

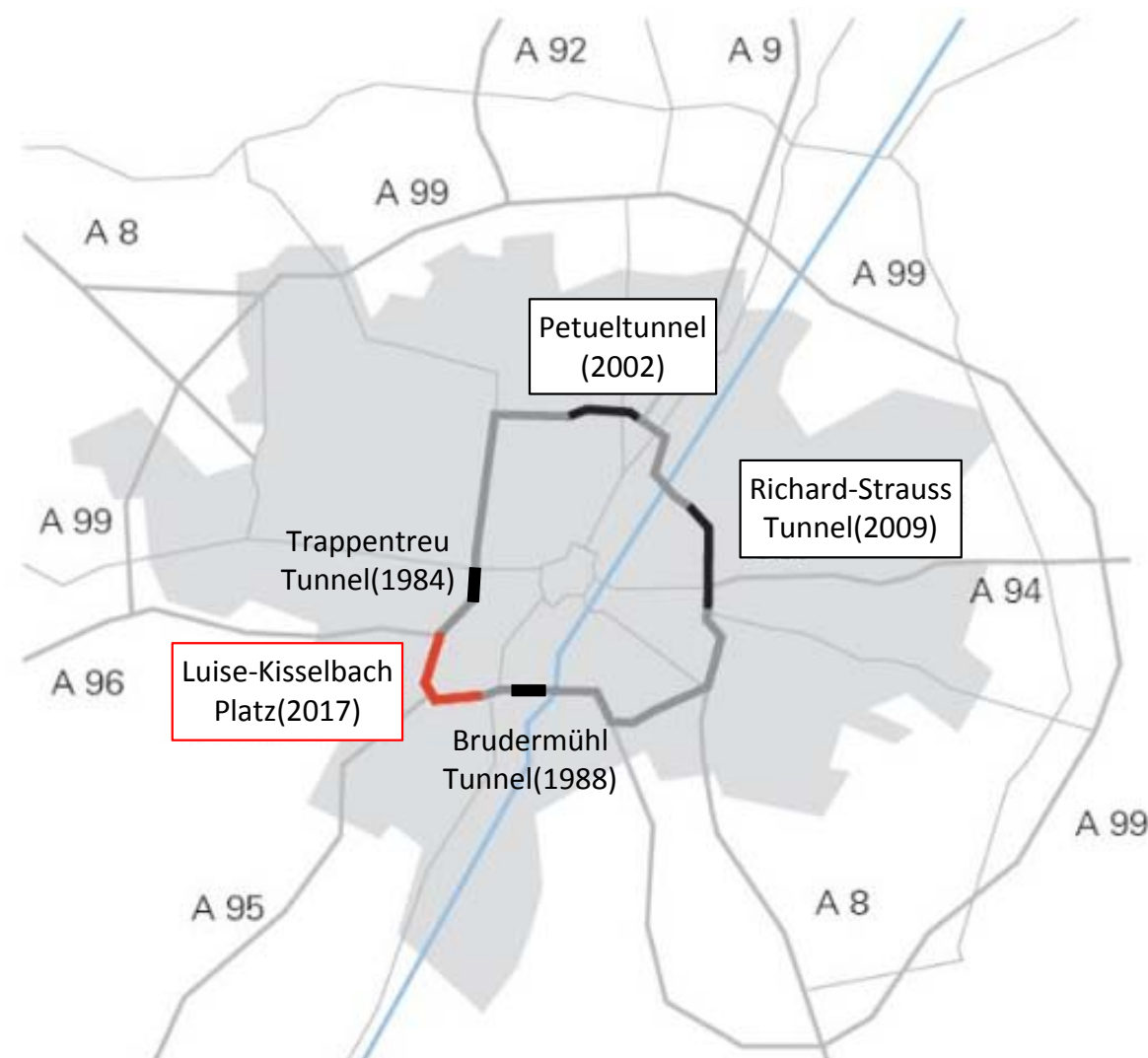
Hedonic estimates of the underground tunnels of 'Mittlerer Ring'

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History of 'Mittlerer Ring'

- Constructed for the 1972 Olympics
- Total length is 28 km and maximum speed is 60kph
- 1984: Trappentreutunnel
- 1988: Brudermühltunnel
- 1990: the Munich city council decided to stop further construction of the underground tunnels
- 1996: Munich's first referendum - 50.7% of the votes were in favour of further development
- 2002: Petuertunnel
- 2009: Richard-Strauss-tunnel
- 2017: Luise-Kiesselbach-Platz tunnel project

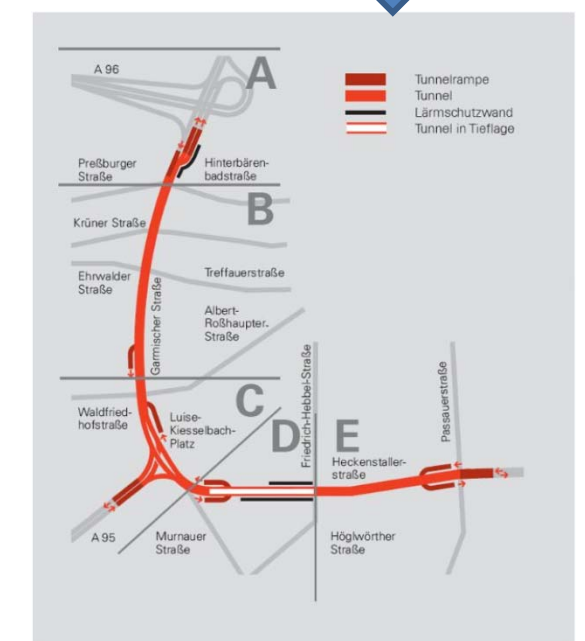


Outline of underground tunnels

Name	Trappentreutunnel	Brudermühltunnel	Petuel tunnel	Richard-Strauss tunnel	Luise-Kiesselbach Platz
Year	1984	1988	2002	2009	2017(scheduled)
Length	550m	852m	1473m	1500m	1500m+1020m
N of motor lane per direction	2	2	2	2	2
Traffic volume per day	Surface :3.000 Under: 135.000	Surface:15.000 Under:134.000	Under:107.500	Surface:6.000 Under:95.000	Under:122.000
Construction cost	135million DM (69million EUR)	176million DM (90million EUR)	205million EUR	325million EUR	373million EUR
Funding			Federal 67% City 33%	Federal 60% City 40%	Federal 50% City 50%
Situation of surface	4 Lanes and sidewalk (zone 30)	4 Lanes and sidewalk	Park(7.4ha)	2 Lanes, bicycle lane and sidewalk	<1500m section> 2 Lanes, bicycle lane and sidewalk
					<600m section> Park

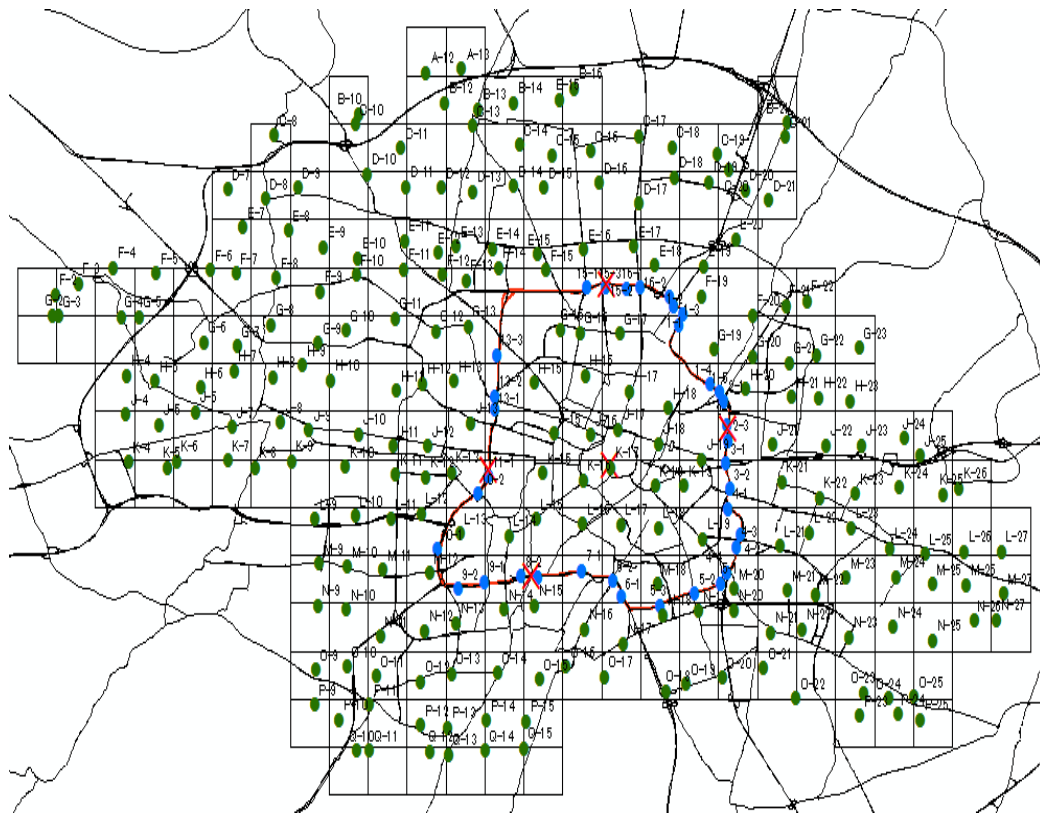
Purpose of this study

- This study reviews the effect of the underground tunnels of Mittlerer Ring based on the Hedonic approach.
- First, the change of land prices along Mittlerer Ring and in the Munich area from 1980 to 2010 is observed.
- Second, by creating a land price function for every 10 years from 1980 to 2010, the change in the effect of the tunnels is examined.
- Lastly, the benefits of the tunnels are estimated.



Data

- Source: a map of land value called 'Bodenrichtwerte' from Munich city
- 35 samples along Mittlerer Ring
- 230 samples from grid zone (1200m x 1000m)
- Year: 1980, 1990, 2000 and 2010



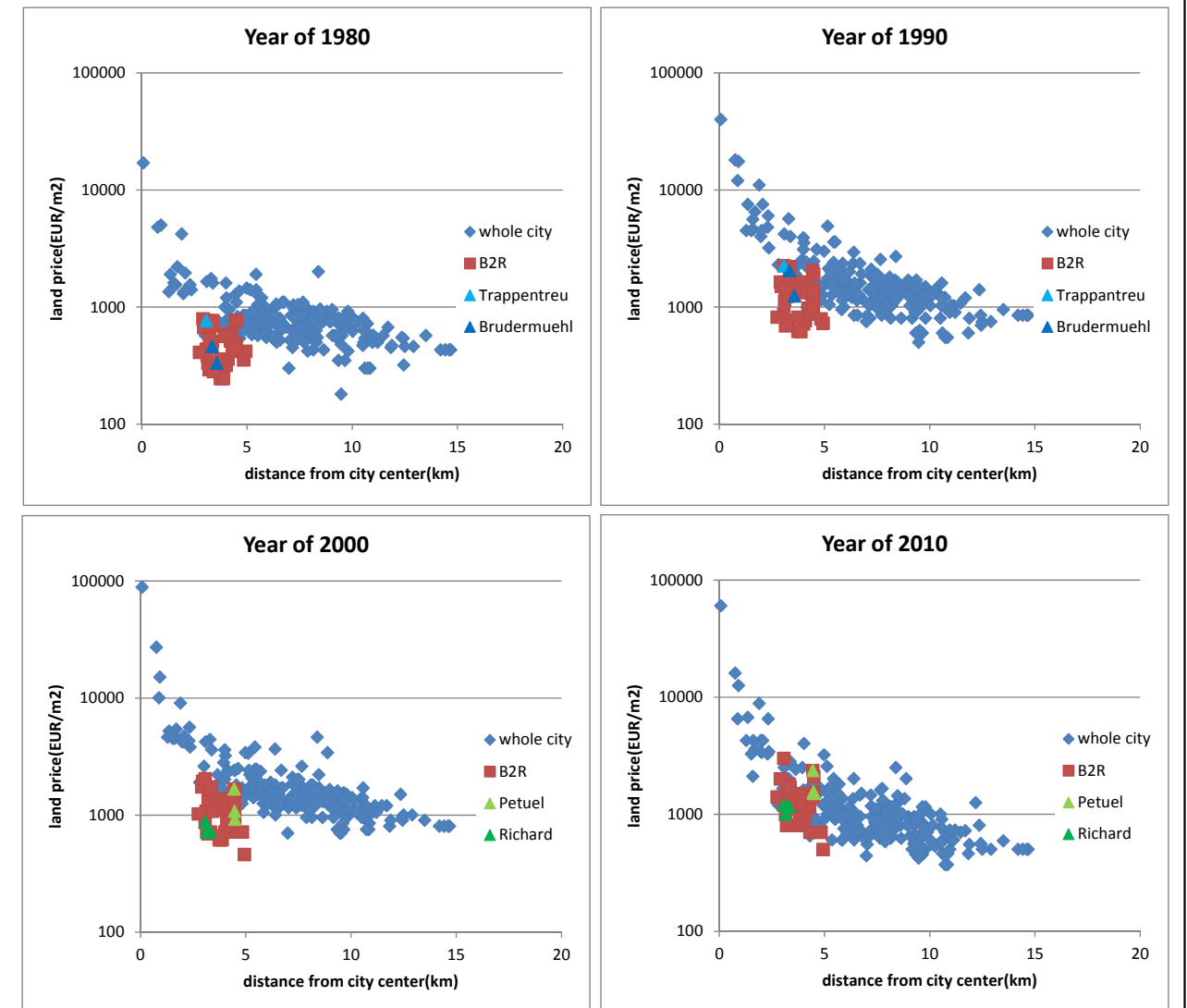
Change in land price

Along Mittlerer Ring:

1980: low price in B2R
 1990: higher than 1980
 2000: lower again
 2010: same as other place

Effect of tunnel construction is observed:

1980->1990: Trappentreu and Brudermuehl
 2000->2010: Petuel and Richard



Land price model

- Estimation results of land price model with ring road dummy

	1980			1990			2000			2010		
	coefficients	t-value	P-value	coefficients	t-value	P-value	coefficients	t-value	P-value	coefficients	t-value	P-value
constant	2.888	55.802	0.000	3.155	74.418	0.000	3.208	83.086	0.000	3.177	55.986	0.000
floor space ratio	0.195	11.301	0.000	0.282	19.775	0.000	0.255	20.293	0.000	0.225	12.282	0.000
log(distance from center)	-0.220	-4.652	0.000	-0.274	-7.119	0.000	-0.287	-8.208	0.000	-0.469	-9.107	0.000
ring road dummy	-0.376	-17.691	0.000	-0.321	-18.045	0.000	-0.369	-23.283	0.000	-0.118	-4.952	0.000
R2	0.744			0.874			0.894			0.806		
n. of sample	250			259			264			265		

- Estimation results of land price model in 1990 and 2010

	1990				2010		
	coefficients	t-value	P-value		coefficients	t-value	P-value
constant	3.202	67.096	0.000	constant	3.184	52.976	0.000
floor space ratio	0.275	18.650	0.000	floor space ratio	0.240	12.188	0.000
log(distance from center)	-0.253	-6.336	0.000	log(distance from center)	-0.371	-5.696	0.000
ring road dummy	-0.329	-18.160	0.000	ring road dummy	-0.139	-5.607	0.000
log(distance from Trappentreu TN)	-0.049	-1.409	0.160	log(distance from Petuel TN)	-0.040	-1.344	0.180
log(distance from Brudermühl TN)	-0.022	-0.712	0.477	log(distance from Richard-Strauss TN)	-0.078	-2.090	0.038
R2	0.876			R2	0.810		
n. of sample	259			n. of sample	265		

Benefits of the underground tunnel

in case of 50% residential floor space and affected tunnel range of 4 km

Total: 187 million EUR
 Zones in Petuel tunnel:
 4.2 million EUR
 Zones in Richard-S-tunnel:
 8.9 million EUR

