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Housing Market in Portugal revisited

A spatial analysis for 275 counties

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A spatial analysis for 275 counties

Pedro G. Carvalho February, 24th, 2003

Abstract

In a former study (Carvalho 1995) we modeled the housing market in Portugal in a classic cross section framework and did find that housing construction was dependant from income, population and sensitive to location. Nevertheless we couldn't find the extent of this sensitivity in such a framework.

This paper is an upgrade of that study, using a spatial econometric model. Comparing the results, there are some slightly different estimates in the coefficients, but a lot more of precision once we incorporate the spatial interaction between the counties, changing the magnitude and significance of the coefficients.

Keywords: Housing Market; Portugal; spatial econometrics

JEL: C53 – R 310

1. Motivation

In 1995 I tested an econometric model to explain housing constructed area in 1990 as a dependent variable, using income, population and housing costs as exogenous variables. The introduction of some dummy variables for county location also enabled us to conclude that Algarve and the Coast counties had a different pattern compared with the rest of the country. However, spatial dependence was not accounted at the time. Heteroskedascity was present and taken into account, once, successively dividing the model by the exogenous variable used for population overcome the White test.

In this study we would like to use the same specification model introducing a set of new tests for spatial effects, in order to accurate the reliability of parameter estimates. We also would like to test for model stability over time (1995, 1996, 1997 and 1998).

All those experiments were base on (Anselin 1988) and (Anselin 1999).

a) The base model used in 1990

Variable description:

Variable	Main symbol	Log form	Per capita	Description
Housing area	A	La	Lapc	Number of square meters of residential housing per county, each year
Income	INC	LINC	LINCPC	Proxy (automobile tax) of income per county, each year
Population	P	LP	INVP (inverse)	Resident population. Census data for 1990, INE estimates for other periods
Cost	Cost	Lcost	Lm2 (per sq.meter)	Data from local authorities reports

The model was first estimated in global values for each variable, and successively transformed, in per capita and/or square meter costs, then logarithmzed.

$$\text{lapc}_{it} = \text{lincpc}_{it} + \text{linvp}_{it} + \text{lm2}_{it} + \varepsilon_{it}$$

$$i = 1, \dots, 275$$

$$t = 1990$$

Results for the used former model (1990)

$$R^2_{\text{adj}} = 0,597 \quad \text{White } \chi^2(13) = 0.0000$$

Variables	β -Coefficient	t - statistic	Probability
Constant	2,292	5,95	0,0000
linvp90	- 0.095	- 3,82	0,0000
lincpc90	0, 455	7,19	0,0000
lm290	- 0,492	- 7,33	0,0000
DummyALG	0, 697	4, 08	0,0000

2. Spatial analysis

The following conclusions are based on the interpretation of the output files named a2, a3, a4, a5 and p (annex), corresponding to the purposed tasks on each assignment of the year 2001 Course 492se - Spatial Econometrics –(Tutor: Luc Anselin) and using the ArcView 3.2 and SpaceStat 1.91 R10 softwares.

a) Selection of meaningful spatial regimes

Six spatial regimes were created in ArcView; I selected two of them, those presenting the best results (magnitude of explanation and higher t-values), respectively ALG and COAST.

The other 4 regimes referred to LIT (coast, including the set of the counties within a certain distance from the west coast of the country); CDIST (the 18 administrative counties); AMP and AML (metropolitan areas of Porto and Lisbon).

The ALG regime contains all the counties of the Algarve province and the COAST regime contains the counties with Atlantic coast, which means that they partially overlap and thus are not used together.

b) Spatial ANOVA for the 2 spatial regimes

There is a highly significant difference between the average of the dependent variable between the two regions (ALG, 3 times more than non-ALG and COAST, 1.5 times more than non-COAST).

c) Testing for Heteroskedasticity using regimes

The base model presents values of adjusted R^2 of 0,579 and 0,540 (COAST and ALG respectively); all the variables are significant at a $p < 0,01$ although the variable for population - $\ln vp90$ - has not the expected negative signal (once housing area should be higher in high populated counties). We will deal with this issue later.

The null hypothesis for error normality in both regimes is rejected (Jaques-Bera test with very low probability values).

The null hypothesis for homoskedasticity is clearly accepted in both regimes, considering the Koenker-Bassett test (probabilities of 0,76 and 0,79). However, the results are different in what individual coefficient stability concerns. In fact, stability for housing cost is rejected in COAST regime.

d) Spatial homogeneity

Using the spatial expansion model (1st order), heterogeneity is the rule with exception for the population variable in both regimes. Heteroskedascity is still remaining.

Using the spatial expansion model (2nd order), heterogeneity is not present anymore (exception to the constant) and heteroskedascity is still present although with a probability of $< 0,1$.

e) Spatial Weights

In order to run the spatial effects tests, several weight matrices (W) were created.

In ArcView we created the *rook* and *queen* matrices. In SpaceStat we created the others weight matrices, based on contiguity of second and third order (2_2 and 2_3); on distance (*d1* and *invd1s* – standardized) and k-nearest neighbors (for 2, 3 and 5 neighbors, respectively *Kn_3_2s*, *Kn_3_3s* and *Kn_5s*).

After running the tests for all the matrices we dropped the *Kn_5s* matrix because the results did not revealed any kind of spatial dependence, even with Moran’s I. We present the results (just the probabilities) for the seven *W*’s obtained:

Diagnostic	<i>rook</i>	<i>queen</i>	<i>invd1s</i>	<i>kn_3_3s</i>	<i>kn_3_2s</i>	2_2	2_3
Moran’s I (error)	0,003312	0,003335	0,000000	0,008665	0,010042	0.000002	0.000689
LM (error)	0,006769	0,006840	0,000916	0,014659	0,015393	0.000014	0.002379
Robust LM (error)	0,267000	0,278842	0,497805	0,374953	0,349358	0.946761	0.427486
K-R (error)	0,012743	0,014310	0,906666	0,077545	0,309251	0.000403	0.000028
LM (lag)	0,000006	0,000007	0,000000	0,000057	0,000088	0.000000	0.000001
Robust LM (lag)	0,000147	0,000171	0,000067	0,000892	0,001274	0.000100	0.000078
LM (SARMA)	0,000019	0,000022	0,000001	0,000204	0,000296	0.000000	0.000004

To decide which matrix we were going to use for the next tests, we looked to Moran’s I probabilities, followed by LM (error and lag), Robust (error and lag) and LM (SARMA). Proceeding this way, we think that the *spatial model* should be the correct specification in this case, once though the LM (error) presents low probabilities, the robust LM is never indicating that possibility.

The tests remain significant for the spatial lag when introducing the spatial regimes; however the probabilities are slightly greater overall.

Because Heteroskedasticity was still present, we run the Heteroskedasticity model (FGLS) and the Wald test do not reject the null hypothesis of homoskedasticity in both cases, although for a strict margin (in ALG - 0,118 – in Coast a 0,129).

f) Spatial Lag and Spatial Error models

We estimated both regression models for lag and error dependence and the results indicate that:

- a) Spatial lag is significant with $\rho = 0,869$, with no heteroskedasticity for COAST regime and still remaining heteroskedasticity for ALG regime; no spatial autocorrelation remaining in both cases, once the Likelihood Ratio rejects the null hypothesis of $\rho = 0$;
- b) Spatial Error model presents significant $\lambda\lambda$ estimates, but heteroskedascity and spatial autocorrelation are still remaining in both regimes.

After these results, the best-fit indicator for all the models is the spatial lag model with the regime COAST.

Comparing this model to the standard OLS estimation, we lose some fitness (LIK is a little bit higher in absolute value – 179.460 vs. 160.322) but we gain the correction of the spatial dependence (and we are aware of the problem), which totally disappears in the spatial lag specification.

Comparing with the model estimated in previous work, there are some slightly different estimates in the coefficients, but a lot more of precision once we incorporate the spatial interaction between the counties, changing the magnitude and significance of the coefficients.

Variables	Normal OLS			Spatial lag model		
	Coefficient β	t - statistic	Probability	Coefficient β	z - value	Probability
Constant	2,292	5,95	0,0000	2.19662	5,01	0,0000
linvp90	- 0.095	- 3,82	0,0000	0.232683	5,99	0,0000
lincpc90	0,455	7,19	0,0000	0.452063	7,96	0,0000
lm290	- 0,492	- 7,33	0,0000	-0.27341	- 11,8	0,0000
DummyALG	0,697	4,08	0,0000	--	--	--
Lambda				0,813	6,46	0,0000

Another important difference refers to the different sign of the population variable. In the normal OLS estimation the predicted signal is negative, once the higher the value of resident population in each county the lower will be its inverse, thus affecting negatively the housing constructed area; estimating a spatial lag model, we can be possibly capturing the decreasing rate of housing construction in high populated counties once the lag smoothes the differences among neighbor counties. For that reason we tried another specification of the model (annex p), including both the variable and the logarithm of the variable (invp90 and linvp90) and the fitness improves as the sign become as expected; it looks like population plays a non-linear role on the equation and there is a decreasing effect the more the county gets highly populated.

We estimated the model with both linvp90 and l2invp90 (power 2) and the results are then consistent with our hypothesis: population coefficients become negative.

g) IV estimation

In all the regressions we carried with IV for spatial lag, the coefficient of the lagged variable (ρ was always > 1).

We tested for endogeneity with all the previous exogenous variables and the results were consistent with non-endogeneity.

3. Further research

I tried the first estimations for the years 1995, 1996, 97 and 98, but the model does not keep the same significant variables. Anyway I would try the new re-specification and intend to present the results for each time period separately studying the hypothesis of a panel data work.

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ANNEX

A2

ANOVA

ORDINARY LEAST SQUARES ESTIMATION
ANALYSIS OF VARIANCE - USING INDICATOR VARIABLES
ALG

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VAR	2	DF	273
R2	0.1545	R2-adj	0.1514				
LIK	-259.982	AIC	523.963	SC		531.197	
RSS	106.663	F-test	49.8991	Prob	1.35159e-011		
SIG-SQ	0.390705	(	0.625064	)	SIG-SQ(ML)	0.387864	(
	0.622787))

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.2438	0.0388396	-32.024031	0.000000
ALG_1	1.13744	0.16102	7.063929	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 1.278973

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	43.846350	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT ALG_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.759592	0.383456

ORDINARY LEAST SQUARES ESTIMATION

ANALYSIS OF VARIANCE - USING INDICATOR VARIABLES

COAST

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VAR	2	DF	273
R2	0.1363	R2-adj	0.1332				

LIK -262.910 AIC 529.819 SC 537.053
 RSS 108.958 F-test 43.0961 Prob 2.61579e-010
 SIG-SQ 0.399114 (0.631755) SIG-SQ(ML) 0.396212 (0.629453)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.31956	0.0438043	-30.124045	0.000000
COAST_1	0.582592	0.0887454	6.564758	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 1.717385

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	82.816245	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	9.994567	0.001570

ORDINARY LEAST SQUARES ESTIMATION

DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 4 DF 271
 R2 0.5159 R2-adj 0.5105
 LIK -183.320 AIC 374.639 SC 389.106
 RSS 61.0765 F-test 96.2573 Prob 1.94637e-042
 SIG-SQ 0.225375 (0.474736) SIG-SQ(ML) 0.222097 (0.471271)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.42786	0.399209	6.081680	0.000000
LINCPC90	0.454962	0.0560489	8.117248	0.000000
LINVP90	0.257756	0.0371117	6.945415	0.000000
LM290	-0.292382	0.0234125	-12.488308	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 34.931108

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	20.545063	0.000035

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT ALG

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	6.792087	0.009156

ORDINARY LEAST SQUARES ESTIMATION

DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 4 DF 271
R2 0.5159 R2-adj 0.5105
LIK -183.320 AIC 374.639 SC 389.106
RSS 61.0765 F-test 96.2573 Prob 1.94637e-042
SIG-SQ 0.225375 (0.474736) SIG-SQ(ML) 0.222097 (0.471271)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.42786	0.399209	6.081680	0.000000
LINCPC90	0.454962	0.0560489	8.117248	0.000000
LINVP90	0.257756	0.0371117	6.945415	0.000000
LM290	-0.292382	0.0234125	-12.488308	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 34.931108
TEST ON NORMALITY OF ERRORS
TEST DF VALUE PROB
Jarque-Bera 2 20.545063 0.000035

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES
CONSTANT COAST
TEST DF VALUE PROB
Koenker-Bassett test 1 2.163765 0.141298

SPATIAL REGIMES

ORDINARY LEAST SQUARES ESTIMATION

STRUCTURAL CHANGE - DIFFERENT SLOPES FOLLOWING VARIABLE COAST
DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 8 DF 267
R2 0.5904 R2-adj 0.5797
LIK -160.322 AIC 336.645 SC 365.579
RSS 51.6698
SIG-SQ 0.193520 (0.439909) SIG-SQ(ML) 0.187890 (0.433463)

VARIABLE	COEFF	S.D.	t-value	Prob
CONST_0	0.25763	0.55555	0.463739	0.643213
LINCP_0	0.199855	0.0732095	2.729901	0.006757
LINVP_0	0.0861443	0.0494058	1.743608	0.082379
LM290_0	-0.244123	0.0263315	-9.271146	0.000000
CONST_1	4.95072	0.620913	7.973280	0.000000
LINCP_1	0.442469	0.095805	4.618436	0.000006
LINVP_1	0.485791	0.0626408	7.755193	0.000000
LM290_1	-0.24375	0.0462973	-5.264883	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 45.486843
TEST ON NORMALITY OF ERRORS
TEST DF VALUE PROB
Jarque-Bera 2 25.518803 0.000003
TEST ON STRUCTURAL INSTABILITY FOR 2 REGIMES DEFINED BY COAST

TEST	DF	VALUE	PROB
Chow test	4 267	12.152110	0.000000

STABILITY OF INDIVIDUAL COEFFICIENTS

TEST	DF	VALUE	PROB
CONST_0	1 267	31.728653	0.000000
LINCP_0	1 267	4.048764	0.045208
LINVP_0	1 267	25.093916	0.000001
LM290_0	1 267	0.000049	0.994416

DIAGNOSTICS FOR HETEROSKEDASTICITY
LINEAR SPECIFICATION USING VARIABLES
CONSTANT COAST_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.089269	0.765109

ORDINARY LEAST SQUARES ESTIMATION
STRUCTURAL CHANGE - DIFFERENT SLOPES FOLLOWING VARIABLE ALG
DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VAR	8	DF	267
R2	0.5523	R2-adj	0.5405				
LIK	-172.570	AIC	361.141	SC		390.075	
RSS	56.4837						
SIG-SQ	0.211549	(0.459945)	SIG-SQ(ML)	0.205395	(
	0.453205)					

VARIABLE	COEFF	S.D.	t-value	Prob
CONST_0	1.85191	0.410169	4.514988	0.000010
LINCP_0	0.39201	0.0575911	6.806789	0.000000
LINVP_0	0.215295	0.0376287	5.721571	0.000000
LM290_0	-0.268032	0.0239667	-11.183480	0.000000
CONST_1	5.70333	2.22903	2.558657	0.011060
LINCP_1	0.739713	0.268545	2.754525	0.006282
LINVP_1	0.521003	0.213484	2.440477	0.015318
LM290_1	-0.294801	0.0947052	-3.112823	0.002054

REGRESSION DIAGNOSTICS
MULTICOLLINEARITY CONDITION NUMBER 49.241065
TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	28.753187	0.000001

TEST ON STRUCTURAL INSTABILITY FOR 2 REGIMES DEFINED BY ALG

TEST	DF	VALUE	PROB
Chow test	4 267	5.427691	0.000324

STABILITY OF INDIVIDUAL COEFFICIENTS

TEST	DF	VALUE	PROB
CONST_0	1 267	2.887671	0.090425
LINCP_0	1 267	1.602709	0.206623
LINVP_0	1 267	1.988812	0.159629
LM290_0	1 267	0.075086	0.784283

DIAGNOSTICS FOR HETEROSKEDASTICITY
LINEAR SPECIFICATION USING VARIABLES
CONSTANT ALG_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.069353	0.792281

SPATIAL EXPANSION

ORDINARY LEAST SQUARES ESTIMATION
 SPATIAL EXPANSION OF COEFFICIENTS - FOLLOWING EXPANSION VARIABLES

Y_COORD

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	7	DF	268
R2	0.5625	R2-adj	0.5527				
LIK	-169.406	AIC	352.811	SC		378.129	
RSS	55.1984	F-test	0.000000	Prob		0.000000	
SIG-SQ	0.205964	(	0.453833	)	SIG-SQ(ML)	0.200722	(
	0.448020)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.3748	0.388404	6.114253	0.000000
LINCPC90	3.41562	1.55644	2.194499	0.029058
LINVP90	-0.337893	0.214765	-1.573317	0.116825
LM290	-2.22076	0.594398	-3.736145	0.000228
A_LINCPC	-6.6842E-007	3.5146E-007	-1.901839	0.058264
A_LINVP91	1.34075E-007	4.6845E-008	2.862100	0.004541
A_LM2904	4.40605E-007	1.3474E-007	3.270030	0.001216

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 393.984837

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	13.965605	0.000928

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	5.482117	0.019212

ORDINARY LEAST SQUARES ESTIMATION

SPATIAL EXPANSION OF COEFFICIENTS - FOLLOWING EXPANSION VARIABLES

Y_COORD

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	7	DF	268
R2	0.5625	R2-adj	0.5527				
LIK	-169.406	AIC	352.811	SC		378.129	
RSS	55.1984	F-test	0.000000	Prob		0.000000	
SIG-SQ	0.205964	(	0.453833	)	SIG-SQ(ML)	0.200722	(
	0.448020)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.3748	0.388404	6.114253	0.000000
LINCPC90	3.41562	1.55644	2.194499	0.029058
LINVP90	-0.337893	0.214765	-1.573317	0.116825
LM290	-2.22076	0.594398	-3.736145	0.000228

A_LINCPC	-6.6842E-007	3.5146E-007	-1.901839	0.058264
A_LINVP91	1.34075E-007	4.6845E-008	2.862100	0.004541
A_LM2904	4.40605E-007	1.3474E-007	3.270030	0.001216

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 393.984837

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	13.965605	0.000928

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT ALG

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	8.837980	0.002950

ORDINARY LEAST SQUARES ESTIMATION

SPATIAL EXPANSION OF COEFFICIENTS - FOLLOWING EXPANSION VARIABLES

Y_COORD

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	10	DF	265
R2	0.5782	R2-adj	0.5639				
LIK	-164.355	AIC	348.710	SC		384.878	
RSS	53.2077	F-test	0.000000	Prob		0.000000	
SIG-SQ	0.200784	(	0.448089	)	SIG-SQ(ML)	0.193482	(
	0.439866)					

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.29789	0.386988	5.937878	0.000000
LINCPC90	39.194	49.8987	0.785471	0.432879
LINVP90	-10.6102	6.25849	-1.695330	0.091187
LM290	17.3572	18.6264	0.931859	0.352258
A_LINCPC	-1.71894E-005	2.2818E-005	-0.753326	0.451923
AA_LINCP	1.90403E-012	2.60593E-012	0.730653	0.465637
A_LINVP	94.84407E-006	2.8719E-006	1.686715	0.092835
AA_LINVP	-5.39533E-013	3.29156E-013	-1.639138	0.102371
A_LM290	-8.46023E-006	8.48941E-006	-0.996564	0.319885
AA_LM290	1.01107E-012	9.66551E-013	1.046058	0.296487

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 26039.835688

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	13.991479	0.000916

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	3.549662	0.059558

ORDINARY LEAST SQUARES ESTIMATION

SPATIAL EXPANSION OF COEFFICIENTS - FOLLOWING EXPANSION VARIABLES

Y_COORD
DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 10 DF 265
R2 0.5782 R2-adj 0.5639
LIK -164.355 AIC 348.710 SC 384.878
RSS 53.2077 F-test 0.000000 Prob 0.000000
SIG-SQ 0.200784 (0.448089) SIG-SQ(ML) 0.193482 (0.439866)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.29789	0.386988	5.937878	0.000000
LINCPC90	39.194	49.8987	0.785471	0.432879
LINVP90	-10.6102	6.25849	-1.695330	0.091187
LM290	17.3572	18.6264	0.931859	0.352258
A_LINCPC	-1.71894E-005	2.2818E-005	-0.753326	0.451923
AA_LINCP	1.90403E-012	2.60593E-012	0.730653	0.465637
A_LINVP	94.84407E-006	2.8719E-006	1.686715	0.092835
AA_LINVP	-5.39533E-013	3.29156E-013	-1.639138	0.102371
A_LM290	-8.46023E-006	8.48941E-006	-0.996564	0.319885
AA_LM290	1.01107E-012	9.66551E-013	1.046058	0.296487

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 26039.835688

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	13.991479	0.000916

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT ALG

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	3.691288	0.054697

A3

Connectivity characteristics of weights matrix queen

Weights matrix stored in GAL format

Weights are row-standardized

Dimension: 275

nonzero links: 1456

% nonzero weights: 1.93232

Average weight: 0.188874

Average # links: 5.29455

3 most connected observation(s) - with 10 link(s):

194 209 274

1 least connected observation(s) - with 1 link(s):

141

^Frequency Count for Weights File queen

Connections Frequency

1	1
2	17
3	21
4	41
5	81

6	50
7	35
8	20
9	6
10	3

Connectivity characteristics of weights matrix rook

Weights matrix stored in GAL format

Weights are row-standardized

Dimension: 275

nonzero links: 1442

% nonzero weights: 1.91374

Average weight: 0.190707

Average # links: 5.24364

2 most connected observation(s) - with 10 link(s):

209 274

1 least connected observation(s) - with 1 link(s):

141

^Frequency Count for Weights File rook

Connections Frequency

1	1
2	17
3	22
4	41
5	86
6	46
7	35
8	19
9	6
10	2

Connectivity characteristics of weights matrix kn_3_3s

Weights matrix is asymmetric

Weights are row-standardized

Dimension: 275

nonzero links: 825

% nonzero weights: 1.09489

Average weight: 0.333333

Average # links: 3.00000

275 most connected observation(s) - with 3 link(s):

1	2	3	4	5	6	7	8	9	10	
11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76
77	78	79	80	81	82	83	84	85	86	87
88										

89	90	91	92	93	94	95	96	97	98	
99	100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131
132	133	134	135	136	137	138	139	140	141	142
143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164
165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186
187	188	189	190	191	192	193	194	195	196	197
198	199	200	201	202	203	204	205	206	207	208
209	210	211	212	213	214	215	216	217	218	219
220	221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240	241
242	243	244	245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260	261	262	263
264	265	266	267	268	269	270	271	272	273	274
275	least connected observation(s) - with 3 link(s):									
	1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76
77	78	79	80	81	82	83	84	85	86	87
88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119	120
121										

122	123	124	125	126	127	128	129	130	131
132	133	134	135	136	137	138	139	140	141
142	143	144	145	146	147	148	149	150	151
152	153	154	155	156	157	158	159	160	161
162	163	164	165	166	167	168	169	170	171
172	173	174	175	176	177	178	179	180	181
182	183	184	185	186	187	188	189	190	191
192	193	194	195	196	197	198	199	200	201
202	203	204	205	206	207	208	209	210	211
212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231
232	233	234	235	236	237	238	239	240	241
242	243	244	245	246	247	248	249	250	251
252	253	254	255	256	257	258	259	260	261
262	263	264	265	266	267	268	269	270	271
272	273	274	275						

^Frequency Count for Weights File kn_3_3s

Connections	Frequency
3	275

Connectivity characteristics of weights matrix kn_3_2s

Weights matrix is asymmetric

Weights are row-standardized

Dimension: 275

nonzero links: 550

% nonzero weights: 0.729927

Average weight: 0.500000

Average # links: 2.00000

275 most connected observation(s) - with 2 link(s):

	1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76
77	78	79	80	81	82	83	84	85	86	87
88										

89	90	91	92	93	94	95	96	97	98	
99	100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131
132	133	134	135	136	137	138	139	140	141	142
143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164
165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186
187	188	189	190	191	192	193	194	195	196	197
198	199	200	201	202	203	204	205	206	207	208
209	210	211	212	213	214	215	216	217	218	219
220	221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240	241
242	243	244	245	246	247	248	249	250	251	252
253	254	255	256	257	258	259	260	261	262	263
264	265	266	267	268	269	270	271	272	273	274
275	least connected observation(s) - with 2 link(s):									
	1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76
77	78	79	80	81	82	83	84	85	86	87
88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119	120
121										

122	123	124	125	126	127	128	129	130	131
132	133	134	135	136	137	138	139	140	141
142	143	144	145	146	147	148	149	150	151
152	153	154	155	156	157	158	159	160	161
162	163	164	165	166	167	168	169	170	171
172	173	174	175	176	177	178	179	180	181
182	183	184	185	186	187	188	189	190	191
192	193	194	195	196	197	198	199	200	201
202	203	204	205	206	207	208	209	210	211
212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231
232	233	234	235	236	237	238	239	240	241
242	243	244	245	246	247	248	249	250	251
252	253	254	255	256	257	258	259	260	261
262	263	264	265	266	267	268	269	270	271
272	273	274	275						

^Frequency Count for Weights File kn_3_2s

Connections	Frequency
2	275

Connectivity characteristics of weights matrix 2_2

Weights matrix stored in GAL format

Weights are row-standardized

Dimension:	275
# nonzero links:	2998
% nonzero weights:	3.97877
Average weight:	0.0917278
Average # links:	10.9018

3 most connected observation(s) - with 22 link(s):

174	200	202
-----	-----	-----

3 least connected observation(s) - with 2 link(s):

156	217	225
-----	-----	-----

^Frequency Count for Weights File 2_2

Connections	Frequency
2	3
3	4
4	9
5	11
6	11
7	17
8	18
9	21
10	23
11	42
12	19

13	37
14	19
15	13
16	6
17	5
18	8
19	4
20	0
21	2
22	3

Connectivity characteristics of weights matrix 2_3
Weights matrix stored in GAL format
Weights are row-standardized

Dimension: 275
nonzero links: 4440
% nonzero weights: 5.89250
Average weight: 0.0619369
Average # links: 16.1455
1 most connected observation(s) - with 31 link(s):
198
1 least connected observation(s) - with 2 link(s):
217

^Frequency Count for Weights File 2_3
Connections Frequency

2	1
3	0
4	4
5	8
6	6
7	9
8	5
9	12
10	11
11	9
12	13
13	15
14	17
15	9
16	19
17	19
18	16
19	19
20	12
21	12
22	16
23	10
24	10
25	8
26	3
27	7
28	2
29	2
30	0
31	1

Connectivity characteristics of weights matrix rook
Weights matrix stored in GAL format

Weights are row-standardized
 Dimension: 275
 # nonzero links: 1442
 % nonzero weights: 1.91374
 Average weight: 0.190707
 Average # links: 5.24364
 2 most connected observation(s) - with 10 link(s):
 209 274
 1 least connected observation(s) - with 1 link(s):
 141
 ^Frequency Count for Weights File rook
 Connections Frequency

1	1
2	17
3	22
4	41
5	86
6	46
7	35
8	19
9	6
10	2

Connectivity characteristics of weights matrix queen
 Weights matrix stored in GAL format

Weights are row-standardized
 Dimension: 275
 # nonzero links: 1456
 % nonzero weights: 1.93232
 Average weight: 0.188874
 Average # links: 5.29455
 3 most connected observation(s) - with 10 link(s):
 194 209 274
 1 least connected observation(s) - with 1 link(s):
 141
 ^Frequency Count for Weights File queen
 Connections Frequency

1	1
2	17
3	21
4	41
5	81
6	50
7	35
8	20
9	6
10	3

TESTS FOR SPATIAL DEPENDENCE
 ORDINARY LEAST SQUARES ESTIMATION
 DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	4	DF	271
R2	0.5159	R2-adj	0.5105				
LIK	-183.320	AIC	374.639	SC		389.106	

RSS 61.0765 F-test 96.2573 Prob 1.94637e-042
 SIG-SQ 0.225375 (0.474736) SIG-SQ(ML) 0.222097 (0.471271)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	2.42786	0.399209	6.081680	0.000000
LINCPC90	0.454962	0.0560489	8.117248	0.000000
LINVP90	0.257756	0.0371117	6.945415	0.000000
LM290	-0.292382	0.0234125	-12.488308	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 34.931108

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	20.545063	0.000035

DIAGNOSTICS FOR HETEROSKEDASTICITY

RANDOM COEFFICIENTS

TEST	DF	VALUE	PROB
Koenker-Bassett test	3	12.819347	0.005044

SPECIFICATION ROBUST TEST

TEST	DF	VALUE	PROB
White	9	64.342527	0.000000

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ROOK (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.104687	2.937152	0.003312
Lagrange Multiplier (error)	1	7.333338	0.006769
Robust LM (error)	1	1.232096	0.267000
Kelejian-Robinson (error)	4	12.717317	0.012743
Lagrange Multiplier (lag)	1	20.510873	0.000006
Robust LM (lag)	1	14.409631	0.000147
Lagrange Multiplier (SARMA)	2	21.742969	0.000019

FOR WEIGHTS MATRIX QUEEN (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.104170	2.935004	0.003335
Lagrange Multiplier (error)	1	7.314530	0.006840
Robust LM (error)	1	1.172727	0.278842
Kelejian-Robinson (error)	4	12.448542	0.014310
Lagrange Multiplier (lag)	1	20.266899	0.000007
Robust LM (lag)	1	14.125096	0.000171
Lagrange Multiplier (SARMA)	2	21.439625	0.000022

```

FOR WEIGHTS MATRIX   INV1S (row-standardized weights)
TEST                MI/DF        VALUE        PROB
Moran's I (error)   0.025552    5.504620    0.000000
Lagrange Multiplier (error) 1    10.989890    0.000916
Robust LM (error)   1    0.459614    0.497805
Kelejian-Robinson (error) 4    1.020540    0.906666
Lagrange Multiplier (lag) 1    26.411912    0.000000
Robust LM (lag)    1    15.881636    0.000067
Lagrange Multiplier (SARMA) 2    26.871526    0.000001
FOR WEIGHTS MATRIX   KN_3_3S (row-standardized weights)
TEST                MI/DF        VALUE        PROB
Moran's I (error)   0.112770    2.624984    0.008665
Lagrange Multiplier (error) 1    5.957036    0.014659
Robust LM (error)   1    0.787185    0.374953
Kelejian-Robinson (error) 4    8.413769    0.077545
Lagrange Multiplier (lag) 1    16.209240    0.000057
Robust LM (lag)    1    11.039388    0.000892
Lagrange Multiplier (SARMA) 2    16.996425    0.000204
FOR WEIGHTS MATRIX   KN_3_2S (row-standardized weights)
TEST                MI/DF        VALUE        PROB
Moran's I (error)   0.135213    2.574379    0.010042
Lagrange Multiplier (error) 1    5.870978    0.015393
Robust LM (error)   1    0.875789    0.349358
Kelejian-Robinson (error) 4    4.792564    0.309251
Lagrange Multiplier (lag) 1    15.375529    0.000088
Robust LM (lag)    1    10.380340    0.001274
Lagrange Multiplier (SARMA) 2    16.251318    0.000296

FOR WEIGHTS MATRIX   2_2 (row-standardized weights)
TEST                MI/DF        VALUE        PROB
Moran's I (error)   0.119247    4.711966    0.000002
Lagrange Multiplier (error) 1    18.891482    0.000014
Robust LM (error)   1    0.004459    0.946761
Kelejian-Robinson (error) 4    20.473736    0.000403
Lagrange Multiplier (lag) 1    34.025026    0.000000
Robust LM (lag)    1    15.138002    0.000100
Lagrange Multiplier (SARMA) 2    34.029485    0.000000
FOR WEIGHTS MATRIX   2_3 (row-standardized weights)
TEST                MI/DF        VALUE        PROB
Moran's I (error)   0.068944    3.393887    0.000689
Lagrange Multiplier (error) 1    9.231717    0.002379
Robust LM (error)   1    0.629644    0.427486
Kelejian-Robinson (error) 4    26.233311    0.000028
Lagrange Multiplier (lag) 1    24.213040    0.000001
Robust LM (lag)    1    15.610967    0.000078
Lagrange Multiplier (SARMA) 2    24.842684    0.000004

```

INTRODUCING THE SPATIAL REGIMES

ORDINARY LEAST SQUARES ESTIMATION

STRUCTURAL CHANGE - DIFFERENT SLOPES FOLLOWING VARIABLE COAST
DATA SET BD90

```

DEPENDENT VARIABLE   LAPC90      OBS 275      VARS 8      DF 267
R2      0.5904      R2-adj 0.5797
LIK      -160.322      AIC      336.645      SC      365.579
RSS      51.6698

```

SIG-SQ 0.193520 (0.439909) SIG-SQ(ML) 0.187890 (0.433463)

VARIABLE	COEFF	S.D.	t-value	Prob
CONST_0	0.25763	0.55555	0.463739	0.643213
LINCP_0	0.199855	0.0732095	2.729901	0.006757
LINVP_0	0.0861443	0.0494058	1.743608	0.082379
LM290_0	-0.244123	0.0263315	-9.271146	0.000000
CONST_1	4.95072	0.620913	7.973280	0.000000
LINCP_1	0.442469	0.095805	4.618436	0.000006
LINVP_1	0.485791	0.0626408	7.755193	0.000000
LM290_1	-0.24375	0.0462973	-5.264883	0.000000

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 45.486843

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	25.518803	0.000003

TEST ON STRUCTURAL INSTABILITY FOR 2 REGIMES DEFINED BY COAST

TEST	DF	VALUE	PROB
Chow test	4 267	12.152110	0.000000

STABILITY OF INDIVIDUAL COEFFICIENTS

TEST	DF	VALUE	PROB
CONST_0	1 267	31.728653	0.000000
LINCP_0	1 267	4.048764	0.045208
LINVP_0	1 267	25.093916	0.000001
LM290_0	1 267	0.000049	0.994416

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.089269	0.765109

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX QUEEN (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.061742	1.902713	0.057078
Lagrange Multiplier (error)	1	2.569608	0.108935
Robust LM (error)	1	0.368730	0.543698
Kelejian-Robinson (error)	8	18.217692	0.019652
Lagrange Multiplier (lag)	1	7.553622	0.005989
Robust LM (lag)	1	5.352743	0.020690
Lagrange Multiplier (SARMA)	2	7.922351	0.019041

FOR WEIGHTS MATRIX ROOK (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.062666	1.919354	0.054940
Lagrange Multiplier (error)	1	2.627745	0.105011
Robust LM (error)	1	0.386613	0.534085
Kelejian-Robinson (error)	8	19.046457	0.014613
Lagrange Multiplier (lag)	1	7.750634	0.005369
Robust LM (lag)	1	5.509503	0.018913
Lagrange Multiplier (SARMA)	2	8.137247	0.017101

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.014733	3.807655	0.000140
Lagrange Multiplier (error)	1	3.653547	0.055950

Robust LM (error)	1	0.222562	0.637095
Kelejian-Robinson (error)	8	3.223583	0.919553
Lagrange Multiplier (lag)	1	10.801251	0.001014
Robust LM (lag)	1	7.370266	0.006631
Lagrange Multiplier (SARMA)	2	11.023813	0.004038
FOR WEIGHTS MATRIX KN_3_2S (row-standardized weights)			
TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.089110	1.795904	0.072510
Lagrange Multiplier (error)	1	2.549910	0.110301
Robust LM (error)	1	0.082056	0.774530
Kelejian-Robinson (error)	8	2.376831	0.967227
Lagrange Multiplier (lag)	1	5.719628	0.016776
Robust LM (lag)	1	3.251775	0.071346
Lagrange Multiplier (SARMA)	2	5.801685	0.054977
FOR WEIGHTS MATRIX 2_2 (row-standardized weights)			
TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.106695	4.320196	0.000016
Lagrange Multiplier (error)	1	15.123669	0.000101
Robust LM (error)	1	1.221602	0.269047
Kelejian-Robinson (error)	8	26.820756	0.000759
Lagrange Multiplier (lag)	1	19.844039	0.000008
Robust LM (lag)	1	5.941972	0.014784
Lagrange Multiplier (SARMA)	2	21.065641	0.000027
FOR WEIGHTS MATRIX 2_3 (row-standardized weights)			
TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.038155	2.041093	0.041242
Lagrange Multiplier (error)	1	2.827354	0.092671
Robust LM (error)	1	0.314225	0.575099
Kelejian-Robinson (error)	8	34.872818	0.000028
Lagrange Multiplier (lag)	1	10.025318	0.001544
Robust LM (lag)	1	7.512189	0.006128
Lagrange Multiplier (SARMA)	2	10.339543	0.005686

ORDINARY LEAST SQUARES ESTIMATION

STRUCTURAL CHANGE - DIFFERENT SLOPES FOLLOWING VARIABLE ALG
 DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 8 DF 267
 R2 0.5523 R2-adj 0.5405
 LIK -172.570 AIC 361.141 SC 390.075
 RSS 56.4837
 SIG-SQ 0.211549 (0.459945) SIG-SQ(ML) 0.205395 (0.453205)

VARIABLE	COEFF	S.D.	t-value	Prob
CONST_0	1.85191	0.410169	4.514988	0.000010
LINCP_0	0.39201	0.0575911	6.806789	0.000000
LINVP_0	0.215295	0.0376287	5.721571	0.000000
LM290_0	-0.268032	0.0239667	-11.183480	0.000000
CONST_1	5.70333	2.22903	2.558657	0.011060
LINCP_1	0.739713	0.268545	2.754525	0.006282
LINVP_1	0.521003	0.213484	2.440477	0.015318
LM290_1	-0.294801	0.0947052	-3.112823	0.002054

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 49.241065

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	28.753187	0.000001

TEST ON STRUCTURAL INSTABILITY FOR 2 REGIMES DEFINED BY ALG

TEST	DF	VALUE	PROB
Chow test	4 267	5.427691	0.000324

STABILITY OF INDIVIDUAL COEFFICIENTS

TEST	DF	VALUE	PROB
CONST_0	1 267	2.887671	0.090425
LINCP_0	1 267	1.602709	0.206623
LINVP_0	1 267	1.988812	0.159629
LM290_0	1 267	0.075086	0.784283

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT ALG_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.069353	0.792281

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX QUEEN (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.056887	1.775819	0.075763
Lagrange Multiplier (error)	1	2.181334	0.139693
Robust LM (error)	1	0.775336	0.378571
Kelejian-Robinson (error)	8	15.946687	0.043150
Lagrange Multiplier (lag)	1	6.234327	0.012530
Robust LM (lag)	1	4.828329	0.027996
Lagrange Multiplier (SARMA)	2	7.009663	0.030052

FOR WEIGHTS MATRIX ROOK (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.057635	1.788284	0.073730
Lagrange Multiplier (error)	1	2.222734	0.135992
Robust LM (error)	1	0.826906	0.363169
Kelejian-Robinson (error)	8	16.444267	0.036445
Lagrange Multiplier (lag)	1	6.429224	0.011226
Robust LM (lag)	1	5.033395	0.024863
Lagrange Multiplier (SARMA)	2	7.256130	0.026568

FOR WEIGHTS MATRIX INVDS (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.015932	4.058763	0.000049
Lagrange Multiplier (error)	1	4.272533	0.038733
Robust LM (error)	1	0.085923	0.769426
Kelejian-Robinson (error)	8	3.203190	0.920967
Lagrange Multiplier (lag)	1	5.617340	0.017784
Robust LM (lag)	1	1.430730	0.231645
Lagrange Multiplier (SARMA)	2	5.703262	0.057750

FOR WEIGHTS MATRIX KN_3_2S (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.093352	1.861446	0.062681
Lagrange Multiplier (error)	1	2.798492	0.094353
Robust LM (error)	1	0.342508	0.558385
Kelejian-Robinson (error)	8	6.416456	0.600689
Lagrange Multiplier (lag)	1	6.196787	0.012798
Robust LM (lag)	1	3.740803	0.053099
Lagrange Multiplier (SARMA)	2	6.539294	0.038020

```

FOR WEIGHTS MATRIX      2_2 (row-standardized weights)
TEST                    MI/DF      VALUE      PROB
Moran's I (error)      0.091787    3.788757    0.000151
Lagrange Multiplier (error) 1    11.192800    0.000821
Robust LM (error)      1    0.185839    0.666402
Kelejian-Robinson (error) 8    30.139704    0.000200
Lagrange Multiplier (lag) 1    16.566144    0.000047
Robust LM (lag)        1    5.559183    0.018384
Lagrange Multiplier (SARMA) 2    16.751983    0.000230
FOR WEIGHTS MATRIX      2_3 (row-standardized weights)
TEST                    MI/DF      VALUE      PROB
Moran's I (error)      0.049911    2.594123    0.009483
Lagrange Multiplier (error) 1    4.838212    0.027836
Robust LM (error)      1    0.000133    0.990808
Kelejian-Robinson (error) 8    53.646186    0.000000
Lagrange Multiplier (lag) 1    9.377696    0.002196
Robust LM (lag)        1    4.539616    0.033119
Lagrange Multiplier (SARMA) 2    9.377828    0.009197

```

HETEROSKEDASTIC ERROR MODEL (GENERIC)

FGLS ESTIMATION

DATA SET BD90

```

DEPENDENT VARIABLE      LAPC90      OBS 275      VARS 4      DF 271
R2      0.4648      Sq. Corr. 0.5152      R2(Buse) 0.4826

```

```

VARIABLE      COEFF      S.D.      z-value      Prob
CONSTANT      2.06385    0.400408    5.154361    0.000000
LINCPC90      0.414286    0.0559409    7.405782    0.000000
  LINVP90      0.230363    0.0368692    6.248120    0.000000
  LM290      -0.2799    0.0231067   -12.113361    0.000000

```

HETEROSKEDASTIC COEFFICIENTS

```

VARIABLE      COEFF      S.D.      z-value      Prob
CONSTANT      0.201534    0.0198819    10.136548    0.000000
  COAST      0.0272361    0.0479708    0.567765    0.570194
  ALG      0.235899    0.16607     1.420481    0.155468

```

REGRESSION DIAGNOSTICS

TESTS ON HETEROSKEDASTICITY

```

TEST      DF      VALUE      PROB
Wald test      2      2.718953    0.256795

```

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX QUEEN (row-standardized weights)

```

TEST      DF      VALUE      PROB
Lagrange Multiplier (error) 1    5.466371    0.019386
Lagrange Multiplier (lag) 1    13.459112    0.000244

```

FOR WEIGHTS MATRIX ROOK (row-standardized weights)

```

TEST      DF      VALUE      PROB
Lagrange Multiplier (error) 1    5.506809    0.018943
Lagrange Multiplier (lag) 1    13.713715    0.000213

```

FOR WEIGHTS MATRIX	INVD1S (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	8.537159	0.003480
Lagrange Multiplier (lag)		1	17.705229	0.000026
FOR WEIGHTS MATRIX	KN_3_2S (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	5.330833	0.020951
Lagrange Multiplier (lag)		1	11.777281	0.000600
FOR WEIGHTS MATRIX	2_2 (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	19.113775	0.000012
Lagrange Multiplier (lag)		1	30.223971	0.000000
FOR WEIGHTS MATRIX	2_3 (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	6.851736	0.008856
Lagrange Multiplier (lag)		1	16.627856	0.000045

HETEROSKEDASTIC ERROR MODEL (GROUPWISE)

FGLS ESTIMATION

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	4	DF	271
GROUPS	COAST_0	COAST_1					
R2	0.4864	Sq. Corr.	0.5151				

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	2.13359	0.409809	5.206292	0.000000
LINCPC90	0.422463	0.0568411	7.432347	0.000000
LINVP90	0.23446	0.0377668	6.208091	0.000000
LM290	-0.286464	0.0231655	-12.365981	0.000000

HETEROSKEDASTIC COEFFICIENTS

VARIABLE	COEFF	S.D.	z-value	Prob
COAST_0	0.202658	0.0198723	10.198039	0.000000
COAST_1	0.282442	0.0487985	5.787918	0.000000

REGRESSION DIAGNOSTICS

TESTS ON HETEROSKEDASTICITY

TEST	DF	VALUE	PROB
Wald test	1	2.292844	0.129972

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX	QUEEN (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	6.728216	0.009490
Lagrange Multiplier (lag)		1	17.409845	0.000030
FOR WEIGHTS MATRIX	ROOK (row-standardized weights)			
TEST		DF	VALUE	PROB
Lagrange Multiplier (error)		1	6.759005	0.009328
Lagrange Multiplier (lag)		1	17.676753	0.000026
FOR WEIGHTS MATRIX	INVD1S (row-standardized weights)			
TEST		DF	VALUE	PROB

Lagrange Multiplier (error)	1	10.548302	0.001163
Lagrange Multiplier (lag)	1	23.517860	0.000001
FOR WEIGHTS MATRIX KN_3_2S (row-standardized weights)			
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.361447	0.020587
Lagrange Multiplier (lag)	1	13.738473	0.000210
FOR WEIGHTS MATRIX KN_3_2S (row-standardized weights)			
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.361447	0.020587
Lagrange Multiplier (lag)	1	13.738473	0.000210
FOR WEIGHTS MATRIX 2_2 (row-standardized weights)			
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	20.220538	0.000007
Lagrange Multiplier (lag)	1	33.985278	0.000000
FOR WEIGHTS MATRIX 2_3 (row-standardized weights)			
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	8.427434	0.003696
Lagrange Multiplier (lag)	1	21.909706	0.000003

HETEROSKEDASTIC ERROR MODEL (GROUPWISE)

FGLS ESTIMATION

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	VARs	4	DF	271
GROUPS	ALG_0	ALG_1					
R2	0.4699	Sq. Corr.	0.5156				

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	2.13716	0.394541	5.416831	0.000000
LINCPC90	0.423602	0.0554056	7.645459	0.000000
LINVP90	0.236236	0.0364323	6.484246	0.000000
LM290	-0.280333	0.0230996	-12.135817	0.000000

HETEROSKEDASTIC COEFFICIENTS

VARIABLE	COEFF	S.D.	z-value	Prob
ALG_0	0.207015	0.0181914	11.379807	0.000000
ALG_1	0.466235	0.164839	2.828427	0.004678

REGRESSION DIAGNOSTICS

TESTS ON HETEROSKEDASTICITY

TEST	DF	VALUE	PROB
Wald test	1	2.443210	0.118034

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX QUEEN (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.406486	0.020062
Lagrange Multiplier (lag)	1	13.440963	0.000246

FOR WEIGHTS MATRIX ROOK (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.444922	0.019625

Lagrange Multiplier (lag)	1	13.687313	0.000216
FOR WEIGHTS MATRIX	INVD1S (row-standardized weights)		
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	8.354873	0.003847
Lagrange Multiplier (lag)	1	17.344045	0.000031
FOR WEIGHTS MATRIX	KN_3_2S (row-standardized weights)		
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.438615	0.019696
Lagrange Multiplier (lag)	1	11.772597	0.000601
FOR WEIGHTS MATRIX	KN_3_3S (row-standardized weights)		
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	5.364213	0.020554
Lagrange Multiplier (lag)	1	11.846051	0.000578
FOR WEIGHTS MATRIX	2_2 (row-standardized weights)		
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	18.623461	0.000016
Lagrange Multiplier (lag)	1	29.506414	0.000000
FOR WEIGHTS MATRIX	2_3 (row-standardized weights)		
TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	6.885156	0.008691
Lagrange Multiplier (lag)	1	16.403887	0.000051

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SPATIAL ERROR MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD90		SPATIAL WEIGHTS MATRIX	INVD1S
DEPENDENT VARIABLE	LAPC90	OBS 275	VARs 4	DF 271
R2	0.4747	Sq. Corr.	0.5154	R2(Buse) 0.4837
LIK	-179.460	AIC	366.920	SC 381.387
SIG-SQ	0.213841	(	0.462429)

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	2.19662	0.437765	5.017812	0.000001
LINCPC90	0.452063	0.0567756	7.962270	0.000000
LINVP90	0.232683	0.0387948	5.997792	0.000000
LM290	-0.27341	0.0231123	-11.829651	0.000000
LAMBDA	0.813859	0.12591	6.463793	0.000000

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT	COAST		
TEST	DF	VALUE	PROB
Breusch-Pagan test	1	3.109619	0.077831
Spatial B-P test	1	3.109620	0.077831

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL ERROR DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	7.719095	0.005464

TEST ON COMMON FACTOR HYPOTHESIS

TEST	DF	VALUE	PROB
Likelihood Ratio Test	3	29.592322	0.000002
Wald Test	3	27.562930	0.000004

LAGRANGE MULTIPLIER TEST ON SPATIAL LAG DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	22.400490	0.000002

SPATIAL ERROR MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD90	SPATIAL WEIGHTS MATRIX			INVD1S
DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	4
R2	0.4747	Sq. Corr.	0.5154	R2(Buse)	0.4837
LIK	-179.460	AIC	366.920	SC	381.387
SIG-SQ	0.213841	(	0.462429)	

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	2.19662	0.437765	5.017812	0.000001
LINCPC90	0.452063	0.0567756	7.962270	0.000000
LINVP90	0.232683	0.0387948	5.997792	0.000000
LM290	-0.27341	0.0231123	-11.829651	0.000000
LAMBDA	0.813859	0.12591	6.463793	0.000000

REGRESSION DIAGNOSTICS
 DIAGNOSTICS FOR HETEROSKEDASTICITY
 LINEAR SPECIFICATION USING VARIABLES
 CONSTANT ALG

TEST	DF	VALUE	PROB
Breusch-Pagan test	1	8.226428	0.004128
Spatial B-P test	1	8.226442	0.004128

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL ERROR DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	7.719095	0.005464

TEST ON COMMON FACTOR HYPOTHESIS

TEST	DF	VALUE	PROB
Likelihood Ratio Test	3	29.592322	0.000002
Wald Test	3	27.562930	0.000004

LAGRANGE MULTIPLIER TEST ON SPATIAL LAG DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	22.400490	0.000002

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SPATIAL LAG MODEL - IV(2SLS) ESTIMATION

DATA SET	BD90	SPATIAL WEIGHTS MATRIX			INVD1S
DEPENDENT VARIABLE	LAPC90	OBS	275	VARS	4
INSTRUMENTS	W_LINCPC	W_LINVP9	W_LM290		DF 270
R2	0.5754	Sq. Corr.	0.5612		
SIG-SQ	0.2051	(	0.4529)	

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	2.00625	0.36357	5.518195	0.000000
CONSTANT	4.31467	0.511796	8.430449	0.000000
LINCPC90	0.377136	0.0552956	6.820364	0.000000
LINVP90	0.223692	0.0359362	6.224703	0.000000
LM290	-0.248448	0.0237106	-10.478332	0.000000

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	0.529650	0.466754

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)

DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 EXOG 4 DF 270

ENDOGENOUS VARIABLES W_AREA90

INSTRUMENTS W_COST90 W_INC90 W_POP90

R2 0.5754 Sq. Corr. 0.5612

SIG-SQ 0.2051 (0.4529)

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	4.31467	0.511796	8.430449	0.000000
LINCPC90	0.377136	0.0552956	6.820364	0.000000
LINVP90	0.223692	0.0359362	6.224703	0.000000
LM290	-0.248448	0.0237106	-10.478332	0.000000
W_AREA90	2.00625	0.36357	5.518195	0.000000

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables

F-test (1 ,269) 2.639374 Prob 0.105416

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	0.616415	0.432382

SPATIAL LAG MODEL - GHET - IV(2SLS) ESTIMATION

DATA SET BD90 SPATIAL WEIGHTS MATRIX INVD1S

DEPENDENT VARIABLE LAPC90 OBS 275 VARS 4 DF 270

INSTRUMENTS W_LINCPC W_LINVP9 W_LM290

GROUPS COAST_0 COAST_1

R2 0.5634 Sq. Corr. 0.5609

Convergence after 8 iterations

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	1.98719	0.366607	5.420473	0.000000
CONSTANT	4.15422	0.521428	7.967001	0.000000
LINCPC90	0.363647	0.0554256	6.560985	0.000000
LINVP90	0.212125	0.0361753	5.863799	0.000000
LM290	-0.246798	0.0234686	-10.516092	0.000000
COAST_0	0.191279	0	0.000000	0.000000
COAST_1	0.232959	0	0.000000	0.000000

SPATIAL LAG MODEL - ROBUST - IV(2SLS) ESTIMATION
 DATA SET BD90 SPATIAL WEIGHTS MATRIX INVD1S
 DEPENDENT VARIABLE LAPC90 OBS 275 VARS 4 DF 270
 INSTRUMENTS W_LINCPC W_LINVP9 W_LM290
 R2 0.5816 Sq. Corr. 0.5608
 SIG-SQ 0.2056 (0.4534)

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	1.96038	0.426427	4.597219	0.000004
CONSTANT	4.47056	0.58883	7.592279	0.000000
LINCPC90	0.361801	0.0682513	5.301020	0.000000
LINVP90	0.243885	0.0457372	5.332312	0.000000
LM290	-0.26055	0.0324164	-8.037614	0.000000

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION
 DATA SET BD90 SPATIAL WEIGHTS MATRIX INVD1S
 DEPENDENT VARIABLE LAPC90 OBS 275 VARS 4 DF 271
 R2 0.2584 Sq. Corr. 0.2584
 LIK -241.967 AIC 491.933 SC 506.400
 SIG-SQ 0.340235 (0.583296)

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	-1.13105E-006	0.444061	-0.000003	0.999998
CONSTANT	2.51159	0.623844	4.025986	0.000057
W_AREA90	3.62701	0.543895	6.668574	0.000000
LINVP90	-0.0654521	0.0355952	-1.838790	0.065946

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY
 LINEAR SPECIFICATION USING VARIABLES
 CONSTANT LINCPC90 LM290

TEST	DF	VALUE	PROB
Breusch-Pagan test	2	43.107391	0.000000
Spatial B-P test	2	43.107391	0.000000

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	-0.000000	-1.000000

LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	20.268292	0.000007

The dataset bd95

with 274 observations on 30 variables:

NORDEM	X_COORD	Y_COORD	INC95	P95	A95	COST95	ALG
ATLA	COAST	AMP	AML	LIT	CDIST	LA95	LINC95
LCOST95	LP95	INVP95	APC95	INCPC95	M295	LAPC95	LINCPC95
LM295	LINVP95	W_LAPC95	W_LINCPC	W_LINVP9	W_LM295		

ORDINARY LEAST SQUARES ESTIMATION

DATA SET BD95

DEPENDENT VARIABLE	LAPC95	OBS	274	VARS	4	DF	270
R2	0.0906	R2-adj	0.0805				
LIK	-307.061	AIC	622.121	SC		636.574	
RSS	150.893	F-test	8.97054	Prob	1.10188e-005		
SIG-SQ	0.558862	(	0.747571	)	SIG-SQ(ML)	0.550703	(
	0.742094)					

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-0.81924	0.669325	-1.223981	0.222026
LINCPC95	0.575095	0.122515	4.694068	0.000004
LINVP95	0.0670017	0.0541488	1.237361	0.217028
LM295	0.0593808	0.0799613	0.742619	0.458358

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 34.569609

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	836.310589	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	7.371063	0.006628

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ID95 (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.000202	0.939813	0.347314
Lagrange Multiplier (error)	1	0.000684	0.979131
Robust LM (error)	1	6.587196	0.010271
Kelejian-Robinson (error)	4	3.266621	0.514238
Lagrange Multiplier (lag)	1	1.631194	0.201538
Robust LM (lag)	1	8.217706	0.004148
Lagrange Multiplier (SARMA)	2	8.218390	0.016421

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD95	SPATIAL WEIGHTS MATRIX	ID95
DEPENDENT VARIABLE	LAPC95	OBS	274
		VARS	5
		DF	269
R2	0.0930	Sq. Corr.	0.0969
LIK	-306.374	AIC	622.747
		SC	640.813
SIG-SQ	0.546920	(	0.739540
)	

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC95	0.43158	0.305196	1.414107	0.157331
CONSTANT	-0.327005	0.782167	-0.418076	0.675891
LINCPC95	0.506859	0.124027	4.086672	0.000044
LINVP95	0.0504431	0.0536742	0.939801	0.347320
LM295	0.0477218	0.0792102	0.602470	0.546861

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY

RANDOM COEFFICIENTS

TEST	DF	VALUE	PROB
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Breusch-Pagan test 3 112.931927 0.000000
 Spatial B-P test 3 112.933113 0.000000
 DIAGNOSTICS FOR SPATIAL DEPENDENCE
 SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX ID95 (row-standardized weights)
 TEST DF VALUE PROB
 Likelihood Ratio Test 1 1.374012 0.241124
 LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE
 WEIGHT STAND ZERO DF VALUE PROB
 ID95 yes no 1 3.273923 0.070389

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION
 DATA SET BD95 SPATIAL WEIGHTS MATRIX ID95
 DEPENDENT VARIABLE LAPC95 OBS 274 VARS 3 DF 271
 R2 0.0876 Sq. Corr. 0.0940
 LIK -306.968 AIC 619.935 SC 630.774
 SIG-SQ 0.548720 (0.740756)

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC95	0.521987	0.2745	1.901596	0.057224
CONSTANT	-0.511252	0.392192	-1.303575	0.192378
LINCPC95	0.434896	0.0999648	4.350491	0.000014

REGRESSION DIAGNOSTICS
 DIAGNOSTICS FOR HETEROSKEDASTICITY
 RANDOM COEFFICIENTS
 TEST DF VALUE PROB
 Breusch-Pagan test 1 7.703244 0.005512
 Spatial B-P test 1 7.703245 0.005512
 DIAGNOSTICS FOR SPATIAL DEPENDENCE
 SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX ID95 (row-standardized weights)
 TEST DF VALUE PROB
 Likelihood Ratio Test 1 2.327312 0.127121
 LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE
 WEIGHT STAND ZERO DF VALUE PROB
 ID95 yes no 1 0.966435 0.325571

ORDINARY LEAST SQUARES ESTIMATION
 ANALYSIS OF VARIANCE - USING INDICATOR VARIABLES
 COAST
 DATA SET BD95
 DEPENDENT VARIABLE LAPC95 OBS 274 VARS 2 DF 272
 R2 0.0767 R2-adj 0.0733
 LIK -309.138 AIC 622.276 SC 629.502
 RSS 153.198 F-test 22.6095 Prob 3.22258e-006
 SIG-SQ 0.563229 (0.750486) SIG-SQ(ML) 0.559118 (0.747742)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.57272	0.0521624	-30.150410	0.000000
COAST_1	0.501581	0.105486	4.754949	0.000003

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 1.719431

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	431.243221	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	4.386295	0.036229

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ID95 (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.011969	2.906393	0.003656
Lagrange Multiplier (error)	1	2.392214	0.121941
Robust LM (error)	1	1.705643	0.191552
Kelejian-Robinson (error)	2	1.559976	0.458411
Lagrange Multiplier (lag)	1	4.488970	0.034114
Robust LM (lag)	1	3.802400	0.051179
Lagrange Multiplier (SARMA)	2	6.194614	0.045171

ORDINARY LEAST SQUARES ESTIMATION

DATA SET BD95

DEPENDENT VARIABLE	LAPC95	OBS	274	VAR	2	DF	272
R2	0.0391	R2-adj	0.0356				
LIK	-314.608	AIC	633.216	SC	640.443		
RSS	159.439	F-test	11.0780	Prob	0.000994148		
SIG-SQ	0.586173	(0.765619)	SIG-SQ(ML)	0.581894	(
	0.762820)					

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.4884	0.0476654	-31.226115	0.000000
ALG	0.65652	0.197251	3.328356	0.000994

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 1.279570

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	204.522356	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

RANDOM COEFFICIENTS

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	1.636965	0.200742

SPECIFICATION ROBUST TEST

TEST	DF	VALUE	PROB
White	1	1.636965	0.200742

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ID95 (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.018678	4.272792	0.000019
Lagrange Multiplier (error)	1	5.826136	0.015790
Robust LM (error)	1	0.276077	0.599284
Kelejian-Robinson (error)	2	2.066966	0.355766
Lagrange Multiplier (lag)	1	6.533915	0.010584
Robust LM (lag)	1	0.983856	0.321249
Lagrange Multiplier (SARMA)	2	6.809992	0.033207

ORDINARY LEAST SQUARES ESTIMATION
ANALYSIS OF VARIANCE - USING INDICATOR VARIABLES

LIT

DATA SET BD95

DEPENDENT VARIABLE	LAPC95	OBS	274	VAR	2	DF	272
R2	0.0191	R2-adj	0.0155				
LIK	-317.429	AIC	638.859	SC		646.085	
RSS	162.756	F-test	5.30810	Prob		0.0219805	
SIG-SQ	0.598369	(	0.773543	)	SIG-SQ(ML)	0.594001	(
	0.770715)					

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.54796	0.0631595	-24.508708	0.000000
LIT_1	0.216308	0.0938866	2.303931	0.021980

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 2.260754

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	222.216481	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT LIT_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	0.731995	0.392237

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ID95 (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.029775	6.176410	0.000000
Lagrange Multiplier (error)	1	14.804954	0.000119
Robust LM (error)	1	0.770679	0.380007
Kelejian-Robinson (error)	2	0.820491	0.663487
Lagrange Multiplier (lag)	1	14.179800	0.000166
Robust LM (lag)	1	0.145525	0.702849
Lagrange Multiplier (SARMA)	2	14.950479	0.000567

ORDINARY LEAST SQUARES ESTIMATION
ANALYSIS OF VARIANCE - USING INDICATOR VARIABLES

CDIST

DATA SET BD95

DEPENDENT VARIABLE	LAPC95	OBS	274	VAR	2	DF	272
R2	0.0009	R2-adj	-0.0028				

LIK -319.959 AIC 643.919 SC 651.145
 RSS 165.790 F-test 0.234298 Prob 0.628745
 SIG-SQ 0.609521 (0.780718) SIG-SQ(ML) 0.605072 (0.777864)

VARIABLE	COEFF	S.D.	t-value	Prob
CONSTANT	-1.45594	0.0486999	-29.896154	0.000000
CDIST_1	0.0946375	0.195514	0.484043	0.628745

REGRESSION DIAGNOSTICS

MULTICOLLINEARITY CONDITION NUMBER 1.289737

TEST ON NORMALITY OF ERRORS

TEST	DF	VALUE	PROB
Jarque-Bera	2	185.182091	0.000000

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT CDIST_1

TEST	DF	VALUE	PROB
Koenker-Bassett test	1	13.028657	0.000307

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX ID95 (row-standardized weights)

TEST	MI/DF	VALUE	PROB
Moran's I (error)	0.032333	6.257032	0.000000
Lagrange Multiplier (error)	1	17.458458	0.000029
Robust LM (error)	1	2.975756	0.084521
Kelejian-Robinson (error)	2	5.259536	0.072095
Lagrange Multiplier (lag)	1	17.584234	0.000027
Robust LM (lag)	1	3.101533	0.078219
Lagrange Multiplier (SARMA)	2	20.559991	0.000034

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)

DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 EXOG 5 DF 269

ENDOGENOUS VARIABLES W_AREA90

INSTRUMENTS W_POP90 W_INC90 W_COST90 W_L2INVP

R2 0.5923 Sq. Corr. 0.5803

SIG-SQ 0.1969 (0.4437)

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	-4.23717	2.51387	-1.685518	0.091889
LINCPC90	0.300876	0.0585756	5.136551	0.000000
LINVP90	-1.40794	0.472612	-2.979049	0.002891
L2INVP90	-0.0789336	0.0227947	-3.462808	0.000535
LM290	-0.233099	0.0236754	-9.845630	0.000000
W_AREA90	1.93367	0.356323	5.426739	0.000000

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables

F-test (1 ,268) 2.088370 Prob 0.149593
 DIAGNOSTICS FOR SPATIAL DEPENDENCE
 FOR WEIGHTS MATRIX INVD1S (row-standardized weights)
 TEST DF VALUE PROB
 Lagrange Multiplier (error) 1 1.218806 0.269595

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)
 DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 EXOG 4 DF 269
 ENDOGENOUS VARIABLES W_AREA90 LM290
 INSTRUMENTS W_POP90 W_INC90 W_COST90 W_L2INVP
 R2 0.4997 Sq. Corr. 0.1722
 SIG-SQ 0.4282 (0.6544)

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	-15.4349	9.7621	-1.581107	0.113853
LINCPC90	0.347547	0.094234	3.688122	0.000226
LINVP90	-3.46963	1.80289	-1.924487	0.054294
L2INVP90	-0.160551	0.0739101	-2.172241	0.029837
W_AREA90	3.2798	1.20612	2.719298	0.006542
LM290	0.179808	0.334822	0.537027	0.591249

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables
 F-test (2 ,267) 2.750174 Prob 0.065728
 DIAGNOSTICS FOR SPATIAL DEPENDENCE
 FOR WEIGHTS MATRIX INVD1S (row-standardized weights)
 TEST DF VALUE PROB
 Lagrange Multiplier (error) 1 0.940345 0.332189

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)
 DATA SET BD90

DEPENDENT VARIABLE LAPC90 OBS 275 EXOG 4 DF 269
 ENDOGENOUS VARIABLES W_AREA90 LINVP90
 INSTRUMENTS W_POP90 W_INC90 W_COST90 W_L2INVP
 R2 0.5944 Sq. Corr. 0.5803
 SIG-SQ 0.1969 (0.4437)

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	-4.81111	6.09101	-0.789870	0.429604
LINCPC90	0.295712	0.0769676	3.842028	0.000122
LM290	-0.231838	0.0266293	-8.706127	0.000000
L2INVP90	-0.0841807	0.055608	-1.513823	0.130071
W_AREA90	1.92961	0.358505	5.382386	0.000000
LINVP90	-1.517	1.15534	-1.313029	0.189173

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables

F-test (2 ,267) 1.045692 Prob 0.352883

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	1.202099	0.272903

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	EXOG	4	DF	269
ENDOGENOUS VARIABLES	W_AREA90	LINCPC90					
INSTRUMENTS	W_POP90	W_INC90	W_COST90	W_L2INVP			
R2	0.5614	Sq. Corr.	0.5648				
SIG-SQ	0.2041	(0.4518)					

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	-7.03207	3.5405	-1.986179	0.047013
LINVP90	-1.95183	0.676872	-2.883597	0.003932
L2INVP90	-0.104696	0.0323584	-3.235512	0.001214
LM290	-0.234267	0.0241304	-9.708402	0.000000
W_AREA90	2.1759	0.420227	5.177923	0.000000
LINCPC90	0.126362	0.163955	0.770710	0.440879

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables

F-test (2 ,267) 1.727338 Prob 0.179737

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	1.869505	0.171532

INSTRUMENTAL VARIABLES ESTIMATION (2SLS)

DATA SET BD90

DEPENDENT VARIABLE	LAPC90	OBS	275	EXOG	4	DF	269
ENDOGENOUS VARIABLES	W_AREA90	L2INVP90					
INSTRUMENTS	W_POP90	W_INC90	W_COST90	W_L2INVP			
R2	0.5941	Sq. Corr.	0.5803				
SIG-SQ	0.1969	(0.4437)					

VARIABLE	COEFF	S.D.	z-value	Prob
CONSTANT	-4.65997	5.67194	-0.821582	0.411315
LINCPC90	0.297101	0.0741125	4.008780	0.000061
LINVP90	-1.48862	1.07931	-1.379238	0.167821
LM290	-0.232338	0.0253851	-9.152539	0.000000
W_AREA90	1.93019	0.35878	5.379889	0.000000

L2INVP90 -0.082837 0.0521828 -1.587438 0.112413

REGRESSION DIAGNOSTICS

DURBIN-WU-HAUSMAN TEST ON EXOGENEITY

All Endogenous Variables

F-test (2 ,267) 1.043780 Prob 0.353554

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	1.208431	0.271643

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SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD90	SPATIAL WEIGHTS MATRIX	INVD1S
DEPENDENT VARIABLE	LAPC90	OBS 275 VARS 6	DF 269
R2	0.5517	Sq. Corr. 0.5728	
LIK	-167.875	AIC 347.750 SC	369.451
SIG-SQ	0.196092	(0.442822)	

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	0.86362	0.0914672	9.441862	0.000000
CONSTANT	4.89054	0.577098	8.474354	0.000000
LINCPC90	0.370387	0.054087	6.847973	0.000000
LM290	-0.258384	0.0222295	-11.623436	0.000000
INVP90	-2997.68	785.703	-3.815283	0.000136
LINVP90	0.396132	0.0529911	7.475438	0.000000

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Breusch-Pagan test	1	2.288295	0.130353
Spatial B-P test	1	2.288295	0.130353

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	16.377624	0.000052

LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	0.381096	0.537017

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD90	SPATIAL WEIGHTS MATRIX	INVD1S
DEPENDENT VARIABLE	LAPC90	OBS 275 VARS 6	DF 269
R2	0.5482	Sq. Corr. 0.5704	
LIK	-168.694	AIC 349.389 SC	371.089
SIG-SQ	0.197202	(0.444074)	

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	0.869059	0.0881334	9.860726	0.000000
CONSTANT	-5.53241	2.48064	-2.230233	0.025732
LINCPC90	0.339434	0.0572808	5.925791	0.000000
LM290	-0.255826	0.0224726	-11.383917	0.000000
LINVP90	-1.44645	0.472865	-3.058900	0.002222
L2INVP90	-0.0816692	0.0227972	-3.582422	0.000340

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Breusch-Pagan test	1	2.954605	0.085633
Spatial B-P test	1	2.954606	0.085633

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	16.951870	0.000038

LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	0.744295	0.388289

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION

DATA SET	BD90	SPATIAL WEIGHTS MATRIX		INVD1S
DEPENDENT VARIABLE	LAPC90	OBS 275	VARS 6	DF 269
R2	0.5517	Sq. Corr.	0.5728	
LIK	-167.875	AIC	347.750	SC 369.451
SIG-SQ	0.196092	(	0.442822)

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	0.86362	0.0914672	9.441862	0.000000
CONSTANT	4.89054	0.577098	8.474354	0.000000
LINCPC90	0.370387	0.054087	6.847973	0.000000
LM290	-0.258384	0.0222295	-11.623436	0.000000
LINVP90	0.396132	0.0529911	7.475438	0.000000
INVP90	-2997.68	785.703	-3.815283	0.000136

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR HETEROSKEDASTICITY

LINEAR SPECIFICATION USING VARIABLES

CONSTANT COAST

TEST	DF	VALUE	PROB
Breusch-Pagan test	1	2.288295	0.130353
Spatial B-P test	1	2.288295	0.130353

DIAGNOSTICS FOR SPATIAL DEPENDENCE

SPATIAL LAG DEPENDENCE FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Likelihood Ratio Test	1	16.377624	0.000052

LAGRANGE MULTIPLIER TEST ON SPATIAL ERROR DEPENDENCE

WEIGHT	STAND	ZERO	DF	VALUE	PROB
INVD1S	yes	no	1	0.744295	0.388289

INVD1S yes no 1 0.381096 0.537017

SPATIAL LAG MODEL - MAXIMUM LIKELIHOOD ESTIMATION

GROUPWISE HETEROSKEDASTICITY

DATA SET	BD90		SPATIAL WEIGHTS MATRIX	INVD1S
DEPENDENT VARIABLE	LAPC90		OBS 275	DF 269
GROUPS		COAST_0 COAST_1	VARS 6	
R2	0.5265	Sq. Corr.	0.5725	
LIK	-166.620	AIC	345.239	SC 366.940

Convergence after 4 iterations

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	0.845528	0.103222	8.191394	0.000000
CONSTANT	4.66414	0.595581	7.831247	0.000000
LINCPC90	0.346541	0.054904	6.311753	0.000000
LM290	-0.253948	0.022165	-11.457164	0.000000
LINVP90	0.38047	0.0542222	7.016870	0.000000
INVP90	-2990.87	768.108	-3.893821	0.000099

GROUP VARIANCES

VARIABLE	COEFF	S.D.	z-value	Prob
COAST_0	0.179129	0.0175893	10.183997	0.000000
COAST_1	0.251117	0.0434055	5.785371	0.000000

REGRESSION DIAGNOSTICS

TEST ON GROUPWISE HETEROSKEDASTICITY

GROUPS	COAST_0	COAST_1		
TEST			DF	VALUE
Likelihood Ratio Test			1	2.510721
				PROB 0.113074

SPATIAL LAG MODEL - IV(2SLS) ESTIMATION

DATA SET	BD90		SPATIAL WEIGHTS MATRIX	INVD1S
DEPENDENT VARIABLE	LAPC90		OBS 275	DF 270
ENDOGENOUS VARIABLES	LM290		EXOG 3	
INSTRUMENTS	W_INC90	W_POP90	W_COST90	W_LINCPC
	W_INVP90			
R2	0.5580	Sq. Corr.	0.0893	
SIG-SQ	0.5194	(0.7207)		

VARIABLE	COEFF	S.D.	z-value	Prob
W_LAPC90	3.4605	0.730867	4.734785	0.000002
CONSTANT	3.64487	0.846355	4.306547	0.000017
LINCPC90	0.450429	0.094131	4.785133	0.000002
INVP90	-4701.8	2382.29	-1.973645	0.048422
LM290	0.248635	0.167877	1.481058	0.138591

REGRESSION DIAGNOSTICS

DIAGNOSTICS FOR SPATIAL DEPENDENCE

FOR WEIGHTS MATRIX INVD1S (row-standardized weights)

TEST	DF	VALUE	PROB
Lagrange Multiplier (error)	1	0.574165	0.448609