class - week 12/09

#### <u>do file</u>

- . log using VMai\_EE538\_Rebate\_Analysis, text
- . import excel "/Users/VivianMai/Desktop/VMai\_MOREV\_Final\_Dataset.xlsx", sheet("3. Combined Sheets - Clean") firstrow
- . summarize
- . list County Municipality if missing(County) | missing(Municipality)
- . describe
- . destring Cherry\_Sheet\_FY, replace
- . describe Cherry\_Sheet\_FY
- . describe

Variable	Obs	Mean	Std. dev.	Min	Max
Municipality County	0 0				
Cherry_She~Y	3,861	2019	3.162687	2014	2024
Population	3,861	19355.78	41056.82	70	694583
DOR_Income	3,861	8.18e+08	1.92e+09	86000	4.05e+10
DOR_Income~a	3,861	43068.8	31721.53	1229	430522
Applicatio~r	51,323	2021.087	2.74033	2014	2024
Applicant_~y	0				
Total_Amount	51,323	2727.27	870.7602	450	6000

#### . summarize

```
. describe
```

Contains data Observations: Variables:	5	1,323 9		
Variable s name	Storage type	Display format	Value label	Variable label
Municipality	str21	%21s		Municipality
County	str10	%10s		County
Cherry_Sheet_F	Y int	%10.0g		Cherry_Sheet_FY
Population	long	%10.0gc		Population
DOR_Income	double	%10.0gc		DOR_Income
DOR_Income_Pe~	a long	%10.0gc		DOR_Income_Per_Capita
Application_R~	r int	%10.0g		Application_Received_Year
Applicant_Cou~	y str10	%10s		Applicant_County
Total_Amount	int	%10.0g		Total_Amount

#### . sort County

. by County: summarize Total\_Amount Population DOR\_Income

-> County =					
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	47,462	2778.991	869.2481	450	6000
Population	0				
DOK_INCOME					
-> County = B/	ARNSTABLE				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	165	2118.182	604.5834	1000	2500
Population	165	14499.59 5 44e+08	11824.12 4 51e+08	1999 6 44e+07	49583 2 22 <u>0</u> 109
	105	5.110100	4.510+00	0.440401	
-> County = Bl	ERKSHIRE				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	352	2024.148	650.5416	1000	2500
Population	352	4015.912	7710.925 1 99e+08	157 2933000	44737 1 27e+09
DOK_INCOME	552	1.120+00	1.556+00	2555000	1.276+05
-> County = BI	RISTOL				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	220	2030.682	624.3001	750	2500
Population	220	28007.73	24994.55	6411	101079
DOK_INCOME	220	8.030+08	4.040408	1.090+00	2.116+09
-> County = Dl	JKES				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	77	2009.74	639.2347	750	2500
Population	77	2550.481	1923.421 8 36e+07	70 86000	5472 3 57e+08
DOK_INCOME		5.290+07	8.300+07	80000	5.576+08
-> County = ES	SSEX				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	374	2112.968	570.827	750	2500
Population	374	22842.31	22617.23	3315	101253
DOK_INCOME	574	9.116+00	0.450+00	1.020+00	3.336+09
-> County = FF	RANKLIN				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	286	2123.252	564.9651	750	2500
Population	286	2729.615	3569.884	112	17768
DOK_INCOME	286	6.80e+07	8.13e+07	671000	4.39e+08
-> County = HA	AMPDEN				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	253	2104.743	578.978	1000	2500
Population	253	20317.46	32295.78	465	155929
DOR_INCOME	253	4.950+08	5.480+08	9460000	2.890+09

#### -> County = HAMPSHIRE

Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	220	2107.955	592.9517	750	2500
Population	220	8031.009	10291.23	385	39924
DOR_Income	220	2.24e+08	2.68e+08	8557000	1.29e+09
-> County = M	IDDLESEX				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	594	2069.444	603.4582	750	2500
Population	594	29228.72	25242.66	3074	118977
DOR_Income	594	1.63e+09	1.77e+09	8.20e+07	1.43e+10
-> County = N/	ANTUCKET				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	11	2272.727	517.8627	1000	2500
Population	11	11401	1523.926	10172	14491
DOR_Income	11	6.56e+08	1.85e+08	4.05e+08	1.02e+09
-> County = N(	ORFOLK				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	308	2130.682	566.5846	750	2500
Population	308	24921.05	19104.16	4356	101636
DOR_Income	308	1.47e+09	1.27e+09	1.21e+08	6.92e+09
-> County = P	LYMOUTH				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	297	2133.838	568.7303	750	2500
Population	297	18954.55	18651.19	2820	105643
DOR_Income	297	7.52e+08	6.18e+08	8.81e+07	3.41e+09
-> County = S	UFFOLK				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	44	2170.455	559.7257	1000	2500
Population	44	192814.7	273295.3	17497	694583
DOR_Income	44	8.24e+09	1.33e+10	4.93e+08	4.05e+10
-> County = W	ORCESTER				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	660	2088.258	595.7888	750	2500
Population	660	13729.43	24351.32	990	206518
DOR_Income	660	4.49e+08	5.80e+08	2.75e+07	5.00e+09

## . summarize Total\_Amount, detail

	Total_Amount							
	Percentiles	Smallest						
1%	1000	450						
5%	1500	450						
10%	1500	450	Obs	51,323				
25%	2500	450	Sum of wgt.	51,323				
50%	2500		Mean	2727.27				
		Largest	Std. dev.	870.7602				
75%	3500	6000						
90%	3500	6000	Variance	758223.3				
95%	3500	6000	Skewness	3487072				
99%	4500	6000	Kurtosis	2.211163				

. summarize Population, detail

### . summarize Population, detail

	Population							
	Percentiles	Smallest						
1%	226	70						
5%	744	70						
10%	1251	75	Obs	3,861				
25%	3690	75	Sum of wgt.	3,861				
50%	10542		Mean	19355.78				
		Largest	Std. dev.	41056.82				
75%	22408	667137						
90%	41110	675647	Variance	1.69e+09				
95%	60374	692600	Skewness	11.35827				
99%	113994	694583	Kurtosis	171.5739				

. summarize DOR\_Income, detail

	DOR_Income							
	Percentiles	Smallest						
1%	4907000	86000						
5%	1.67e+07	671000						
10%	3.40e+07	685000	Obs	3,861				
25%	1.32e+08	695000	Sum of wgt.	3,861				
50%	4.11e+08		Mean	8.18e+08				
		Largest	Std. dev.	1.92e+09				
75%	1.01e+09	3.52e+10						
90%	1.73e+09	3.71e+10	Variance	3.68e+18				
95%	2.31e+09	3.72e+10	Skewness	12.55058				
99%	5.58e+09	4.05e+10	Kurtosis	207.659				

. preserve

- . collapse (sum) Total\_Amount (mean) Population DOR\_Income DOR\_Income\_Per\_Capita, by(County)
- . scatter Total\_Amount Population, title("Rebates vs Population")



### . regress Total\_Amount Population

Source	SS	df	MS	Numbe	er of obs	5 =	14
Model Residual	1.6321e+11 1.7768e+12	1 12	1.6321e+11 1.4807e+11	- F(1, L Prob L R-squ	> F ared	=	1.10 0.3145 0.0841
Total	1.9401e+12	13	1.4923e+11	- Adj H L Root	-squared MSE	1 = =	0.0078 3.8e+05
Total_Amount	Coefficient	Std. err.	t	P> t	[95% 0	conf.	interval]
Population _cons	-2.322246 642165.4	2.211938 120218.2	-1.05 5.34	0.314 0.000	-7.1410 380232	545 2.6	2.497153 904098.3

. scatter Total\_Amount DOR\_Income, title("Rebates vs Income")



. regress Total\_Amount DOR\_Income

Source	SS	df	MS	Number	of ob	s =	14
Model Residual	1.4281e+11 1.7972e+12	1 12	1.4281e+11 1.4977e+11	- F(1, 1 L Prob > L R-squa	2) F red	= =	0.95 0.3481 0.0736
Total	1.9401e+12	13	1.4923e+11	- Adj K- L Root M	square SE	a = =	-0.0036 3.9e+05
Total_Amount	Coefficient	Std. err.	t	P> t	[95% 0	conf.	interval]
DOR_Income _cons	0000502 635769.1	.0000514 119768.2	-0.98 5.31	0.348 0.000	00010 374810	522 5.6	.0000618 896721.6

. scatter Total\_Amount DOR\_Income\_Per\_Capita, title("Rebates vs Income Per Capita")



### . regress Total\_Amount DOR\_Income\_Per\_Capita

Source	55	5 df	MS	Numbe	er of obs	=	1	4
Model Residual	1.1964¢ 1.8204¢	e+11 1 e+12 12	1.1964e+11 1.5170e+11	F(1, Prob R-squ	12) > F uared		0.7 0.392 0.061	9 0 7
Total	1.94010	e+12 13	1.4923e+11	Adj H Root	MSE	=	-0.016 3.9e+	5 05
Tota	L_Amount	Coefficient	Std. err.	t	P> t	[95	5% conf.	interval]
DOR_Income_Pe	r_Capita _cons	6.881297 295001.2	7.748726 333962.7	0.89 0.88	0.392 0.394	-10. -432	00173 2640.9	23.76432 1022643

- . restore
- . preserve
- . oneway Total\_Amount County

Analysis of variance							
Source	SS	df	MS	F	Prob > F		
Between groups Within groups	5544043.23 1.3592e+09	13 3847	426464.864 353314.001	1.21	0.2667		
Total	1.3647e+09	3860	353560.365				
Bartlett's equal-	variances test:	chi2(	13) = 14.4143	Prob>	chi2 = 0.34		

### . collapse (sum) Total\_Amount, by(Application\_Received\_Year)

. twoway (line Total\_Amount Application\_Received\_Year), title("Rebates Over Time")



. collapse (sum) Total\_Amount, by(County Application\_Received\_Year)

. twoway (line Total\_Amount Application\_Received\_Year if County == "BARNSTABLE"), title("Rebate Trends for Barnstable")



. twoway (line Total\_Amount Application\_Received\_Year if County == "BERKSHIRE"), title("Rebate Trends for Berkshire")



. twoway (line Total\_Amount Application\_Received\_Year if County == "BRISTOL"), title("Rebate Trends for Bristol")



. twoway (line Total\_Amount Application\_Received\_Year if County == "DUKES"), title("Rebate Trends for Dukes")



. twoway (line Total\_Amount Application\_Received\_Year if County == "ESSEX"), title("Rebate Trends for Essex")



. twoway (line Total\_Amount Application\_Received\_Year if County == "FRANKLIN"), title("Rebate Trends for Franklin")



. twoway (line Total\_Amount Application\_Received\_Year if County == "HAMPDEN"), title("Rebate Trends for Hampden")



. twoway (line Total\_Amount Application\_Received\_Year if County == "HAMPSHIRE"), title("Rebate Trends for Hampshire")



. twoway (line Total\_Amount Application\_Received\_Year if County == "MIDDLESEX"), title("Rebate Trends for Middlesex")



. twoway (line Total\_Amount Application\_Received\_Year if County == "NANTUCKET"), title("Rebate Trends for Nantucket")



. twoway (line Total\_Amount Application\_Received\_Year if County == "NORFOLK"), title("Rebate Trends for Norfolk")



. twoway (line Total\_Amount Application\_Received\_Year if County == "PLYMOUTH"), title("Rebate Trends for Plymouth")



. twoway (line Total\_Amount Application\_Received\_Year if County == "SUFFOLK"), title("Rebate Trends for Suffolk")



. twoway (line Total\_Amount Application\_Received\_Year if County == "WORCESTER"), title("Rebate Trends for Worcester")



. summarize DOR\_Income, detail

	DOR_Income							
	Percentiles	Smallest						
1%	4907000	86000						
5%	1.67e+07	671000						
10%	3.40e+07	685000	Obs	3,861				
25%	1.32e+08	695000	Sum of wgt.	3,861				
50%	4.11e+08		Mean	8.18e+08				
		Largest	Std. dev.	1.92e+09				
75%	1.01e+09	3.52e+10						
90%	1.73e+09	3.71e+10	Variance	3.68e+18				
95%	2.31e+09	3.72e+10	Skewness	12.55058				
99%	5.58e+09	4.05e+10	Kurtosis	207.659				

// median income for income group differentiation: <u>https://www.statista.com/statistics/205951/</u> median-household-income-in-massachusetts/ //

- . gen Income\_Group = cond(DOR\_Income\_Per\_Capita > 106500, "High Income", "Low Income")
- . tabulate Income\_Group

Income_Grou p	Freq.	Percent	Cum.
High Income Low Income	47,615 3,708	92.78 7.22	92.78 100.00
Total	51,323	100.00	

. sort Income\_Group

. by Income\_Group: summarize Total\_Amount

-> Income_Group = High Income										
Variable	Obs	Mean	Std. dev.	Min	Max					
Total_Amount	47,615	2776.582	869.6008	450	6000					
-> Income_Grou	up = Low Incom	ie								
Variable	0bs	Mean	Std. dev.	Min	Max					
Total_Amount	3,708	2094.053	593.3294	750	2500					

Source	SS	5 df	MS	Numb	er of obs	=	3,863	1
Model Residual	2018328 1.36276	3.63 2 e+09 3,858	1009164.32 353220.497	Prob R-sq	> F uared	=	0.057	5
Total	1.36476	2+09 3,860	353560.365	- Adj Root	MSE	=	594.32	2
Tota	L_Amount	Coefficient	Std. err.	t	P> t	[95%	conf.	interval]
DOR_Income_Per Pop	r_Capita pulation _cons	0006408 .0002496 2114.258	.0003016 .000233 16.78884	-2.12 1.07 125.93	0.034 0.284 0.000	001 0002 2081	L232 2073 .342	0000495 .0007064 2147.174

. regress Total\_Amount DOR\_Income\_Per\_Capita Population

. graph bar Total\_Amount, over(County, sort(1)) title("Total Rebates by County")





. graph box Total\_Amount, over(County, sort(1)) title("Rebate Distribution by County")

. histogram DOR\_Income\_Per\_Capita, bin(30) normal title("Distribution of DOR\_Income\_Per\_Capita")



. summarize DOR\_Income\_Per\_Capita, detail

	DOR_Income_Per_Capita							
	Percentiles	Smallest						
1%	12988	1229						
5%	18043	5545						
10%	20978	5661	Obs	3,861				
25%	26946	5744	Sum of wgt.	3,861				
50%	34801		Mean	43068.8				
		Largest	Std. dev.	31721.53				
75%	47913	351332						
90%	70190	354387	Variance	1.01e+09				
95%	96660	386499	Skewness	4.292949				
99%	180027	430522	Kurtosis	31.98604				

. xtile income\_group = DOR\_Income\_Per\_Capita, n(4)

. tabulate income\_group

4 quantiles of DOR_Income_ Per_Capita	Freq.	Percent	Cum.
1	966	25.02	25.02
2	965	24.99	50.01
3	965	24.99	75.01
4	965	24.99	100.00
Total	3,861	100.00	

## . sort income\_group

-> income_grou	up = 1				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	966	2155.538	560.4105	750	2500
-> income_grou	ap = 2				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	965	2125.907	582.265	750	2500
-> income_grou	1p = 3				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	965	2024.093	619.7412	750	2500
-> income_grou	ıp = 4				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	965	2060.363	606.1334	750	2500
-> income_grou	ıp = .				
Variable	Obs	Mean	Std. dev.	Min	Max
Total_Amount	47,462	2778.991	869.2481	450	6000

. by income\_group: summarize Total\_Amount



. graph bar Total\_Amount, over(income\_group) title("Total Rebates by Income Group")

. gen Income\_Group = cond(DOR\_Income\_Per\_Capita > 106500, "High Income", "Low Income")

. graph bar Total\_Amount, over(Income\_Group) title("Rebates by Income Group")



. gen Rebate\_Per\_Capita = Total\_Amount / Population

graph bar Rebate\_Per\_Capita, over(County, sort(1)) title("Rebate Per Capita by County")



panel for municipality

- . encode Municipality, gen(Municipality\_ID)
- . duplicates report Municipality\_ID Application\_Received\_Year
- . duplicates list Municipality\_ID Application\_Received\_Year
- . preserve
- . collapse (sum) Total\_Amount Population DOR\_Income\_Per\_Capita, by(Municipality\_ID Application\_Received\_Year)
- . duplicates drop Municipality\_ID Application\_Received\_Year, force

. xtset Municipality\_ID Application\_Received\_Year

Fixed-effects (within) Group variable: Munici	regression Dali~D		Number o Number o	of obs of groups	=	1,404 351	1 L
R-sauared:			Obs per	aroup:			
Within $= 0.5488$				min	=	4	ļ.
Between = $0.0052$				ava	=	4.6	0
Overall = 0.2707				max	-	4	1
			F(2, 105	51)	_	639.05	5
$corr(u_i, Xb) = -0.6960$	)		Prob > F	:	=	0.000	)
	Coefficient	Std. err.	t	P> t	[95%	6 conf.	interva
 DOR_Income_Per_Capita	.0218275	.000735	29.70	0.000	.020	3852	.023269
Population	.0080535	.0008833	9.12	0.000	.006	53203	.009786
_cons	2737.7	101.373	27.01	0.000	2538	3.783	2936.63
	2067.9417						
sigma_e	2106.4439						
rho	.49077735	(fraction	of variar	nce due to	u_i)		
F test that all u_i=0:	F(350, 1051)	= 1.98		Prob	> F =	0.000	0

. xtreg Total\_Amount DOR\_Income\_Per\_Capita Population i.Application\_Received\_Year, fe

Fixed-effects (within) reg Group variable: Municipali	Num Num	ber of ol ber of gi	roups =	1,404 351		
R-squared:		0bs	per grou	up:		
Within = 0.8417				min =	4	
Between = 0.0057				avg =	4.0	
0verall = 0.7659				max =	4	
		F(5	, 1048)		1114.27	
corr(u_i, Xb) = -0.2194		Pro	b > F	=	0.0000	
	Coefficient	Std. err.	t	P>ItI	[95% conf.	interval
 DOR_Income_Per_Capita	.0070749	.0006361	11.12	0.000	.0058268	.00832
Population	.0031173	.0005394	5.78	0.000	.002059	.004175
Application_Received_Year						
2015	2668.266	101.9838	26.16	0.000	2468.15	2868.38
2016	4110.065	144.244	28.49	0.000	3827.025	4393.10
2017	-818.6773	96.7087	-8.47	0.000	-1008.442	-628.912
_cons	3257.809	76.29716	42.70	0.000	3108.096	3407.52
	799.63773					
sigma_e	1249.4994					
rho	.2905573	(fraction	of varia	nce due t	:o u_i)	
F test that all u_i=0: F(3	50, 1048) = 0.	84		Prob >	F = 0.9751	

. gen Income\_Pop\_Interaction = DOR\_Income\_Per\_Capita \* Population

. xtreg Total\_Amount DOR\_Income\_Per\_Capita Population Income\_Pop\_Interaction, fe

Fixed-effects (within)		Number of	f obs	=	1,404		
dioup vultuble. Multicipo	att~D		Number of	groups	-	221	
R-squared:			Obs per g	group:			
Within = 0.6135				min	=	4	
Between = $0.0068$				avg	=	4.0	
Overall = 0.2453				max	=	4	
			F(3, 1050	<b>)</b> )	=	555.66	
corr(u_i, Xb) = -0.7669			Prob > F		-	0.0000	
 Total_Amount	Coefficient	Std. err.	t	P> t	[	_95% conf.	interval
DOR_Income_Per_Capita	.0256202	.0007381	34.71	0.000		0241718	.027068
Population	.0301966	.0018586	16.25	0.000		0265497	.033843
Income_Pop_Interaction	-8.71e-08	6.57e-09	-13.27	0.000	-1	L.00e-07	-7.42e-0
_cons	1802.929	117.3601	15.36	0.000	1	1572.642	2033.21
	2642.6643						
sigma_e	1950.2989						
rho	.64739539	(fraction	of varia	nce due t	o u_	i)	
E test that all u i=0: I	F(350, 1050) =	2.77		Prob	> F	= 0.0000	

. gen Income\_Group = cond(DOR\_Income\_Per\_Capita > 106500, "High", "Low")

. encode Income\_Group, gen(Income\_Group\_ID)

. xtreg Total\_Amount i.Income\_Group\_ID##c.Population, fe

Fixed-effects (within) regress Group variable: Municipali~D	Number Number	r of obs r of group	= 05 =	1,404 351		
R-squared: Within = 0.5696 Between = 0.0070 Overall = 0.2634		Obs pe	er group: r r	nin = avg = nax =	4 4.0 4	
corr(u_i, Xb) = -0.7217		F(3, 2 Prob >	1050) > F	=	463.24 0.0000	
 Total_Amount	Coefficient	Std. err.	t	P> t	[95% conf.	interval]
Income_Group_ID Low Population	-4724.108 .0110031	151.5968 .0008702	-31.16 12.64	0.000 0.000	-5021.575 .0092956	-4426.641 .0127107
Income_Group_ID#c.Population Low	.0218636	.0018141	12.05	0.000	.0183039	.0254232
_cons	7584.645	126.0676	60.16	0.000	7337.272	7832.018
sigma_u sigma_e rho	2245.1527 2058.1329 .54337786	(fraction	of varia	nce due ·	to u_i)	
F test that all u_i=0: F(350,	1050) = 1.70		Pi	rob > F :	= 0.0000	

. gen Policy\_2019 = Application\_Received\_Year == 2019

. gen Policy\_2020 = Application\_Received\_Year == 2020

. gen Policy\_2023 = Application\_Received\_Year == 2023

. xtreg Total\_Amount DOR\_Income\_Per\_Capita Population Policy\_2019 Policy\_2020 Policy\_2023, fe

note: Policy\_2019 omitted because of collinearity. note: Policy\_2020 omitted because of collinearity. note: Policy\_2023 omitted because of collinearity.

Fixed-effects (within) Group variable: Munici	Number Number	of obs of groups	=	1,40 35	4 1		
R-squared: Within = 0.5488 Between = 0.0052			Obs per	group: mir avg	1 = ] =	4.0	4
Overall = 0.2707 corr(u_i, Xb) = -0.6960	0		F(2, 10 Prob >	ma> 51) F	<	639.0 0.000	4 5 0
Total_Amount	Coefficient	Std. err.	t	P> t	[95%	conf.	interval]
DOR_Income_Per_Capita Population Policy_2019 Policy_2020 Policy_2023 _cons	.0218275 .0080535 0 0 0 2737.7	.000735 .0008833 (omitted) (omitted) (omitted) 101.373	29.70 9.12 27.01	0.000 0.000 0.000	.020 .006 2538	3852 3203	.0232698 .0097866 2936.616
sigma_u sigma_e rho	2067.9417 2106.4439 .49077735	(fraction	of varia	nce due to	o u_i)		

F test that all  $u_i=0$ : F(350, 1051) = 1.98

Prob > F = 0.0000

# . xtreg Total\_Amount DOR\_Income\_Per\_Capita Population Policy\_2019 Policy\_2020

Policy\_2023, re

Random-effects GLS regression Group variable: Municipali~D			Number Number	of obs of groups	=	1,404 353	4 1
R-squared: Within = 0.5481 Between = 0.0048 Overall = 0.2714			Obs per	group: mi av ma	.n = /g = 1x =	4.0	4 0 4
corr(u_i, X) = 0 (assur	ned)		<u>Wald ch</u> Prob > 0	<u>i2(2)</u> chi2	=		•
Total_Amount	Coefficient	Std. err.	z	P> z	[959	6 conf.	interval
DOR_Income_Per_Capita Population Policy_2019 Policy_2020 Policy_2023 _cons	.0111749 .0035147 0 0 0 4240.979	.0005391 .0004803 (omitted) (omitted) (omitted) 91.19523	20.73 7.32 46.50	0.000 0.000 0.000	.010 .002 4062	01183 25733 2.239	.012231 .004456
sigma_u sigma_e rho	0 2106.4439 0	(fraction	of varia	nce due t	:o u_i)		

## . gen Post\_2019 = Application\_Received\_Year >= 2019

Fixed-effects (within) Group variable: Munici	Number Number	of obs of groups	=	1,404 35:	4 1		
R-squared: Within = 0.5488 Between = 0.0052 Overall = 0.2707			Obs per	group: mir avg ma>	) = ) = ( =	4.0	4 0 4
corr(u_i, Xb) = -0.696	0		F(2, 10 Prob > 1	51) F	=	639.0 0.000	5 0
Total_Amount	Coefficient	Std. err.	t	P> t	[959	6 conf.	interval]
DOR_Income_Per_Capita Population Post_2019 Post_2020 Post_2023 cons	.0218275 .0080535 0 0 0 2737.7	.000735 .0008833 (omitted) (omitted) (omitted) 101.373	29.70 9.12 27.01	0.000 0.000 0.000	. 020 . 000 2538	03852 53203 8.783	.0232698 .0097866 2936.616
sigma_u	2067.9417						

sigma_e rho	2106.4439 .49077735	(fraction of variance	due to u_i)
F to $s$ that $s$ $1$ $u$ $i$ $0$	E(2E0 10E1)	_ 1 08	$Drob \times E = 0.0000$

. gen Post\_2020 = Application\_Received\_Year >= 2020

. gen Post\_2023 = Application\_Received\_Year >= 2023

. xtreg Total\_Amount DOR\_Income\_Per\_Capita Population Post\_2019 Post\_2020 Post\_2023, fe

// starting over //

. summarize DOR\_Income\_Per\_Capita

Variable	0bs	Mean	Std. dev.	Min	Max
DOR_Income~a	3,861	43068.8	31721.53	1229	430522

. gen Income\_Group = cond(DOR\_Income\_Per\_Capita > 43070, "High Income", "Low Income") . tab Income\_Group

Income_Grou p	Freq.	Percent	Cum.
High Income Low Income	48,666 2,657	94.82 5.18	94.82 100.00
Total	51,323	100.00	

### . ttest Total\_Amount, by(Income\_Group)

-			-	
- cample	+ + + + + + + + + + + + + + + + + + + +	with		Vaniances
Sumpre	L LESL	WYLLLII	Euuur	vui lunces

Group	0bs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
High Inc Low Inco	48,666 2,657	2761.177 2106.229	3.947759 11.43539	870.8904 589.4496	2753.44 2083.806	2768.915 2128.652
Combined	51,323	2727.27	3.843639	870.7602	2719.737	2734.804
diff		654.9484	17.10543		621.4216	688.4752
diff = H0: diff =	= mean(High = 0	Inc) - mean	(Low Inco)	Degrees	t : of freedom :	= 38.2889 = 51321
Ha: di Pr(T < t)	iff < 0 ) = 1.0000	Pr(l	Ha: diff != T  >  t ) = 0	0 0.0000	Ha: d Pr(T > t	iff > 0 ) = 0.0000

. histogram Total\_Amount if Income\_Group == "High Income"



. histogram Total\_Amount if Income\_Group == "Low Income"



. graph box Total\_Amount, over(Income\_Group)



. collapse (sum) Total\_Amount (mean) Population, by(Municipality Income\_Group) . oneway Total\_Amount Municipality, tabulate

	Summary of	(sum) Tota	l_Amount
Municipality	Mean	Std. dev.	Freq.
Abington	25500	0	1
Acton	21500	0	1
Acushnet	21500	0	1
Adams	25000	0	1
Agawam	22000	0	1
Alford	11000	8485.2814	2
Amesbury	22500	0	1
Amherst	23500	0	1
Andover	22000	0	1
Aquinnah	11500	10606.602	2
Arlington	22500	0	1
Ashburnham	23000	0	1
Ashby	26000	0	1
Ashfield	21500	0	1
Ashland	11750	6010.4076	2
Athol	24000	0	1
Attleboro	20500	0	1
Auburn	21500	0	1
Avon	25500	0	1
Ayer	21500	0	1
Barnstable	12500	14142.136	2
Barre	21250	0	1
Becket	19500	0	1
Bedford	27500	0	1
Belchertown	22500	0	1
Bellingham	24000	0	1
Belmont	25000	0	1
Berkley	13000	14849.242	2
Berlin	12750	10960.155	2
Bernardston	24000	0	1
Beverly	11500	3535.5339	2
Billerica	11750	14495.689	2
Blackstone	23500	0	1
Blandford	26500	0	1
Bolton	23000	0	1

Boston	12500	4949.7475
Bourne	13000	14849.242
Boxborough	23500	0
Boxford	26500	0
Boylston	20500	4596 1041
Browstor	9750	4390.1941
Bridgewater	24500	13788.382
Rrimfield	24500	0
Brockton	24500	0
Brookfield	25000	0
Brookline	22000	0
Buckland	22000	Ő
Burlington	12250	3181.9805
Cambridge	25500	0
Canton	24000	0
Carlisle	21000	0
Carver	24000	0
Charlemont	22500	0
Charlton	11500	14142.136
Chatham	11000	9899.4949
Chelmsford	10000	3535.5339
Chelsea	25000	0
Cheshire	22500	0
Chester	24000	0
Chesterfield	19250	0
Chilmank	20500	0
Clarksburg	22000	0
Clinton	22000	0
Cohasset	23500	0
Colrain	20500	0
Concord	21500	ø
Conway	11750	13081.475
Cummington	11750	13081.475
Dalton	23500	0
Danvers	13250	4596.1941
Dartmouth	22000	0
Dedham	12500	14142.136
Deerfield	11000	5656.8542
Dennis	23500	0
Dighton	22500	0
Douglas	23000	0
Dover	22500	0
Dracut	23000	0
Dualey	22500	6
Dunstable	21000	6
uxbury 1st Bridgewater	24000	0
ast Brookfield	23750	0
ast Lonameadow	13000	6363 961
Fastham	22500	0303.301
Easthampton	24000	0
Easton	12750	7424.6212
Edgartown	11750	9545.9415
Egremont	20500	0
Erving	21000	0
Essex	25500	0
Everett	23000	0
Fairhaven	23000	0
Fall River	21750	0
Falmouth	11750	8131.728
Fitchburg	24000	0
Florida	23500	0
Foxborough	11500	10606.602
Framingham	22000	0
Franklin	11250	3181.9805
Freetown	21500	0
Gardner	23250	0
Georgetown	11750	7424.6212
Gill	23500	12274 269
GLOUCESter	10250	12374.369
Gosnen	23500	6
Goshold	10000	1949 7475
Granby	21500	4949.7475
aranby	21300	V

41 Miley		
Granville	22500	0
Great Barrington	12000	8485.2814
Greenfield	24500	0
Groton	22500	0
Groveland	12000	9899.4949
Hadley	27500	0
Halifax	11000	14142.136
Hamilton	21500	0
Hampden	11500	12727.922
Hancock	23000	0
Hanover	11500	12727.922
Hanson	22000	0
Hardwick	21000	0
Harvard	26500	0
Harwich	10250	12374 369
Hatfield	26500	22314.309
Haverhill	21500	0
Hawlov	22500	0
Hawtey	22300	0
Hinchem	24000	0
Hinsdale	24000	0
Hinsaale	23500	0
HOLDFOOK	21500	2000 0072
Holden	9750	3889.0873
Holland	22500	0
Holliston	21000	0
Holyoke	24000	0
Hopedale	11500	8485.2814
Hopkinton	22000	0
Hubbardston	26500	0
Hudson	10000	10606.602
Hull	12500	4949.7475
Huntington	23000	0
Ipswich	23250	0
Kingston	12500	8485.2814
Lakeville	12250	10253.048
Lancaster	10750	13081.475
Lanesborough	23000	0
Lawrence	24000	0
Lee	19500	0
Leicester	25500	0
Lenox	11000	707.10678
Leominster	23500	0
Leverett	10750	6717.5144
Lexington	23000	0
Leyden	13250	15202.796
Lincoln	22000	0
Littleton	10750	8131.728
Longmeadow	23000	0
Lowell	24000	0
Ludlow	22500	0
Lunenburg	13000	16970.563
Lvnn	22000	0
Lynnfield	19500	0
Malden	21500	0
Manchester By The	25000	0
Mansfield	10250	1767.767
Marblehead	25000	0
Marion	20250	0
Marlborough	23500	0
Marshfield	10250	353 55330
Mashnoo	11750	13081 475
Mattanoisott	22000	13001.473
Mattapolisett	10750	13081 475
Maynard	25500	13081.475
Mediteld	23500	10060 155
Meatora	11750	1242 6403
Meaway	10500	4242.0407
Melrose	11000	2828.4271
Mendon	13250	15202.796
Merrimac	11250	10960.155
Methuen	22500	0
Middleborough	21500	0
Middlefield	21500	0
Middleton	12750	3889.0873
Milford	23500	0
Millbury	23000	0
Millis	11750	6717.5144

		MILLER COMPANY
Millvillo	25500	0111.31++
MILLVILLE	25500	v
Milton	26500	0
Monroe	24500	0
Monson	22000	0
Montague	24750	0
Monterev	24500	0
Montaomery	22000	Ő
Mount Washington	26000	0
Nabant	24000	0
Nandrit	12500	14142 120
Nantucket	12500	14142.136
Natick	22500	0
Needham	24500	0
New Ashford	23500	0
New Bedford	25500	0
New Braintree	24000	0
New Marlborouab	21000	0
New Salem	23000	0
Nowbury	24500	0
Newbury	24500	0
Newburyport	24000	0
Newton	24000	0
Norfolk	22000	0
North Adams	22500	0
North Andover	24000	0
orth Attleborouah	11750	14495.689
North Brookfield	24500	0
North Reading	25000	0
Northemater	11750	15202 700
Northampton	11/50	15202.796
Northborough	21000	0
Northbridge	9750	12374.369
Northfield	25000	0
Norton	23000	0
Norwell	22500	0
Norwood	10125	6894.2911
Oak Bluffs	24000	0
Oakham	21000	0
Oakham	21000	0
Orange	24500	0124 720
Orleans	13250	8131.728
Otis	23000	0
Oxford	23000	0
Palmer	22500	0
Paxton	23500	0
Peabody	25000	0
Pelham	24000	0
Pembroke	12500	10606 602
Pennoroll	12250	13788 592
Pepperett	12230	13100.302
Peru	22500	0
Petersham	24000	0
Phillipston	26500	0
Pittsfield	20000	0
Plainfield	23000	0
Plainville	12500	7071.0678
Plymouth	13250	15202.796
Plympton	10000	10606 602
Princeton	23000	0
Provincetown	125000	4949 7475
Provincetown	12500	4949.7475
Quincy	22500	0
Randolph	26500	0
Raynham	11750	13081.475
Reading	10500	12727.922
Rehoboth	11250	1767.767
Revere	22000	0
Richmond	9750	10253 048
Rechaster	12250	4596 1041
Rochester Dockiland	22500	+590.1941
Rockland	22500	1414 2420
Rockport	11000	1414.2136
Rowe	23000	0
Rowley	11250	1767.767
Royalston	21500	0
Russell	22500	0
Rutland	21500	ø
Salom	22500	0
Calisburg	22500	Ø
Salisbury	21500	0
Sandisfield	20000	0
Sandwich	9500	7071.0678
Saugus	21500	0
Savov	22000	0

Scituate	25500	0	1
Seekonk	11000	12020.815	2
Sharon	21500	0	1
Sheffield	25000	0	1
Shelburne	20000	0	1
Sherborn	21500	Ø	1
Shirley	23500	12020 015	1
Shutachury	23000	12020.015	۲ ۲
Somerset	18500	0	1
Somerville	11500	3535.5339	2
South Hadley	24500	0	1
Southampton	10250	10253.048	2
Southborough	24000	0	1
Southbridge	20250	0	1
Southwick	10250	12374.369	2
Spencer	22250	0	1
Springrieiu	11750	1060.6602	2
Stockbridge	11750	7424.6212	2
Stoneham	11500	5656.8542	2
Stoughton	23000	0	1
Stow	22500	0	1
Sturbridge	12500	3535.5339	2
Sunderland	25000	0	1
Sutton	13750	12374.369	2
Swampscott	24000	0	1
Swansea	20500	0	1
Taunton	19000	0	1
Templeton	21500	0	1
Tewksbury	11250	10960.155	2
Tolland	24500	0	1
Topsfield	24000	õ	1
Townsend	23000	0	1
Truro	11000	8485.2814	2
Tyngsborough	11250	7424.6212	2
lyringham	21000	0545 0415	1
llybridge	9000	9545.9415 10606 602	2
Wakefield	11500	0	2
Wales	24000	0	1
Walpole	12250	10253.048	2
Waltham	9000	11313.708	2
Ware	25000	0	1
Warren	24000	0	1
Warwick	25000	Ő	1
Washington	9500	12020.815	2
Watertown	10500	2828.4271	2
Wayland	25000	0	1
Webster	21500	0	1
Wellesley	11750	6010 4076	1
Wendell	25500	0 101-0100	1
Wenham	23000	0	1
West Boylston	22000	0	1
West Bridgewater	22500	0	1
West Brookfield	23500	0	1
West Newbury West Springfield	21500	0	1 1
West Stockbridge	9500	3535.5339	2
West Tisbury	10500	11313.708	2
Westborough	21000	0	1
Westfield	23500	0	1
Westford	22750	0	1
Westhampton	11500	11313.708	2
Weston	22500	14049.242	1
Westport	12000	7778.1746	2
Westwood	23500	0	1
Weymouth	26500	0	1
Whately	25000	0	1
Whitman Wilbraham	25000	4596 1941	1
<b>WEEDP</b> unum	11230	1330.1941	2

Bartlett's eaual	-varian	ces test:	chi2(	107) = 47.850	1 Prob	>chi2 = 1.000
Total	2.6	946e+10	459	58705177.5		
Within groups	1.0	430e+10	109	95685206.4		
Between groups	1.6	516e+10	350	47188540	0.49	1.0000
Source		Analysis SS	of va df	riance MS	F	Prob > F
1	otal	17554.8	91 7		460	
Wren	tham outh	235 245	00 00	0	1	
Worthin	gton	205	00	0	1	
Worce	ster	250	00	0	1	
Wo	burn	112	50 6	717.5144	2	
Wint	hrop	235	00	Ő	1	
winche Wip	ster	225	00 00	0	1	
Winche	ndon	225	00	0	1	
Wilmin	gton	122	50 3	53.55339	2	
Williams	town	235	00	0	1	
Williams	burg	235	00	0	1	

. encode Municipality, gen(Municipality\_ID)