BUAN 6312.003

APPLIED ECONOMETRICS AND TIME SERIES ANALYSIS

HOW DO DRUNK DRIVING LAWS AFFECT TRAFFIC DEATHS?

GROUP PROJECT

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Table of Contents

1.0 Introduction:

In this project we evaluated the impacts of driving laws and other socio-economic factors on the vehicle fatality rates. We utilized data obtained by the U.S. Department of Transportation Fatal Accident Reporting System. The data is compiled for lower 48 states between years 1982 to 1988.

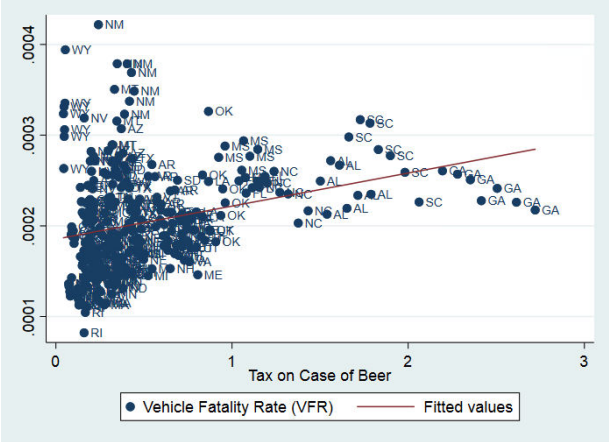
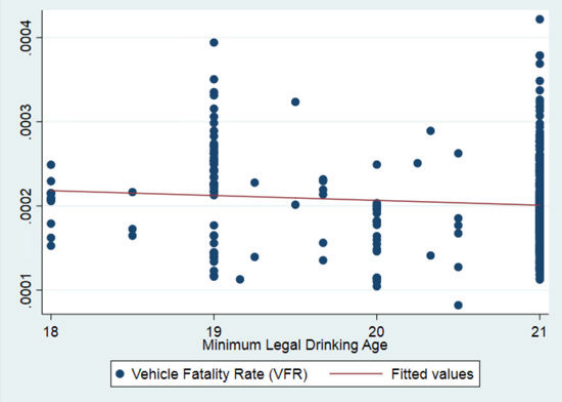
2.0 Data Exploration:

There are 39 features in this dataset. Out of them, 5 variables describe the laws, which were enacted by the state government. These are the tax on the case of beer, minimum legal drinking age, mandatory jail sentence, mandatory community service and percentage of population residing in dry counties. 13 variables account for the state economy: personal income, unemployment rate and drivers. The state governments cannot change these variables. We try to understand the effect of these variables on the fatality rates. The dataset also provides variables, which describe the proportion of religious communities like percentage of Southern Baptists and Mormons across different states. There are 15 variables, which provide information about the fatality rate across different age groups- 15-17 years, 18-20 years and 21-24 years. Our project provides analysis based on two dependent variables, which are:

- MRALL- Vehicle Fatality Rate
- MRALLN-Night time Vehicle Fatality rate

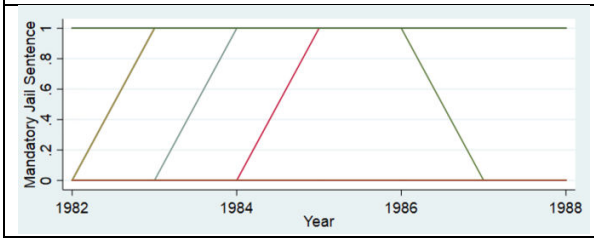
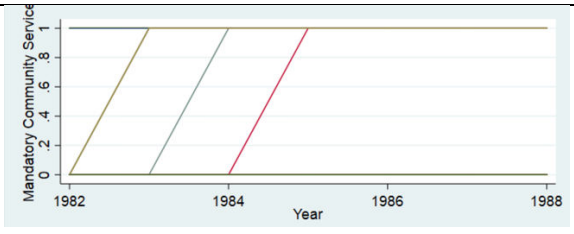
We now try to understand the distributions of the explanatory variables and two-way linear prediction plots against the dependent variable MRALL. The primary purpose is to see if there is any linear relationship between the explanatory variables and the dependent variable and also find some interesting characteristics.

2.1 Understanding the relationship between drunk driving laws and MRALL:

Impact of **BEERTAX** and **MLDA** on MRALL	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and BEERTAX	Two-Way Linear Prediction Plot Vehicle Fatality Rate and MLDA
	

Plotting BEERTAX and MRALL, we see there is a large portion of BEERTAX that is near zero, in this range there does not appear to be a linear relationship between BEERTAX and MRALL. As BEERTAX increases, there appears to be an increasing linear effect on MRALL.

The enforced MLDA is 21. However, we can see from the graph that a large number of youngsters of age 19-20 are involved in vehicle fatalities. The enforced law does not seem to have a deterrence effect on the alcohol related fatalities. There seems to be a negative relationship between the two variables.

Impact of **JAILD** and **COMSERD** on MRALL	
JAILD: Mandatory Jail Sentence	COMSERD: Mandatory Community Service
Panel-Data Line Plot JAILD from 1982-1988 of all States	Panel-Data Line Plot COMSERD from 1982-1988 of all States
	

. xttrans jaild

Mandatory Jail Sentence	Mandatory Jail Sentence 0	1	Total
0	97.10	2.90	100.00
1	1.25	98.75	100.00
Total	70.38	29.62	100.00

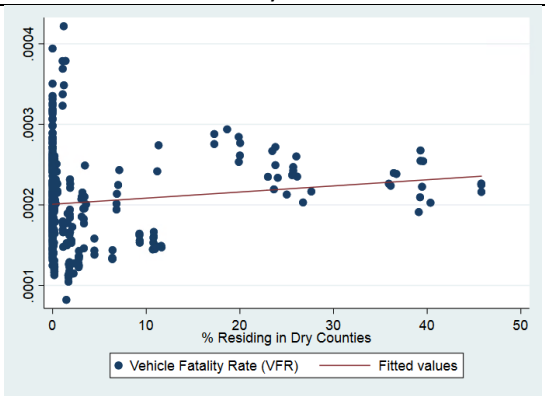
. xttrans comserd

Mandatory Community Service	Mandatory Community Service 0	1	Total
0	97.87	2.13	100.00
1	0.00	100.00	100.00
Total	80.14	19.86	100.00

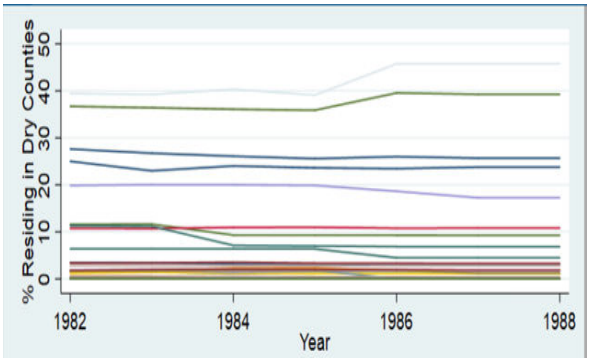
JAILD is a binary variable, indicating whether or not states require jail time for an initial drunk driving conviction. As seen in the table displaying the change in JAILD and COMSERD over time, very few states made changes to these policies in the years 1982 – 1988. Therefore, the variables are largely time-invariant and will not contribute much in Fixed Effects Models, since there is very little within-variation.

DRY: % Residing in Dry Counties

Two-Way Linear Prediction Plot
Vehicle Fatality Rate and DRY

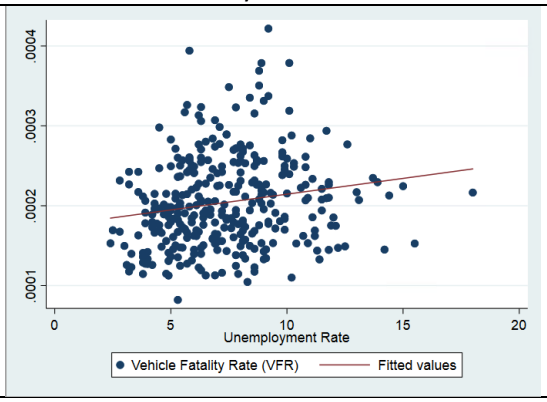
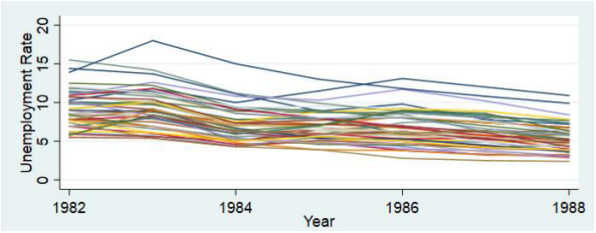


Panel-Data Line Plot
DRY from 1982-1988 of all States

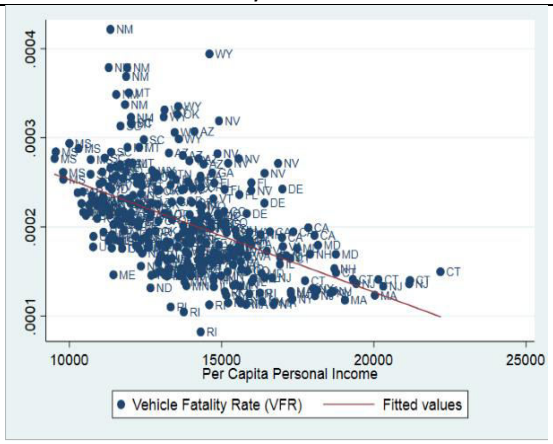
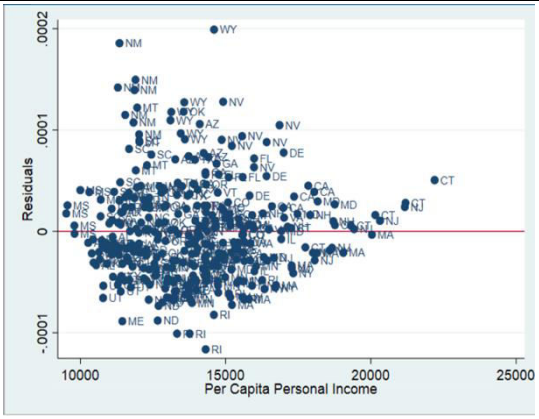


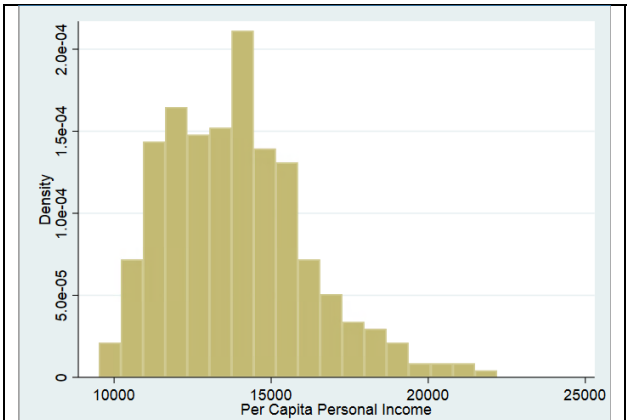
Many states reported 0% residing in dry counties for all years included in the panel (as seen in the graphs above and table in appendix). Variables with little variability do not contribute much in estimating a dependent variable, here the vehicle fatality rate.

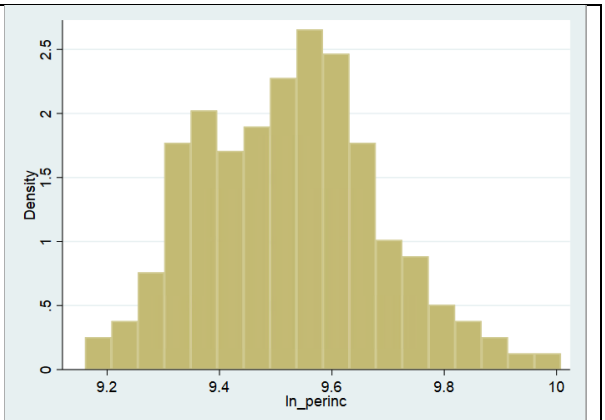
2.2 Understanding relationship between socio-economic factors and MRALL:

UNRATE: State Unemployment Rate (%)	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and UNRATE	Panel-Data Line Plot UNRATE from 1982-1988 of all States
	

Plotting state unemployment rate against vehicle fatality rate reveals a slight positive relationship. Unemployment rates have a decreasing trend over the years 1982 – 1988.

PERINC: Per Capita Personal Income ($)	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and PERINC	Residual Plot of PERINC
	
Histogram of PERINC	Histogram of the log of PERINC

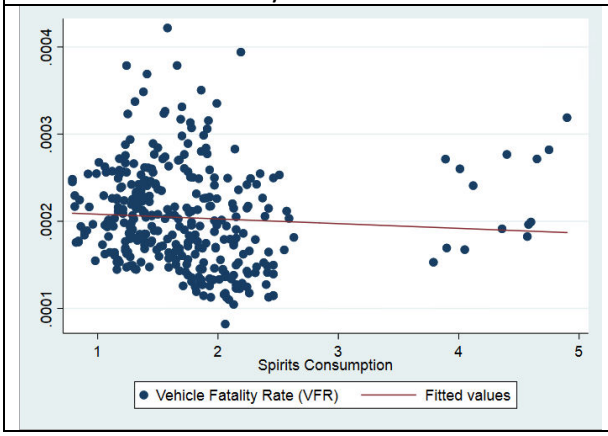


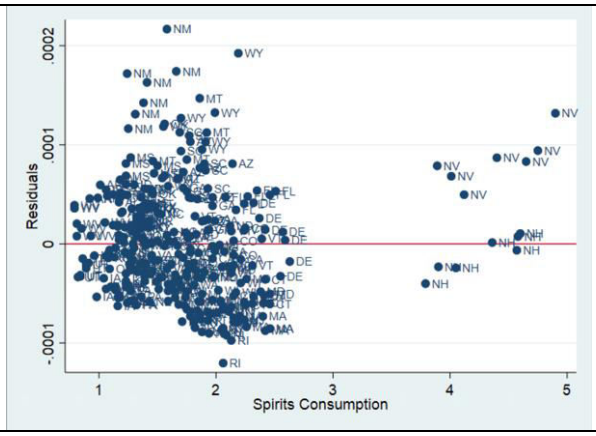


As seen in the histogram of per capital personal income, the data is slightly right skewed; after taking the log of this variable it becomes more normalized, the transformed variable is used in the analysis.

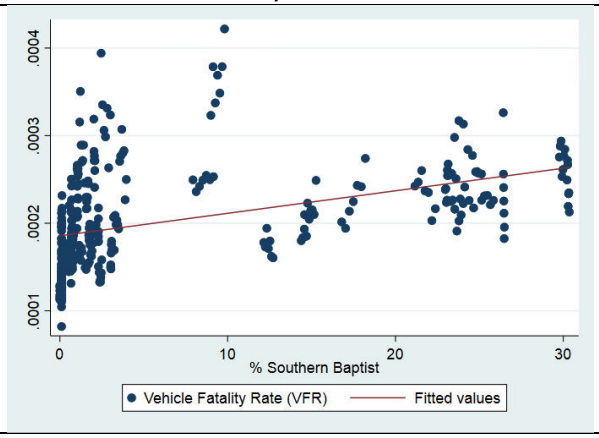
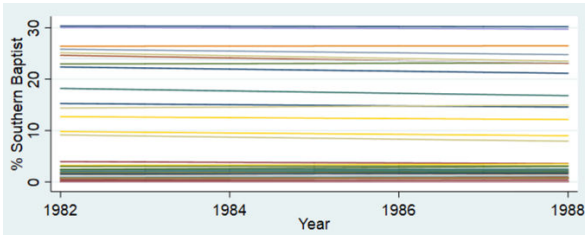
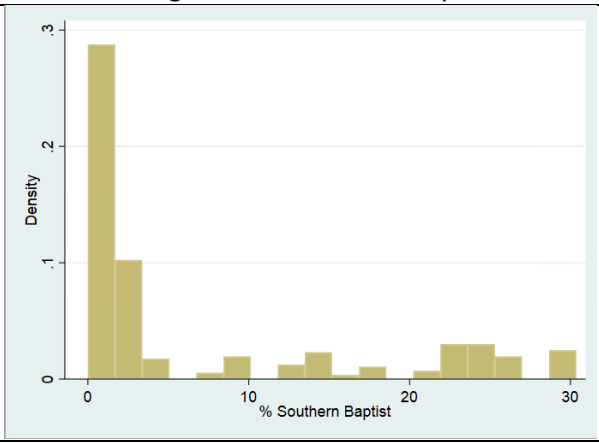
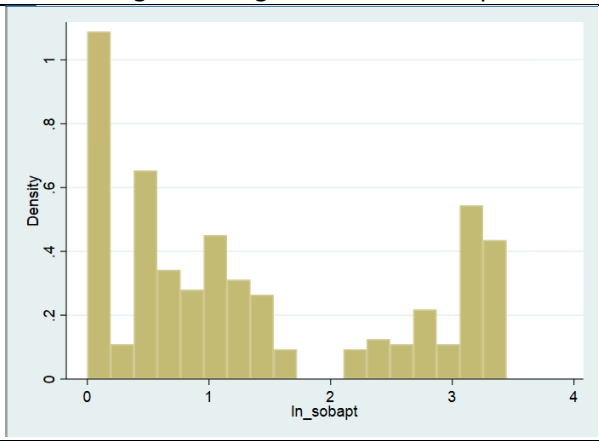
Vehicle fatality rate and PERINC have an inverse relationship, as PERINC increases the vehicle fatality rate decreases. Examining the residual plots, the errors do not show a strong pattern but in general are mostly evenly distributed about zero.

SPIRCONS: Per Capita Pure Alcohol Consumption (Annual, Gallons)	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and SPIRCONS	Residual Plots of SPIRCONS



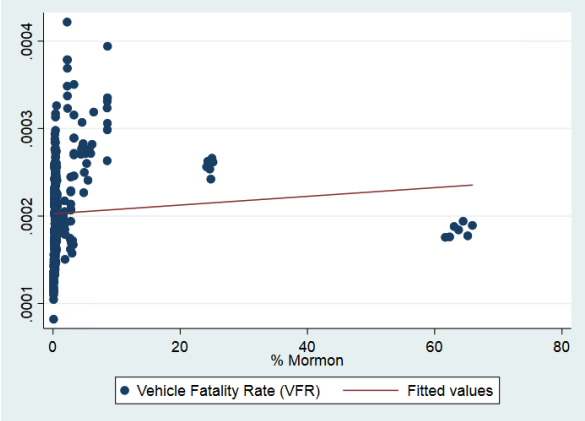
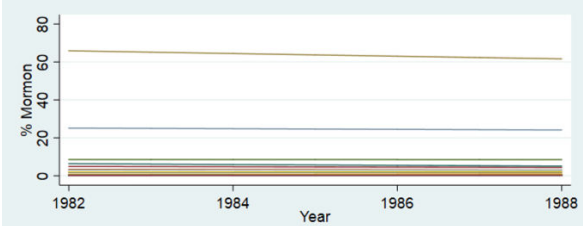


Per capital pure alcohol consumption (annual, gallons) and vehicle fatality rate do not appear to have a linear correlation.

<table>
<tr><th colspan="2">SOBAPT: % Southern Baptist</th></tr>
<tr><td>Two-Way Linear Prediction Plot
Vehicle Fatality Rate and SOBAPT</td><td>Panel-Data Line Plot
SOBAPT from 1982-1988 of all States</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Histogram of % Southern Baptist</td><td>Histogram of log of % Southern Baptist</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

The plot of SOBAPT reveals many states with 0%, indicating this variable may not have sufficient variation to contribute to estimating vehicle fatality rate.

The distribution is skewed because a large portion of states have 0% Southern Baptist. To normalize the variable, the log of SOBAPT is used in analysis., which is more normally distributed, as seen in the histogram.

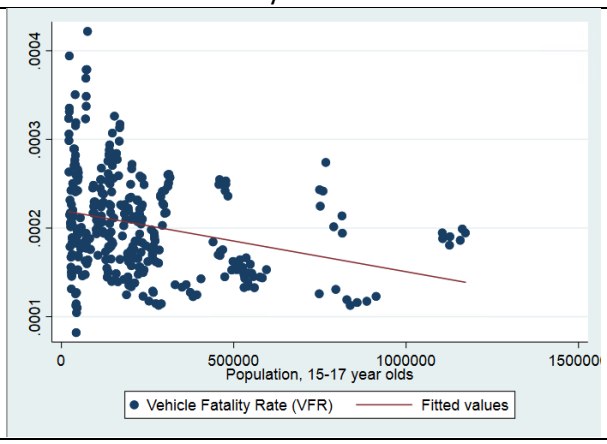
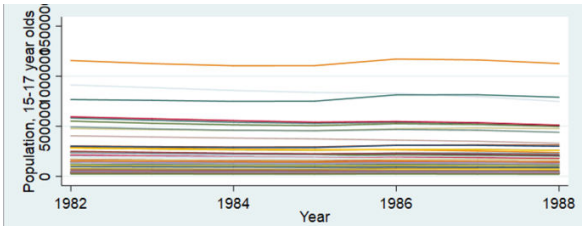
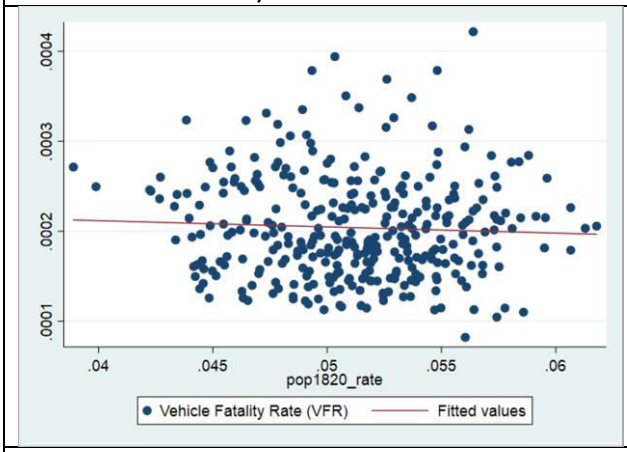
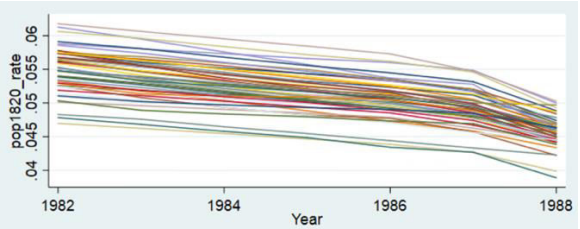
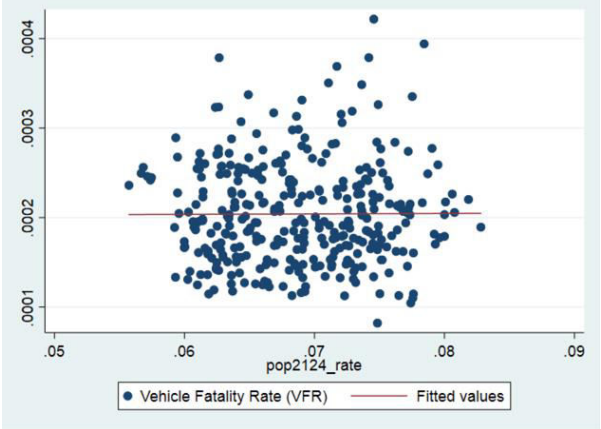
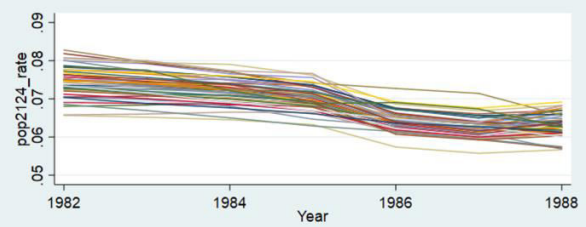
MORMON: % Mormon	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and MORMON	Panel-Data Line Plot MORMON from 1982-1988 of all States
	

Similarly to SOBAPT, many states have 0% Mormon, which indicates this variable, has little variation and thus may not contribute significantly in estimating the vehicle fatality rate.

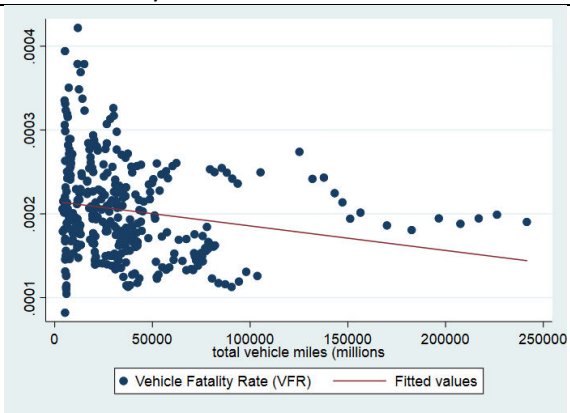
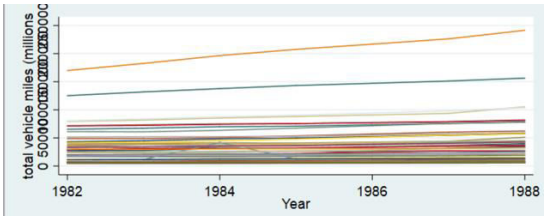
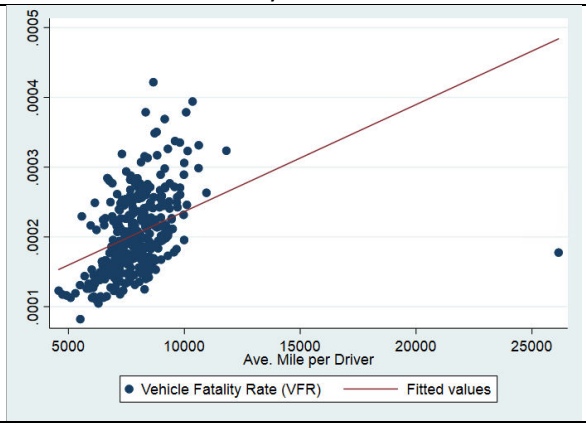
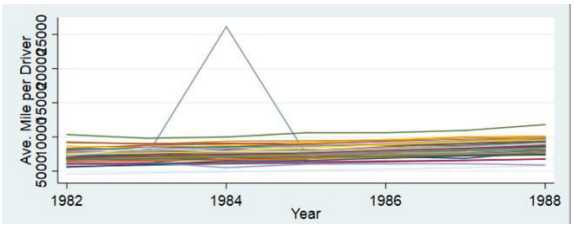
Examining the correlations of the population variables, many were highly correlated. To overcome this problem, the population segment variables were transformed into ratios by diving the variable by the population to make the variables consistent across states. The transformed variables were used in the analysis.

```
. corr mrall pop pop1517 pop1820 pop2124 pop1517_rate pop1820_rate pop2124_rate
(obs=336)
```

	mrall	pop	pop1517	pop1820	pop2124	pop151~e	pop182~e	pop212~e
mrall	1.0000							
pop	-0.2681	1.0000						
pop1517	-0.2791	0.9945	1.0000					
pop1820	-0.2740	0.9949	0.9974	1.0000				
pop2124	-0.2660	0.9942	0.9940	0.9985	1.0000			
pop1517_rate	0.0912	-0.0682	0.0065	-0.0116	-0.0293	1.0000		
pop1820_rate	-0.0498	-0.1612	-0.1152	-0.0939	-0.1002	0.6521	1.0000	
pop2124_rate	0.0049	-0.0878	-0.0565	-0.0290	-0.0152	0.4134	0.8034	1.0000

POP1517: Population of 15-17 Year-olds	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and POP1517	Panel-Data Line Plot POP1517 from 1982-1988 of all States
	
POP1820: Population of 18-20 Year-olds	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and POP1820 Rate	Panel-Data Line Plot POP1820 Rate from 1982-1988 of all States
	
POP2124: Population of 21-24 Year-olds	
Two-Way Linear Prediction Plot Vehicle Fatality Rate and POP2124 Rate	Panel-Data Line Plot POP2124 Rate from 1982-1988 of all States
	

The percentage of young drivers (aged 15-24), plotted against vehicle fatality rate so not appear to have a linear relationship. There seems to be a decreasing trend in young drivers during the years included in this panel.

<table>
<tr><td colspan="2">MILES: Total Vehicle Miles (Millions)</td></tr>
<tr><td>Two-Way Linear Prediction Plot
Vehicle Fatality Rate and MILES</td><td>Panel-Data Line Plot
MILES from 1982-1988 of all States</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">VMILES: Average Mile per Driver</td></tr>
<tr><td>Two-Way Linear Prediction Plot
Vehicle Fatality Rate and VMILES</td><td>Panel-Data Line Plot
VMILES from 1982-1988 of all States</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

The average miles per driver, VMILES, is a function of total miles and total number of drivers. VMILES was used in analysis while MILES was not since miles MILES does not account for variation in state population while VMILES does.

Average miles per driver and vehicle fatality rate have a positive relationship as seen in the two-way plot.

3.0 Understanding the impact of different factors on MRALL:

In this section, we set up three hypotheses, based on our intuition, to understand controlling for which variables could have the most significant impact on decreasing the vehicle fatality rate. After regression analysis, we might reject some of hypothesis, as certain explanatory variables are not statistically significant.

Hypothesis 1:

Drunk driving laws of minimum legal drinking age (MLDA), tax on beer case (BEERTAX), mandatory jail sentence (JAILD), mandatory community service (COMSERD), percentage of population residing in dry counties (DRY) have a **significant and direct** deterrence effect on drunk driving.

```
. xtreg mrall beertax mlda dry jaild comserd , fe cluster (state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.0533                                         min =         6
     between = 0.0421                                         avg =       7.0
     overall = 0.0341                                         max =         7

                                                F(4,47)            =         .
corr(u_i, Xb)  = -0.6507                        Prob > F           =         .

                                (Std. Err. adjusted for 48 clusters in state)
```

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
beertax	-.0000647	.0000301	-2.15	0.037	-.0001252	-4.20e-06
mlda	1.49e-06	2.56e-06	0.58	0.564	-3.66e-06	6.63e-06
dry	2.48e-06	1.76e-06	1.41	0.165	-1.06e-06	6.02e-06
jaild	-5.12e-06	4.60e-07	-11.14	0.000	-6.05e-06	-4.20e-06
comserd	.0000108	.000013	0.83	0.412	-.0000154	.000037
_cons	.0001958	.0000584	3.35	0.002	.0000782	.0003133
sigma_u	.00007078					
sigma_e	.00001903					
rho	.93260583	(fraction of variance due to u_i)				

From our regression results, we see that BEERTAX and JAILD are significant for 5% significance level. Increasing the tax on beer by $1 decrease fatality rate on an average by 0.0000647 per 1000 people living in the state. If a state requires jail time, the fatality rate decreases on an average by 0.000005 per 1000 people living in the state.

Hypothesis 2:

Economic factors like state unemployment rate (UNRATE), per capita income (PERINC), economic growth (GSPCH) have a significant impact on alcohol related fatalities.

```
. xtreg mrall unrate perinc gspch , fe cluster (state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.1012                                         min =         7
     between = 0.1691                                         avg =       7.0
     overall = 0.0624                                         max =         7

                                                F(3,47)            =     11.48
corr(u_i, Xb)  = -0.4108                        Prob > F           =    0.0000

                                (Std. Err. adjusted for 48 clusters in state)
------------------------------------------------------------------------------
             |               Robust
       mrall |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unrate |  -3.41e-06   1.22e-06    -2.79   0.008    -5.87e-06   -9.50e-07
      perinc |   1.08e-09   2.93e-09     0.37   0.714    -4.82e-09    6.98e-09
       gspch |  -.0000479   .0000276    -1.73   0.090    -.0001035    7.74e-06
       _cons |   .0002153   .0000486     4.43   0.000     .0001175    .0003131
-------------+----------------------------------------------------------------
     sigma_u |  .00005813
     sigma_e |  .00001844
         rho |  .90856398   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

From the regression results we find that unemployment rate is the significant at 5%significance level. Increasing unemployment rate by 1% leads to a decrease in fatality rate by 0.00000341%.

Hypothesis 3:

Social factors like percentage of Mormons (MORMON), percentage of pure alcohol consumption (SPIRCONS) and percentage of southern Baptists (SOBAPT) should not have a very significant impact on fatality rate.

```
. xtreg mrall spircons sobapt mormon , fe cluster (state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.0513                                         min =         7
     between = 0.1836                                         avg =       7.0
     overall = 0.1638                                         max =         7

                                                F(3,47)            =      3.39
corr(u_i, Xb)  = -0.9627                        Prob > F           =    0.0256

                                 (Std. Err. adjusted for 48 clusters in state)
------------------------------------------------------------------------------
             |               Robust
       mrall |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    spircons |   .0000239   .0000129     1.85   0.071    -2.12e-06      .00005
      sobapt |  -.0000145   .0000126    -1.15   0.257    -.0000399     .0000109
      mormon |   2.38e-06   2.50e-06     0.95   0.345    -2.65e-06     7.41e-06
       _cons |   .0002592   .0000906     2.86   0.006     .0000769     .0004414
-------------+----------------------------------------------------------------
     sigma_u |  .00018323
     sigma_e |  .00001895
         rho |  .98941943   (fraction of variance due to u_i)
------------------------------------------------------------------------------

.
end of do-file
```

From the regression results we find that variables- spircons, sobapt and Mormon are not significant at 5% significance level with p values greater than 0.05.

4.0 Regression Analysis

4.1 Regression with dependent variable MRALL: Vehicle Fatality Rate

In Panel Data, there is likely individual heterogeneity hiding in the error terms causing serial correlation, there are different strategies to overcome this problem.

Pooled Least Squares relaxes the assumption of zero error correlation over time for the same individual, allowing for observed heterogeneity within the same individual over time. Cluster Robust Standard Errors overcomes the problem of serial correlated errors and heteroskedasticity by correcting the standard errors. While the standard errors are correct, the estimator is inefficient. However, if an unobserved variable is correlated with an explanatory variable in the model, the explanatory variable captures the effect of the unobserved heterogeneity.

The fixed effects model with year indicator variables allows us to test if there are time fixed effects by conducting joint significance F-tests for the year dummy variables. The year intercepts are tested against

a null hypothesis that they are all equal to zero against the alternative that at least one is not equal zero indicating a non-zero effect on the vehicle fatality rate.

The data is not a random draw from a larger population, rather, it consists of the population of U.S. States; thus, the random effects model that assumes the data is randomly selected from a larger population) is not sensible in this case. The random effects model was used to obtain estimates in order to make comparisons to other estimation methods.

The Hausman test was conducted to compare the coefficients between the Fixed Effects Model and Random Effects Model to examine if the random component, u_i is correlated with the explanatory variables in the model.

In estimating the vehicle fatality rate, we compared several regression estimation techniques:

a. Pooled Least Squares with Cluster Robust Standard Errors (Used in Round 2 Regressions)
a. Fixed Effects with Year Indicator Variables and Cluster Robust Standard Errors
b. Fixed Effects with Cluster Robust Standard Errors
c. Fixed Effects without Cluster Robust Standard Errors
d. Random Effects Model

The regression equation was estimated using each of the above models (b, c and d), then non-significant variables were removed and the equations were estimated again with each above model, this process continued until only significant variables were included 'Step 1 Model (R1)' is referred to as the starting equation with all explanatory variables, thought 'Step 4 Model (R1)', which includes only significant variables).

This process was done using two different sets of explanatory variables, referred to as 'Round 1 Regressions (R1)' and 'Round 2 Regressions (R2)', the different explanatory variable choices will be explained in each.

ROUND 1 REGRESSIONS:

Step 1 Model (R1): MRALL = SPIRCONS UNRATE LN_PERINC BEERTAX LN_SOBAPT LN_MORMON MLDA DRY YNGDRV VMILES JAILD COMSERD MRALLN MRA1517 MRA1517N MRA1820 MRA1820N MRA2124 MRA2124N MRAIDALL POP POP1517_RATE POP1820_RATE POP2124_RATE GSPCH

(Non-significant variables removed: BEERTAX, LN_SOBAPT, LN_MORMON, MLDA, YNGDRV, JAILD, POP, POP1517_RATE, POP1820_RATE, POP2124_RATE)

Step 2 Model (R1): XTREG = MRALL SPIRCONS UNRATE LN_PERINC DRY VMILES COMSERD MRALLN MRA1517 MRA1517N MRA1820 MRA1820N MRA2124 MRA2124N MRAIDALL GSPCH

(Non-significant variable removed: COMSERD)

Step 3 Model (R1): XTREG = MRALL SPIRCONS UNRATE LN_PERINC DRY VMILES MRALLN MRA1517 MRA1517N MRA1820 MRA1820N MRA2124 MRA2124N MRAIDALL GSPCH

(Non-significant variables removed: GSPCH)

Step 4 Model (R1): XTREG = MRALL SPIRCONS UNRATE LN_PERINC DRY VMILES MRALLN MRA1517 MRA1517N MRA1820 MRA1820N MRA2124 MRA2124N MRAIDALL

The Fixed Effects Models with Cluster Robust Standard Errors and Random Effects are presented below (Full Results included in appendix). In the Fixed Effects with year indicator variables, in Step 1 and Step 2 Models the time effects captured in the year indicator variables were not found to be significantly different from zero, indicating the dummy variables did not need to be included in the model.

MODELS	c. FE Cluster Robust SE			d. Fixed Effects			e. Random Effects		
mrall	Coef.	Robust Std. Err.	t	Coef.	Robust Std. Err.	t	Coef.	Std. Err.	z
spircons	.0000352	9.43e-06	3.74	.0000352	7.36e-06	4.78	7.33e-06	2.34e-06	3.14
unrate	-1.33e-06	6.21e-07	-2.15	-1.33e-06	6.53e-07	-2.04	-1.52e-06	5.78e-07	-2.63
ln_perinc	.0000997	.000027	3.69	.0000997	.0000239	4.17	-.000035	.0000147	-2.38
beertax	-.000014	9.72e-06	-1.44	-.000014	9.79e-06	-1.43	3.77e-06	3.55e-06	1.06
ln_sobapt	.000028	.000031	0.90	.000028	.0000282	0.99	8.41e-06	1.73e-06	4.86
ln_mormon	-.0000178	.0000258	-0.69	-.0000178	.0000245	-0.73	6.94e-06	1.92e-06	3.61
mlda	9.00e-07	1.05e-06	0.85	9.00e-07	1.04e-06	0.87	9.74e-07	1.06e-06	0.92
dry	1.11e-06	4.30e-07	2.59	1.11e-06	7.45e-07	1.50	1.23e-07	1.68e-07	0.73
yngdrv	.0000723	.0000478	1.51	.0000723	.0000503	1.44	.0001008	.0000485	2.08
vmiles	1.35e-09	3.29e-10	4.09	1.35e-09	5.08e-10	2.66	1.67e-09	5.68e-10	2.94
jaild	-1.03e-06	1.94e-06	-0.53	-1.03e-06	6.88e-06	-0.15	6.57e-07	3.40e-06	0.19
comserd	8.04e-06	4.40e-06	1.83	8.04e-06	7.91e-06	1.02	4.33e-06	3.89e-06	1.11
mralln	1.391133	.172189	8.08	1.391133	.1465053	9.50	1.691318	.1599576	10.57
mra1517	.054705	.0151342	3.61	.054705	.0099582	5.49	.0691969	.0112994	6.12
mra1517n	-.0818413	.0328816	-2.49	-.0818413	.0213492	-3.83	-.1015923	.024663	-4.12
mra1820	.0698745	.0088135	7.93	.0698745	.0088681	7.88	.103745	.0096303	10.77
mra1820n	-.0563169	.0280791	-2.01	-.0563169	.0159976	-3.52	-.1071737	.0180661	-5.93
mra2124	.0798523	.012014	6.65	.0798523	.0100219	7.97	.1225913	.0109685	11.18
mra2124n	-.1182463	.0346906	-3.41	-.1182463	.0211036	-5.60	-.1688907	.0239419	-7.05
mraidall	.1469089	.0809589	1.81	.1469089	.0478144	3.07	.1615826	.0507559	3.18
pop	1.61e-12	2.06e-12	0.78	1.61e-12	3.19e-12	0.50	1.97e-13	3.15e-13	0.62
pop1517_rate	.000022	.0004392	0.05	.000022	.0004376	0.05	-.0003058	.000407	-0.75
pop1820_rate	.0002864	.0004301	0.67	.0002864	.0004791	0.60	-.0005528	.0004874	-1.13
pop2124_rate	-.0002353	.0003039	-0.77	-.0002353	.000269	-0.87	-.0001561	.0002706	-0.58
gspch	-.0000259	.000018	-1.44	-.0000259	.0000194	-1.34	-.0000135	.0000208	-0.65
_cons	-.0009906	.0002826	-3.51	-.0009906	.0002613	-3.79	.0003643	.0001486	2.45
spircons	.0000343	5.84e-06	5.87	.0000343	5.08e-06	6.76	2.37e-06	2.36e-06	1.00
unrate	-1.36e-06	4.96e-07	-2.74	-1.36e-06	6.01e-07	-2.26	-2.07e-06	5.64e-07	-3.67
ln_perinc	.0000972	.0000226	4.29	.0000972	.0000197	4.92	-.0000392	.0000123	-3.18
dry	1.02e-06	3.48e-07	2.93	1.02e-06	7.23e-07	1.41	4.80e-07	1.91e-07	2.51
vmiles	1.28e-09	2.77e-10	4.61	1.28e-09	4.96e-10	2.58	2.01e-09	5.71e-10	3.51
comserd	6.19e-06	3.99e-06	1.55	6.19e-06	3.86e-06	1.60	.0000125	3.34e-06	3.73
mralln	1.415417	.159427	8.88	1.415417	.138207	10.24	1.763377	.1574153	11.20
mra1517	.0567919	.0148848	3.82	.0567919	.0096028	5.91	.0736688	.0112411	6.55
mra1517n	-.0846924	.0336564	-2.52	-.0846924	.0203956	-4.15	-.1097727	.0245678	-4.47
mra1820	.0686641	.008737	7.86	.0686641	.0084845	8.09	.1060202	.0094196	11.26
mra1820n	-.0576384	.0268356	-2.15	-.0576384	.0156865	-3.67	-.1081812	.0182374	-5.93
mra2124	.0818295	.0113983	7.18	.0818295	.0096276	8.50	.1272756	.0108026	11.78
mra2124n	-.1168128	.0337999	-3.46	-.1168128	.0204072	-5.72	-.1869631	.0234694	-7.97
mraidall	.1492288	.0771375	1.93	.1492288	.0458012	3.26	.1738138	.0519504	3.35
gspch	-.0000294	.0000161	-1.82	-.0000294	.0000181	-1.62	-.0000239	.0000208	-1.15
_cons	-.0009067	.0002228	-4.07	-.0009067	.000194	-4.67	.0004104	.0001209	3.39

spircons	.0000342	5.64e-06	6.08	.0000342	5.07e-06	6.76	2.63e-06	2.45e-06	1.07
unrate	-1.37e-06	4.95e-07	-2.77	-1.37e-06	6.01e-07	-2.28	-2.15e-06	5.76e-07	-3.74
ln_perinc	.0000992	.0000219	4.53	.0000992	.0000197	5.03	-.0000375	.0000127	-2.95
dry	1.05e-06	3.31e-07	3.16	1.05e-06	7.24e-07	1.45	3.97e-07	1.98e-07	2.00
vmiles	1.27e-09	2.86e-10	4.44	1.27e-09	4.96e-10	2.55	1.93e-09	5.78e-10	3.34
mralln	1.410741	.1618722	8.72	1.410741	.138266	10.20	1.75107	.159314	10.99
mral517	.0583499	.0151142	3.86	.0583499	.0095484	6.11	.0782607	.0112622	6.95
mral517n	-.085456	.0341999	-2.50	-.085456	.0204101	-4.19	-.1127829	.0247743	-4.55
mral820	.0683972	.0086825	7.88	.0683972	.0084853	8.06	.1054713	.0095307	11.07
mral820n	-.0596094	.0272638	-2.19	-.0596094	.0156526	-3.81	-.1120344	.0183685	-6.10
mra2124	.080191	.011086	7.23	.080191	.0095828	8.37	.1252482	.0109318	11.46
mra2124n	-.1155874	.0339027	-3.41	-.1155874	.0204086	-5.66	-.1862506	.02372	-7.85
mraidall	.1532561	.0796802	1.92	.1532561	.0457787	3.35	.1853879	.0525576	3.53
gspch	-.000026	.0000164	-1.58	-.000026	.000018	-1.44	-.0000176	.000021	-0.84
_cons	-.0009239	.0002153	-4.29	-.0009239	.0001938	-4.77	.0003977	.0001245	3.19
spircons	.0000338	5.69e-06	5.94	.0000338	5.07e-06	6.67	2.44e-06	2.45e-06	0.99
unrate	-1.07e-06	4.92e-07	-2.17	-1.07e-06	5.64e-07	-1.89	-2.00e-06	5.44e-07	-3.68
ln_perinc	.0001008	.0000221	4.55	.0001008	.0000197	5.11	-.0000372	.0000128	-2.92
dry	1.06e-06	3.27e-07	3.24	1.06e-06	7.25e-07	1.46	3.86e-07	2.00e-07	1.93
vmiles	1.19e-09	2.92e-10	4.06	1.19e-09	4.94e-10	2.40	1.88e-09	5.75e-10	3.27
mralln	1.41105	.1606329	8.78	1.41105	.138538	10.19	1.747112	.1588688	11.00
mral517	.0590784	.0151316	3.90	.0590784	.0095538	6.18	.0784941	.0112145	7.00
mral517n	-.0849647	.034653	-2.45	-.0849647	.0204475	-4.16	-.112186	.0246737	-4.55
mral820	.0688224	.0085781	8.02	.0688224	.0084968	8.10	.1053127	.0095008	11.08
mral820n	-.0594129	.0276242	-2.15	-.0594129	.0156828	-3.79	-.1109093	.0182989	-6.06
mra2124	.0793785	.0115537	6.87	.0793785	.0095851	8.28	.1240495	.010882	11.40
mra2124n	-.1118069	.0332259	-3.37	-.1118069	.0202797	-5.51	-.1828111	.0234532	-7.79
mraidall	.1530014	.0812487	1.88	.1530014	.0458685	3.34	.1862546	.0524277	3.55
_cons	-.0009413	.0002176	-4.33	-.0009413	.0001938	-4.86	.000394	.000125	3.15

The Fixed Effects with Cluster Robust Standard Errors has larger Standard Errors than the Fixed Effects Model, and the coefficients are the same. Although using cluster robust standard errors leads to a less precise estimation, we have greater confidence in the results.

The Random Effects Model compared to the two Fixed Effects Models results in coefficients that differ in sign, magnitude, and significance. The Hausman test, comparing the Fixed Effects Model without cluster robust standard errors and the Random Effects Model (comparing Step 1 Model to Step 1 Model through Step 4 Model to Step 4 Model), results in large χ^2 values, we reject the null hypothesis and conclude that the random effects model does not converge to the true parameters and the fixed effects model is preferred.

Fixed Effects with Cluster Robust Standard Errors (c):

	AIC	BIC
Step 1 Model	-6884.128	-6792.589
Step 2 Model	-6893.941	-6836.729
Step 3 Model	-6914.448	-6861.008
Step 4 Model	-6913.902	-6864.28

Although the AIC and BIC do not both agree on the same model as the preferred model AIC the Step 3 Model and the Step 4 Model are very close. Interpretations will be provided for Step Model 4.

SPIRCONS: As per capita alcohol consumption (annually) increases by one gallon, the expected vehicle fatality rate increases by .00000733% per 10,000 people annually, all else constant (t = 5.94, p-value = 0).

UNRATE: When unemployment rate increases by 1%, the expected vehicle fatality rate decreases by .00000107% per 10,000 people annually, all else constant (t = -2.17, p-value = 0.035).

Ln_PERINC: When per capita personal income increases by 1% it leads to approximately an increase of .000001008% in the vehicle fatality rate per 10,000 people annually, all else constant (t = 4.55, p-value = 0).

DRY: When the percentage of people residing in dry counties increases by one percent, the estimated vehicle fatality rate increases by 0.00000106% per 10,000 people annually, all else constant (t = 3.24, p-value=0.02).

VMILES: When the average mile per driver is increased by one mile, the estimated vehicle fatality rate increases by 0.00000000119% per 10,000 people annually, all else constant (t = 4.06, p-value = 0).

MRALLN: When the night time vehicle fatality rate increases by one percent, the estimated vehicle fatality rate increases by 1.41% per 10,000 people annually, all else constant (t = 8.78, p-value = 0).

The explanatory vehicle fatality rate variables have lager coefficients than the other explanatory variables in the model, indicating a greater impact on the vehicle fatality rate. But, these variables are directly related to the vehicle fatality rate, the variables are determined within the system and are endogenous regressors. There is an argument in support of incorporating instruments in estimating vehicle mortality rate to overcome this endogeneity problem. Using previous time period values of the vehicle fatality rate explanatory variables as instruments in estimating *t* time vehicle fatality rate may serve to provide a better estimator.

ROUND 2 REGRESSIONS:

The endogenous vehicle fatality rate explanatory variables used in Round 1 Regressions were removed from the equation, and the model was estimated using a different subset of variables. As in Round 1, the regression equation is estimated using the techniques below (a-e), non-significant variables are removed and the model is estimated again, this process is followed until only significant variables remain in the model.

a. Pooled Least Squares with Cluster Robust Standard Errors
b. Fixed Effects with Year Indicator Variables and Cluster Robust Standard Errors
c. Fixed Effects with Cluster Robust Standard Errors
d. Fixed Effects without Cluster Robust Standard Errors
e. Random Effects Model

Step 1 Model (R2): MRALL = SPIRCONS UNRATE LN_PERINC BEERTAX LN_SOBAPT LN_MORMON MLDA DRY YNGDRV VMILES JAILD COMSERD POP POP1517_RATE POP1820_RATE POP2124_RATE GSPCH

(Non-significant variable removed: MLDA, POP, POP2124_RATE, GSPCH)

Step 2 Model (R2: MRALL = SPIRCONS UNRATE LN_PERINC BEERTAX LN_SOBAPT LN_MORMON DRY YNGDRV VMILES JAILD COMSERD POP1517_RATE POP1820_RATE

(Non-significant variable removed: LN_MORMON, YNGDRV, JAILD, COMSERD)

Step 3 Model (R2): MRALL = SPIRCONS UNRATE LN_PERINC BEERTAX LN_SOBAPT DRY VMILES POP1517_RATE POP1820_RATE

(Non-significant variable removed: BEERTAX, LN_SOBAPT, VMILES)

Step 4 Model (R2): MRALL = SPIRCONS UNRATE LN_PERINC DRY POP1517_RATE POP1820_RATE

(Non-significant variable removed: POP1820_RATE)

Step 5 Model (R2): MRALL = SPIRCONS UNRATE LN_PERINC DRY POP1517_RATE

MODELS	a. Pooled OLS			c. FE Cluster Robust SE			e. RE		
mrall	Coef.	Robust Std. Err.	t	Coef.	Robust Std. Err.	t	Coef.	Std. Err.	z
spircons	.0000293	5.84e-06	5.02	.0000772	.0000189	4.08	.0000232	6.89e-06	3.37
unrate	-4.18e-06	1.85e-06	-2.26	-2.18e-06	1.04e-06	-2.09	-5.03e-06	1.08e-06	-4.66
ln_perinc	-.0001957	.0000426	-4.60	.0002555	.0000624	4.10	.0000733	.0000343	2.14
beertax	-.0000175	.0000127	-1.37	-.0000373	.0000246	-1.51	-.0000157	.0000107	-1.47
ln_sobapt	.0000269	6.41e-06	4.20	.0000439	.000068	0.64	.0000395	5.45e-06	7.26
ln_mormon	.0000142	7.80e-06	1.82	-.0000334	.0000667	-0.50	.0000295	6.37e-06	4.62
mlda	-3.53e-06	4.26e-06	-0.83	1.66e-06	2.19e-06	0.76	4.12e-07	1.88e-06	0.22
dry	-7.31e-07	6.04e-07	-1.21	2.54e-06	1.05e-06	2.42	3.05e-07	5.55e-07	0.55
yngdrv	.0002041	.0001454	1.40	.0000147	.0000998	0.15	.0002016	.0000883	2.28
vmiles	7.52e-09	5.13e-09	1.47	1.28e-09	6.94e-10	1.85	1.86e-09	9.48e-10	1.96
jaild	.0000126	.000012	1.05	3.33e-06	2.49e-06	1.34	.0000202	9.17e-06	2.20
comserd	-3.29e-06	.0000135	-0.24	-9.17e-07	.0000112	-0.08	-.000017	.0000106	-1.60
pop	4.66e-13	7.53e-13	0.62	1.15e-12	5.45e-12	0.21	-2.19e-12	1.05e-12	-2.09
pop1517_rate	.0027574	.0020824	1.32	.0030132	.0009964	3.02	.0030578	.0007263	4.21
pop1820_rate	-.0032021	.0015545	-2.06	-.0002036	.0008586	-0.24	-.0011543	.0008366	-1.38
pop2124_rate	-.0009766	.0009002	-1.08	.000126	.0005896	0.21	.0004426	.0004427	1.00
gspch	-.0000268	.0000864	-0.31	-.000019	.000022	-0.86	-.0000349	.000036	-0.97
_cons	.0020847	.0003778	5.52	-.002572	.0006854	-3.75	-.0007311	.0003471	-2.11
spircons	.0000277	5.78e-06	4.80	.0000762	.0000152	5.00	.0000266	6.37e-06	4.17
unrate	-3.82e-06	1.88e-06	-2.03	-2.01e-06	1.01e-06	-2.00	-5.18e-06	9.90e-07	-5.23
ln_perinc	-.0001949	.0000404	-4.82	.000259	.0000615	4.21	.0000465	.0000315	1.48
beertax	-.0000163	.0000122	-1.33	-.0000372	.0000246	-1.51	-.000016	.0000107	-1.49
ln_sobapt	.0000264	6.18e-06	4.27	.0000338	.0000618	0.55	.0000385	5.44e-06	7.08
ln_mormon	.0000131	8.77e-06	1.50	-.000032	.0000661	-0.48	.0000312	6.38e-06	4.89
dry	-8.04e-07	5.42e-07	-1.48	2.42e-06	1.02e-06	2.37	3.00e-07	5.57e-07	0.54
yngdrv	.0001816	.0001578	1.15	.0000193	.000108	0.18	.0002435	.0000832	2.93
vmiles	7.38e-09	4.98e-09	1.48	1.20e-09	7.08e-10	1.69	1.90e-09	9.44e-10	2.01
jaild	.0000114	.0000125	0.92	2.74e-06	2.18e-06	1.26	.0000217	9.10e-06	2.39
comserd	-3.93e-06	.0000139	-0.28	-1.02e-06	.0000105	-0.10	-.0000185	.0000106	-1.75
pop1517_rate	.0031877	.0019254	1.66	.0030783	.0009057	3.40	.0029527	.0006658	4.43
pop1820_rate	-.0044244	.0013791	-3.21	-.0002474	.0007976	-0.31	-.0009889	.0007192	-1.37
_cons	.0019887	.0004062	4.90	-.0025443	.0006545	-3.89	-.0004649	.0003239	-1.44

spircons	.0000303	4.50e-06	6.72	.0000748	.0000125	6.01	.0000283	6.70e-06	4.22
unrate	-3.47e-06	1.80e-06	-1.93	-2.08e-06	9.94e-07	-2.09	-5.35e-06	1.04e-06	-5.13
ln_perinc	-.0002558	.0000388	-6.60	.0002584	.0000608	4.25	-2.15e-07	.0000317	-0.01
beertax	-.0000206	.0000124	-1.66	-.000034	.0000228	-1.49	-.0000235	.0000112	-2.09
ln_sobapt	.0000255	6.01e-06	4.25	.0000256	.0000537	0.48	.0000378	5.81e-06	6.50
dry	-1.25e-06	5.15e-07	-2.43	2.48e-06	1.00e-06	2.47	-2.57e-07	5.87e-07	-0.44
vmiles	8.08e-09	5.45e-09	1.48	1.19e-09	6.93e-10	1.71	1.91e-09	9.94e-10	1.93
pop1517_rate	.0030495	.0018371	1.66	.003128	.0008997	3.48	.002646	.0006963	3.80
pop1820_rate	-.0051351	.0010117	-5.08	-.0000931	.0008148	-0.11	-.0004382	.0006546	-0.67
cons	.0026498	.0003915	6.77	-.0025534	.0006657	-3.84	.0000396	.0003246	0.12
spircons	.0000268	6.38e-06	4.19	.0000744	.0000128	5.80	.0000278	7.63e-06	3.64
unrate	-4.10e-06	2.11e-06	-1.94	-2.31e-06	9.24e-07	-2.50	-5.29e-06	1.04e-06	-5.09
ln_perinc	-.0003213	.0000479	-6.71	.0002601	.000055	4.73	.0000418	.000033	1.27
dry	-2.84e-07	4.44e-07	-0.64	2.45e-06	1.10e-06	2.21	1.85e-06	6.72e-07	2.75
pop1517_rate	.0025811	.0022689	1.14	.0032126	.0009585	3.35	.0028504	.0006875	4.15
pop1820_rate	-.0063944	.0013322	-4.80	-.0004297	.0007713	-0.56	-.000417	.0006621	-0.63
_cons	.003455	.0004714	7.33	-.0025269	.0005651	-4.47	-.0003245	.000335	-0.97
spircons	.0000164	.0000102	1.61	.0000709	.0000123	5.78	.0000272	6.70e-06	4.06
unrate	-3.10e-06	2.07e-06	-1.50	-2.43e-06	1.02e-06	-2.39	-5.24e-06	1.02e-06	-5.15
ln_perinc	-1.67e-08	3.09e-09	-5.41	.0002664	.00005	5.33	.0000603	.0000308	1.96
dry	-6.86e-08	3.94e-07	-0.17	2.41e-06	1.09e-06	2.22	1.92e-06	6.87e-07	2.80
pop1517_rate	-5.26e-12	2.94e-11	-0.18	.0030986	.000907	3.42	.0027552	.0006411	4.30
_cons	.0004317	.0000554	7.79	-.0025957	.0005106	-5.08	-.0005173	.0003103	-1.67

	b. FE with Year Indicator Variables			
mrall	Coef.	Robust Std. Err.	t	testparm i.year
spircons	.0000808	.0000186	4.33	F(6, 47) = 3.14
unrate	-3.84e-06	1.29e-06	-2.98	Prob > F = 0.0114
ln_perinc	.0001979	.0000559	3.54	
beertax	-.0000379	.0000229	-1.65	
ln_sobapt	.0000285	.0000609	0.47	
ln_mormon	-.0000391	.0000581	-0.67	
mlda	1.40e-06	2.05e-06	0.68	
dry	2.11e-06	1.03e-06	2.05	
yngdrv	-.0000315	.0001036	-0.30	
vmiles	1.19e-09	6.92e-10	1.72	
jaild	4.57e-06	2.51e-06	1.82	
comserd	-2.07e-07	.0000121	-0.02	
pop	3.14e-12	4.15e-12	0.76	
pop1517_rate	.0011259	.0010708	1.05	
pop1820_rate	-.0014173	.0012214	-1.16	
pop2124_rate	.0004539	.0006741	0.67	
gspch	.0000219	.0000384	0.57	
year				
1983	-6.81e-06	5.38e-06	-1.27	
1984	-.0000181	6.87e-06	-2.64	
1985	-.0000214	8.13e-06	-2.63	
1986	-9.51e-06	.0000111	-0.86	
1987	-.0000157	.0000133	-1.18	
1988	-.0000231	.0000171	-1.35	
_cons	-.0018452	.0006021	-3.06	

spircons	.0000789	.0000181	4.36	F(6, 47) = 3.21
unrate	-4.08e-06	1.22e-06	-3.35	Prob > F = 0.0101
ln_perinc	.0002078	.0000592	3.51	
beertax	-.0000377	.000023	-1.64	
ln_sobapt	.000014	.0000576	0.24	
ln_mormon	-.0000383	.0000608	-0.63	
dry	1.91e-06	9.51e-07	2.01	
yngdrv	-.0000381	.0001077	-0.35	
vmiles	1.22e-09	7.13e-10	1.71	
jaild	4.52e-06	2.28e-06	1.98	
comserd	-4.44e-07	.0000114	-0.04	
pop1517_rate	.0010451	.0010781	0.97	
pop1820_rate	-.001021	.00116	-0.88	
year				
1983	-5.77e-06	4.22e-06	-1.37	
1984	-.0000174	5.95e-06	-2.92	
1985	-.0000219	7.97e-06	-2.75	
1986	-.000012	.0000107	-1.12	
1987	-.0000185	.000013	-1.42	
1988	-.0000246	.0000171	-1.44	
_cons	-.001853	.0006176	-3.00	
spircons	.0000741	.0000149	4.96	F(6, 47) = 3.35
unrate	-4.18e-06	1.14e-06	-3.67	Prob > F = 0.0079
ln_perinc	.000209	.0000617	3.39	
beertax	-.0000343	.0000225	-1.52	
ln_sobapt	.000013	.0000557	0.23	
dry	2.00e-06	8.99e-07	2.23	
vmiles	1.26e-09	7.34e-10	1.72	
pop1517_rate	.0012118	.0010547	1.15	
pop1820_rate	-.0010375	.0012303	-0.84	
year				
1983	-5.21e-06	4.02e-06	-1.30	
1984	-.0000168	5.47e-06	-3.07	
1985	-.0000212	7.37e-06	-2.88	
1986	-.000012	.0000103	-1.17	
1987	-.0000186	.0000125	-1.48	
1988	-.0000244	.0000164	-1.49	
_cons	-.0018949	.0006489	-2.92	
spircons	.0000752	.0000164	4.58	F(6, 47) = 2.69
unrate	-4.27e-06	1.12e-06	-3.81	Prob > F = 0.0250
ln_perinc	.0002139	.000059	3.62	
dry	1.94e-06	9.72e-07	2.00	
pop1517_rate	.0012541	.0012173	1.03	
pop1820_rate	-.0011305	.0012274	-0.92	
year				
1983	-5.06e-06	4.21e-06	-1.20	
1984	-.0000161	6.17e-06	-2.61	
1985	-.0000205	8.21e-06	-2.49	
1986	-.0000107	.000011	-0.97	
1987	-.0000167	.0000135	-1.24	
1988	-.0000219	.0000178	-1.23	
_cons	-.0019305	.0005755	-3.35	

spircons	.0000752	.0000163	4.62	F(6, 47) = 2.66
unrate	-4.22e-06	1.11e-06	-3.80	Prob > F = 0.0262
ln_perinc	.0002174	.0000599	3.63	
dry	1.88e-06	9.25e-07	2.03	
pop1517_rate	.0011238	.0012174	0.92	
year				
1983	-4.01e-06	3.59e-06	-1.12	
1984	-.000014	5.11e-06	-2.74	
1985	-.0000173	6.25e-06	-2.77	
1986	-6.30e-06	7.80e-06	-0.81	
1987	-.0000108	9.14e-06	-1.18	
1988	-.0000125	.0000107	-1.16	
_cons	-.0020193	.0005894	-3.43	

a. Pooled Least Squares coefficient estimates differ in magnitude, sign and significance compared to the Fixed Effects Model. The pooled least squares model does not account for unobserved differences in the States, which can cause the least squares estimators of the endogenous explanatory variables to be biased and inconsistent. We conclude the Pooled Least Squares model is not preferred.

b) In the fixed effects model with dummy year variables, the year coefficients in Step 1-5 Models found the year effects of 1984 and 1985 to be significantly different than the base year of 1982 in estimating vehicle fatality rate. In all F-tests, testing whether the year coefficients are equal to zero, the null was rejected, concluding at least one of the parameters was significantly different from zero.

d & e) The Hausman test comparing the Fixed Effects coefficients to the Random Effects coefficients,

Step 1 Model	$\chi^2 = 313.36$, p-value = 0
Step 2 Model	$\chi^2 = 275.35$, p-value = 0
Step 3 Model	$\chi^2 = 2291.76$
Step 4 Model	$\chi^2 = 12.43$, p-value = 0.0531
Step 5 Model	$\chi^2 = 133.31$, p-value = 0

Note: Step 3 Model - data fails to meet asymptotic assumptions of Hausman test.

Based on the Hausman test, rejection of the null hypothesis that both the fixed effects and random effects estimators converge to the true parameter, we conclude that despite the loss of efficiency we prefer the fixed effects model.

Comparing AIC and BIC:

	Pooled OLS		FE Year Dummy		Fixed Effects	
	AIC	BIC	AIC	BIC	AIC	BIC
Step 1 Model	-5943.08	5878.244	-6557.92	-6474.01	-6542.17	-6481.14
Step 2 Model	-5943.87	5890.469	-6563.89	-6495.24	-6548.45	-6502.68
Step 3 Model	-5929.24	5891.065	-6588.24	-6530.98	-6573.83	-6539.48
Step 4 Model	-5786.87	5760.148	-6584.32	-6538.51	-6570.98	-6548.08
Step 5 Model	-5722.78	5703.695	-6585.05	-6543.06	-6572.39	-6553.30

Based on all findings, the Fixed Effects estimation, used to obtain Step 5 Model (R2) is the preferred model for our data. The Round 1 regression models are not preferred since there is an endogeneity problem and the least squares estimators of endogenous variables are biased and inconsistent.

Interpretations of coefficient estimates obtained in the Fixed Effects model with Year Indication Variables:

SPIRCONS: When per capita pure alcohol consumption increases by one gallon, the estimated vehicle fatality rate increases by .0000752% per 10,000 people annually, all else constant (t = 4.96, p-value = 0).

UNRATE: When the unemployment rate increases by one percent, the estimated vehicle fatality rate decreases by 0.00000422% per 10,000 people annually, all else constant (t = -3.67, p-value = 0.001).

PERINC: When per capital personal income increases by one percent it leads approximately to an increase in vehicle fatality rate of 0.000002174% per 10,000 people annually, all else constant (t = 3.39, p-value = 0.001).

DRY: When the percentage of people residing in dry counties increases by one percent, the estimated vehicle fatality rate increases by 0.00000188% per 10,000 people annually, all else constant (t = 2.23, p-value = 0.031).

4.2 Regression with dependent variable MRALLN: Night Time Vehicle Fatality Rate

Models	FE Cluster Robust SE			Models	FE Cluster Robust SE		
mralln	Coef.	Robust Std. Err.	t	mralln	Coef.	Robust Std. Err.	t
spircons	9.55e-06	6.62e-06	1.44	spircons	.0000127	5.54e-06	2.29
unrate	-1.10e-07	3.56e-07	-0.31	unrate	5.41e-08	3.46e-07	0.16
ln_perinc	.0000403	.0000206	1.96	ln_perinc	.0000375	.0000196	1.91
beertax	-9.32e-06	7.89e-06	-1.18	beertax	-9.68e-06	7.44e-06	-1.30
ln_sobapt	6.84e-06	9.16e-06	0.75	ln_sobapt	7.66e-06	8.79e-06	0.87
ln_mormon	-2.76e-06	6.67e-06	-0.41	ln_mormon	-3.26e-06	7.05e-06	-0.46
mlda	2.53e-07	7.51e-07	0.34	dry	5.30e-07	6.42e-07	0.83
dry	4.63e-07	5.56e-07	0.83	yngdrv	3.14e-06	.0000251	0.12
yngdrv	-9.80e-06	.0000244	-0.40	vmiles	-1.99e-10	2.33e-10	-0.85
vmiles	-1.63e-10	2.41e-10	-0.67	jaild	5.74e-07	5.24e-07	1.10
jaild	7.74e-07	7.15e-07	1.08	comserd	-3.67e-06	2.57e-06	-1.43
comserd	-3.65e-06	2.89e-06	-1.26	pop1517_rate	.000917	.0002604	3.52
pop	-1.89e-12	2.18e-12	-0.87	pop1820_rate	.0000625	.0002803	0.22
pop1517_rate	.0009804	.0002759	3.55	_cons	-.0003895	.0002068	-1.88
pop1820_rate	-.000056	.0002867	-0.20				
pop2124_rate	.0002267	.0002211	1.03				
gspch	-.0000127	.0000141	-0.90				
_cons	-.0004149	.0002154	-1.93				

spircons	.0000126	5.31e-06	2.38	spircons	.0000124	4.94e-06	2.51
unrate	7.57e-08	3.46e-07	0.22	unrate	3.26e-08	3.14e-07	0.10
ln_perinc	.0000359	.0000188	1.91	ln_perinc	.0000344	.0000162	2.12
beertax	-.0000104	6.57e-06	-1.58	dry	5.34e-07	6.81e-07	0.78
ln_sobapt	7.55e-06	7.86e-06	0.96	pop1517_rate	.0010032	.0002906	3.45
vmiles	-2.10e-10	2.21e-10	-0.95	pop1820_rate	-.0000286	.0002608	-0.11
dry	5.43e-07	6.33e-07	0.86	_cons	-.0003589	.0001678	-2.14
pop1517_rate	.000966	.0002761	3.50				
pop1820_rate	.0000752	.0002701	0.28				
_cons	-.000375	.0001975	-1.90				
spircons	.0000122	4.74e-06	2.57				
unrate	2.46e-08	3.19e-07	0.08				
ln_perinc	.0000348	.0000149	2.33				
dry	5.32e-07	6.78e-07	0.78				
pop1517_rate	.0009956	.0002811	3.54				
_cons	-.0003635	.0001536	-2.37				

5.0 Conclusion

In conclusion, based on our analysis, which is a balanced panel data set comprised of states in the U.S. with observations taken yearly for years 1982 – 1988. The data is not a random draw from a larger population, rather, it consists of the population of U.S. States; thus, the random effects model (that assumes the data is randomly selected from a larger population) is not sensible. The random effects model was used to obtain estimates in order to make comparisons to other estimation methods. Based on model selection, we reject the first hypothesis that driving laws have significant effect on reducing the fatality rate. We do not reject our second hypothesis and find evidence to prove that economic factors indeed have a significant effect on fatality rate. We also reject the third hypothesis, as we get evidence to prove that social factors like percent of alcohol consumption are significant.

6.0 Appendix

BEERTAX = 0 by Year and State	Year						
	1982	1983	1984	1985	1986	1987	1988
	Mandatory Jail Sentence	Mandatory Jail Sentence	Mandatory Jail Sentence	Mandatory Jail Sentence	Mandatory Jail Sentence	Mandatory Jail Sentence	Mandatory Jail Sentence
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
State ID (FIPS) Code							
AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA	0.00	0.00	0.00	0.00	0.00	0.00	.
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CT	0.00	0.00	0.00	.	.	.	.
DE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NV	0.00	.	.	.	.	.	.
NH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	.	.	.	.	0.00	0.00
OK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OR	0.00	0.00	.	.	.	.	.
PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SC	0.00	.	.	.	.	.	.
SD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TX	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UT	0.00	.	.	.	.	.	.
VT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WI	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DRY=0 by Year and State	Year						
	1982	1983	1984	1985	1986	1987	1988
	% Residing in Dry Counties	% Residing in Dry Counties	% Residing in Dry Counties	% Residing in Dry Counties	% Residing in Dry Counties	% Residing in Dry Counties	% Residing in Dry Counties
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
State ID (FIPS) Code							
AZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NV	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TN	.	.	.	.	0.00	0.00	0.00
VA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WV	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WY	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COMSERD=0 by Year and State

	Year						
	1982	1983	1984	1985	1986	1987	1988
	Mandatory Community Service	Mandatory Community Service	Mandatory Community Service	Mandatory Community Service	Mandatory Community Service	Mandatory Community Service	Mandatory Community Service
	Sum	Sum	Sum	Sum	Sum	Sum	Sum
State ID (FIPS) Code							
AL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA	0.00	0.00	0.00	0.00	0.00	0.00	.
CT	0.00	0.00	0.00	.	.	.	.
DE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ID	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IL	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ME	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NV	0.00	.	.	.	.	.	.
NH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NM	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NC	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OR	0.00	0.00	.	.	.	.	.
PA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SC	0.00	.	.	.	.	.	.
SD	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TX	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UT	0.00	.	.	.	.	.	.
VT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WV	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WI	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WY	0.00	0.00	0.00	0.00	0.00	0.00	0.00

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> ralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate
> rate gspch i.year, fe vce(cluster  state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8152                                         min =         6
     between = 0.2834                                         avg =       7.0
     overall = 0.3222                                         max =         7

                                                F(29,47)           =         .
corr(u_i, Xb)  = -0.4307                        Prob > F           =         .
```

Step 1 Model (R1): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000352	.0000111	3.19	0.003	.000013	.0000575
unrate	-1.81e-06	8.88e-07	-2.04	0.047	-3.60e-06	-2.68e-08
ln_perinc	.0000943	.0000301	3.13	0.003	.0000337	.0001549
beertax	-.0000139	9.75e-06	-1.42	0.161	-.0000335	5.73e-06
ln_sobapt	.0000272	.0000311	0.87	0.386	-.0000353	.0000897
ln_mormon	-.0000194	.0000262	-0.74	0.463	-.0000721	.0000333
mlda	9.45e-07	1.07e-06	0.88	0.381	-1.21e-06	3.10e-06
dry	1.11e-06	4.53e-07	2.45	0.018	1.99e-07	2.02e-06
yngdrv	.0000634	.0000531	1.19	0.238	-.0000434	.0001702
vmiles	1.40e-09	3.49e-10	4.00	0.000	6.94e-10	2.10e-09
jaild	-1.39e-06	2.07e-06	-0.67	0.504	-5.55e-06	2.77e-06
comserd	8.21e-06	4.16e-06	1.97	0.054	-1.62e-07	.0000166
ralln	1.354405	.1723115	7.86	0.000	1.007759	1.701051
mra1517	.0523947	.0149943	3.49	0.001	.02223	.0825594
mra1517n	-.0777077	.031065	-2.50	0.016	-.1402023	-.015213
mra1820	.0702242	.0093801	7.49	0.000	.0513539	.0890946
mra1820n	-.0543998	.0281293	-1.93	0.059	-.1109887	.0021891
mra2124	.0798483	.0121784	6.56	0.000	.0553486	.104348
mra2124n	-.1151565	.0357295	-3.22	0.002	-.1870349	-.0432781
mraidall	.1491037	.0776248	1.92	0.061	-.0070572	.3052647
pop	1.47e-12	2.00e-12	0.74	0.466	-2.56e-12	5.50e-12
pop1517_rate	-.0000273	.0005345	-0.05	0.959	-.0011026	.001048
pop1820_rate	-.0000288	.0006142	-0.05	0.963	-.0012645	.0012069
pop2124_rate	-.0000241	.000445	-0.05	0.957	-.0009193	.000871
gspch	-.0000388	.0000292	-1.33	0.191	-.0000975	.00002
year						
1983	2.78e-06	3.08e-06	0.90	0.371	-3.41e-06	8.97e-06
1984	6.04e-08	2.95e-06	0.02	0.984	-5.88e-06	6.00e-06
1985	-5.03e-07	4.25e-06	-0.12	0.906	-9.04e-06	8.04e-06
1986	1.60e-06	6.54e-06	0.24	0.808	-.0000116	.0000147
1987	1.08e-06	7.90e-06	0.14	0.892	-.0000148	.000017
1988	-1.15e-06	8.54e-06	-0.14	0.893	-.0000183	.000016
_cons	-.0009277	.0003041	-3.05	0.004	-.0015394	-.0003159
sigma_u	.00005183					
sigma_e	8.823e-06					
rho	.97183455	(fraction of variance due to u_i)				

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> ralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate
> rate gspch, fe  cluster(state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8125                                         min =         6
     between = 0.2931                                         avg =       7.0
     overall = 0.3310                                         max =         7

                                                F(23,47)           =         .
corr(u_i, Xb)  = -0.4350                        Prob > F           =         .
```

Step 1 Model (R1): c

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000352	9.43e-06	3.74	0.001	.0000163	.0000542
unrate	-1.33e-06	6.21e-07	-2.15	0.037	-2.58e-06	-8.30e-08
ln_perinc	.0000997	.000027	3.69	0.001	.0000454	.000154
beertax	-.000014	9.72e-06	-1.44	0.156	-.0000336	5.55e-06
ln_sobapt	.000028	.000031	0.90	0.370	-.0000343	.0000904
ln_mormon	-.0000178	.0000258	-0.69	0.495	-.0000698	.0000342
mlda	9.00e-07	1.05e-06	0.85	0.397	-1.22e-06	3.02e-06
dry	1.11e-06	4.30e-07	2.59	0.013	2.50e-07	1.98e-06
yngdrv	.0000723	.0000478	1.51	0.137	-.0000237	.0001684
vmiles	1.35e-09	3.29e-10	4.09	0.000	6.86e-10	2.01e-09
jaild	-1.03e-06	1.94e-06	-0.53	0.599	-4.93e-06	2.87e-06
comserd	8.04e-06	4.40e-06	1.83	0.074	-8.20e-07	.0000169
ralln	1.391133	.172189	8.08	0.000	1.044734	1.737533
mra1517	.054705	.0151342	3.61	0.001	.0242589	.0851511
mra1517n	-.0818413	.0328816	-2.49	0.016	-.1479905	-.0156921
mra1820	.0698745	.0088135	7.93	0.000	.0521441	.0876049
mra1820n	-.0563169	.0280791	-2.01	0.051	-.1128048	.0001709
mra2124	.0798523	.012014	6.65	0.000	.0556834	.1040213
mra2124n	-.1182463	.0346906	-3.41	0.001	-.1880348	-.0484579
mraidall	.1469089	.0809589	1.81	0.076	-.0159595	.3097772
pop	1.61e-12	2.06e-12	0.78	0.438	-2.53e-12	5.75e-12
pop1517_rate	.000022	.0004392	0.05	0.960	-.0008615	.0009055
pop1820_rate	.0002864	.0004301	0.67	0.509	-.0005789	.0011517
pop2124_rate	-.0002353	.0003039	-0.77	0.443	-.0008466	.0003761
gspch	-.0000259	.000018	-1.44	0.155	-.0000621	.0000102
_cons	-.0009906	.0002826	-3.51	0.001	-.0015591	-.0004221
sigma_u	.0000516					
sigma_e	8.785e-06					
rho	.97182949	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3466.064**	**24**	**-6884.128**	**-6792.589**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> ralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate
> rate gspch, fe

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8125                                         min =         6
     between = 0.2931                                         avg =       7.0
     overall = 0.3310                                         max =         7

                                                F(25,262)          =     45.42
corr(u_i, Xb)  = -0.4350                        Prob > F           =    0.0000
```

Step 1 Model (R1): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000352	7.36e-06	4.78	0.000	.0000207	.0000497
unrate	-1.33e-06	6.53e-07	-2.04	0.042	-2.62e-06	-4.79e-08
ln_perinc	.0000997	.0000239	4.17	0.000	.0000526	.0001469
beertax	-.000014	9.79e-06	-1.43	0.154	-.0000333	5.26e-06
ln_sobapt	.000028	.0000282	0.99	0.322	-.0000276	.0000837
ln_mormon	-.0000178	.0000245	-0.73	0.468	-.000066	.0000304
mlda	9.00e-07	1.04e-06	0.87	0.388	-1.15e-06	2.95e-06
dry	1.11e-06	7.45e-07	1.50	0.136	-3.53e-07	2.58e-06
yngdrv	.0000723	.0000503	1.44	0.151	-.0000267	.0001713
vmiles	1.35e-09	5.08e-10	2.66	0.008	3.49e-10	2.35e-09
jaild	-1.03e-06	6.88e-06	-0.15	0.881	-.0000146	.0000125
comserd	8.04e-06	7.91e-06	1.02	0.311	-7.54e-06	.0000236
ralln	1.391133	.1465053	9.50	0.000	1.102656	1.679611
mra1517	.054705	.0099582	5.49	0.000	.0350966	.0743133
mra1517n	-.0818413	.0213492	-3.83	0.000	-.1238792	-.0398035
mra1820	.0698745	.0088681	7.88	0.000	.0524127	.0873363
mra1820n	-.0563169	.0159976	-3.52	0.001	-.0878171	-.0248167
mra2124	.0798523	.0100219	7.97	0.000	.0601186	.0995861
mra2124n	-.1182463	.0211036	-5.60	0.000	-.1598006	-.076692
mraidall	.1469089	.0478144	3.07	0.002	.0527594	.2410583
pop	1.61e-12	3.19e-12	0.50	0.614	-4.67e-12	7.89e-12
pop1517_rate	.000022	.0004376	0.05	0.960	-.0008397	.0008836
pop1820_rate	.0002864	.0004791	0.60	0.550	-.0006569	.0012297
pop2124_rate	-.0002353	.000269	-0.87	0.383	-.000765	.0002944
gspch	-.0000259	.0000194	-1.34	0.183	-.0000642	.0000123
_cons	-.0009906	.0002613	-3.79	0.000	-.001505	-.0004761
sigma_u	.0000516					
sigma_e	8.785e-06					
rho	.97182949	(fraction of variance due to u_i)				

F test that all u_i=0: F(**47, 262**) = **9.62** Prob > F = **0.0000**

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3466.064**	**25**	**-6882.128**	**-6786.775**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. estimates store fixed_1

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820
> 4 mra2124n mraidall gspch, fe  cluster(state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8079                                         min =         6
     between = 0.2926                                         avg =       7.0
     overall = 0.3411                                         max =         7

                                                F(14,47)           =         .
corr(u_i, Xb)  = -0.1495                        Prob > F           =         .
```

Step 2 Model (R1): c

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000343**	**5.84e-06**	**5.87**	**0.000**	**.0000225**	**.0000461**
unrate	**-1.36e-06**	**4.96e-07**	**-2.74**	**0.009**	**-2.36e-06**	**-3.62e-07**
ln_perinc	**.0000972**	**.0000226**	**4.29**	**0.000**	**.0000517**	**.0001428**
dry	**1.02e-06**	**3.48e-07**	**2.93**	**0.005**	**3.20e-07**	**1.72e-06**
vmiles	**1.28e-09**	**2.77e-10**	**4.61**	**0.000**	**7.20e-10**	**1.84e-09**
comserd	**6.19e-06**	**3.99e-06**	**1.55**	**0.127**	**-1.83e-06**	**.0000142**
mralln	**1.415417**	**.159427**	**8.88**	**0.000**	**1.094692**	**1.736143**
mra1517	**.0567919**	**.0148848**	**3.82**	**0.000**	**.0268476**	**.0867362**
mra1517n	**-.0846924**	**.0336564**	**-2.52**	**0.015**	**-.1524004**	**-.0169844**
mra1820	**.0686641**	**.008737**	**7.86**	**0.000**	**.0510875**	**.0862407**
mra1820n	**-.0576384**	**.0268356**	**-2.15**	**0.037**	**-.1116246**	**-.0036522**
mra2124	**.0818295**	**.0113983**	**7.18**	**0.000**	**.058899**	**.1047599**
mra2124n	**-.1168128**	**.0337999**	**-3.46**	**0.001**	**-.1848093**	**-.0488162**
mraidall	**.1492288**	**.0771375**	**1.93**	**0.059**	**-.0059519**	**.3044096**
gspch	**-.0000294**	**.0000161**	**-1.82**	**0.075**	**-.0000618**	**3.03e-06**
_cons	**-.0009067**	**.0002228**	**-4.07**	**0.000**	**-.001355**	**-.0004584**
sigma_u	**.00004656**					
sigma_e	**8.728e-06**					
rho	**.96605902**	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3461.97**	**15**	**-6893.941**	**-6836.729**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820
> 4 mra2124n mraidall gspch,  fe

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8079                                         min =         6
     between = 0.2926                                         avg =       7.0
     overall = 0.3411                                         max =         7

                                                F(15,272)          =     76.26
corr(u_i, Xb)  = -0.1495                        Prob > F           =    0.0000
```

Step 2 Model (R1): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000343	5.08e-06	6.76	0.000	.0000243	.0000443
unrate	-1.36e-06	6.01e-07	-2.26	0.025	-2.54e-06	-1.76e-07
ln_perinc	.0000972	.0000197	4.92	0.000	.0000584	.0001361
dry	1.02e-06	7.23e-07	1.41	0.159	-4.02e-07	2.44e-06
vmiles	1.28e-09	4.96e-10	2.58	0.011	3.01e-10	2.25e-09
comserd	6.19e-06	3.86e-06	1.60	0.110	-1.41e-06	.0000138
mralln	1.415417	.138207	10.24	0.000	1.143326	1.687509
mra1517	.0567919	.0096028	5.91	0.000	.0378867	.0756971
mra1517n	-.0846924	.0203956	-4.15	0.000	-.1248458	-.0445391
mra1820	.0686641	.0084845	8.09	0.000	.0519605	.0853677
mra1820n	-.0576384	.0156865	-3.67	0.000	-.0885208	-.0267559
mra2124	.0818295	.0096276	8.50	0.000	.0628753	.1007836
mra2124n	-.1168128	.0204072	-5.72	0.000	-.156989	-.0766365
mraidall	.1492288	.0458012	3.26	0.001	.0590589	.2393988
gspch	-.0000294	.0000181	-1.62	0.106	-.0000651	6.33e-06
_cons	-.0009067	.000194	-4.67	0.000	-.0012887	-.0005248
sigma_u	.00004656					
sigma_e	8.728e-06					
rho	.96605902	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(47, 272)  = 14.28                     Prob > F =  0.0000

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3461.97**	**15**	**-6893.941**	**-6836.729**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. estimates store fixed_2

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall gspch, fe  cluster(state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8061                                         min =         7
     between = 0.2793                                         avg =       7.0
     overall = 0.3284                                         max =         7

Step 3 Model (R1): c                            F(13,47)           =         .
corr(u_i, Xb)  = -0.1514                        Prob > F           =         .

                                    (Std. Err. adjusted for 48 clusters in  state)
```

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000342	5.64e-06	6.08	0.000	.0000229	.0000456
unrate	-1.37e-06	4.95e-07	-2.77	0.008	-2.37e-06	-3.76e-07
ln_perinc	.0000992	.0000219	4.53	0.000	.0000551	.0001433
dry	1.05e-06	3.31e-07	3.16	0.003	3.81e-07	1.71e-06
vmiles	1.27e-09	2.86e-10	4.44	0.000	6.93e-10	1.84e-09
mralln	1.410741	.1618722	8.72	0.000	1.085096	1.736386
mra1517	.0583499	.0151142	3.86	0.000	.0279441	.0887558
mra1517n	-.085456	.0341999	-2.50	0.016	-.1542573	-.0166547
mra1820	.0683972	.0086825	7.88	0.000	.0509304	.0858641
mra1820n	-.0596094	.0272638	-2.19	0.034	-.1144571	-.0047617
mra2124	.080191	.011086	7.23	0.000	.0578889	.102493
mra2124n	-.1155874	.0339027	-3.41	0.001	-.183791	-.0473839
mraidall	.1532561	.0796802	1.92	0.061	-.0070398	.3135521
gspch	-.000026	.0000164	-1.58	0.120	-.000059	7.01e-06
_cons	-.0009239	.0002153	-4.29	0.000	-.001357	-.0004909
sigma_u	.00004701					
sigma_e	8.737e-06					
rho	.96661904	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	336	3195.659	3471.224	14	-6914.448	-6861.008

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall gspch, fe

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8061                                         min =         7
     between = 0.2793                                         avg =       7.0
     overall = 0.3284                                         max =         7

                                                F(14,274)          =     81.35
corr(u_i, Xb)  = -0.1514                        Prob > F           =    0.0000
```

Step 3 Model (R1): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000342	5.07e-06	6.76	0.000	.0000243	.0000442
unrate	-1.37e-06	6.01e-07	-2.28	0.023	-2.56e-06	-1.89e-07
ln_perinc	.0000992	.0000197	5.03	0.000	.0000604	.000138
dry	1.05e-06	7.24e-07	1.45	0.149	-3.77e-07	2.47e-06
vmiles	1.27e-09	4.96e-10	2.55	0.011	2.90e-10	2.24e-09
mralln	1.410741	.138266	10.20	0.000	1.138543	1.68294
mra1517	.0583499	.0095484	6.11	0.000	.0395524	.0771474
mra1517n	-.085456	.0204101	-4.19	0.000	-.1256366	-.0452754
mra1820	.0683972	.0084853	8.06	0.000	.0516926	.0851019
mra1820n	-.0596094	.0156526	-3.81	0.000	-.090424	-.0287948
mra2124	.080191	.0095828	8.37	0.000	.0613257	.0990563
mra2124n	-.1155874	.0204086	-5.66	0.000	-.1557651	-.0754098
mraidall	.1532561	.0457787	3.35	0.001	.0631335	.2433788
gspch	-.000026	.000018	-1.44	0.150	-.0000615	9.47e-06
_cons	-.0009239	.0001938	-4.77	0.000	-.0013055	-.0005423
sigma_u	.00004701					
sigma_e	8.737e-06					
rho	.96661904	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(47, 274)  = 15.96                     Prob > F =  0.0000

. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	336	3195.659	3471.224	14	-6914.448	-6861.008

```
Note: N=Obs used in calculating BIC; see [R] BIC note.

. estimates store fixed_3

.
end of do-file
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall, fe  cluster(state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8046                                         min =         7
     between = 0.2776                                         avg =       7.0
     overall = 0.3268                                         max =         7

                                                F(12,47)           =         .
corr(u_i, Xb)  = -0.1505                        Prob > F           =         .

                                    (Std. Err. adjusted for 48 clusters in  state)
```

Step 4 Model (R1): c

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000338	5.69e-06	5.94	0.000	.0000224	.0000453
unrate	-1.07e-06	4.92e-07	-2.17	0.035	-2.06e-06	-7.98e-08
ln_perinc	.0001008	.0000221	4.55	0.000	.0000563	.0001453
dry	1.06e-06	3.27e-07	3.24	0.002	4.01e-07	1.72e-06
vmiles	1.19e-09	2.92e-10	4.06	0.000	5.99e-10	1.77e-09
mralln	1.41105	.1606329	8.78	0.000	1.087898	1.734202
mra1517	.0590784	.0151316	3.90	0.000	.0286375	.0895192
mra1517n	-.0849647	.034653	-2.45	0.018	-.1546777	-.0152518
mra1820	.0688224	.0085781	8.02	0.000	.0515656	.0860793
mra1820n	-.0594129	.0276242	-2.15	0.037	-.1149856	-.0038401
mra2124	.0793785	.0115537	6.87	0.000	.0561356	.1026215
mra2124n	-.1118069	.0332259	-3.37	0.002	-.1786487	-.0449651
mraidall	.1530014	.0812487	1.88	0.066	-.0104498	.3164526
_cons	-.0009413	.0002176	-4.33	0.000	-.001379	-.0005036
sigma_u	.00004706					
sigma_e	8.754e-06					
rho	.96655894	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	336	3195.659	3469.951	13	-6913.902	-6864.28

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall, fe

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8046                                         min =         7
     between = 0.2776                                         avg =       7.0
     overall = 0.3268                                         max =         7

                                                F(13,275)          =     87.10
corr(u_i, Xb)  = -0.1505                        Prob > F           =    0.0000
```

Step 4 Model (R1): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000338	5.07e-06	6.67	0.000	.0000238	.0000438
unrate	-1.07e-06	5.64e-07	-1.89	0.059	-2.18e-06	4.19e-08
ln_perinc	.0001008	.0000197	5.11	0.000	.000062	.0001396
dry	1.06e-06	7.25e-07	1.46	0.145	-3.69e-07	2.49e-06
vmiles	1.19e-09	4.94e-10	2.40	0.017	2.13e-10	2.16e-09
mralln	1.41105	.138538	10.19	0.000	1.13832	1.68378
mra1517	.0590784	.0095538	6.18	0.000	.0402705	.0778862
mra1517n	-.0849647	.0204475	-4.16	0.000	-.1252182	-.0447113
mra1820	.0688224	.0084968	8.10	0.000	.0520953	.0855496
mra1820n	-.0594129	.0156828	-3.79	0.000	-.0902864	-.0285393
mra2124	.0793785	.0095851	8.28	0.000	.060509	.0982481
mra2124n	-.1118069	.0202797	-5.51	0.000	-.1517302	-.0718837
mraidall	.1530014	.0458685	3.34	0.001	.0627035	.2432994
_cons	-.0009413	.0001938	-4.86	0.000	-.0013229	-.0005597
sigma_u	.00004706					
sigma_e	8.754e-06					
rho	.96655894	(fraction of variance due to u_i)				

F test that all u_i=0: F(**47, 275**) = **15.96** Prob > F = **0.0000**

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	336	3195.659	3469.951	13	-6913.902	-6864.28

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. estimates store fixed_4

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> ralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate
> rate gspch, re

Random-effects GLS regression                   Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.7627                                         min =         6
     between = 0.9630                                         avg =       7.0
     overall = 0.9413                                         max =         7

                                                Wald chi2(24)      =         .
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =         .
```

Step 1 Model (R1): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	7.33e-06	2.34e-06	3.14	0.002	2.75e-06	.0000119
unrate	-1.52e-06	5.78e-07	-2.63	0.009	-2.65e-06	-3.87e-07
ln_perinc	-.000035	.0000147	-2.38	0.017	-.0000639	-6.19e-06
beertax	3.77e-06	3.55e-06	1.06	0.289	-3.19e-06	.0000107
ln_sobapt	8.41e-06	1.73e-06	4.86	0.000	5.01e-06	.0000118
ln_mormon	6.94e-06	1.92e-06	3.61	0.000	3.17e-06	.0000107
mlda	9.74e-07	1.06e-06	0.92	0.356	-1.10e-06	3.04e-06
dry	1.23e-07	1.68e-07	0.73	0.465	-2.07e-07	4.52e-07
yngdrv	.0001008	.0000485	2.08	0.038	5.82e-06	.0001958
vmiles	1.67e-09	5.68e-10	2.94	0.003	5.55e-10	2.78e-09
jaild	6.57e-07	3.40e-06	0.19	0.847	-6.00e-06	7.32e-06
comserd	4.33e-06	3.89e-06	1.11	0.266	-3.29e-06	.0000119
mralln	1.691318	.1599576	10.57	0.000	1.377807	2.004829
mra1517	.0691969	.0112994	6.12	0.000	.0470504	.0913433
mra1517n	-.1015923	.024663	-4.12	0.000	-.1499309	-.0532537
mra1820	.103745	.0096303	10.77	0.000	.08487	.12262
mra1820n	-.1071737	.0180661	-5.93	0.000	-.1425826	-.0717647
mra2124	.1225913	.0109685	11.18	0.000	.1010935	.1440891
mra2124n	-.1688907	.0239419	-7.05	0.000	-.2158159	-.1219655
mraidall	.1615826	.0507559	3.18	0.001	.0621029	.2610623
pop	1.97e-13	3.15e-13	0.62	0.532	-4.21e-13	8.15e-13
pop1517_rate	-.0003058	.000407	-0.75	0.452	-.0011035	.0004918
pop1820_rate	-.0005528	.0004874	-1.13	0.257	-.0015081	.0004025
pop2124_rate	-.0001561	.0002706	-0.58	0.564	-.0006863	.0003742
gspch	-.0000135	.0000208	-0.65	0.517	-.0000543	.0000273
_cons	.0003643	.0001486	2.45	0.014	.0000731	.0006555
sigma_u	6.347e-06					
sigma_e	8.785e-06					
rho	.34294777	(fraction of variance due to u_i)				

```
. estimates store  random_1

. hausman fixed_1  random_1

Note: the rank of the differenced variance matrix (15) does not equal the number of coefficients b
        tested (25); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_1	(B) random_1	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	.0000352	7.33e-06	.0000279	6.98e-06
unrate	-1.33e-06	-1.52e-06	1.86e-07	3.03e-07
ln_perinc	.0000997	-.000035	.0001348	.0000189
beertax	-.000014	3.77e-06	-.0000178	9.12e-06
ln_sobapt	.000028	8.41e-06	.0000196	.0000282
ln_mormon	-.0000178	6.94e-06	-.0000247	.0000244
mlda	9.00e-07	9.74e-07	-7.38e-08	.
dry	1.11e-06	1.23e-07	9.92e-07	7.26e-07
yngdrv	.0000723	.0001008	-.0000285	.0000134
vmiles	1.35e-09	1.67e-09	-3.21e-10	.
jaild	-1.03e-06	6.57e-07	-1.68e-06	5.98e-06
comserd	8.04e-06	4.33e-06	3.72e-06	6.89e-06
mralln	1.391133	1.691318	-.3001843	.
mra1517	.054705	.0691969	-.0144919	.
mra1517n	-.0818413	-.1015923	.019751	.
mra1820	.0698745	.103745	-.0338705	.
mra1820n	-.0563169	-.1071737	.0508568	.
mra2124	.0798523	.1225913	-.042739	.
mra2124n	-.1182463	-.1688907	.0506444	.

mraidall	.1469089	.1615826	-.0146737	.
pop	1.61e-12	1.97e-13	1.41e-12	3.17e-12
pop1517_rate	.000022	-.0003058	.0003278	.0001608
pop1820_rate	.0002864	-.0005528	.0008392	.
pop2124_rate	-.0002353	-.0001561	-.0000792	.
gspch	-.0000259	-.0000135	-.0000125	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**15**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **-85.95** chi2<0 ==> model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820
> 4 mra2124n mraidall gspch, re

Random-effects GLS regression — Number of obs = **335**
Group variable: **state** — Number of groups = **48**

R-sq:
within = **0.7553**
between = **0.9534**
overall = **0.9257**

Obs per group:
min = **6**
avg = **7.0**
max = **7**

Wald chi2(**15**) = **1650.19**
corr(u_i, X) = **0** (assumed) — Prob > chi2 = **0.0000**

Step 2 Model (R1): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	2.37e-06	2.36e-06	1.00	0.315	-2.26e-06	7.00e-06
unrate	-2.07e-06	5.64e-07	-3.67	0.000	-3.18e-06	-9.64e-07
ln_perinc	-.0000392	.0000123	-3.18	0.001	-.0000633	-.000015
dry	4.80e-07	1.91e-07	2.51	0.012	1.05e-07	8.55e-07
vmiles	2.01e-09	5.71e-10	3.51	0.000	8.87e-10	3.13e-09
comserd	.0000125	3.34e-06	3.73	0.000	5.91e-06	.000019
mralln	1.763377	.1574153	11.20	0.000	1.454849	2.071905
mra1517	.0736688	.0112411	6.55	0.000	.0516366	.0957011
mra1517n	-.1097727	.0245678	-4.47	0.000	-.1579246	-.0616208
mra1820	.1060202	.0094196	11.26	0.000	.0875581	.1244822
mra1820n	-.1081812	.0182374	-5.93	0.000	-.1439259	-.0724366
mra2124	.1272756	.0108026	11.78	0.000	.1061028	.1484483
mra2124n	-.1869631	.0234694	-7.97	0.000	-.2329623	-.1409638
mraidall	.1738138	.0519504	3.35	0.001	.0719928	.2756348
gspch	-.0000239	.0000208	-1.15	0.251	-.0000647	.0000169
_cons	.0004104	.0001209	3.39	0.001	.0001735	.0006473
sigma_u	9.021e-06					
sigma_e	8.728e-06					
rho	.51654028	(fraction of variance due to u_i)				

```
. estimates store  random_2

. hausman fixed_2  random_2

Note: the rank of the differenced variance matrix (9) does not equal the number of coefficients be
        tested (15); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_2	(B) random_2	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	**.0000343**	**2.37e-06**	**.0000319**	**4.49e-06**
unrate	**-1.36e-06**	**-2.07e-06**	**7.10e-07**	**2.08e-07**
ln_perinc	**.0000972**	**-.0000392**	**.0001364**	**.0000154**
dry	**1.02e-06**	**4.80e-07**	**5.41e-07**	**6.97e-07**
vmiles	**1.28e-09**	**2.01e-09**	**-7.29e-10**	**.**
comserd	**6.19e-06**	**.0000125**	**-6.26e-06**	**1.94e-06**
mralln	**1.415417**	**1.763377**	**-.3479596**	**.**
mra1517	**.0567919**	**.0736688**	**-.0168769**	**.**
mra1517n	**-.0846924**	**-.1097727**	**.0250803**	**.**
mra1820	**.0686641**	**.1060202**	**-.037356**	**.**
mra1820n	**-.0576384**	**-.1081812**	**.0505429**	**.**
mra2124	**.0818295**	**.1272756**	**-.0454461**	**.**
mra2124n	**-.1168128**	**-.1869631**	**.0701503**	**.**
mraidall	**.1492288**	**.1738138**	**-.0245849**	**.**
gspch	**-.0000294**	**-.0000239**	**-5.50e-06**	**.**

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(9) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =      266.30
              Prob>chi2 =      0.0000
               (V_b-V_B is not positive definite)

.
end of do-file

   . do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall gspch, re

Random-effects GLS regression                   Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.7538                                         min =         7
     between = 0.9473                                         avg =       7.0
     overall = 0.9183                                         max =         7

                                                Wald chi2(14)      =   1535.42
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

Step 3 Model (R1): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	2.63e-06	2.45e-06	1.07	0.283	-2.17e-06	7.43e-06
unrate	-2.15e-06	5.76e-07	-3.74	0.000	-3.28e-06	-1.02e-06
ln_perinc	-.0000375	.0000127	-2.95	0.003	-.0000624	-.0000126
dry	3.97e-07	1.98e-07	2.00	0.046	7.82e-09	7.85e-07
vmiles	1.93e-09	5.78e-10	3.34	0.001	7.97e-10	3.06e-09
mralln	1.75107	.159314	10.99	0.000	1.438821	2.06332
mra1517	.0782607	.0112622	6.95	0.000	.0561872	.1003343
mra1517n	-.1127829	.0247743	-4.55	0.000	-.1613397	-.0642262
mra1820	.1054713	.0095307	11.07	0.000	.0867916	.1241511
mra1820n	-.1120344	.0183685	-6.10	0.000	-.148036	-.0760329
mra2124	.1252482	.0109318	11.46	0.000	.1038224	.146674
mra2124n	-.1862506	.02372	-7.85	0.000	-.232741	-.1397603
mraidall	.1853879	.0525576	3.53	0.000	.0823768	.288399
gspch	-.0000176	.000021	-0.84	0.402	-.0000587	.0000235
_cons	.0003977	.0001245	3.19	0.001	.0001537	.0006417
sigma_u	9.462e-06					
sigma_e	8.737e-06					
rho	.53976815	(fraction of variance due to u_i)				

```
. estimates store  random_3

. hausman fixed_3  random_3

Note: the rank of the differenced variance matrix (10) does not equal the number of coefficients b
        tested (14); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_3	(B) random_3	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	.0000342	2.63e-06	.0000316	4.44e-06
unrate	-1.37e-06	-2.15e-06	7.81e-07	1.71e-07
ln_perinc	.0000992	-.0000375	.0001367	.0000151
dry	1.05e-06	3.97e-07	6.50e-07	6.96e-07
vmiles	1.27e-09	1.93e-09	-6.62e-10	.
mralln	1.410741	1.75107	-.340329	.
mra1517	.0583499	.0782607	-.0199108	.
mra1517n	-.085456	-.1127829	.0273269	.
mra1820	.0683972	.1054713	-.0370741	.
mra1820n	-.0596094	-.1120344	.052425	.
mra2124	.080191	.1252482	-.0450572	.
mra2124n	-.1155874	-.1862506	.0706632	.
mraidall	.1532561	.1853879	-.0321318	.
gspch	-.000026	-.0000176	-8.43e-06	.

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(10) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                       =   -74.08     chi2<0 ==> model fitted on  these
                                      data fails to meet the asymptotic
                                      assumptions of the Hausman test;
                                      see suest for a generalized  test
```

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall, re

Random-effects GLS regression                   Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.7529                                         min =         7
     between = 0.9487                                         avg =       7.0
     overall = 0.9191                                         max =         7

                                                Wald chi2(13)      =   1520.10
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

Step 4 Model (R1): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	2.44e-06	2.45e-06	0.99	0.320	-2.37e-06	7.25e-06
unrate	-2.00e-06	5.44e-07	-3.68	0.000	-3.07e-06	-9.37e-07
ln_perinc	-.0000372	.0000128	-2.92	0.004	-.0000622	-.0000122
dry	3.86e-07	2.00e-07	1.93	0.053	-5.27e-09	7.77e-07
vmiles	1.88e-09	5.75e-10	3.27	0.001	7.55e-10	3.01e-09
mralln	1.747112	.1588688	11.00	0.000	1.435735	2.05849
mra1517	.0784941	.0112145	7.00	0.000	.0565142	.1004741
mra1517n	-.112186	.0246737	-4.55	0.000	-.1605455	-.0638264
mra1820	.1053127	.0095008	11.08	0.000	.0866915	.1239339
mra1820n	-.1109093	.0182989	-6.06	0.000	-.1467745	-.075044
mra2124	.1240495	.010882	11.40	0.000	.1027211	.1453778
mra2124n	-.1828111	.0234532	-7.79	0.000	-.2287787	-.1368436
mraidall	.1862546	.0524277	3.55	0.000	.0834982	.289011
_cons	.000394	.000125	3.15	0.002	.0001491	.000639
sigma_u	9.655e-06					
sigma_e	8.754e-06					
rho	.54884098	(fraction of variance due to u_i)				

```
. estimates store  random_4

. hausman fixed_4  random_4

Note: the rank of the differenced variance matrix (9) does not equal the number of coefficients be
        tested (13); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_4	(B) random_4	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	.0000338	2.44e-06	.0000314	4.44e-06
unrate	-1.07e-06	-2.00e-06	9.35e-07	1.49e-07
ln_perinc	.0001008	-.0000372	.000138	.0000151
dry	1.06e-06	3.86e-07	6.72e-07	6.97e-07
vmiles	1.19e-09	1.88e-09	-6.96e-10	.
mralln	1.41105	1.747112	-.3360627	.
mra1517	.0590784	.0784941	-.0194158	.
mra1517n	-.0849647	-.112186	.0272212	.
mra1820	.0688224	.1053127	-.0364903	.
mra1820n	-.0594129	-.1109093	.0514964	.
mra2124	.0793785	.1240495	-.0446709	.
mra2124n	-.1118069	-.1828111	.0710042	.

```
    mraidall |     .1530014      .1862546       -.0332532              .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(9) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =   -48.22    chi2<0 ==> model fitted on  these
                                        data fails to meet the asymptotic
                                        assumptions of the Hausman test;
                                        see suest for a generalized  test

.
end of do-file

.
```

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3468.484**	**30**	**-6876.967**	**-6762.543**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. estimates store Dummy_year1

. testparm i.year

 ( 1)  1983.year = 0
 ( 2)  1984.year = 0
 ( 3)  1985.year = 0
 ( 4)  1986.year = 0
 ( 5)  1987.year = 0
 ( 6)  1988.year = 0

       F(  6,     47) =     0.38
            Prob > F =     0.8888

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820
> 4 mra2124n mraidall i.year, fe vce(cluster  state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8102                                         min =         6
     between = 0.2585                                         avg =       7.0
     overall = 0.3091                                         max =         7

                                                F(19,47)           =         .
corr(u_i, Xb)  = -0.1812                        Prob > F           =         .
```

Step 2 Model (R1): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000349	9.18e-06	3.80	0.000	.0000164	.0000534
unrate	-1.67e-06	6.11e-07	-2.73	0.009	-2.90e-06	-4.39e-07
ln_perinc	.0000959	.0000268	3.58	0.001	.000042	.0001498
dry	1.01e-06	3.45e-07	2.92	0.005	3.12e-07	1.70e-06
vmiles	1.31e-09	3.15e-10	4.15	0.000	6.73e-10	1.94e-09
comserd	5.59e-06	3.88e-06	1.44	0.156	-2.21e-06	.0000134
mralln	1.374403	.1578429	8.71	0.000	1.056864	1.691942
mra1517	.053839	.0150265	3.58	0.001	.0236096	.0840684
mra1517n	-.0826853	.0322848	-2.56	0.014	-.147634	-.0177366
mra1820	.0696256	.0089287	7.80	0.000	.0516634	.0875877
mra1820n	-.055613	.0268766	-2.07	0.044	-.1096817	-.0015443
mra2124	.077829	.0124045	6.27	0.000	.0528743	.1027837
mra2124n	-.1123665	.0340254	-3.30	0.002	-.1808168	-.0439163
mraidall	.1447083	.0761934	1.90	0.064	-.008573	.2979897
year						
1983	5.69e-07	1.82e-06	0.31	0.755	-3.08e-06	4.22e-06
1984	-3.24e-06	2.24e-06	-1.45	0.155	-7.74e-06	1.27e-06

1985	**-2.30e-06**	**2.96e-06**	**-0.78**	**0.442**	**-8.25e-06**	**3.66e-06**
1986	**-3.30e-07**	**3.77e-06**	**-0.09**	**0.931**	**-7.91e-06**	**7.25e-06**
1987	**-5.28e-07**	**4.56e-06**	**-0.12**	**0.908**	**-9.71e-06**	**8.65e-06**
1988	**-3.23e-06**	**4.96e-06**	**-0.65**	**0.518**	**-.0000132**	**6.75e-06**
_cons	**-.0008893**	**.000254**	**-3.50**	**0.001**	**-.0014002**	**-.0003784**
sigma_u	**.00004798**					
sigma_e	**8.755e-06**					
rho	**.9677747**	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3464.024**	**20**	**-6888.049**	**-6811.766**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
. estimates store Dummy_year2

. testparm i.year

 ( 1)  1983.year = 0
 ( 2)  1984.year = 0
 ( 3)  1985.year = 0
 ( 4)  1986.year = 0
 ( 5)  1987.year = 0
 ( 6)  1988.year = 0

       F(  6,    47) =    1.09
            Prob > F =    0.3817

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> ralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate
> rate gspch, fe vce(cluster  state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8125                                         min =         6
     between = 0.2931                                         avg =       7.0
     overall = 0.3310                                         max =         7

                                                F(23,47)           =         .
corr(u_i, Xb)  = -0.4350                        Prob > F           =         .
```

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000352**	**9.43e-06**	**3.74**	**0.001**	**.0000163**	**.0000542**
unrate	**-1.33e-06**	**6.21e-07**	**-2.15**	**0.037**	**-2.58e-06**	**-8.30e-08**
ln_perinc	**.0000997**	**.000027**	**3.69**	**0.001**	**.0000454**	**.000154**
beertax	**-.000014**	**9.72e-06**	**-1.44**	**0.156**	**-.0000336**	**5.55e-06**
ln_sobapt	**.000028**	**.000031**	**0.90**	**0.370**	**-.0000343**	**.0000904**
ln_mormon	**-.0000178**	**.0000258**	**-0.69**	**0.495**	**-.0000698**	**.0000342**
mlda	**9.00e-07**	**1.05e-06**	**0.85**	**0.397**	**-1.22e-06**	**3.02e-06**
dry	**1.11e-06**	**4.30e-07**	**2.59**	**0.013**	**2.50e-07**	**1.98e-06**
yngdrv	**.0000723**	**.0000478**	**1.51**	**0.137**	**-.0000237**	**.0001684**
vmiles	**1.35e-09**	**3.29e-10**	**4.09**	**0.000**	**6.86e-10**	**2.01e-09**
jaild	**-1.03e-06**	**1.94e-06**	**-0.53**	**0.599**	**-4.93e-06**	**2.87e-06**
comserd	**8.04e-06**	**4.40e-06**	**1.83**	**0.074**	**-8.20e-07**	**.0000169**
mralln	**1.391133**	**.172189**	**8.08**	**0.000**	**1.044734**	**1.737533**
mra1517	**.054705**	**.0151342**	**3.61**	**0.001**	**.0242589**	**.0851511**
mra1517n	**-.0818413**	**.0328816**	**-2.49**	**0.016**	**-.1479905**	**-.0156921**
mra1820	**.0698745**	**.0088135**	**7.93**	**0.000**	**.0521441**	**.0876049**
mra1820n	**-.0563169**	**.0280791**	**-2.01**	**0.051**	**-.1128048**	**.0001709**
mra2124	**.0798523**	**.012014**	**6.65**	**0.000**	**.0556834**	**.1040213**
mra2124n	**-.1182463**	**.0346906**	**-3.41**	**0.001**	**-.1880348**	**-.0484579**
mraidall	**.1469089**	**.0809589**	**1.81**	**0.076**	**-.0159595**	**.3097772**
pop	**1.61e-12**	**2.06e-12**	**0.78**	**0.438**	**-2.53e-12**	**5.75e-12**
pop1517_rate	**.000022**	**.0004392**	**0.05**	**0.960**	**-.0008615**	**.0009055**
pop1820_rate	**.0002864**	**.0004301**	**0.67**	**0.509**	**-.0005789**	**.0011517**
pop2124_rate	**-.0002353**	**.0003039**	**-0.77**	**0.443**	**-.0008466**	**.0003761**
gspch	**-.0000259**	**.000018**	**-1.44**	**0.155**	**-.0000621**	**.0000102**
_cons	**-.0009906**	**.0002826**	**-3.51**	**0.001**	**-.0015591**	**-.0004221**
sigma_u	**.0000516**					
sigma_e	**8.785e-06**					
rho	**.97182949**	(fraction of variance due to u_i)				

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820
> 4 mra2124n  mraidall, fe vce(cluster  state)

Fixed-effects (within) regression               Number of obs      =       335
  Group variable: state                         Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8060                                         min =         6
      between = 0.2890                                        avg =       7.0
      overall = 0.3378                                        max =         7

                                                F(13,47)           =         .
corr(u_i, Xb)  = -0.1488                        Prob > F           =         .
```

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000338**	**5.90e-06**	**5.74**	**0.000**	**.000022**	**.0000457**
unrate	**-1.02e-06**	**4.95e-07**	**-2.06**	**0.045**	**-2.02e-06**	**-2.55e-08**
ln_perinc	**.0000993**	**.0000228**	**4.35**	**0.000**	**.0000533**	**.0001452**
dry	**1.04e-06**	**3.39e-07**	**3.05**	**0.004**	**3.53e-07**	**1.72e-06**
vmiles	**1.19e-09**	**2.85e-10**	**4.16**	**0.000**	**6.11e-10**	**1.76e-09**
comserd	**5.47e-06**	**3.66e-06**	**1.50**	**0.141**	**-1.89e-06**	**.0000128**
mralln	**1.414969**	**.1582677**	**8.94**	**0.000**	**1.096576**	**1.733363**
mra1517	**.0578184**	**.01499**	**3.86**	**0.000**	**.0276623**	**.0879744**
mra1517n	**-.0842209**	**.0342589**	**-2.46**	**0.018**	**-.1531409**	**-.015301**
mra1820	**.0690852**	**.0086149**	**8.02**	**0.000**	**.0517543**	**.0864161**
mra1820n	**-.0576341**	**.0273059**	**-2.11**	**0.040**	**-.1125664**	**-.0027017**
mra2124	**.0807398**	**.0119107**	**6.78**	**0.000**	**.0567785**	**.1047011**
mra2124n	**-.1124332**	**.0331194**	**-3.39**	**0.001**	**-.1790609**	**-.0458055**
mraidall	**.149439**	**.0792203**	**1.89**	**0.065**	**-.0099318**	**.3088098**
_cons	**-.0009284**	**.0002248**	**-4.13**	**0.000**	**-.0013807**	**-.0004761**
sigma_u	**.00004668**					
sigma_e	**8.754e-06**					
rho	**.96602283**	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**335**	**3185.648**	**3460.362**	**14**	**-6892.725**	**-6839.327**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\10\STD250c_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra212
> 4n mraidall, fe vce(cluster state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.8046                                         min =         7
     between = 0.2776                                         avg =       7.0
     overall = 0.3268                                         max =         7

                                                F(12,47)           =         .
corr(u_i, Xb)  = -0.1505                        Prob > F           =         .
```

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000338**	**5.69e-06**	**5.94**	**0.000**	**.0000224**	**.0000453**
unrate	**-1.07e-06**	**4.92e-07**	**-2.17**	**0.035**	**-2.06e-06**	**-7.98e-08**
ln_perinc	**.0001008**	**.0000221**	**4.55**	**0.000**	**.0000563**	**.0001453**
dry	**1.06e-06**	**3.27e-07**	**3.24**	**0.002**	**4.01e-07**	**1.72e-06**
vmiles	**1.19e-09**	**2.92e-10**	**4.06**	**0.000**	**5.99e-10**	**1.77e-09**
mralln	**1.41105**	**.1606329**	**8.78**	**0.000**	**1.087898**	**1.734202**
mra1517	**.0590784**	**.0151316**	**3.90**	**0.000**	**.0286375**	**.0895192**
mra1517n	**-.0849647**	**.034653**	**-2.45**	**0.018**	**-.1546777**	**-.0152518**
mra1820	**.0688224**	**.0085781**	**8.02**	**0.000**	**.0515656**	**.0860793**
mra1820n	**-.0594129**	**.0276242**	**-2.15**	**0.037**	**-.1149856**	**-.0038401**
mra2124	**.0793785**	**.0115537**	**6.87**	**0.000**	**.0561356**	**.1026215**
mra2124n	**-.1118069**	**.0332259**	**-3.37**	**0.002**	**-.1786487**	**-.0449651**
mraidall	**.1530014**	**.0812487**	**1.88**	**0.066**	**-.0104498**	**.3164526**
_cons	**-.0009413**	**.0002176**	**-4.33**	**0.000**	**-.001379**	**-.0005036**
sigma_u	**.00004706**					
sigma_e	**8.754e-06**					
rho	**.96655894**	(fraction of variance due to u_i)				

```
. estat ic

Akaike's information criterion and Bayesian information criterion
```

Model	Obs	ll(null)	ll(model)	df	AIC	BIC
.	**336**	**3195.659**	**3469.951**	**13**	**-6913.902**	**-6864.28**

Note: N=Obs used in calculating BIC; see **[R] BIC note**.

```
.
end of do-file

.
```

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
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 Notes:
       1.  Unicode is supported; see help  unicode advice.
       2.  Maximum number of variables is set to 5000; see help set_maxvar.

. doedit "H:\BUAN 6312\Project\Project.do"

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. use "H:\BUAN 6312\Project\car_fatalities.dta"

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. gen pop1517_rate =  pop1517/pop

. gen pop1820_rate =  pop1820/pop

. gen pop2124_rate =  pop2124/pop

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. gen ln_perinc =  ln(perinc)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram perinc
(bin=18, start=9513.7617, width=704.42741)

.
end of do-file
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram ln_perinc
(bin=18, start=9.1604948, width=.04705879)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. gen ln_sobapt =  ln(sobapt+1)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram sobapt
(bin=18, start=0, width=1.6864278)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram ln_sobapt
(bin=18, start=0, width=.19141089)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram mormon
(bin=18, start=.1, width=3.656472)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. gen ln_mormon =  ln(mormon+1)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. histogram ln_mormon
(bin=18, start=.09531018, width=.22822974)

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"
```

```
. miles_pop = miles/pop
command miles_pop is unrecognized
r(199);

end of do-file

r(199);

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. gen miles_pop =  miles/pop

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mldsa dry yngdrv vmiles jaild co
> p pop1517_rate pop1820_rate pop2124_rate gspch, vce (cluster state)
variable mldsa not found
r(111);

end of do-file

r(111);

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. *model 1.9;
. reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild com
>  pop1517_rate pop1820_rate pop2124_rate gspch, vce (cluster  state)

Linear regression                               Number of obs     =        335
                                                F(16, 47)         =          .
                                                Prob > F          =          .
                                                R-squared         =     0.6787
                                                Root MSE          =    3.3e-05
```

Step 1 Model (R2): a

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000293	5.84e-06	5.02	0.000	.0000175	.000041
unrate	-4.18e-06	1.85e-06	-2.26	0.028	-7.90e-06	-4.66e-07
ln_perinc	-.0001957	.0000426	-4.60	0.000	-.0002813	-.0001101
beertax	-.0000175	.0000127	-1.37	0.176	-.0000431	8.14e-06
ln_sobapt	.0000269	6.41e-06	4.20	0.000	.000014	.0000398
ln_mormon	.0000142	7.80e-06	1.82	0.075	-1.48e-06	.0000299
mlda	-3.53e-06	4.26e-06	-0.83	0.412	-.0000121	5.04e-06
dry	-7.31e-07	6.04e-07	-1.21	0.233	-1.95e-06	4.85e-07
yngdrv	.0002041	.0001454	1.40	0.167	-.0000883	.0004965
vmiles	7.52e-09	5.13e-09	1.47	0.149	-2.79e-09	1.78e-08
jaild	.0000126	.000012	1.05	0.298	-.0000115	.0000366
comserd	-3.29e-06	.0000135	-0.24	0.809	-.0000305	.0000239
pop	4.66e-13	7.53e-13	0.62	0.539	-1.05e-12	1.98e-12
pop1517_rate	.0027574	.0020824	1.32	0.192	-.0014319	.0069466
pop1820_rate	-.0032021	.0015545	-2.06	0.045	-.0063293	-.0000748
pop2124_rate	-.0009766	.0009002	-1.08	0.283	-.0027876	.0008343
gspch	-.0000268	.0000864	-0.31	0.757	-.0002007	.000147
_cons	.0020847	.0003778	5.52	0.000	.0013246	.0028449

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. *model 1.9;
. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch, fe vce(cluster state)
must specify panelvar; use xtset
r(459);

end of do-file

r(459);

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtset state year
       panel variable:  state (strongly balanced)
        time variable:  year, 1982 to 1988
                delta:  1 unit

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch, fe vce(cluster state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4542                                         min =         6
     between = 0.0178                                         avg =       7.0
     overall = 0.0092                                         max =         7

                                                F(16,47)           =         .
corr(u_i, Xb)  = -0.8608                        Prob > F           =         .
```

Step 1 Model (R2): c

(Std. Err. adjusted for 48 clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000772	.0000189	4.08	0.000	.0000391	.0001153
unrate	-2.18e-06	1.04e-06	-2.09	0.042	-4.28e-06	-8.52e-08
ln_perinc	.0002555	.0000624	4.10	0.000	.00013	.0003809
beertax	-.0000373	.0000246	-1.51	0.137	-.0000868	.0000123
ln_sobapt	.0000439	.000068	0.64	0.522	-.000093	.0001807
ln_mormon	-.0000334	.0000667	-0.50	0.619	-.0001675	.0001007
mlda	1.66e-06	2.19e-06	0.76	0.452	-2.74e-06	6.07e-06
dry	2.54e-06	1.05e-06	2.42	0.020	4.24e-07	4.65e-06
yngdrv	.0000147	.0000998	0.15	0.884	-.0001861	.0002155
vmiles	1.28e-09	6.94e-10	1.85	0.071	-1.15e-10	2.68e-09
jaild	3.33e-06	2.49e-06	1.34	0.188	-1.68e-06	8.35e-06
comserd	-9.17e-07	.0000112	-0.08	0.935	-.0000234	.0000216
pop	1.15e-12	5.45e-12	0.21	0.833	-9.81e-12	1.21e-11
pop1517_rate	.0030132	.0009964	3.02	0.004	.0010087	.0050177
pop1820_rate	-.0002036	.0008586	-0.24	0.814	-.0019308	.0015237
pop2124_rate	.000126	.0005896	0.21	0.832	-.0010601	.0013121
gspch	-.000019	.000022	-0.86	0.391	-.0000633	.0000252
_cons	-.002572	.0006854	-3.75	0.000	-.0039508	-.0011932
sigma_u	.00010948					
sigma_e	.00001476					

rho	**.98213872**	(fraction of variance due to u_i)

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch, fe cluster (state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4542                                         min =         6
     between = 0.0178                                         avg =       7.0
     overall = 0.0092                                         max =         7

                                                F(16,47)           =         .
corr(u_i, Xb)  = -0.8608                        Prob > F           =         .

                                  (Std. Err. adjusted for 48 clusters in state)
```

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000772**	**.0000189**	**4.08**	**0.000**	**.0000391**	**.0001153**
unrate	**-2.18e-06**	**1.04e-06**	**-2.09**	**0.042**	**-4.28e-06**	**-8.52e-08**
ln_perinc	**.0002555**	**.0000624**	**4.10**	**0.000**	**.00013**	**.0003809**
beertax	**-.0000373**	**.0000246**	**-1.51**	**0.137**	**-.0000868**	**.0000123**
ln_sobapt	**.0000439**	**.000068**	**0.64**	**0.522**	**-.000093**	**.0001807**
ln_mormon	**-.0000334**	**.0000667**	**-0.50**	**0.619**	**-.0001675**	**.0001007**
mlda	**1.66e-06**	**2.19e-06**	**0.76**	**0.452**	**-2.74e-06**	**6.07e-06**
dry	**2.54e-06**	**1.05e-06**	**2.42**	**0.020**	**4.24e-07**	**4.65e-06**
yngdrv	**.0000147**	**.0000998**	**0.15**	**0.884**	**-.0001861**	**.0002155**
vmiles	**1.28e-09**	**6.94e-10**	**1.85**	**0.071**	**-1.15e-10**	**2.68e-09**
jaild	**3.33e-06**	**2.49e-06**	**1.34**	**0.188**	**-1.68e-06**	**8.35e-06**
comserd	**-9.17e-07**	**.0000112**	**-0.08**	**0.935**	**-.0000234**	**.0000216**
pop	**1.15e-12**	**5.45e-12**	**0.21**	**0.833**	**-9.81e-12**	**1.21e-11**
pop1517_rate	**.0030132**	**.0009964**	**3.02**	**0.004**	**.0010087**	**.0050177**
pop1820_rate	**-.0002036**	**.0008586**	**-0.24**	**0.814**	**-.0019308**	**.0015237**
pop2124_rate	**.000126**	**.0005896**	**0.21**	**0.832**	**-.0010601**	**.0013121**
gspch	**-.000019**	**.000022**	**-0.86**	**0.391**	**-.0000633**	**.0000252**
_cons	**-.002572**	**.0006854**	**-3.75**	**0.000**	**-.0039508**	**-.0011932**
sigma_u	**.00010948**					
sigma_e	**.00001476**					
rho	**.98213872**	(fraction of variance due to u_i)				

```
. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch,  fe

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4542                                         min =         6
     between = 0.0178                                         avg =       7.0
     overall = 0.0092                                         max =         7

                                                F(17,270)          =     13.22
corr(u_i, Xb)  = -0.8608                        Prob > F           =    0.0000
```

Step 1 Model (R2): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000772	.0000119	6.50	0.000	.0000539	.0001006
unrate	-2.18e-06	1.07e-06	-2.05	0.042	-4.28e-06	-8.45e-08
ln_perinc	.0002555	.0000375	6.81	0.000	.0001816	.0003293
beertax	-.0000373	.0000163	-2.29	0.023	-.0000693	-5.20e-06
ln_sobapt	.0000439	.0000458	0.96	0.339	-.0000463	.0001341
ln_mormon	-.0000334	.0000408	-0.82	0.414	-.0001136	.0000469
mlda	1.66e-06	1.70e-06	0.98	0.330	-1.69e-06	5.01e-06
dry	2.54e-06	1.24e-06	2.04	0.042	9.03e-08	4.98e-06
yngdrv	.0000147	.0000839	0.18	0.861	-.0001505	.0001799
vmiles	1.28e-09	8.39e-10	1.53	0.128	-3.72e-10	2.93e-09
jaild	3.33e-06	.0000115	0.29	0.771	-.0000192	.0000259
comserd	-9.17e-07	.0000131	-0.07	0.944	-.0000267	.0000249
pop	1.15e-12	5.28e-12	0.22	0.827	-9.25e-12	1.16e-11
pop1517_rate	.0030132	.0006863	4.39	0.000	.001662	.0043644
pop1820_rate	-.0002036	.0007606	-0.27	0.789	-.0017011	.001294
pop2124_rate	.000126	.0004249	0.30	0.767	-.0007106	.0009626
gspch	-.000019	.0000321	-0.59	0.554	-.0000822	.0000442
_cons	-.002572	.0004083	-6.30	0.000	-.0033758	-.0017682
sigma_u	.00010948					
sigma_e	.00001476					
rho	.98213872	(fraction of variance due to u_i)				

F test that all u_i=0: F(47, 270) = 28.40 Prob > F = 0.0000

```
. estimates store fixed_19

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch,  re

Random-effects GLS regression                   Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.3466                                         min =         6
     between = 0.4598                                         avg =       7.0
     overall = 0.4451                                         max =         7

                                                Wald chi2(16)      =         .
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =         .
```

Step 1 Model (R2): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	.0000232	6.89e-06	3.37	0.001	9.70e-06	.0000367
unrate	-5.03e-06	1.08e-06	-4.66	0.000	-7.15e-06	-2.92e-06
ln_perinc	.0000733	.0000343	2.14	0.033	6.07e-06	.0001405
beertax	-.0000157	.0000107	-1.47	0.142	-.0000367	5.24e-06
ln_sobapt	.0000395	5.45e-06	7.26	0.000	.0000289	.0000502
ln_mormon	.0000295	6.37e-06	4.62	0.000	.000017	.0000419
mlda	4.12e-07	1.88e-06	0.22	0.826	-3.27e-06	4.10e-06
dry	3.05e-07	5.55e-07	0.55	0.582	-7.82e-07	1.39e-06
yngdrv	.0002016	.0000883	2.28	0.022	.0000285	.0003747
vmiles	1.86e-09	9.48e-10	1.96	0.050	6.80e-13	3.72e-09
jaild	.0000202	9.17e-06	2.20	0.028	2.21e-06	.0000381
comserd	-.000017	.0000106	-1.60	0.109	-.0000377	3.78e-06
pop	-2.19e-12	1.05e-12	-2.09	0.037	-4.25e-12	-1.35e-13
pop1517_rate	.0030578	.0007263	4.21	0.000	.0016342	.0044813
pop1820_rate	-.0011543	.0008366	-1.38	0.168	-.0027939	.0004853

pop2124_rate	.0004426	.0004427	1.00	0.317	-.0004251	.0013103
gspch	-.0000349	.000036	-0.97	0.333	-.0001055	.0000358
_cons	-.0007311	.0003471	-2.11	0.035	-.0014114	-.0000509
sigma_u	.00002778					
sigma_e	.00001476					
rho	.77968528	(fraction of variance due to u_i)				

```
. estimates store random_19

. hausman fixed_19 random_19

Note: the rank of the differenced variance matrix (15) does not equal the number of coefficients b
        tested (17); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_19	(B) random_19	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	.0000772	.0000232	.000054	9.67e-06
unrate	-2.18e-06	-5.03e-06	2.85e-06	.
ln_perinc	.0002555	.0000733	.0001822	.0000152
beertax	-.0000373	-.0000157	-.0000216	.0000123
ln_sobapt	.0000439	.0000395	4.34e-06	.0000455
ln_mormon	-.0000334	.0000295	-.0000628	.0000403
mlda	1.66e-06	4.12e-07	1.25e-06	.
dry	2.54e-06	3.05e-07	2.23e-06	1.11e-06
yngdrv	.0000147	.0002016	-.0001869	.
vmiles	1.28e-09	1.86e-09	-5.79e-10	.
jaild	3.33e-06	.0000202	-.0000168	6.86e-06
comserd	-9.17e-07	-.000017	.0000161	7.74e-06
pop	1.15e-12	-2.19e-12	3.35e-12	5.18e-12
pop1517_rate	.0030132	.0030578	-.0000446	.
pop1820_rate	-.0002036	-.0011543	.0009508	.
pop2124_rate	.000126	.0004426	-.0003166	.
gspch	-.000019	-.0000349	.0000158	.

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                 chi2(15) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       313.36
               Prob>chi2 =       0.0000
                (V_b-V_B is not positive definite)

.
end of do-file

.
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd
> rate pop1820_rate, vce (cluster  state)

Linear regression                               Number of obs     =        335
                                                F(13, 47)         =      24.56
                                                Prob > F          =     0.0000
                                                R-squared         =     0.6737
                                                Root MSE          =   3.3e-05
```

Step 2 Model (R2): a

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000277	5.78e-06	4.80	0.000	.0000161	.0000393
unrate	-3.82e-06	1.88e-06	-2.03	0.048	-7.60e-06	-3.72e-08
ln_perinc	-.0001949	.0000404	-4.82	0.000	-.0002762	-.0001135
beertax	-.0000163	.0000122	-1.33	0.190	-.0000409	8.33e-06
ln_sobapt	.0000264	6.18e-06	4.27	0.000	.0000139	.0000388
ln_mormon	.0000131	8.77e-06	1.50	0.141	-4.51e-06	.0000308
dry	-8.04e-07	5.42e-07	-1.48	0.145	-1.89e-06	2.86e-07
yngdrv	.0001816	.0001578	1.15	0.256	-.000136	.0004991
vmiles	7.38e-09	4.98e-09	1.48	0.144	-2.63e-09	1.74e-08
jaild	.0000114	.0000125	0.92	0.365	-.0000137	.0000365
comserd	-3.93e-06	.0000139	-0.28	0.778	-.0000319	.000024
pop1517_rate	.0031877	.0019254	1.66	0.104	-.0006856	.0070611
pop1820_rate	-.0044244	.0013791	-3.21	0.002	-.0071989	-.00165
_cons	.0019887	.0004062	4.90	0.000	.0011716	.0028058

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comser
> 7_rate pop1820_rate, fe vce (cluster  state)

Fixed-effects (within) regression               Number of obs     =        335
Group variable: state                           Number of groups  =         48

R-sq:                                           Obs per group:
     within  = 0.4514                                         min =          6
     between = 0.0408                                         avg =        7.0
     overall = 0.0252                                         max =          7

                                                F(12,47)          =          .
corr(u_i, Xb)  = -0.8604                        Prob > F          =          .
```

Step 2 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000762	.0000152	5.00	0.000	.0000455	.0001068
unrate	-2.01e-06	1.01e-06	-2.00	0.052	-4.04e-06	1.39e-08
ln_perinc	.000259	.0000615	4.21	0.000	.0001353	.0003826
beertax	-.0000372	.0000246	-1.51	0.137	-.0000867	.0000122
ln_sobapt	.0000338	.0000618	0.55	0.586	-.0000904	.0001581
ln_mormon	-.000032	.0000661	-0.48	0.631	-.000165	.0001011
dry	2.42e-06	1.02e-06	2.37	0.022	3.68e-07	4.48e-06
yngdrv	.0000193	.000108	0.18	0.859	-.000198	.0002366
vmiles	1.20e-09	7.08e-10	1.69	0.097	-2.25e-10	2.62e-09
jaild	2.74e-06	2.18e-06	1.26	0.215	-1.64e-06	7.12e-06

comserd	**-1.02e-06**	**.0000105**	**-0.10**	**0.923**	**-.0000222**	**.0000201**
pop1517_rate	**.0030783**	**.0009057**	**3.40**	**0.001**	**.0012563**	**.0049003**
pop1820_rate	**-.0002474**	**.0007976**	**-0.31**	**0.758**	**-.001852**	**.0013572**
_cons	**-.0025443**	**.0006545**	**-3.89**	**0.000**	**-.003861**	**-.0012275**
sigma_u	**.00010835**					
sigma_e	**.00001469**					
rho	**.98194142**	(fraction of variance due to u_i)				

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comser
> 7_rate pop1820_rate, fe cluster(state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4514                                         min =         6
     between = 0.0408                                         avg =       7.0
     overall = 0.0252                                         max =         7

                                                F(12,47)           =         .
corr(u_i, Xb)  = -0.8604                        Prob > F           =         .

                                    (Std. Err. adjusted for 48 clusters in state)
```

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	**.0000762**	**.0000152**	**5.00**	**0.000**	**.0000455**	**.0001068**
unrate	**-2.01e-06**	**1.01e-06**	**-2.00**	**0.052**	**-4.04e-06**	**1.39e-08**
ln_perinc	**.000259**	**.0000615**	**4.21**	**0.000**	**.0001353**	**.0003826**
beertax	**-.0000372**	**.0000246**	**-1.51**	**0.137**	**-.0000867**	**.0000122**
ln_sobapt	**.0000338**	**.0000618**	**0.55**	**0.586**	**-.0000904**	**.0001581**
ln_mormon	**-.000032**	**.0000661**	**-0.48**	**0.631**	**-.000165**	**.0001011**
dry	**2.42e-06**	**1.02e-06**	**2.37**	**0.022**	**3.68e-07**	**4.48e-06**
yngdrv	**.0000193**	**.000108**	**0.18**	**0.859**	**-.000198**	**.0002366**
vmiles	**1.20e-09**	**7.08e-10**	**1.69**	**0.097**	**-2.25e-10**	**2.62e-09**
jaild	**2.74e-06**	**2.18e-06**	**1.26**	**0.215**	**-1.64e-06**	**7.12e-06**
comserd	**-1.02e-06**	**.0000105**	**-0.10**	**0.923**	**-.0000222**	**.0000201**
pop1517_rate	**.0030783**	**.0009057**	**3.40**	**0.001**	**.0012563**	**.0049003**
pop1820_rate	**-.0002474**	**.0007976**	**-0.31**	**0.758**	**-.001852**	**.0013572**
_cons	**-.0025443**	**.0006545**	**-3.89**	**0.000**	**-.003861**	**-.0012275**
sigma_u	**.00010835**					
sigma_e	**.00001469**					
rho	**.98194142**	(fraction of variance due to u_i)				

```
. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comser
> 7_rate pop1820_rate, fe

Fixed-effects (within) regression               Number of obs      =       335
  Group variable: state                         Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4514                                         min =         6
      between = 0.0408                                        avg =       7.0
      overall = 0.0252                                        max =         7
```

```
                                                F(13,274)         =      17.35
corr(u_i, Xb)  = -0.8604                        Prob > F          =     0.0000
```

Step 2 Model (R2): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000762	.00001	7.58	0.000	.0000564	.0000959
unrate	-2.01e-06	1.00e-06	-2.01	0.045	-3.99e-06	-4.35e-08
ln_perinc	.000259	.0000366	7.07	0.000	.0001868	.0003311
beertax	-.0000372	.0000162	-2.30	0.022	-.0000691	-5.40e-06
ln_sobapt	.0000338	.0000417	0.81	0.417	-.0000482	.0001159
ln_mormon	-.000032	.0000395	-0.81	0.419	-.0001097	.0000458
dry	2.42e-06	1.21e-06	2.00	0.047	3.47e-08	4.82e-06
yngdrv	.0000193	.0000811	0.24	0.812	-.0001403	.0001789
vmiles	1.20e-09	8.29e-10	1.45	0.149	-4.33e-10	2.83e-09
jaild	2.74e-06	.0000113	0.24	0.809	-.0000196	.000025
comserd	-1.02e-06	.000013	-0.08	0.937	-.0000267	.0000246
pop1517_rate	.0030783	.0005988	5.14	0.000	.0018994	.0042572
pop1820_rate	-.0002474	.0006919	-0.36	0.721	-.0016094	.0011146
_cons	-.0025443	.0003944	-6.45	0.000	-.0033207	-.0017678
sigma_u	.00010835					
sigma_e	.00001469					
rho	.98194142	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(47, 274)  = 29.18                     Prob > F = 0.0000

. estimates store fixed_29

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comser
> 7_rate pop1820_rate, re

Random-effects GLS regression                   Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.3246                                         min =         6
     between = 0.4548                                         avg =       7.0
     overall = 0.4393                                         max =         7

                                                Wald chi2(13)      =    171.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

Step 2 Model (R2): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	.0000266	6.37e-06	4.17	0.000	.0000141	.0000391
unrate	-5.18e-06	9.90e-07	-5.23	0.000	-7.12e-06	-3.23e-06
ln_perinc	.0000465	.0000315	1.48	0.140	-.0000152	.0001082
beertax	-.000016	.0000107	-1.49	0.136	-.0000369	5.00e-06
ln_sobapt	.0000385	5.44e-06	7.08	0.000	.0000278	.0000491
ln_mormon	.0000312	6.38e-06	4.89	0.000	.0000187	.0000437
dry	3.00e-07	5.57e-07	0.54	0.591	-7.93e-07	1.39e-06
yngdrv	.0002435	.0000832	2.93	0.003	.0000804	.0004066
vmiles	1.90e-09	9.44e-10	2.01	0.044	4.84e-11	3.75e-09
jaild	.0000217	9.10e-06	2.39	0.017	3.90e-06	.0000396
comserd	-.0000185	.0000106	-1.75	0.080	-.0000393	2.25e-06
pop1517_rate	.0029527	.0006658	4.43	0.000	.0016478	.0042577
pop1820_rate	-.0009889	.0007192	-1.37	0.169	-.0023985	.0004208
_cons	-.0004649	.0003239	-1.44	0.151	-.0010996	.0001699
sigma_u	.00002783					

```
     sigma_e |  .00001469
         rho |  .78199423   (fraction of variance due to  u_i)
------------------------------------------------------------------------------

. estimates store random_29

. hausman fixed_29 random_29

Note: the rank of the differenced variance matrix (12) does not equal the number of coefficients b
        tested (13); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scalin
        variables so that the coefficients are on a similar scale.
```

	Coefficients (b) fixed_29	(B) random_29	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	**.0000762**	**.0000266**	**.0000496**	**7.77e-06**
unrate	**-2.01e-06**	**-5.18e-06**	**3.16e-06**	**1.48e-07**
ln_perinc	**.000259**	**.0000465**	**.0002125**	**.0000188**
beertax	**-.0000372**	**-.000016**	**-.0000213**	**.0000121**
ln_sobapt	**.0000338**	**.0000385**	**-4.63e-06**	**.0000413**
ln_mormon	**-.000032**	**.0000312**	**-.0000632**	**.000039**
dry	**2.42e-06**	**3.00e-07**	**2.13e-06**	**1.08e-06**
yngdrv	**.0000193**	**.0002435**	**-.0002242**	**.**
vmiles	**1.20e-09**	**1.90e-09**	**-6.99e-10**	**.**
jaild	**2.74e-06**	**.0000217**	**-.000019**	**6.74e-06**
comserd	**-1.02e-06**	**-.0000185**	**.0000175**	**7.56e-06**
pop1517_rate	**.0030783**	**.0029527**	**.0001256**	**.**
pop1820_rate	**-.0002474**	**-.0009889**	**.0007415**	**.**

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

```
    Test:  Ho:  difference in coefficients not systematic

                 chi2(12) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      275.35
                Prob>chi2 =      0.0000
                 (V_b-V_B is not positive definite)

.
end of do-file

.
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, vce
>  state)

Linear  regression                              Number of obs      =        336
                                                F(9, 47)           =      30.30
                                                Prob > F           =     0.0000
                                                R-squared          =     0.6309
                                                Root MSE           =   3.5e-05
```

Step 3 Model (R2): a

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000303	4.50e-06	6.72	0.000	.0000212	.0000393
unrate	-3.47e-06	1.80e-06	-1.93	0.059	-7.08e-06	1.43e-07
ln_perinc	-.0002558	.0000388	-6.60	0.000	-.0003339	-.0001778
beertax	-.0000206	.0000124	-1.66	0.104	-.0000457	4.38e-06
ln_sobapt	.0000255	6.01e-06	4.25	0.000	.0000135	.0000376
dry	-1.25e-06	5.15e-07	-2.43	0.019	-2.28e-06	-2.14e-07
vmiles	8.08e-09	5.45e-09	1.48	0.145	-2.88e-09	1.90e-08
pop1517_rate	.0030495	.0018371	1.66	0.104	-.0006463	.0067453
pop1820_rate	-.0051351	.0010117	-5.08	0.000	-.0071705	-.0030998
_cons	.0026498	.0003915	6.77	0.000	.0018622	.0034373

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe v
> ter state)
option fe not allowed
r(198);

end of do-file

r(198);

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe
> ster state)

Fixed-effects (within) regression               Number of obs      =        336
Group variable: state                           Number of groups   =         48

R-sq:                                           Obs per group:
     within  = 0.4494                                         min =          7
     between = 0.0281                                         avg =        7.0
     overall = 0.0148                                         max =          7

                                                F(9,47)            =      12.00
corr(u_i, Xb)  = -0.8198                        Prob > F           =     0.0000
```

Step 3 Model (R2): c

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000748	.0000125	6.01	0.000	.0000498	.0000999
unrate	-2.08e-06	9.94e-07	-2.09	0.042	-4.08e-06	-7.70e-08
ln_perinc	.0002584	.0000608	4.25	0.000	.000136	.0003807
beertax	-.000034	.0000228	-1.49	0.142	-.0000798	.0000118
ln_sobapt	.0000256	.0000537	0.48	0.635	-.0000824	.0001337
dry	2.48e-06	1.00e-06	2.47	0.017	4.58e-07	4.50e-06
vmiles	1.19e-09	6.93e-10	1.71	0.093	-2.08e-10	2.58e-09
pop1517_rate	.003128	.0008997	3.48	0.001	.001318	.004938
pop1820_rate	-.0000931	.0008148	-0.11	0.910	-.0017323	.0015461
_cons	-.0025534	.0006657	-3.84	0.000	-.0038927	-.0012142
sigma_u	.00009694					
sigma_e	.00001459					
rho	.97785164	(fraction of variance due to u_i)				

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe
> (state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4494                                         min =         7
     between = 0.0281                                         avg =       7.0
     overall = 0.0148                                         max =         7

                                                F(9,47)            =     12.00
corr(u_i, Xb)  = -0.8198                        Prob > F           =    0.0000
```

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000748	.0000125	6.01	0.000	.0000498	.0000999
unrate	-2.08e-06	9.94e-07	-2.09	0.042	-4.08e-06	-7.70e-08
ln_perinc	.0002584	.0000608	4.25	0.000	.000136	.0003807
beertax	-.000034	.0000228	-1.49	0.142	-.0000798	.0000118
ln_sobapt	.0000256	.0000537	0.48	0.635	-.0000824	.0001337
dry	2.48e-06	1.00e-06	2.47	0.017	4.58e-07	4.50e-06
vmiles	1.19e-09	6.93e-10	1.71	0.093	-2.08e-10	2.58e-09
pop1517_rate	.003128	.0008997	3.48	0.001	.001318	.004938
pop1820_rate	-.0000931	.0008148	-0.11	0.910	-.0017323	.0015461
_cons	-.0025534	.0006657	-3.84	0.000	-.0038927	-.0012142
sigma_u	.00009694					
sigma_e	.00001459					
rho	.97785164	(fraction of variance due to u_i)				

```
. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4494                                         min =         7
     between = 0.0281                                         avg =       7.0
     overall = 0.0148                                         max =         7

                                                F(9,279)           =     25.30
corr(u_i, Xb)  = -0.8198                        Prob > F           =    0.0000
```

Step 3 Model (R2): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000748	9.29e-06	8.05	0.000	.0000565	.0000931
unrate	-2.08e-06	9.87e-07	-2.10	0.036	-4.02e-06	-1.33e-07
ln_perinc	.0002584	.0000361	7.15	0.000	.0001872	.0003295
beertax	-.000034	.0000157	-2.17	0.031	-.0000648	-3.21e-06
ln_sobapt	.0000256	.0000393	0.65	0.515	-.0000518	.000103
dry	2.48e-06	1.20e-06	2.06	0.040	1.09e-07	4.85e-06
vmiles	1.19e-09	8.20e-10	1.45	0.149	-4.26e-10	2.80e-09
pop1517_rate	.003128	.0005848	5.35	0.000	.0019769	.0042791
pop1820_rate	-.0000931	.0006288	-0.15	0.882	-.0013309	.0011447
_cons	-.0025534	.0003902	-6.54	0.000	-.0033216	-.0017852
sigma_u	.00009694					
sigma_e	.00001459					
rho	.97785164	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(47, 279)  = 34.25                     Prob > F =  0.0000

. estimates store fixed_39

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, re

Random-effects GLS regression                   Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.2790                                         min =         7
     between = 0.2487                                         avg =       7.0
     overall = 0.2473                                         max =         7

                                                Wald chi2(9)       =    111.94
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

Step 3 Model (R2): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	.0000283	6.70e-06	4.22	0.000	.0000152	.0000414
unrate	-5.35e-06	1.04e-06	-5.13	0.000	-7.39e-06	-3.30e-06
ln_perinc	-2.15e-07	.0000317	-0.01	0.995	-.0000624	.000062
beertax	-.0000235	.0000112	-2.09	0.036	-.0000455	-1.49e-06
ln_sobapt	.0000378	5.81e-06	6.50	0.000	.0000264	.0000492
dry	-2.57e-07	5.87e-07	-0.44	0.661	-1.41e-06	8.93e-07
vmiles	1.91e-09	9.94e-10	1.93	0.054	-3.43e-11	3.86e-09
pop1517_rate	.002646	.0006963	3.80	0.000	.0012813	.0040107
pop1820_rate	-.0004382	.0006546	-0.67	0.503	-.0017212	.0008448
_cons	.0000396	.0003246	0.12	0.903	-.0005966	.0006759

```
     sigma_u |  .00002823
     sigma_e |  .00001459
         rho |  .78920951   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimates store random_39

. hausman fixed_39 random_39

Note: the rank of the differenced variance matrix (8) does not equal the number of coefficients be
        tested (9); be sure this is what you expect, or there may be problems computing the test.
        the output of your estimators for anything unexpected and possibly consider scaling your v
        so that the coefficients are on a similar  scale.

                    Coefficients
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |   fixed_39     random_39       Difference          S.E.
-------------+----------------------------------------------------------------
    spircons |    .0000748     .0000283        .0000466        6.44e-06
      unrate |   -2.08e-06    -5.35e-06        3.27e-06               .
   ln_perinc |    .0002584    -2.15e-07        .0002586        .0000173
     beertax |   -.000034     -.0000235       -.0000105        .0000109
   ln_sobapt |    .0000256     .0000378       -.0000121        .0000389
         dry |    2.48e-06    -2.57e-07        2.73e-06        1.05e-06
      vmiles |    1.19e-09     1.91e-09       -7.26e-10               .
pop1517_rate |     .003128      .002646         .000482               .
pop1820_rate |   -.0000931    -.0004382        .0003451               .

                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(8) =  (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =  -2291.76    chi2<0 ==> model fitted on  these
                                       data fails to meet the asymptotic
                                       assumptions of the Hausman test;
                                       see suest for a generalized  test

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild c
> op pop1517_rate pop1820_rate pop2124_rate gspch i.year, fe vce(cluster state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4976                                         min =         6
     between = 0.0755                                         avg =       7.0
     overall = 0.0512                                         max =         7

                                                F(22,47)           =         .
corr(u_i, Xb)  = -0.8827                        Prob > F           =         .
```

Step 1 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000808	.0000186	4.33	0.000	.0000433	.0001183
unrate	-3.84e-06	1.29e-06	-2.98	0.005	-6.43e-06	-1.25e-06
ln_perinc	.0001979	.0000559	3.54	0.001	.0000854	.0003104
beertax	-.0000379	.0000229	-1.65	0.105	-.000084	8.24e-06
ln_sobapt	.0000285	.0000609	0.47	0.643	-.0000941	.0001511
ln_mormon	-.0000391	.0000581	-0.67	0.504	-.0001559	.0000778
mlda	1.40e-06	2.05e-06	0.68	0.497	-2.72e-06	5.52e-06
dry	2.11e-06	1.03e-06	2.05	0.046	4.37e-08	4.19e-06
yngdrv	-.0000315	.0001036	-0.30	0.762	-.0002398	.0001768
vmiles	1.19e-09	6.92e-10	1.72	0.093	-2.05e-10	2.58e-09
jaild	4.57e-06	2.51e-06	1.82	0.075	-4.77e-07	9.61e-06
comserd	-2.07e-07	.0000121	-0.02	0.986	-.0000245	.0000241
pop	3.14e-12	4.15e-12	0.76	0.453	-5.21e-12	1.15e-11
pop1517_rate	.0011259	.0010708	1.05	0.298	-.0010282	.00328
pop1820_rate	-.0014173	.0012214	-1.16	0.252	-.0038745	.0010398
pop2124_rate	.0004539	.0006741	0.67	0.504	-.0009022	.00181
gspch	.0000219	.0000384	0.57	0.571	-.0000554	.0000992
year						
1983	-6.81e-06	5.38e-06	-1.27	0.212	-.0000176	4.01e-06
1984	-.0000181	6.87e-06	-2.64	0.011	-.000032	-4.33e-06
1985	-.0000214	8.13e-06	-2.63	0.012	-.0000377	-5.03e-06
1986	-9.51e-06	.0000111	-0.86	0.397	-.0000319	.0000128
1987	-.0000157	.0000133	-1.18	0.244	-.0000425	.0000111
1988	-.0000231	.0000171	-1.35	0.184	-.0000576	.0000114
_cons	-.0018452	.0006021	-3.06	0.004	-.0030564	-.0006341
sigma_u	.00011628					
sigma_e	.00001433					
rho	.9850499	(fraction of variance due to u_i)				

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comser
> 7_rate pop1820_rate i.year, fe  vce  (cluster  state)

Fixed-effects (within) regression               Number of obs      =       335
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4946                                         min =         6
     between = 0.1276                                         avg =       7.0
     overall = 0.0914                                         max =         7

                                                F(18,47)           =         .
corr(u_i, Xb)  = -0.8888                        Prob > F           =         .
```

Step 2 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000789	.0000181	4.36	0.000	.0000425	.0001153
unrate	-4.08e-06	1.22e-06	-3.35	0.002	-6.53e-06	-1.63e-06
ln_perinc	.0002078	.0000592	3.51	0.001	.0000888	.0003268
beertax	-.0000377	.000023	-1.64	0.108	-.0000839	8.60e-06
ln_sobapt	.000014	.0000576	0.24	0.809	-.0001019	.00013
ln_mormon	-.0000383	.0000608	-0.63	0.531	-.0001606	.0000839
dry	1.91e-06	9.51e-07	2.01	0.050	-3.93e-09	3.82e-06
yngdrv	-.0000381	.0001077	-0.35	0.725	-.0002548	.0001785
vmiles	1.22e-09	7.13e-10	1.71	0.095	-2.18e-10	2.65e-09
jaild	4.52e-06	2.28e-06	1.98	0.053	-6.55e-08	9.11e-06
comserd	-4.44e-07	.0000114	-0.04	0.969	-.0000233	.0000224
pop1517_rate	.0010451	.0010781	0.97	0.337	-.0011237	.0032139
pop1820_rate	-.001021	.00116	-0.88	0.383	-.0033547	.0013128
year						
1983	-5.77e-06	4.22e-06	-1.37	0.178	-.0000143	2.73e-06
1984	-.0000174	5.95e-06	-2.92	0.005	-.0000293	-5.41e-06
1985	-.0000219	7.97e-06	-2.75	0.008	-.0000379	-5.88e-06
1986	-.000012	.0000107	-1.12	0.267	-.0000335	9.51e-06
1987	-.0000185	.000013	-1.42	0.161	-.0000446	7.64e-06
1988	-.0000246	.0000171	-1.44	0.158	-.000059	9.86e-06
_cons	-.001853	.0006176	-3.00	0.004	-.0030955	-.0006105
sigma_u	.00011638					
sigma_e	.00001426					
rho	.98520653	(fraction of variance due to u_i)				

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate i.y
> vce(cluster state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4910                                         min =         7
     between = 0.0678                                         avg =       7.0
     overall = 0.0418                                         max =         7

                                                F(15,47)           =     11.18
corr(u_i, Xb)  = -0.8366                        Prob > F           =    0.0000
```

Step 3 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000741	.0000149	4.96	0.000	.000044	.0001041
unrate	-4.18e-06	1.14e-06	-3.67	0.001	-6.46e-06	-1.89e-06
ln_perinc	.000209	.0000617	3.39	0.001	.0000848	.0003332
beertax	-.0000343	.0000225	-1.52	0.134	-.0000795	.000011
ln_sobapt	.000013	.0000557	0.23	0.816	-.0000991	.0001251
dry	2.00e-06	8.99e-07	2.23	0.031	1.94e-07	3.81e-06
vmiles	1.26e-09	7.34e-10	1.72	0.092	-2.13e-10	2.74e-09
pop1517_rate	.0012118	.0010547	1.15	0.256	-.00091	.0033336
pop1820_rate	-.0010375	.0012303	-0.84	0.403	-.0035126	.0014376

year						
1983	**-5.21e-06**	**4.02e-06**	**-1.30**	**0.201**	**-.0000133**	**2.87e-06**
1984	**-.0000168**	**5.47e-06**	**-3.07**	**0.004**	**-.0000278**	**-5.78e-06**
1985	**-.0000212**	**7.37e-06**	**-2.88**	**0.006**	**-.000036**	**-6.38e-06**
1986	**-.000012**	**.0000103**	**-1.17**	**0.249**	**-.0000326**	**8.67e-06**
1987	**-.0000186**	**.0000125**	**-1.48**	**0.145**	**-.0000438**	**6.64e-06**
1988	**-.0000244**	**.0000164**	**-1.49**	**0.144**	**-.0000575**	**8.61e-06**
_cons	**-.0018949**	**.0006489**	**-2.92**	**0.005**	**-.0032004**	**-.0005894**

sigma_u	**.00010008**	
sigma_e	**.00001418**	
rho	**.98031907**	(fraction of variance due to u_i)

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

  . testparm i.year

 ( 1)  1983.year = 0
 ( 2)  1984.year = 0
 ( 3)  1985.year = 0
 ( 4)  1986.year = 0
 ( 5)  1987.year = 0
 ( 6)  1988.year = 0

       F(  6,    47) =    3.35
            Prob > F =    0.0079

.
end of do-file

.
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, vce (cluster state)

Linear regression                               Number of obs     =        336
                                                F(6, 47)          =      18.97
                                                Prob > F          =     0.0000
                                                R-squared         =     0.4260
                                                Root MSE          =    4.4e-05
```

Step 4 Model (R2): a

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000268	6.38e-06	4.19	0.000	.0000139	.0000396
unrate	-4.10e-06	2.11e-06	-1.94	0.058	-8.36e-06	1.49e-07
ln_perinc	-.0003213	.0000479	-6.71	0.000	-.0004176	-.000225
dry	-2.84e-07	4.44e-07	-0.64	0.526	-1.18e-06	6.10e-07
pop1517_rate	.0025811	.0022689	1.14	0.261	-.0019833	.0071456
pop1820_rate	-.0063944	.0013322	-4.80	0.000	-.0090746	-.0037143
_cons	.003455	.0004714	7.33	0.000	.0025067	.0044033

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate i.year, fe vce(cluster state

Fixed-effects (within) regression               Number of obs     =        336
Group variable: state                           Number of groups  =         48

R-sq:                                           Obs per group:
     within  = 0.4758                                         min =          7
     between = 0.1011                                         avg =        7.0
     overall = 0.0680                                         max =          7

                                                F(12,47)          =      12.32
corr(u_i, Xb)  = -0.8550                        Prob > F          =     0.0000
```

Step 4 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000752	.0000164	4.58	0.000	.0000422	.0001083
unrate	-4.27e-06	1.12e-06	-3.81	0.000	-6.53e-06	-2.01e-06
ln_perinc	.0002139	.000059	3.62	0.001	.0000951	.0003327
dry	1.94e-06	9.72e-07	2.00	0.051	-1.24e-08	3.90e-06
pop1517_rate	.0012541	.0012173	1.03	0.308	-.0011948	.0037031
pop1820_rate	-.0011305	.0012274	-0.92	0.362	-.0035998	.0013387
year						
1983	-5.06e-06	4.21e-06	-1.20	0.236	-.0000135	3.41e-06
1984	-.0000161	6.17e-06	-2.61	0.012	-.0000285	-3.71e-06
1985	-.0000205	8.21e-06	-2.49	0.016	-.000037	-3.93e-06
1986	-.0000107	.000011	-0.97	0.337	-.0000328	.0000115
1987	-.0000167	.0000135	-1.24	0.223	-.0000438	.0000105
1988	-.0000219	.0000178	-1.23	0.224	-.0000576	.0000139
_cons	-.0019305	.0005755	-3.35	0.002	-.0030883	-.0007728
sigma_u	.00010408					
sigma_e	.00001431					

```
         rho |   .98144037   (fraction of variance due to u_i)
```

```
. testparm i.year

( 1)  1983.year = 0
( 2)  1984.year = 0
( 3)  1985.year = 0
( 4)  1986.year = 0
( 5)  1987.year = 0
( 6)  1988.year = 0

       F(  6,     47) =     2.69
            Prob > F =     0.0250

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, fe cluster(state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4347                                         min =         7
     between = 0.1133                                         avg =       7.0
     overall = 0.0798                                         max =         7

                                                F(6,47)            =     14.67
corr(u_i, Xb)  = -0.8628                        Prob > F           =    0.0000
```

Step 4 Model (R2): c

```
                                    (Std. Err. adjusted for 48 clusters in state)
```

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000744	.0000128	5.80	0.000	.0000486	.0001002
unrate	-2.31e-06	9.24e-07	-2.50	0.016	-4.17e-06	-4.55e-07
ln_perinc	.0002601	.000055	4.73	0.000	.0001495	.0003707
dry	2.45e-06	1.10e-06	2.21	0.032	2.24e-07	4.67e-06
pop1517_rate	.0032126	.0009585	3.35	0.002	.0012844	.0051408
pop1820_rate	-.0004297	.0007713	-0.56	0.580	-.0019815	.001122
_cons	-.0025269	.0005651	-4.47	0.000	-.0036639	-.00139
sigma_u	.00010582					
sigma_e	.0000147					
rho	.98105983	(fraction of variance due to u_i)				

```
. xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, fe

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4347                                         min =         7
     between = 0.1133                                         avg =       7.0
     overall = 0.0798                                         max =         7

                                                F(6,282)           =     36.14
corr(u_i, Xb)  = -0.8628                        Prob > F           =    0.0000
```

Step 4 Model (R2): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000744	9.27e-06	8.03	0.000	.0000562	.0000927
unrate	-2.31e-06	9.53e-07	-2.43	0.016	-4.19e-06	-4.39e-07
ln_perinc	.0002601	.0000338	7.71	0.000	.0001937	.0003266
dry	2.45e-06	1.21e-06	2.02	0.045	5.95e-08	4.83e-06
pop1517_rate	.0032126	.0005867	5.48	0.000	.0020576	.0043675
pop1820_rate	-.0004297	.0006067	-0.71	0.479	-.001624	.0007646
_cons	-.0025269	.0003415	-7.40	0.000	-.0031991	-.0018548
sigma_u	.00010582					
sigma_e	.0000147					
rho	.98105983	(fraction of variance due to u_i)				

F test that all u_i=0: F(**47, 282**) = **55.53** Prob > F = **0.0000**

```
. estimates store fixed_49

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons  unrate  ln_perinc  dry  pop1517_rate pop1820_rate,  re
```

Random-effects GLS regression — Number of obs = **336**
Group variable: **state** — Number of groups = **48**

R-sq:
within = **0.3314**
between = **0.0390**
overall = **0.0172**

Obs per group:
min = **7**
avg = **7.0**
max = **7**

Wald chi2(**6**) = **79.62**
corr(u_i, X) = **0** (assumed) — Prob > chi2 = **0.0000**

Step 4 Model (R2): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	.0000278	7.63e-06	3.64	0.000	.0000128	.0000427
unrate	-5.29e-06	1.04e-06	-5.09	0.000	-7.32e-06	-3.25e-06
ln_perinc	.0000418	.000033	1.27	0.205	-.0000228	.0001064
dry	1.85e-06	6.72e-07	2.75	0.006	5.32e-07	3.17e-06
pop1517_rate	.0028504	.0006875	4.15	0.000	.0015028	.0041979
pop1820_rate	-.000417	.0006621	-0.63	0.529	-.0017148	.0008807
_cons	-.0003245	.000335	-0.97	0.333	-.0009812	.0003321
sigma_u	.00003942					
sigma_e	.0000147					
rho	.87789182	(fraction of variance due to u_i)				

```
. estimates store random_49
```

```
. hausman fixed_49 random_49
```

	Coefficients (b) fixed_49	(B) random_49	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	**.0000744**	**.0000278**	**.0000466**	**5.26e-06**
unrate	**-2.31e-06**	**-5.29e-06**	**2.97e-06**	**.**
ln_perinc	**.0002601**	**.0000418**	**.0002183**	**7.34e-06**
dry	**2.45e-06**	**1.85e-06**	**5.97e-07**	**1.01e-06**
pop1517_rate	**.0032126**	**.0028504**	**.0003622**	**.**
pop1820_rate	**-.0004297**	**-.000417**	**-.0000127**	**.**

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**6**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **12.43**
Prob>chi2 = **0.0531**
(V_b-V_B is not positive definite)

```
.
end of do-file

.
```

```
. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. reg mrall spircons unrate ln_perinc dry pop1517_rate, vce (cluster state)

Linear  regression                              Number of obs      =        336
                                                F(5, 47)           =      17.60
                                                Prob > F           =     0.0000
                                                R-squared          =     0.3199
                                                Root MSE           =    4.7e-05
```

Step 5 Model (R2): a

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000192	9.43e-06	2.03	0.048	2.06e-07	.0000382
unrate	-2.37e-06	2.07e-06	-1.14	0.258	-6.54e-06	1.80e-06
ln_perinc	-.0002638	.0000464	-5.69	0.000	-.0003571	-.0001705
dry	-9.20e-08	4.40e-07	-0.21	0.835	-9.78e-07	7.94e-07
pop1517_rate	-.0023931	.0018595	-1.29	0.204	-.0061339	.0013477
_cons	.0028137	.0004671	6.02	0.000	.0018739	.0037534

```
.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry pop1517_rate i.year, fe vce(cluster state)

Fixed-effects (within) regression               Number of obs      =        336
Group variable: state                           Number of groups   =         48

R-sq:                                           Obs per group:
     within  = 0.4738                                         min =          7
     between = 0.1061                                         avg =        7.0
     overall = 0.0720                                         max =          7

                                                F(11,47)           =      12.73
corr(u_i, Xb)  = -0.8567                        Prob > F           =     0.0000
```

Step 5 Model (R2): b

(Std. Err. adjusted for **48** clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000752	.0000163	4.62	0.000	.0000425	.000108
unrate	-4.22e-06	1.11e-06	-3.80	0.000	-6.45e-06	-1.98e-06
ln_perinc	.0002174	.0000599	3.63	0.001	.0000968	.000338
dry	1.88e-06	9.25e-07	2.03	0.048	1.55e-08	3.74e-06
pop1517_rate	.0011238	.0012174	0.92	0.361	-.0013252	.0035729
year						
1983	-4.01e-06	3.59e-06	-1.12	0.270	-.0000112	3.21e-06
1984	-.000014	5.11e-06	-2.74	0.009	-.0000243	-3.74e-06
1985	-.0000173	6.25e-06	-2.77	0.008	-.0000299	-4.77e-06
1986	-6.30e-06	7.80e-06	-0.81	0.423	-.000022	9.39e-06
1987	-.0000108	9.14e-06	-1.18	0.243	-.0000292	7.59e-06
1988	-.0000125	.0000107	-1.16	0.251	-.000034	9.11e-06
_cons	-.0020193	.0005894	-3.43	0.001	-.003205	-.0008337
sigma_u	.0001044					
sigma_e	.00001431					
rho	.98154966	(fraction of variance due to u_i)				

```
. testparm i.year

( 1)  1983.year = 0
( 2)  1984.year = 0
( 3)  1985.year = 0
( 4)  1986.year = 0
( 5)  1987.year = 0
( 6)  1988.year = 0

       F(  6,     47) =     2.66
            Prob > F =     0.0262

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons unrate ln_perinc dry pop1517_rate, fe cluster(state)

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4337                                         min =         7
     between = 0.1230                                         avg =       7.0
     overall = 0.0871                                         max =         7

                                                F(5,47)            =     17.38
corr(u_i, Xb)  = -0.8623                        Prob > F           =    0.0000
```

Step 5 Model (R2): c

(Std. Err. adjusted for 48 clusters in state)

mrall	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000709	.0000123	5.78	0.000	.0000462	.0000955
unrate	-2.43e-06	1.02e-06	-2.39	0.021	-4.48e-06	-3.89e-07
ln_perinc	.0002664	.00005	5.33	0.000	.0001658	.0003669
dry	2.41e-06	1.09e-06	2.22	0.031	2.29e-07	4.60e-06
pop1517_rate	.0030986	.000907	3.42	0.001	.001274	.0049232
_cons	-.0025957	.0005106	-5.08	0.000	-.0036228	-.0015686
sigma_u	.00010519					
sigma_e	.00001469					
rho	.98086952	(fraction of variance due to u_i)				

```
. xtreg mrall spircons unrate  ln_perinc dry pop1517_rate, fe

Fixed-effects (within) regression               Number of obs      =       336
Group variable: state                           Number of groups   =        48

R-sq:                                           Obs per group:
     within  = 0.4337                                         min =         7
     between = 0.1230                                         avg =       7.0
     overall = 0.0871                                         max =         7

                                                F(5,283)           =     43.35
corr(u_i, Xb)  = -0.8623                        Prob > F           =    0.0000
```

Step 5 Model (R2): d

mrall	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
spircons	.0000709	7.80e-06	9.09	0.000	.0000555	.0000862
unrate	-2.43e-06	9.36e-07	-2.60	0.010	-4.28e-06	-5.92e-07
ln_perinc	.0002664	.0000326	8.18	0.000	.0002023	.0003305
dry	2.41e-06	1.21e-06	1.99	0.047	3.10e-08	4.79e-06
pop1517_rate	.0030986	.0005637	5.50	0.000	.0019889	.0042082
_cons	-.0025957	.0003271	-7.94	0.000	-.0032395	-.0019519
sigma_u	.00010519					
sigma_e	.00001469					
rho	.98086952	(fraction of variance due to u_i)				

F test that all u_i=0: F(**47, 283**) = **67.01** Prob > F = **0.0000**

```
. estimates store fixed_59

.
end of do-file

. do "C:\Users\BXB160~1\AppData\Local\Temp\4\STD4e24_000000.tmp"

. xtreg mrall spircons  unrate  ln_perinc  dry pop1517_rate, re
```

Random-effects GLS regression — Number of obs = **336**
Group variable: **state** — Number of groups = **48**

R-sq:
within = **0.3459**
between = **0.0593**
overall = **0.0303**

Obs per group:
min = **7**
avg = **7.0**
max = **7**

Wald chi2(**5**) = **84.59**
corr(u_i, X) = **0** (assumed) — Prob > chi2 = **0.0000**

Step 5 Model (R2): e

mrall	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
spircons	.0000272	6.70e-06	4.06	0.000	.0000141	.0000403
unrate	-5.24e-06	1.02e-06	-5.15	0.000	-7.24e-06	-3.25e-06
ln_perinc	.0000603	.0000308	1.96	0.050	-1.20e-07	.0001207
dry	1.92e-06	6.87e-07	2.80	0.005	5.74e-07	3.27e-06
pop1517_rate	.0027552	.0006411	4.30	0.000	.0014986	.0040117
_cons	-.0005173	.0003103	-1.67	0.096	-.0011255	.0000909
sigma_u	.00004144					
sigma_e	.00001469					
rho	.88837756	(fraction of variance due to u_i)				

```
. estimates store random_59

. hausman fixed_59 random_59
```

	Coefficients (b) fixed_59	(B) random_59	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
spircons	.0000709	.0000272	.0000437	3.99e-06
unrate	-2.43e-06	-5.24e-06	2.81e-06	.
ln_perinc	.0002664	.0000603	.0002061	.0000105
dry	2.41e-06	1.92e-06	4.92e-07	9.96e-07
pop1517_rate	.0030986	.0027552	.0003434	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

```
    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       133.31
                Prob>chi2 =       0.0000
                  (V_b-V_B is not positive definite)

.
end of do-file

.
```

BUAN 6312.003
Project CODE

Chinar Arora – CXA180005
Pooja Banthia – PNB180000
Brittany Brooks – BXB160230
Vishakha Nangia – VXN180007
Jimit Patel – JXP180021

STATA CODE:

```
use "H:\BUAN 6312\Project\car_fatalities.dta"
clear
sum
xtdescribe
xtset state year

*correlations;
cor mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517
mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 miles gspch

gen pop1517_rate = pop1517/pop
gen pop1820_rate = pop1820/pop
gen pop2124_rate = pop2124/pop

gen ln_perinc = ln(perinc)
histogram perinc
histogram ln_perinc

gen ln_sobapt = ln(sobapt+1)
histogram sobapt
histogram ln_sobapt
sum ln_sobapt sobapt

inspect sobapt ln_sobapt ln_sobapt2
summarize sobapt ln_sobapt ln_sobapt2

histogram mormon
gen ln_mormon = ln(mormon+1)
histogram ln_mormon

*vmiles=miles/pop - yes
gen miles_pop = miles/pop
```

```
cor mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd pop pop1517_rate pop1820_rate pop2124_rate gspch
corr mrall pop pop1517 pop1820 pop2124 pop1517_rate pop1820_rate pop2124_rate
corr mrall mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 pop1517_rate pop1820_rate pop2124_rate

*a) pooled ols
*all variables, model 1;
reg mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 miles gspch, vce (cluster state)
estimates store OLS
*some variables, model 2;
reg mrall beertax mlda dry vmiles jaild comserd gspch, vce (cluster state)
estimates store OLS
*model 3;
reg mrall spircons unrate perinc beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate pop2124_rate gspch, vce (cluster state)
*model 4 variables in model 3 removed;
reg mrall spircons unrate perinc beertax sobapt mormon dry yngdrv vmiles jaild pop1517_rate pop1820_rate, vce (cluster state)
*model 5;
reg mrall spircons unrate perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, vce (cluster state)
*model 6;
reg mrall spircons unrate ln_perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, vce (cluster state)
*12/9
*model 1.9;
reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd pop pop1517_rate pop1820_rate pop2124_rate gspch, vce (cluster state)
estat ic
*model 2.9;
reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate, vce (cluster state)
estat ic
*model 3.9;
reg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, vce (cluster state)
estat ic
*model 4.9;
reg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, vce (cluster state)
estat ic
*model 5.9;
```

```
reg mrall spircons unrate ln_perinc dry pop1517_rate, vce (cluster state)
estat ic
reg mrall spircons unrate perinc dry pop1517, vce (cluster state)
estat ic
*model 1.11;
reg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd
mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate
pop1820_rate pop2124_rate gspch, vce (cluster state)
estat ic

*b) year as dummy variables
*model 1;
xtreg mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln
mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124
miles gspch i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 2;
xtreg mrall beertax mlda dry vmiles jaild comserd gspch i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 3;
xtreg mrall spircons unrate perinc beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd
pop1517_rate pop1820_rate pop2124_rate gspch i.year, fe vce (cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 4;
xtreg mrall spircons unrate perinc beertax sobapt mormon dry yngdrv vmiles jaild pop1517_rate
pop1820_rate i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 5;
xtreg mrall spircons unrate perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate i.year, fe
vce(cluster state)
*model 6;
xtreg mrall spircons unrate ln_perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate i.year, fe
vce(cluster state)
predict ehat2ln, res
graph twoway scatter ehat2ln sobapt, mlabel(state) yline(0)
*model 1.9;
```

```
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd pop pop1517_rate pop1820_rate pop2124_rate gspch i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 2.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate i.year, fe vce (cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 3.9
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 4.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 5.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
*model 6.9;
xtreg mrall spircons unrate ln_perinc dry ib7.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year
xtreg mrall spircons unrate perinc dry pop1517 i.year, fe vce(cluster state)
estat ic
estimates store Dummy_Year
testparm i.year

*1.11 mra variables included;
*Round 2 Regressions;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate pop2124_rate gspch i.year, fe vce(cluster state)
estat ic
estimates store Dummy_year1
```

```
testparm i.year
*2.11 mra variables included;
xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall, fe vce(cluster state)
estat ic
estimates store Dummy_year2
testparm i.year
*3.11 mra variables included;
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall, fe vce(cluster state)
estat ic
estimates store Dummy_year2
testparm i.year

*c&d) fe
*model 1;
xtreg mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 miles gspch, fe cluster(state)
estimates store fe_cluster
xtreg mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 miles gspch, fe
estimates store fixed
*model 2;
xtreg mrall beertax mlda dry vmiles jaild comserd gspch, fe cluster(state)
estimates store fe_cluster
xtreg mrall beertax mlda dry vmiles jaild comserd gspch, fe
estimates store fixed
*model 3;
xtreg mrall spircons unrate perinc beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate pop2124_rate gspch, fe cluster(state)
xtreg mrall spircons unrate perinc beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate pop2124_rate gspch, fe
*model 4
xtreg mrall spircons unrate perinc beertax sobapt mormon dry yngdrv vmiles jaild pop1517_rate pop1820_rate, fe cluster(state)
xtreg mrall spircons unrate perinc beertax sobapt mormon dry yngdrv vmiles jaild pop1517_rate pop1820_rate, fe
estimates store fixed_4
*model 5;
xtreg mrall spircons unrate perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, fe cluster(state)
xtreg mrall spircons unrate perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, fe
```

```
estimates store fixed_5
*model 6;
xtreg mrall spircons unrate ln_perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, fe cluster(state)
xtreg mrall spircons unrate ln_perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, fe
estimates store fixed_6
*model 1.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd pop pop1517_rate pop1820_rate pop2124_rate gspch, fe cluster (state)
estat ic
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd pop pop1517_rate pop1820_rate pop2124_rate gspch, fe
estat ic
estimates store fixed_19
*model 2.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd pop1517_rate pop1820_rate, fe
estat ic
estimates store fixed_29
*model 3.9
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, fe
estat ic
estimates store fixed_39
*model 4.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, fe
estat ic
estimates store fixed_49
*model 5.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc dry pop1517_rate, fe
estat ic
estimates store fixed_59

xtreg mrall spircons unrate perinc dry pop1517, fe cluster(state)
xtreg mrall spircons unrate perinc dry pop1517, fe
```

```
*1.11;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate pop2124_rate gspch, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate pop1820_rate pop2124_rate gspch, fe
estat ic
estimates store fixed_111
*2.11;
xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall gspch, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall gspch, fe
estat ic
estimates store fixed_211
*3.11;
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall gspch, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall gspch, fe
estat ic
estimates store fixed_311
*4.11;
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall, fe cluster(state)
estat ic
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall, fe
estat ic
estimates store fixed_411
estimates store fixed_59

xttrans comserd

*e) re;
*model 1;
xtreg mrall spircons unrate beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517 pop1820 pop2124 miles gspch, re
```

```
estat ic
estimates store random
*model 2;
xtreg mrall beertax mlda dry vmiles jaild comserd gspch, re
estimates store random
*model 3
xtreg mrall spircons unrate perinc beertax sobapt mormon mlda dry yngdrv vmiles jaild comserd
pop1517_rate pop1820_rate pop2124_rate gspch, re
*model 4
xtreg mrall spircons unrate perinc beertax sobapt mormon dry yngdrv vmiles jaild pop1517_rate
pop1820_rate, re
estimates store random_4
*model 5;
xtreg mrall spircons unrate perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, re
estimates store random_5
hausman fixed_5 random_5
*model ;
xtreg mrall spircons unrate ln_perinc sobapt mormon dry yngdrv pop1517_rate pop1820_rate, re
estimates store random_6
hausman fixed_6 random_6
*model 1.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild
comserd pop pop1517_rate pop1820_rate pop2124_rate gspch, re
estimates store random_19
hausman fixed_19 random_19
*model 2.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon dry yngdrv vmiles jaild comserd
pop1517_rate pop1820_rate, re
estimates store random_29
hausman fixed_29 random_29
*model 3.9;
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt dry vmiles pop1517_rate pop1820_rate, re
estimates store random_39
hausman fixed_39 random_39
*model 4.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate pop1820_rate, re
estimates store random_49
hausman fixed_49 random_49
*model 5.9;
xtreg mrall spircons unrate ln_perinc dry pop1517_rate, re
estimates store random_59
hausman fixed_59 random_59

*1.11;
```

```
xtreg mrall spircons unrate ln_perinc beertax ln_sobapt ln_mormon mlda dry yngdrv vmiles jaild
comserd mralln mra1517 mra1517n mra1820 mra1820n mra2124 mra2124n mraidall pop pop1517_rate
pop1820_rate pop2124_rate gspch, re
estimates store random_111
hausman fixed_111 random_111
*2.11;
xtreg mrall spircons unrate ln_perinc dry vmiles comserd mralln mra1517 mra1517n mra1820 mra1820n
mra2124 mra2124n mraidall gspch, re
estimates store random_211
hausman fixed_211 random_211
*3.11;
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n
mra2124 mra2124n mraidall gspch, re
estimates store random_311
hausman fixed_311 random_311
*4.11;
xtreg mrall spircons unrate ln_perinc dry vmiles mralln mra1517 mra1517n mra1820 mra1820n
mra2124 mra2124n mraidall, re
estimates store random_411
hausman fixed_411 random_411

-- Visualizing Data --
xtline mlda, t(year) i(state) overlay

twoway scatter mrall  perinc, mlabel(state) || lfit mrall perinc, clstyle(p2)

reg mrall gspch
predict ehat127, res
graph twoway scatter ehat197 gspch, mlabel(state) yline(0)

*plot variables ..
xtset state year
xtline year allmort
scatter mrall spircons
line mrall beertax
xtsum spircons unrate perinc ln_perinc beertax sobapt ln_sobapt mormon ln_mormon mlda dry yngdrv
vmiles jaild comserd pop pop1517 pop1517_rate pop1820 pop1820_rate pop2124 pop2124_rate gspch
xtline mrall beertax
twoway scatter mrall mra2124 || lfit mrall mra2124
graph scatter mrall
twoway lfit mrall yngdrv

twoway histogram mormon
```

variables
spircons unrate perinc beertax sobapt mormon mlda dry yngdrv
vmiles jaild comserd allmort mrall allnite mralln allsvn a1517 mra1517 a1517n mra1517
a1517n mra1517n a1820 a1820n mra1820 mra1820n a2124 mra2124 a2124n mra2124n aidall
mraidall pop pop1517 pop1820 pop2124 miles gspch;
class state year;

SAS CODE:

```
*10.1, input data for project;
proc univariate data=work.car; run;
proc contents data=pr.car; run;
data pr.car; set work.car; run;
proc means data=pr.car sum; var jaild; by state; run;
proc tabulate data=pr.car; class state year; var pop; table state * year * pop; run;
proc tabulate data=pr.car; class year; var allmort; table year * allmort; run;

*compare total deaths per year to deaths related to alcohol;
proc means data=pr.car sum;
var allmort aidall;
class year;
run;

proc sort data=pr.car; by year; run;
proc means data=pr.car sum; var spircons; class state; run;

*per capita pure alcohol consumption (annual, gallons) sum over all states per year. increase from 82-
88;
proc means data = pr.car sum; var spircons; class year; run;
proc means data = pr.car sum; var perinc; class year; run;
proc means data=pr.car sum; var allmort aidall; class year; run;
proc means data=pr.car
proc tabulate data=pr.car; class state year jaild comserd; table state, year, jaild comserd; run;

*drinking age per state per yr;
proc tabulate data=pr.car; class state year; var mlda; table state, year, mlda; run;

*per capita al consumption;
proc tabulate data=pr.car; class state year; var spircons; table state, year, spircons; run;

*dry county;
proc tabulate data=pr.car; class state year; var dry; table state, year, dry; run;

*distribution of dry per state and per year;
```

```
proc univariate data=pr.car; var dry; id state year; histogram dry; probplot dry; run;

proc univariate data=pr.car; var sobapt mormon; id state year; histogram sobapt mormon; probplot
sobapt mormon; run;

*young drivers;
proc tabulate data=pr.car; class state year; var yngdrv; table state, year, yngdrv; run;
proc sort data=pr.car; by state year; run;

*create total allmort per state (combined years);
proc means data=pr.car2 noprint;
class state year;
var allmort;
output out=pr.allmort_tot
sum(allmort) = allmort;
run;

proc sort data= pr.cars; by state; run;

*examine histograms of variables;
proc sgplot data=pr.cars;
histogram yngdrv / group=year;
run;

proc sgpanel data=pr.cars; panelby year; histogram spircons; run;

*examine variable dry;
proc univariate data=pr.car; var dry;
run;

proc means data=pr.cars sum noprint; var spircons; by state;
output out=pr.cars_sp sum(spircons) = tot_spir;
run;

proc sort data=pr.cars_sp; by tot_spir; run;
proc print data=pr.car; where jaild = 0; var state year; run;
proc univariate data=pr.car; var mrall; histogram mrall; probplot mrall; run;

*sum of deaths per year;
proc means data = pr.car; var allmort; by year; run;

*view variation in policy variables;
proc means data=pr.car mean min max;
var spircons unrate perinc beertax sobapt mormon mlda dry yngdrv
```

```
vmiles jaild comserd allmort mrall allnite mralln allsvn a1517 mra1517 a1517n mra1517
a1517n mra1517n a1820 a1820n mra1820 mra1820n a2124 mra2124 a2124n mra2124n aidall mraidall
pop pop1517 pop1820 pop2124
miles gspch;
class state year;
run;

proc print data=pr.car; where jaild = 0; var state year; run;
```