The Effects of the Light Rail On Land Value and Land Use Pattern

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Assumptions & Questions

Assumptions

- Economic theory assumes that accessibility to transportation services should be capitalized into property values
- Public transit is always expected to lead to the change of the land use pattern such as more mixed, dense and diverse land use pattern

Questions

- What's the impacts of the Yellow line light rail at Portland on land value in our study area?
- What's the effects of the Yellow line light rail at Portland on land use pattern in our study area?

Data and Research Methodology

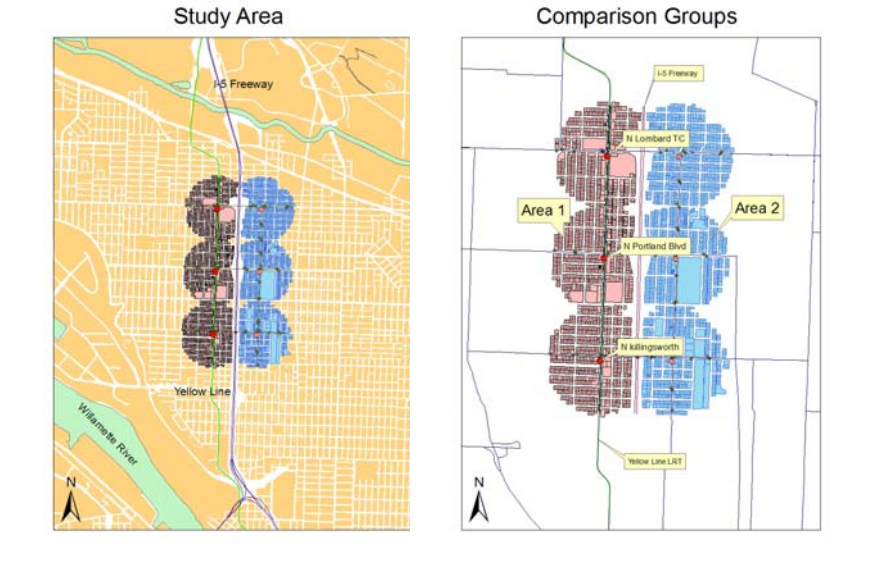
Data

- Rlis data in the year of 2000, 2002, 2004, and 2006
- Data layer: Taxlots, Transit, Street

Methodology

- "Before and After": land value and land use pattern change trajectory in/between the year 2000, 2002, 2004 and 2006 (the Yellow line was open in May 2004)
- "Here and There": two comparison area groups (one with the light rail and one without) were constructed and compared

Study Area and Comparison Groups

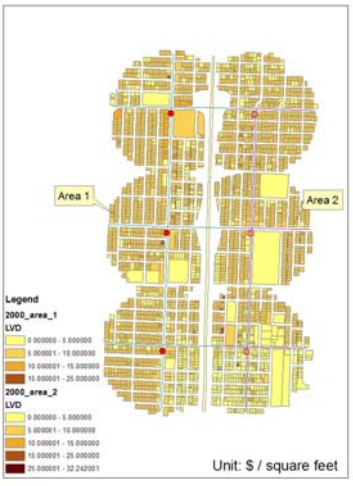


Part I:

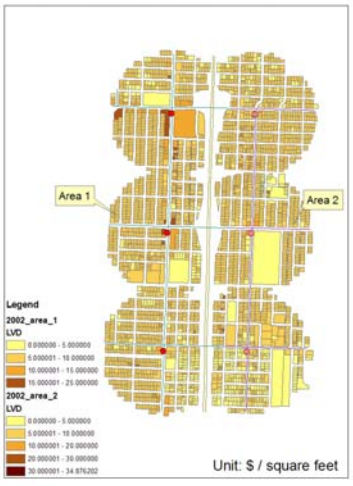
The effects of Yellow Line Light Rail on Land Value

Land Value Density

Land Value Density in 2000

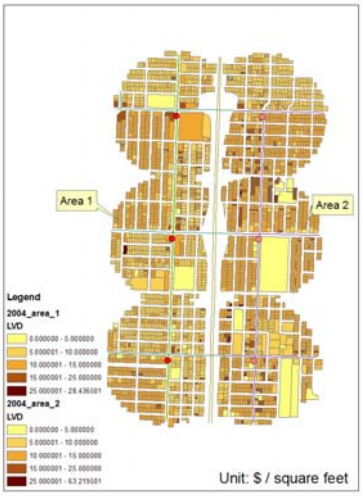


Land Value Density in 2002

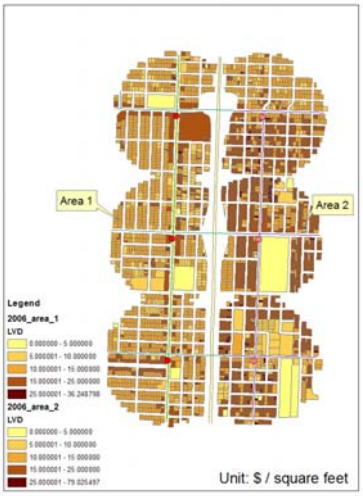


Land Value Density (LVD) = Land Value / land area

Land Value Density in 2004

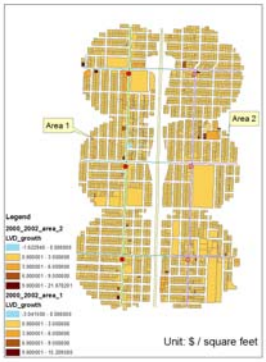


Land Value Density in 2006

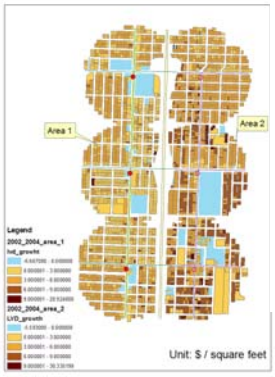


Land Value Density Changes

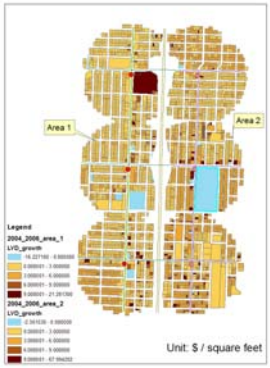
Land Value Change from 2000 to 2002



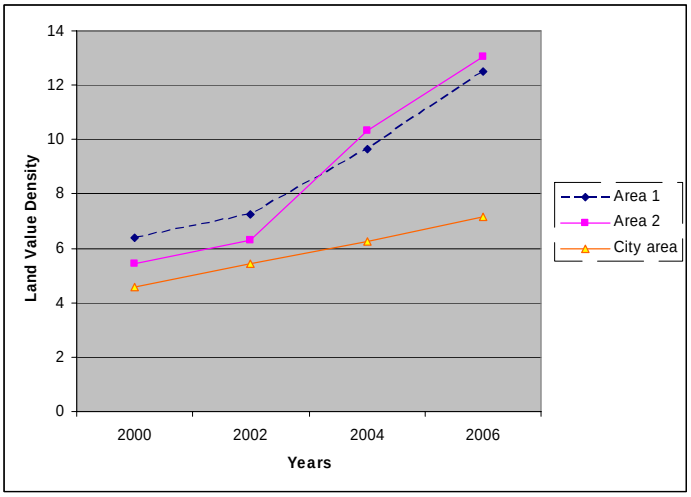
Land Value Change from 2002 to 2004



Land Value Change from 2004 to 2006



Land Value Density Comparison Between the Study Area and the Whole City Area



Compare land Value change between 2 areas from 2004 to 2006

Group statistics

	N	Mean	Std. Deviation	Std. Error Mean
Area1	1578	2.8927	1.1917	3.000E-02
Area2	1595	3.2986	1.3946	3.492E-02

Independent samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	47.044	.000	-8.810	3171	.000
Equal variances not assumed			-8.817	3105.396	.000

A t-test was used to examine the difference of LVD increase between the 2 areas from 2004 to 2006. The result was significant and indicated that the LVD increase in Area 2 (M=3.3) is significantly larger than that of area 1 (M=2.9) from 2004 to 2006.

ANOVA test of the Area 1 from 2000 to 2006

Descriptive statistics

	Mean	Std. Deviation	N
from 2000 to 2002	.7531	1.0348	1597
from 2002 to 2004	2.9202	1.6723	1597
from 2004 to 2002	3.0089	1.7653	1597

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.	Eta Squared
TIME	Pillai's Trace	.647	1464.254	2.000	1595.000	.000	.647
	Wilks' Lambda	.353	1464.254	2.000	1595.000	.000	.647
	Hotelling's Trace	1.836	1464.254	2.000	1595.000	.000	.647
	Roy's Largest Root	1.836	1464.254	2.000	1595.000	.000	.647

An ANOVA test was used to examine the difference of the LVD increase in area 1 in three different stages. The result was significant and indicated that LVD increase in Area 1 during the three stages (from 2000 to 2002, from 2002 to 2004, and from 2004 to 2006) is significantly different.

Follow-up paired compare between 2002-2004 & 2004-2006 in Area 1

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
from 2002 to 2004	2.9198	1601	1.6709	4.176E-02
from 2004 to 2006	3.0173	1601	1.7929	4.481E-02

Paired Samples Test

	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
2002 to 2004 & 2004 to 2006	-9.7529E-02	2.4233	6.056E-02	-1.610	1600	.108

A follow-up paired t-test was used to examine the difference of LVD increase between the stage 2002 to 2004 and 2004 to 2006. The result was not significant and indicated that the LVD increase in Area 1 from 2002 to 2004 is not significantly different from that from 2004 to 2006.

Conclusions for land value

"Before and After" Comparison

- Compared with the land value density increase in the whole city area, LVD in area 1 increased more rapidly since 2002, instead 2004, the year in which Yellow line was open
- A follow-up t-test showed that LVD increase between stage of 2002 to 2004 and stage of 2004 to 2006 is not significantly different
- LVD in area 2 increased more since 2002 too

"Here and There" Comparison

- A independent t-test indicated that the LVD increase in Area 2 is significantly larger than that of area 1 from 2004 to 2006

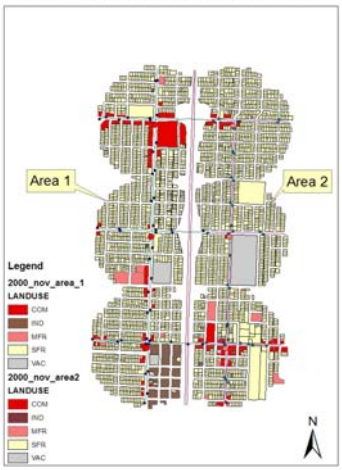
Conclusions

- Neither "Before and After" nor "Here and There" comparisons shows outstanding effects of the Yellow line on land value

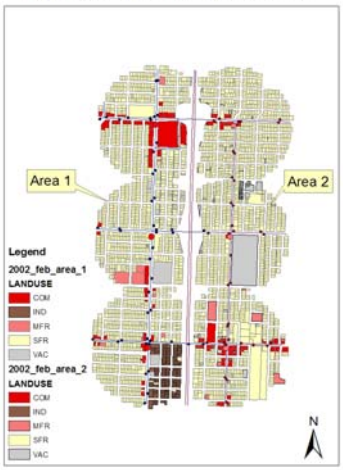
Part II:
The Effects of Yellow Line Light Rail on Land Use Pattern

Land Use Pattern in Different Year

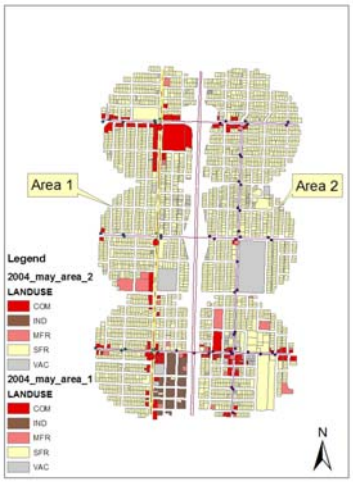
Land Use Pattern in Nov. 2000



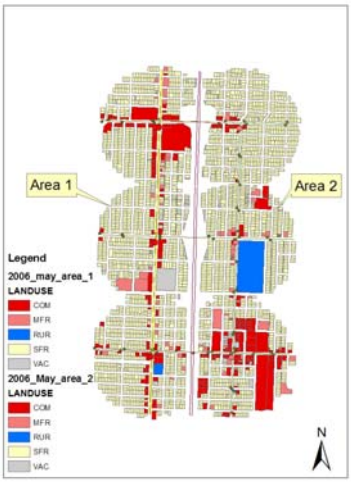
Land Use Pattern in Feb. 2002



Land Use Pattern in May. 2004



Land Use Pattern in May. 2006



Taxlots with Land Use Pattern Changed

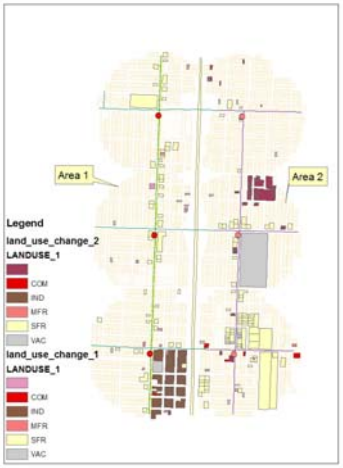
Taxlots with Land Use Changed from 2000 to 2006

Taxlots with Land Use Changed from 2004 to 2006

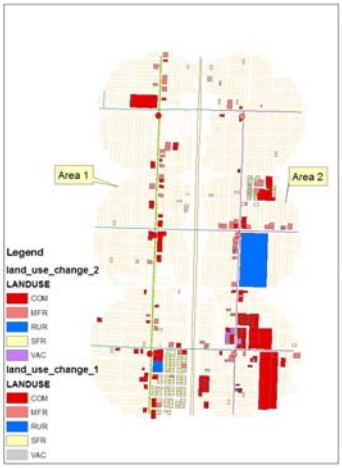
Most land use change from 2000 to 2006 happened during the time from 2004 to 2006, both in area 1 and area 2.

Land use pattern of taxlots with change from 2000 to 2006

Taxlots with Changes In Land Use (2000)



Taxlots with Changes In Land Use (2006)



Areas of the Taxlots with land use changes from 2000 to 2006

(Unit: Square feet)

Area 1	2000	2006	Change
COM	4,991	582,306	577,315
SFR	630,432	530,990	-99,442
MFR	10,078	196,556	186,478
IND	598,035	0	-598,035
RUR	0	54,775	54,775
VAC	80,331	18,546	-61,785
total	1,323,867	1,383,173	

Area 2	2000	2006	Change
COM	36,938	1350,476	1,313,538
SFR	1414,548	162,108	1,252,440
MFR	4,999	277,079	272,080
IND	5,295	0	-5,295
RUR	0	715,158	71,518
VAC	774,569	63,278	-711,291
total	2,236,349	2,568,099	

COM: Commercial Land
MFR: Multi-Family Land
RUR: Rural or for Future Urban Land
SFR: Single Family Land
IND: Industrial Land
VAC: Vacancy Land

Change of land use in area 1 Unit: feet²

landuse	2000	landuse changes to	2006
SFR	630432	COM	465,036
		MFR	157,471
IND	598035	SFR	471,022
		MFR	26,947
		COM	114,771
VAC	80331	RUR	54,775
		SFR	20,603
MFR	10078	SFR	10,078

Change in land use in area 2 Unit: feet²

landuse	2000	landuse changes to	2006
SFR	1414548	COM	1,206,132
		MFR	156,143
		VAC	52,272
VAC	774569	RUR	715,157
		SFR	31,378
		COM	18,021
		MFR	10,011
IND	5295	COM	5,295
MFR	4999	SFR	4,999

Conclusions for Land Use

Similarities between 2 comparison areas:

- Area of commercial land increased most
- Most land use change in single family was changed to commercial land use
- Area of vacancy land decreased most
- Most vacancy land was changed into rural or future land use and single family land use
- Multi-family land area increased
- Land for Rural or for future land use increased
- Industrial land disappeared

Differences between 2 comparison areas

- Most land use change in area 1 happened along the light rail and industrial area, but in area 2, most land use change happened in its school district (PCC)
- Though the total area was similar between to comparison areas, more land use change happened in area 2 (nearly two times) than area 1
- Area of single family (SFR) land use decreased in area 1 but increased in area 2
- In area 1, most industrial land use was transferred into Single Family land use but, in area 2, all the industrial land use was transferred into commercial land use

- "Before and After" comparison showed that there were much more land use change after the year of 2004 than before, both in Area 1 and Area 2
- "Here and There" comparison showed similar change pattern in Area 1 and area 2, so more land use change after 2004 in area 1 cannot be contributed the open of Yellow line

Conclusions

- The open of the Yellow line did lead more land use change concentrated alone it
- Both the comparisons in total land use change areas and change pattern between two areas did not show significant impacts from Yellow line
- The area of multi-family land use in area 1 increased while that in area 2 decreased, but the causation between the increase of multi-family land use and the open of Yellow line need to be further studied.

Limitations

- Rlis data on the land use pattern is not so detailed and accurate. Using such data may underestimate the level of the land use pattern change
- Generally, it takes 4 or more years to see a dramatic land use and value changes caused by light rail. But the Yellow line is only 2 years old. So this study may underestimate the influences of the light rail too