

(Markov)

*1)

2
, , 가
(cross-section analysis) Markov
가
. 20, 30

I. 序論

가
가 (micro-data)
가
가 (micro-data)
(socio-economic group) 가

* LG , Illinois (email: gs-kim@uiuc.edu).
Illinois CIBER

. 自營業²⁾
 . 30%가
 (, 2000). 10%
 産業構造 調整 가
 가 1 가³⁾
 가 (cross-section) Markov (transition probability)
 . Markov 2 (time-series) 가
 가 Markov 가
 . 50
 . 20, 30

2) 自營業(self-employment)

Data 가 가 “ ” 가
 가 (, Freelancer)가 가 가
 가 가 가 가
 가 가 Kim (2000b) survey

3) (2000), (2000), (2000)

8) , 가
 18 가
 () 가 , 가
 , 가 가
 가 . 가
 가 .

< 1 >

	0: (); 1: ; 2: Dummy (0: ; 1:)
	Dummy (0: (); 1: 外) Dummy (0: ; 1:)

가 18 67 가 15
 , 18 가 가
 , 68
 가 가 ,
 (mutually exclusive) 5 10 , 18 -27 , 28 -37 , 38
 -47 , 48 -57 58 -67 9)
 가 , 가 가
 , 14 , (covariates)
 男女
 가
 14 ()
 (Urban) (Rural)
 dummy
 (Coll) .

8)

9)

10 5
 가 (empty cell)가 10 5
 , 18 -22 가 가

Age (covariates)가 Age group
 Age group (interaction) 5 3
 가 15 가
 data < 2> 1 2
 18 67 9,013
 4,347 48.2% 3,208 35.6%
 29.2%

< 2> (:)

				外		
	4347	0	1586	2761	1500	2847
	-	4666	1622	3044	1131	3535
	-	-	3208	0	1416	1792
外	-	-	-	5805	1215	4590
	-	-	-	-	2631	0
	-	-	-	-	-	6382

< 3>

. 98 3.8% 99 19.7%
 가 . 98 11.3%
 7.9% . 98
 82.7% 99

< 3>

(average transition matrix)

(:)

		1999 (t)			
					total
1998 (t-1)		3313	164	854	4331
	(row %)	(76.50)	(3.79)	(19.69)	(100.00)
		166	1191	117	1474
	(row %)	(11.26)	(80.80)	(7.94)	(100.00)
		436	120	2652	3208
	(row %)	(13.59)	(3.74)	(82.67)	(100.00)
	total	3915	1475	3623	9013
	(row %)	(43.44)	(16.35)	(40.17)	(100.00)

III.

1.

가. Markov (transition probability)

가 Markov (transition probability) (Stochastic process) $\{E_t\}$ 가
 (t) (Stochastic process) $\{E_t\}$ 가
 (E_t=0), (E_t=1), (E_t=2)
 3가
 가 (t-1) 가 i 가 (t) j가 가 (P_{ij})

$$\Pr(E_t = j | E_{t-1} = i) = F(\beta'_{ij} x_t), i, j \in S = \{0, 1, 2\} \quad (1)$$

, multinomial logit , $F(\beta'_{ij} x_t) = \frac{\exp(\beta'_{ij} x_t)}{\sum_{k=0}^2 \exp(\beta'_{ik} x_t)}$, β_{ij}

, x_t

(1) multinomial logit regression $\beta_{0j}, \beta_{1j}, \beta_{2j}$

data

< >

(transition probabilities)

3가

(matrix)

$$P = \begin{bmatrix} P_{00} & P_{01} & P_{02} \\ P_{10} & P_{11} & P_{12} \\ P_{20} & P_{21} & P_{22} \end{bmatrix} \quad (2)$$

(1)

(transition matrix)

Markov

가

Markov

가

G

가

i

가

P^G_{ij}

(1) (P_{ij}^G) 가 G
 (τ) j ($\pi_{j,\tau}^G$) (recursive)

$$\pi_{j,\tau}^G = \sum_{i=0}^N P_{ij}^G \cdot \pi_{i,\tau-1}^G \dots \dots \dots (3)$$

가 ($E_t = 0$), ($E_t = 1$) ($E_t = 2$) 3가
 . 가 G 20 가 가
 . $\pi_{1,20}^G = P_{01}^G \cdot \pi_{0,19}^G + P_{11}^G \cdot \pi_{1,19}^G + P_{21}^G \cdot \pi_{2,19}^G$ 가
 ($\pi_{0,19}^G, \pi_{1,19}^G, \pi_{2,19}^G$) 18 가
 ($\pi_{0,18}^G, \pi_{1,18}^G, \pi_{2,18}^G$) ($P_{01}^G, P_{11}^G, P_{21}^G$) . G
 가 , 가 , 가
 .10)

가 가 가
 가 . 就業率 (4)
 . (4) 가
 (E_τ^G) .11)

$$E_\tau^G = \pi_{1,\tau}^G + \pi_{2,\tau}^G \dots \dots \dots (4)$$

, $\pi_{1,\tau}^G$ G τ ($E_t = 1$) 가 ,
 $\pi_{2,\tau}^G$ G τ ($E_t = 2$)가 가 .

$$S_\tau^G = \frac{\pi_{1,\tau}^G}{\pi_{1,\tau}^G + \pi_{2,\tau}^G} \dots \dots \dots (5)$$

10) 18 multinomial logit

11) 1 1

data

, $S_{i,t}^G$ G τ 가 .

Markov

(1999)
 ()
 (cross-section analysis) Markov
 가 , 가 .
 (Cross-Section)
 “ ”
 (6)

$$\Phi_{i,t}^{G,t} = \sum_{j=0}^2 P_{ji,t-1}^{G,t-1} \cdot \Phi_{j,t-1}^{G,t-1} \dots \dots \dots (6)$$

, $\Phi_{i,t}^{G,t}$ t G τ i
 (6) . t
 (i= 1)가 가 t- 1 3가 (, ,) (proportion)
 3가 t- 1
 (i= 1)가 가 t- 2 3가 가
 , t- 2 t- 3
 가 가
 가 .
 “ ”

data 가 .
 Markov 期(t- 1) 期(t)

가 . τ 가 가
 $\tau- 1$ (, ,) 3가
 가 , $\tau- 1$ 가 가 $\tau- 2$
 3가 3가 가
 , $\tau- 2$ 가 $\tau- 3$. ()
 1998 1999) (, 18 19 , 19 20 , 20 21)
 가 (3가) 가
 Markov “ ”

가 Markov 가

. Bootstrap

가 가 Bootstrap resampling random sample

Markov resampling (replication)

가 (standard normal distribution) (standard error)

가 가

가 40 (replication) 40

가 Markov Age

Bootstrap < 5>

2. .

가.

(profile) < 4> 3가 (age effect)

(covariates)가 Age group Age

(interaction) 5 3 multinomial model 2 30

(states) < 4> 가 가 가

.12) 外

12)

Blanchflower and

自營業 賃金勤勞

가

< 4> - Multinomial Logit Estimates

	(Dependent Variable)			
	(reference category: (E _t = 1))		(E _t = 2)	
	Coefficient	p-value	Coefficient	p-value
Female20	- 1.1717	0.000	- 0.2394	0.008
Female30	- 2.6368	0.000	- 2.3829	0.000
Female40	- 2.5267	0.000	- 1.8942	0.000
Female50	- 2.1105	0.000	- 1.6959	0.000
Female60	- 1.7558	0.000	- 0.7375	0.019
Rural20	0.4019	0.142	0.0004	0.997
Rural30	0.2727	0.052	0.3782	0.000
Rural40	0.1981	0.146	0.0773	0.502
Rural50	0.3406	0.049	0.1722	0.255
Rural60	0.4590	0.233	0.5852	0.210
College20	- 0.6745	0.016	- 0.2251	0.013
College30	- 0.0826	0.580	0.5126	0.000
College40	- 0.2625	0.118	- 0.0421	0.772
College50	0.2426	0.286	0.3344	0.107
College60	- 0.7739	0.182	0.2939	0.592
Age20	- 1.3477	0.003	1.9829	0.000
Age30	1.4801	0.000	3.2332	0.000
Age40	1.9748	0.000	3.3476	0.000
Age50	1.1070	0.007	2.4483	0.000
constant	- 0.9991	0.007	- 2.0059	0.000
log likelihood	= - 7941.2425			
Number of obs.	= 9013			
Pseudo R ²	= 0.1402			

1)

Oswald(1998) Blanchflower and Meyer(1994), Schiller and Crewson(1997), Dunn and Holtz-Eakin(2000), Hout and Rosen(1999), Evans and Leighton(1989), Laband and Lentz(1992), Blanchflower and Oswald(1998), Bernhardt(1994), Carrasco(2000), Evans and Jovanovic(1989), Holtz-Eakin *et al.*(1994), Fairlie(1999) time-series Blau(1987)가 Devine(1994)

Markov

가

Markov
가

가

(benchmark)

“ (- -)” 3가 (- -)
(-) , (benchmark)
, (- -),
(- 外-),
(- -) , ,

[1]

, benchmark

20

가

30

60 가

30%

가

. 30

[2] Markov (transition probability)

. Markov

.13)

가 60

가

가

[3]

14)

13) Cross-section

10

Markov

10

. 가

가

Cross-section

10

, Markov

10

(3)

(recursive)

update

14)

가

가

外

()

30
 60 가 가
 Markov [4]
 20 30 40
 .15) 外 20 30
 , 40 .16)
 30 가

2)

[5] 14 가
 가 가 60
 가
 < 5>
 Bootstrap 60 10% 가 [6]
 , 가
 40% 20 30 45%
 가 30% 10%
 가
 가 5% 30 60
 [7] 14 外 [5]
 가

Markov

가 [8]

가 50

. 50

Markov

15) 30

가
Kim (2000b)

16)

(2000)

가

가 가

(human capital)

가 가

3)

[9]-[12] Markov

[9]

가

30

, 50

30

5%

가

[10]

30

가 5%

30

40

[11]

外

14

30

가

40

Markov

가

가

가

20

30

5%

[12]

가 Markov

20, 30, 60

Rees and Shah(1986), Fujii and Hawley(1991), Evans and Leighton(1989)

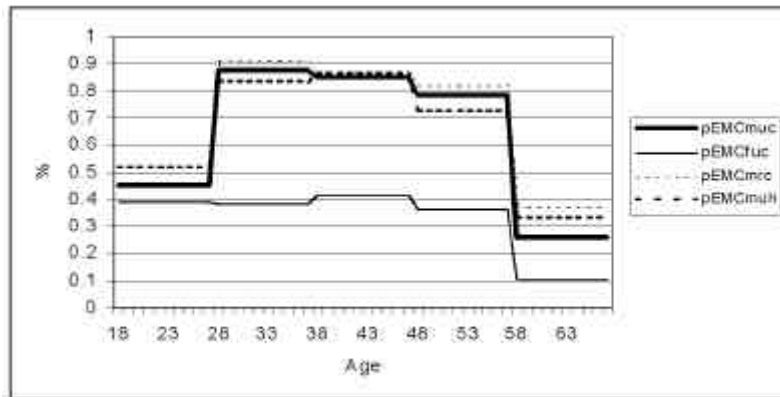
Bates(1990)

Lucas(1978)

逆

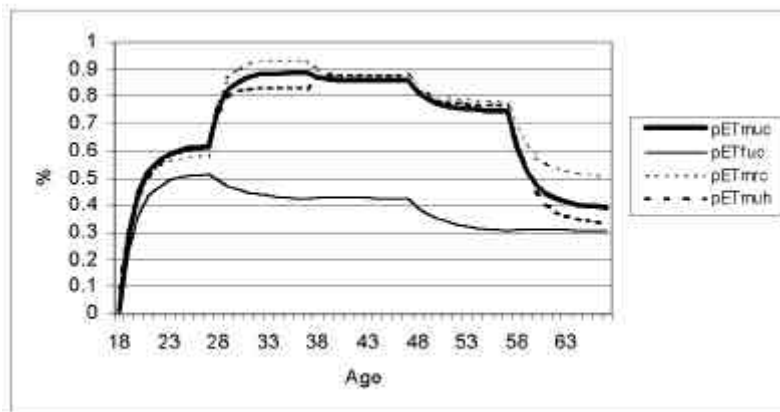
가

[1] ,



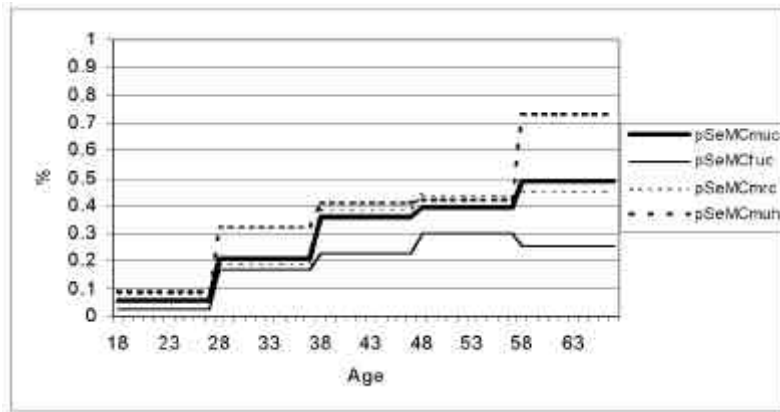
: (legend) muc - - - , fuc - - - , mrc - 外- , muh -

[2] Markov ,



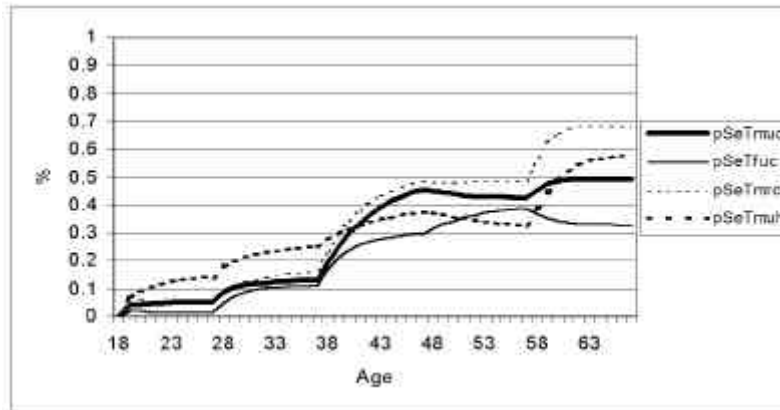
: [1]

[3] ,



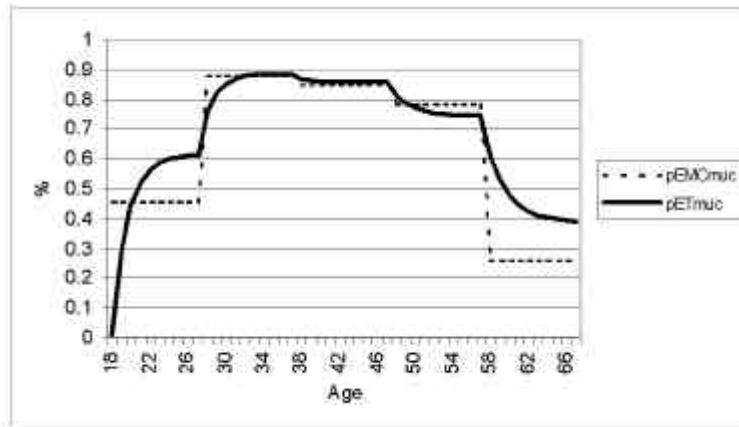
: [1]

[4] Markov



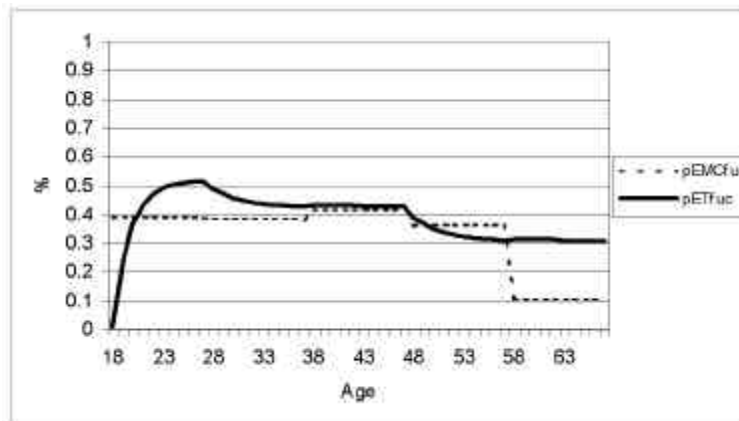
: [1]

[5] - -



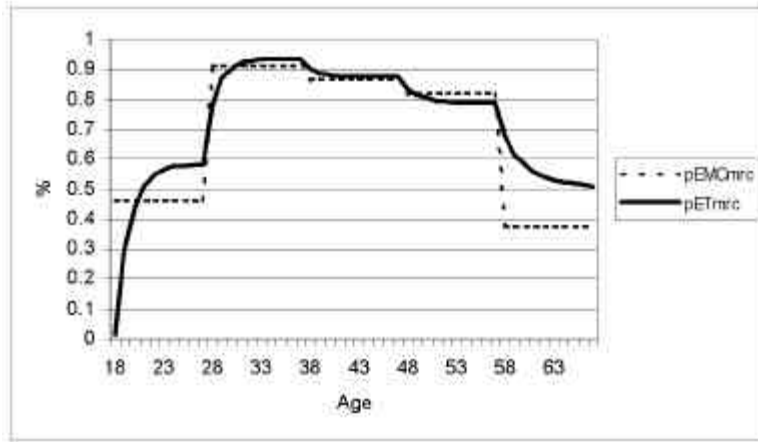
: (legend) pEMC pET
Markov

[6] - -



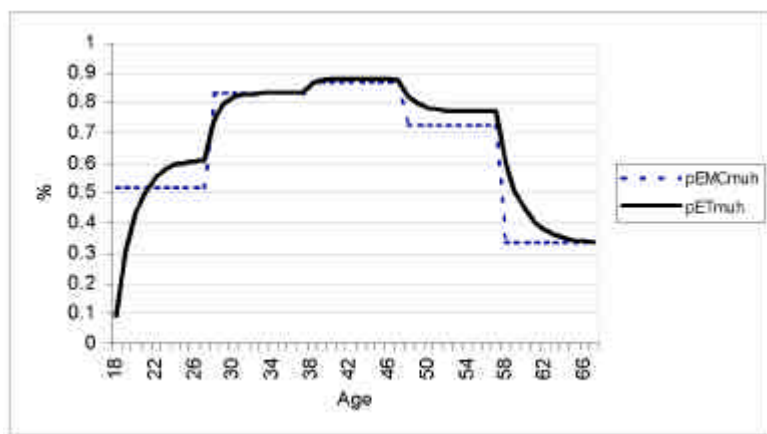
: [5]

[7] - 外-



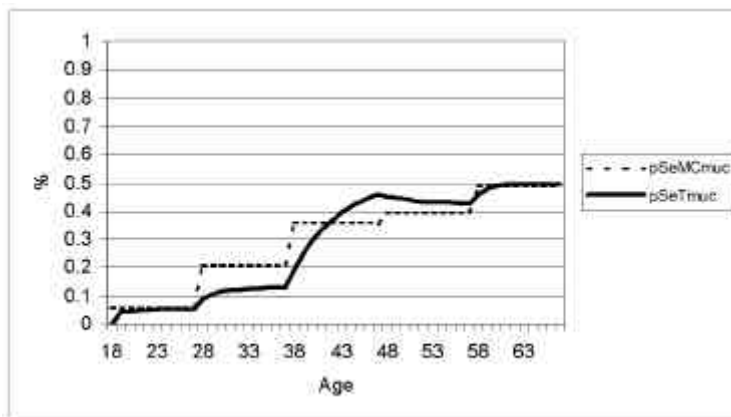
: [5]

[8] - -



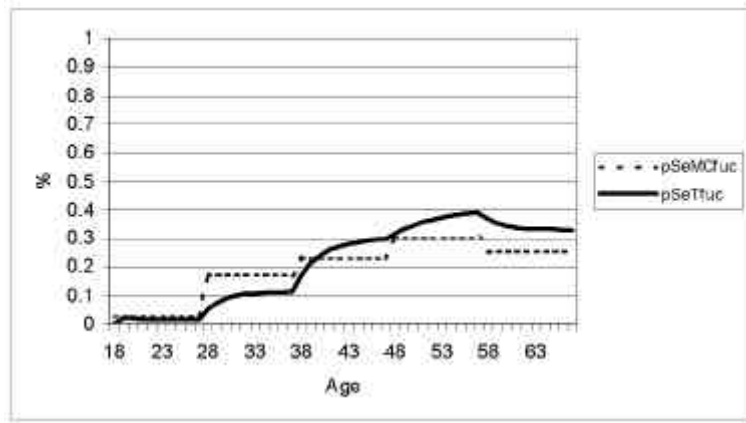
: [5]

[9] - -



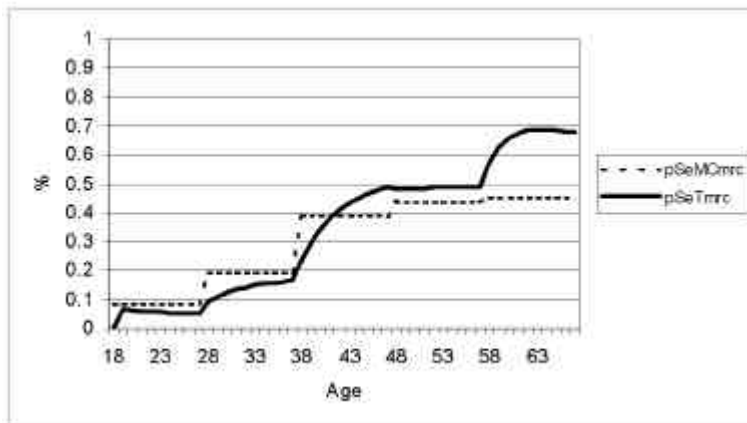
: [5]

[10] - -



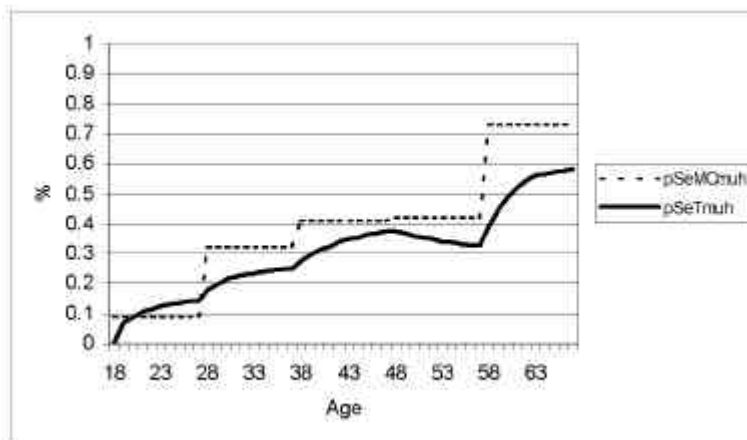
: [5]

[11] - 外



: [5]

[12] - -



: [5]

< 5> Bootstrap resampling

		Bootstrap		Bootstrap	
-	20	-0.0329**	0.0166	0.0149	0.0114
	30	0.0171	0.0121	0.0890**	0.0202
	40	-0.0095	0.0176	0.0002	0.0503
	50	0.0193	0.0420	-0.0390	0.0714
	60	-0.1887*	0.1042	-0.0021	0.2046
-	20	-0.0193	0.0145	0.0082	0.0060
	30	-0.0585**	0.0285	0.0730**	0.0242
	40	-0.0114	0.0376	-0.0317	0.0496
	50	0.0295	0.0545	-0.0602	0.0952
	60	-0.2069**	0.0915	-0.0840	0.1969
- 外-	20	-0.0080	0.0226	0.0343**	0.0134
	30	0.0035	0.0102	0.0521**	0.0256
	40	-0.0146	0.0212	-0.0120	0.0465
	50	0.0239	0.0346	-0.0497	0.0586
	60	-0.1822*	0.0945	-0.2100	0.2084
-	20	0.0314*	0.0178	0.0453**	0.0219
	30	-0.0266	0.0175	0.2034**	0.0347
	40	0.0058	0.0131	0.0522	0.0441
	50	-0.0355	0.0274	-0.0169	0.0619
	60	-0.1136	0.0775	0.2456*	0.1296

: Markov

** 5%, * 10%

IV. 要約 結論

2 (micro- data)
 ,
 , 가 ,
 ,
 (cross- section) Markov (transition
 probability) , Bootstrap resampling 가

가
 50

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< >

(Transition Probability)

Multinomial Logit

		Age Groups					p-value of equality
		20	30	40	50	60	
	Female	-0.853*	-1.477**	-2.038**	-1.421**	-1.381	0.345
	Rural	0.551	-0.056	-0.448	0.475	-0.806	0.273
	College	-0.397	-0.448	-0.158	0.502	(dropped)	0.513
	Intercept Shift	-1.076	1.226	1.810**	0.511	0	0.000
	Constant	-2.653**	-2.653**	-2.653**	-2.653**	-2.653**	
	Female	-0.255*	-1.638**	-1.681**	-1.494**	0.099	0.000
	Rural	-0.020	0.347**	-0.105	0.086	0.156	0.425
	College	0.211	-0.151	-0.830**	-0.922*	0.726	0.006
	Intercept Shift	1.955**	2.914**	3.326**	2.438**	0	0.000
	Constant	-3.110**	-3.110**	-3.110**	-3.110**	-3.110**	
	Female	-1.763**	-2.254**	-1.221**	-0.947**	0.049	0.026
	Rural	0.785	0.517	0.381	0.130	1.398*	0.688
	College	0.973	0.228	0.238	(dropped)	(dropped)	0.616
	Intercept Shift	-0.292	0.909	0.655	0.619	0	0.595
	Constant	1.560**	1.560**	1.560**	1.560**	1.560**	
	Female	-1.611	-2.115**	-0.529	-0.313	(dropped)	0.000
	Rural	1.251	0.641	0.855	0.068	(dropped)	0.213
	College	2.438**	0.425	0.735	(dropped)	(dropped)	0.056
	Intercept Shift	-0.175	0.626	-1.155	-0.275	0	0.122
	Constant	-0.223	-0.223	-0.223	-0.223	-0.223	
	Female	-1.540**	-1.409**	-1.114**	-0.620	(dropped)	0.000
	Rural	-0.277	1.161**	0.619	-0.162	(dropped)	0.005
	College	-0.940	-0.012	0.395	(dropped)	(dropped)	0.410
	Intercept Shift	(dropped)	(dropped)	0.624	0.170	(dropped)	0.475
	Constant	-1.339**	-1.339**	-1.339**	-1.339**	-1.339**	
	Female	-0.193	-1.242**	-0.781**	-0.755**	(dropped)	0.000
	Rural	-0.201	0.472**	0.191	-0.055	(dropped)	0.147
	College	-0.194	0.710**	0.046	0.281	(dropped)	0.019
	Intercept Shift	0.845**	1.224**	1.540**	1.104**	0	0.155
	Constant	0.792**	0.792**	0.792**	0.792**	0.792**	

: ** Significance at 5% level. * Significance at 10% level.

Intercept Shift Age Group (shift) .
 p-value of equality Age Group 가 joint .
 2 4331, 2 1474, 2
 3208 .