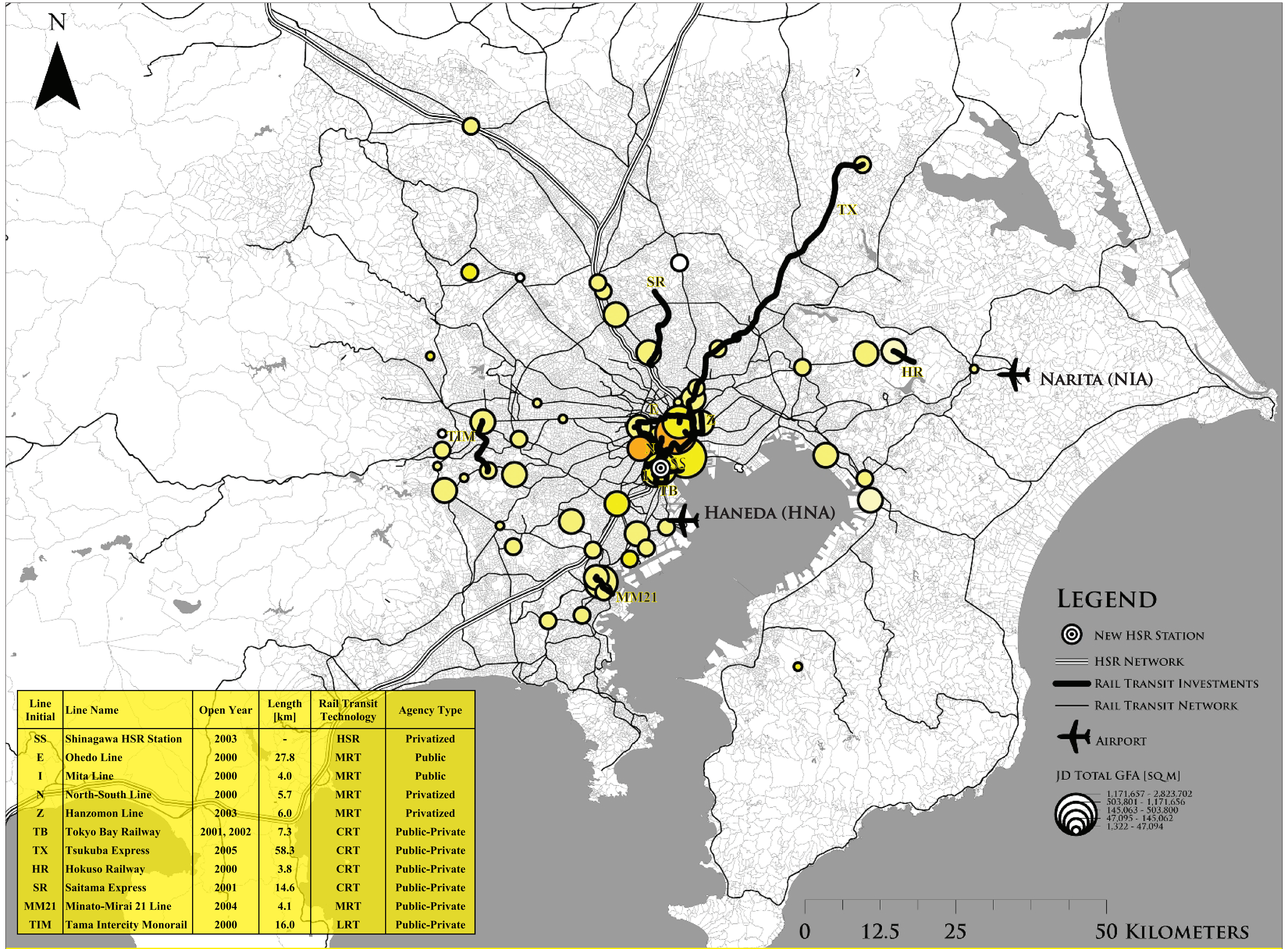


HEDONIC PRICE MODELING

Multi-level modeling (MLM) is appropriate when units of observation fall into certain groups. The Tokyo Megalopolis Region's land market models are assumed to have a two-level structure and formulated as the following semi-log random intercept function:

$$\ln Y_{ij} = \beta_{00} + \sum_k \beta_k X_{kij} + \zeta_{0j} + \varepsilon_{ij}$$

Wherein
Y_{ij}: land value adjusted by the Consumer Price Index (CPI) in 2007 [JPY/sq m]
X_{kij}: independent variable for attribute k
β_{00}: constant
β_k: coefficient for the attribute k
ζ_{0j}: random intercept
ε_{ij}: level-1 error
i: land price points (level-1 observations)
j: wards/cities/towns/villages (level-2 districts)
k: 8 attributes (k= 1~8)



Line Initial	Line Name	Open Year	Length [km]	Rail Transit Technology	Agency Type
SS	Shinagawa HSR Station	2003	-	HSR	Privatized
E	Ohedo Line	2000	27.8	MRT	Public
I	Mita Line	2000	4.0	MRT	Public
N	North-South Line	2000	5.7	MRT	Privatized
Z	Hanzomon Line	2003	6.0	MRT	Privatized
TB	Tokyo Bay Railway	2001, 2002	7.3	CRT	Public-Private
TX	Tsukuba Express	2005	58.3	CRT	Public-Private
HR	Hokuso Railway	2000	3.8	CRT	Public-Private
SR	Saitama Express	2001	14.6	CRT	Public-Private
MM21	Minato-Mirai 21 Line	2004	4.1	MRT	Public-Private
TIM	Tama Intercity Monorail	2000	16.0	LRT	Public-Private

RAIL TRANSIT INVESTMENTS & JOINT DEVELOPMENT ARRANGEMENTS IN THE TOKYO MEGALOPOLIS REGION, 2000-2007

EMPIRICAL RESULTS

Determinants of ln Land Value adjusted by the Consumer Price Index (CPI) in 2007 [JPY/sq m], 2000 and 2007

Land Markets	Residential		Commercial		Mixed		Industrial	
Attributes/Variables	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Fixed Effects								
Land Parcel								
Land Area [sq m]	9.12E-05	0.000	7.64E-05	0.000	2.31E-04	0.000	-9.53E-06	0.000
Maximum FAR [%]	4.45E-04	0.000	3.18E-03	0.000	2.42E-03	0.000	2.02E-03	0.000
SDA Size [sq km]	0.015	0.000			-0.015	0.036	-0.024	0.012
1/Distance to Coastline [m]	-31.078	0.003						
1/Distance to River [m]	-1.180	0.007	-8.034	0.002	1.826	0.000		
Urban Agglomeration Pattern, 2000/01								
Total Job Density [per sq km]	-1.20E-06	0.000			-1.65E-06	0.002		
Total Labor Density [per sq km]	3.52E-06	0.076	2.07E-05	0.002			1.40E-05	0.058
Job Mixture Index [0~1]			-0.510	0.002	-0.186	0.081		
Labor Mixture Index [0~1]	-1.399	0.000			-0.508	0.009		
OFFC Location Quotient							0.247	0.017
RETL Location Quotient					0.084	0.016	0.195	0.008
FCTY Location Quotient							0.118	0.015
SKPR Location Quotient	0.211	0.000						
MNGR Location Quotient	0.050	0.000						
ADMN Location Quotient	0.229	0.000			0.219	0.017		
SALE Location Quotient	0.153	0.000						
SVLB Location Quotient	0.163	0.000			0.120	0.001		
TRCM Location Quotient	0.078	0.002						
FCLB Location Quotient					-0.146	0.010		
Job and Labor Access								
Total Jobs in 30 minutes by Rail + Road	2.05E-08	0.000			3.17E-08	0.000		
Job MAG Index [-1~+1]					-0.207	0.001		
Total Workers in 30 minutes by Rail + Road			5.23E-08	0.000				
Labor MAG Index [-1~+1]			-0.300	0.006			-0.197	0.000
Megalopolis Location								
ATT Distance to CBD [hours]	0.107	0.000						
ATT Distance to NIA [hours]					0.232	0.000		
ATT Distance to HNA [hours]					-0.291	0.000	-0.456	0.000
ATT Distance to CBD [hours] * Year 2007 Dummy [1/0]	-0.007	0.000	-0.006	0.000	-0.008	0.000	-0.013	0.000
ATT Distance to HNA [hours] * Year 2007 Dummy [1/0]	0.002	0.000			0.003	0.000	0.003	0.000
Public Institute								
# of National Government Offices	0.004	0.000	-0.010	0.008			0.011	0.046
# of Local Government Office	0.018	0.000						
# of Public Research Institutes	-0.006	0.000						
# of Public Cultural Facilities			0.045	0.000			0.026	0.094
# of University Departments			-0.020	0.000			-0.013	0.028
Transportation Infrastructure, 2000								
1/Distance to Highway [m]	-4.357	0.003	-2.613	0.048			8.838	0.000
1/Distance to National Road [m]					-0.524	0.027	423.535	0.026
1/Distance to HSR Station [m]	295.848	0.000	175.967	0.000	200.404	0.000		
1/Distance to CRT Station [m]	17.971	0.000	19.784	0.000	6.656	0.001		
1/Distance to MRT Station [m]	19.842	0.000	13.940	0.000	8.295	0.000	-70.868	0.010
1/Distance to LRT Station [m]							423.535	0.026

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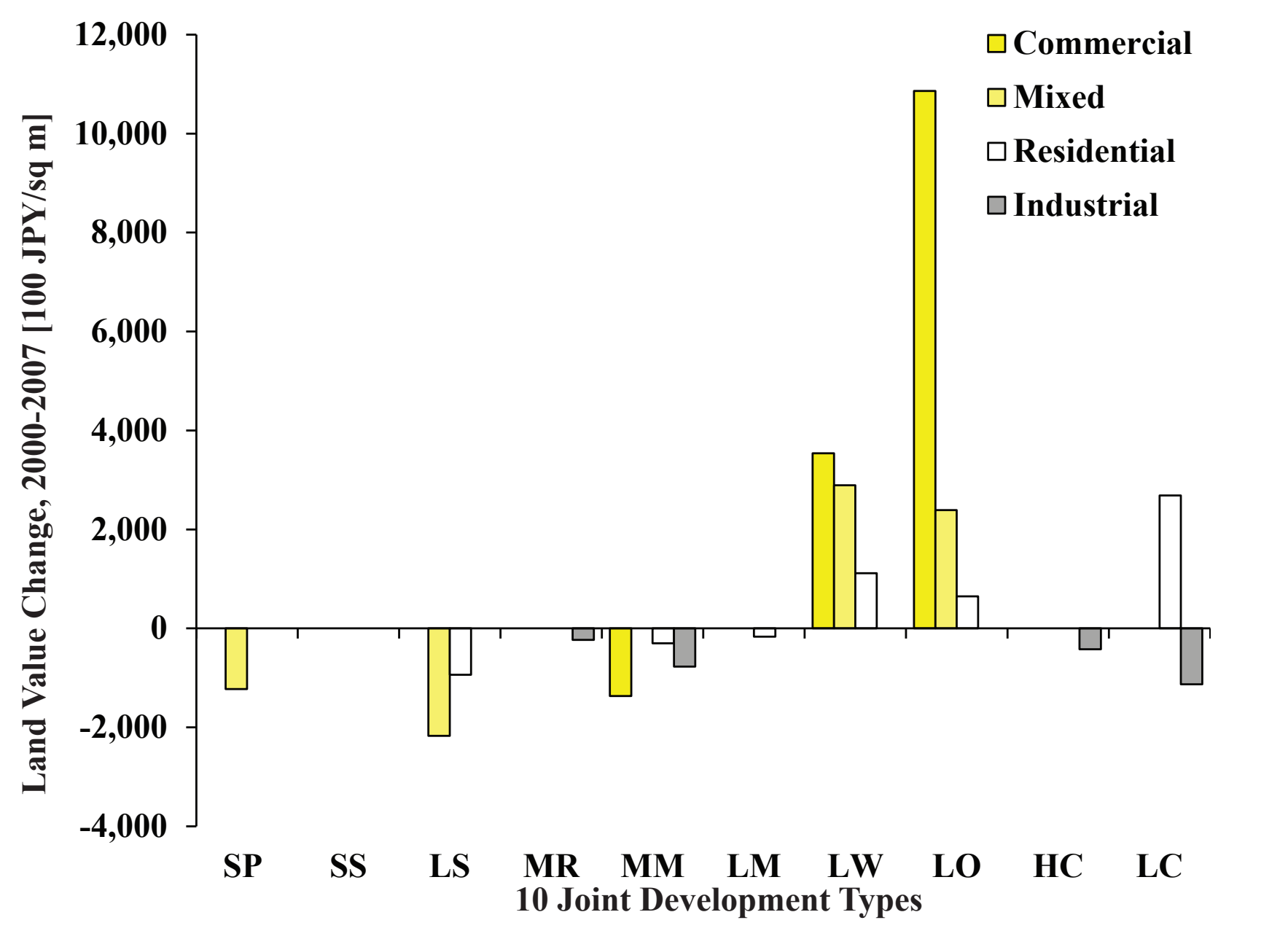
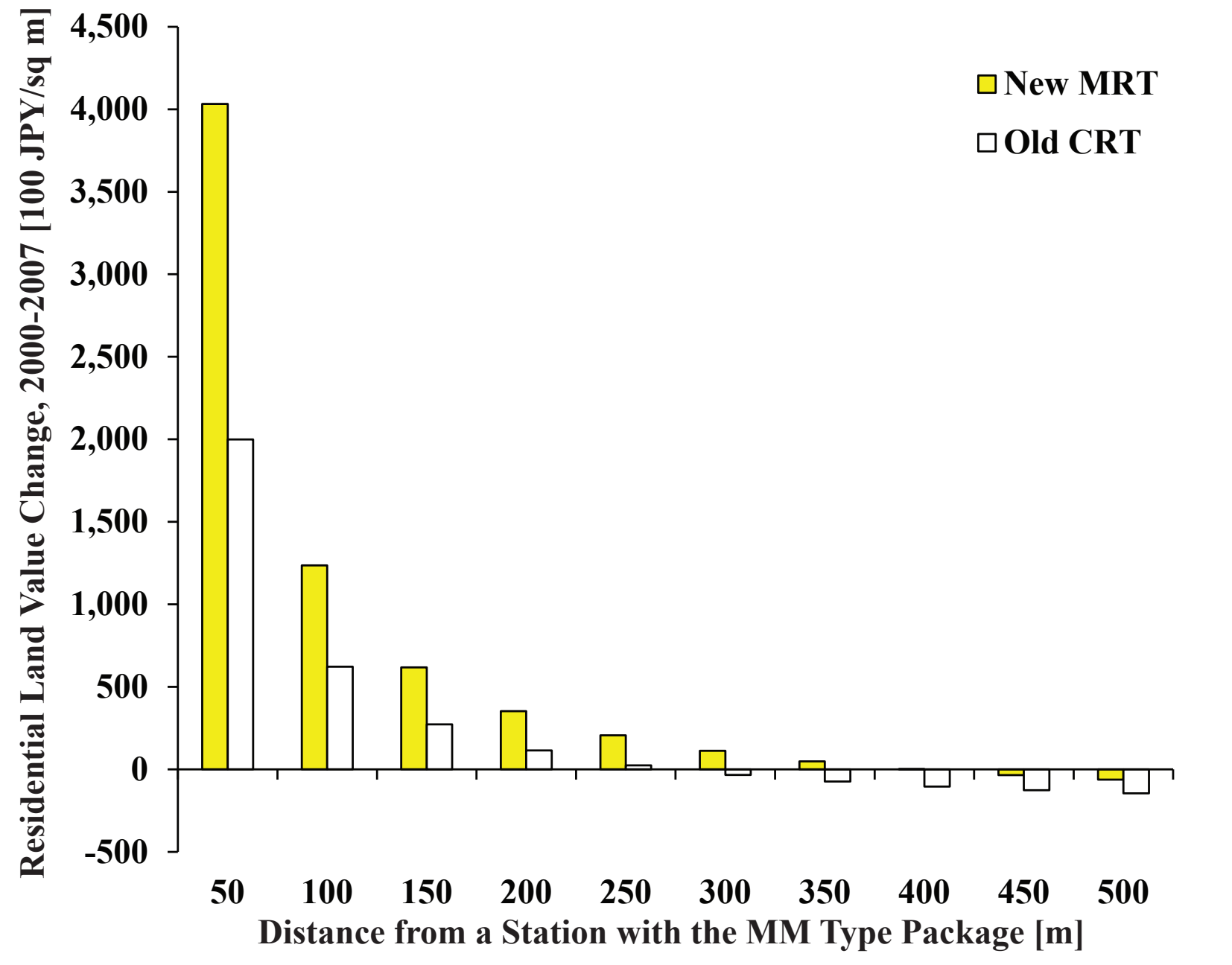
Property Markets	Residential		Commercial		Mixed		Industrial	
Attributes/Variables	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Transportation Infrastructure, 2000								
1/Distance to Highway [m] * Year 2007 Dummy [1/0]			3.140	0.037				
1/Distance to Local Road [m] * Year 2007 Dummy [1/0]			0.277	0.092	0.227	0.003		
1/Distance to HSR Station [m] * Year 2007 Dummy [1/0]	-58.973	0.082	-125.014	0.000	-211.298	0.000	-500.710	0.001
1/Distance to CRT Station [m] * Year 2007 Dummy [1/0]	12.739	0.000						
1/Distance to MRT Station [m] * Year 2007 Dummy [1/0]							44.235	0.009
1/Distance to LRT Station [m] * Year 2007 Dummy [1/0]							49.208	0.089
Transportation Investment, 2000-2007								
1/Distance to New Highway [m]					-73.165	0.073		
1/Distance to New HSR Station [m]	387.039	0.000	242.102	0.000			306.717	0.050
1/Distance to New CRT Station [m]	-44.501	0.002						
1/Distance to New MRT Station [m]	28.521	0.000	16.815	0.021	17.313	0.001		
1/Distance to New LRT Station [m]			123.496	0.027	89.166	0.011	512.297	0.024
New Pedestrian Space [%]	-0.032	0.000					0.023	0.058
Joint Development, 2000- 2007								
SP Type Dummy [1/0]					-0.240	0.017		
LS Type Dummy [1/0]	-0.564	0.000			-0.474	0.011		
MR Type Dummy [1/0]							-0.085	0.026
MM Type Dummy [1/0]	-0.149	0.000	-0.136	0.041			-0.318	0.000
LM Type Dummy [1/0]	-0.081	0.024						
LW Type Dummy [1/0]	0.413	0.000	0.285	0.000	0.407	0.000		
LO Type Dummy [1/0]	0.260	0.000	0.700	0.000	0.348	0.000		
HC Type Dummy [1/0]							-0.161	0.018
LC Type Dummy [1/0]	0.804	0.001					-0.507	0.001
Interaction Terms								
1/Distance to CRT Station [m] * MM Type Dummy [1/0]	40.024	0.001						
1/Distance to New MRT Station [m] * MM Type Dummy [1/0]	59.861	0.097						
New Pedestrian Space [%] * 1/Distance to HSR Station [m]			61.266	0.002	41.961	0.007		
New Pedestrian Space [%] * 1/Distance to New CRT Station [m]	9.821	0.001						
New Pedestrian Space [%] * 1/Distance to New LRT Station [m]	43.031	0.001						
New Pedestrian Space [%] * Total Labor Density [sq km]	5.51E-06	0.000						
(Constant)	12.147	0.000	11.626	0.000	12.036	0.000	11.488	0.000
Random Effects								
$\sum \zeta$	0.555		0.317		0.288		0.464	
$\sum \varepsilon$	0.166		0.428		0.265		0.167	
ρ	0.918		0.354		0.542		0.885	
Level-1 Observations	4,404		1,802		1,640		391	
Level-2 Districts	113		77		84		53	

Notes: FAR (Floor Area Ratio); SDA (Strategic Development Area); OFFC (Office); RETL (Retail and Restaurant); FCTY (Factory); SKPR (Skilled Professional); MNGR (Manager); ADMN (Administrator); SALE (Sales Worker); SVLB (Service Worker); TRCM (Transportation and Communication Worker); FCLB (Factory Labor); MAG (Modal Accessibility Gap); ATT (Average Travel Time); NIA (Narita International Airport); HNA (Haneda Airport); SP (Small-scale Public); SS (Small-scale Shopping); LS (Large-scale Shopping); MR (Mid-scale Residential); MM (Mid-scale Mixed); LM (Large-scale Mixed); LW (Large-scale Waterfront); LO (Large-scale Office); HC (High-rise Commercial); LC (Large-scale Commercial); HSR (High Speed Rail); CRT (Commuter Rail Transit); MRT (Metro Rail Transit); LRT (Light Rail Transit).

CAPITALIZATION EFFECTS



Impacts of Joint Development Arrangements on Land Values, 2000-2007



Impacts of the MM Arrangement on Land Values in 500 m of New MRT and Old CRT Stations, 2000-2007

CONCLUSIONS

- **The ability of the new HSR terminal, MRT extensions, and high-rise office property redevelopments to stimulate local economic development was considerable in central Tokyo; on the other hand, the ability of the new CRT extensions and automobile-dependent commercial property developments was insignificant in outer Tokyo;**
- **The considerable capitalization benefits promise the potential of value capture practices to recover the capital costs of the new HSR terminal and MRT extensions in central Tokyo; oppositely, the insignificant capitalization effects suggest the difficulty of value capture applications to recoup the capital costs of the new CRT extensions in outer Tokyo for the short term; &**
- **The economic impacts of mega-transit investments and joint development arrangements were redistributive from the existing railway station and highway interchange areas in outer Tokyo to the renewable railway terminal areas in central Tokyo and within each of the new MRT and existing CRT station areas where urban neighborhoods were already well-developed.**

The redistributive effects of rail transit investments and joint development arrangements should not simply be discussed as a zero-sum game. In the context of Japan's slowing economy and shrinking population, Tokyo's land value redistributions rather suggest **a new spatial order** to produce innovative business services and consume creative social lifestyles in a transit-oriented manner for global competitiveness and local livability.