Socioeconomic Characteristics of a High NCAA FBS Football Program Value

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Abstract

College football is a booming business, with valuations for programs in the Football Bowl Subdivision (FBS) often estimated at well above $100 million and ranging to more than $1 billion (Brewer, 2015). Football is the most popular sport in the United States as a whole (Gaines, 2014), and preferences for college football vary significantly across different regions of the country, suggesting underlying cultural drivers of football popularity that could potentially be reflected by social, demographic, and economic variables. Political divides have also been proposed by the recent media: Survey results and high school football participation rates suggest a negative correlation between football enthusiasm and Democratic Party affiliation. The current sports finance literature has focused primarily on the impact program-specific and school-specific variables have on sports program valuations and revenues. No study was found in the literature analyzing the relationships between FBS program valuation or revenues and political affiliation, ethnicity, or education levels. This paper examines the relationship between FBS program valuations and state-level socioeconomic variables. Associations with education, income, ethnicity, political affiliation, and school enrollment are analyzed using a panel of data across three presidential election years: 2004, 2008, and 2012. A fixed effects model is implemented to test the hypotheses that Democratic affiliation is negatively associated with FBS program values in the state, and that Republican affiliation is positively associated with FBS program values. Potential relationships with education, income, and ethnic composition are explored as well. Results indicate that college education rates and income are positively associated with higher FBS program values in that state, while the magnitude of Democratic political leaning is negatively associated with program values.

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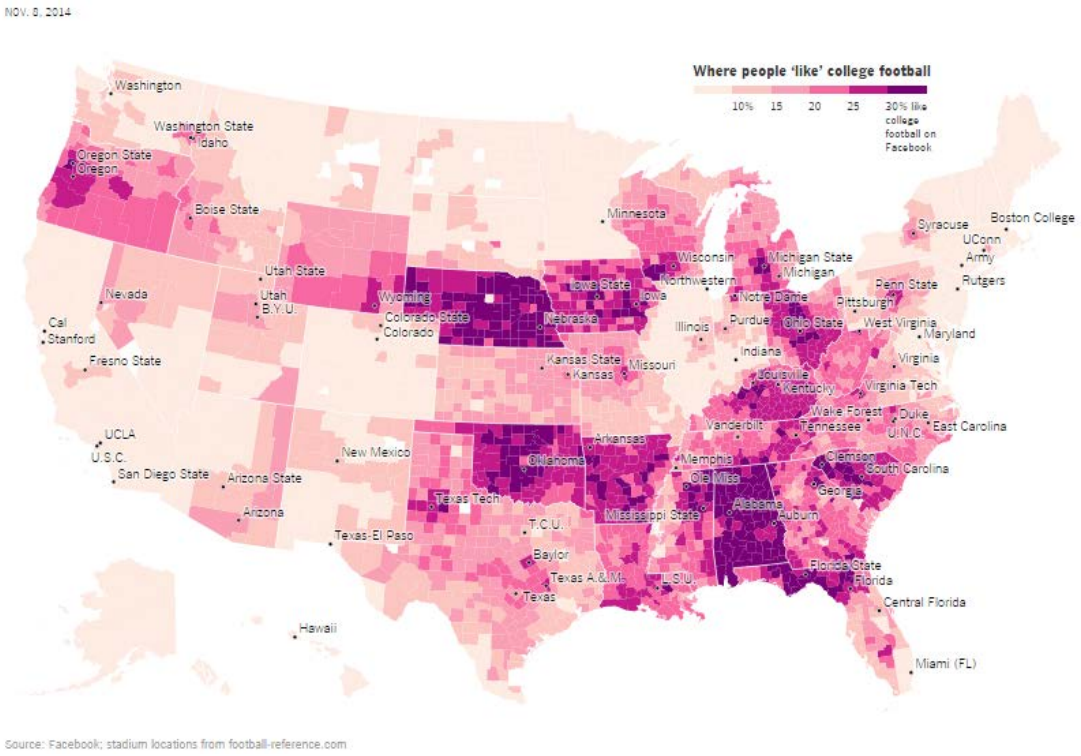
A 2012 Gallup poll showed that 54% of Americans identify themselves as college football fans (Gallup, 2014). The *USA Today* reported in January 2014 that college football is the third-most popular spectator sport in the country, behind only professional football and professional baseball (Schwartz & McGarry, 2014). From an investments perspective, the tremendous popularity of NCAA football programs translates to a booming sports business with considerable sustainable growth potential, offering justification for further investment. NCAA Football Bowl Subdivision (FBS) football programs are frequently valued at well above $100 million with marquee programs commonly above $500 million and in a handful of cases, near or above $1 billion, with revenues in some cases exceeding $100 million (Brewer & Pedersen, 2013b; Smith, 2013). The valuations of NCAA Division I football programs have grown by nearly 20% over the year leading up to December 31, 2014 (Brewer, 2015; Brewer, 2014).

In an ever-changing higher education market with threats of reduced student matriculation ranging from online choices to certification programs, universities are constantly seeking means of attracting new and better students, attracting and retaining high quality faculty, and attracting and securing donations and increases to endowment levels. Since growth in intercollegiate sports – particularly football – has been consistently productive in driving organizational identity and university brand recognition with the promise of significant media attention and other intangible benefits that would inure to the host universities who operate football programs, it is clear that university administrators are confronted with a choice to invest or reinvest in capital projects in athletics, or to risk missing the opportunity. Yet – what is the opportunity cost of not investing in college football? In this paper, we submit that it depends upon where a given university is located.

While on a national level, football is a favorite sport (Schwartz & McGarry, 2014), opinions on the game vary significantly in different parts of the country. The college football fan base is clearly not evenly distributed throughout the country. Consider the following figure:

Figure 1. Where People "Like" College Football (Irwin & Quealy, 2014)



The map, a result of a combined effort between the *New York Times* and Facebook, shows the percentage of Facebook users across the country who have "liked" a college football team (Irwin & Quealy, 2014). Generally, the Midwest and the Southeast are college football powerhouses, but regional characteristics alone seem inadequate to describe the amount of variation. For example, Illinois and Indiana, in the heart of the Midwest, have low concentrations of Facebook college football fans, while surrounding states have much larger percentages; meanwhile Oregon on the West Coast, surrounded by states much more indifferent to college football, has a relatively high concentration of Facebook fans. In general, two latitudinal bands

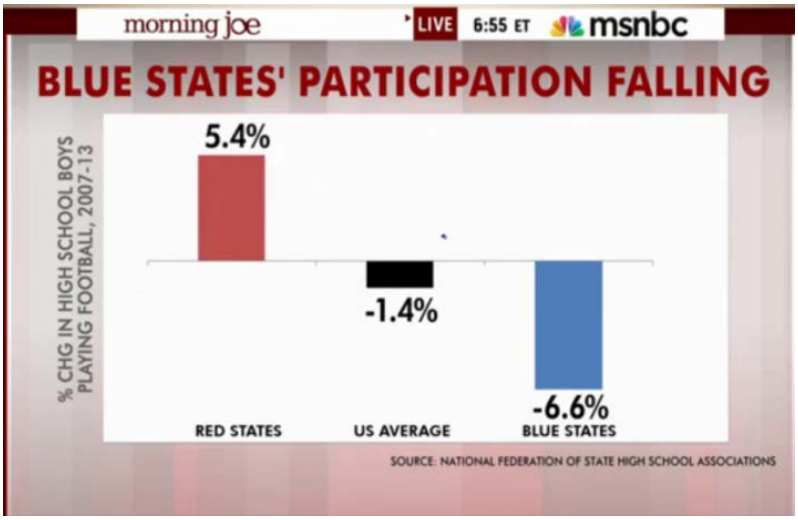
of football fan identification appear across the country – the upper Midwest to West Coast and the Southeast, which are connected across the Appalachian mountain ranges.

Simple regional generalizations about a state's preferences for college football are inadequate to describe the variances in popularity levels. While in some instances proximity to a professional football team likely detracts from the NCAA football popularity (Price & Sen, 2003), we suggest other explanations may exist for the locations of college football fans. Perhaps underlying characteristics of the fan base driving some of the variance in enthusiasm for college football are cultural in nature and perhaps reflected by demographic data.

In reference to American football in general, political lines seem to be correlated to enthusiasm for the sport. Recently, a New York Times article discussed national views on youth football, what it termed "the newest partisan divide" (Leonhardt, 2014). Increasingly, parents are concerned about letting their sons play the sport. In a recent poll, people were asked about their attitudes on the subject. Interestingly, while American football is the most valuable commercial sport in the U.S., the national survey results showed that only 55% of parents were comfortable with their sons playing football, a sharp contrast to the above-90% figures for baseball, soccer, and track (Leonhardt, 2014). Even more intriguing, however, was the variance of responses across the respondents' socioeconomic characteristics. Specifically, unlike responses for baseball, soccer, track, and hockey, the pattern of respondents' answers were clearly different when it comes to political party affiliation: being an educated democrat. Only 32% of parents who self-reported as being democratic party voters with a bachelor's degree were comfortable with their sons playing football. In contrast, all Republican voters and Democratic voters without a college degree had similar response rates – between 58% and 65% for each category (Leonhardt, 2014).

The contrast in opinions about youth football extends beyond surveys into participation statistics. While nationwide, high school football participation declined by 1.4% between 2007 and 2013, participation has *increased* by 5.4% in "red states" (states which voted for Republican presidential candidate Mitt Romney in 2012), with a 6.6% *decrease* among "blue states" (states which voted for President Obama in 2012) (National Federation of State High School Associations -"Even Football is Red and Blue," 2014).

Figure 2. High School Football Participation ("Even Football is Red and Blue," 2014)



Anecdotal evidence, looking at the demographic or socioeconomic composition of people living in "red" and "blue" states – beyond political affiliations - would suggest there may be demographic and ideological characteristics associated with college football popularity. If so, implications exist for college football program values: if socioeconomic characteristics drive popularity of college football, then these characteristics likely also impact the magnitude of a program's revenue growth prospects, and consequently, the program's valuation, merely as a function of where within the country a program is located.

In this study, we addressed the following question: On a state-by-state level, what fan base characteristics are associated with a strong college football program? Specifically, we

looked at the relationships that education level, ethnicity, income, and political affiliation - each measured state-by-state — have with NCAA college football program values.

Literature Review

Largely, the literature has not examined the relationship socioeconomic variables have with FBS program values, though some studies have discussed relationships with various program-level variables. Brewer and Pedersen (2013a) found that FBS program values were significantly associated with both short and long term team success, stadium size, endowment size, student population, stadium age, and head coach's salary. Looking at team values in professional baseball, basketball, hockey, and football, Alexander and Kern (2004) explored the impact regional and local population and local income levels have on valuations, in addition to other team-specific characteristics. McEvoy, Morse, and Shapiro (2013) found that Bowl Championship Series (BCS) conference membership and school enrollment were significantly correlated to FBS program revenues, while finding no significant relationship with population and per capita income at the county level.

While the current literature has explored the effect of certain socioeconomic variables on football program financial data (Alexander & Kern, 2004; McEvoy, Morse, & Shapiro, 2013), we looked at additional factors not considered by these authors. Additionally, we used state-level variables, rather than local-level or regional-level variables used in previous studies.

Methodology

To analyze how changes in socioeconomic status are associated with changes in program value, we used a balanced panel dataset of variables across three presidential election years: 2004, 2008, and 2012. With 100 observations in each year and three years of data, the panel includes 300 observations.

To determine whether a random effects model or a fixed effects model was more appropriate for the dataset, we used the Hausman test:

$$H = (b_{FE} - \beta_{RE})'[V_{FE} - V_{RE}]^{-1}(b_{FE} - \beta_{RE})$$

where H is the test statistic, following a chi-squared distribution; b_{FE} and β_{RE} are the coefficient vectors for the fixed effects and random effects models, respectively; and V_{FE} and V_{RE} are the covariance matrices for the fixed effects and random effects models, respectively (Hausman, 1978; Greene, 2008, p. 209). The test statistic led to rejection of the null that β_{RE} is efficient, indicating that a fixed effects model was more suitable to this dataset. Using within-groups fixed effects, we estimated the following model, paneled by program across three election years:

$$y_{it} - \overline{y_i} = \sum_{j=1}^{6} \beta_j (X_{jit} - \bar{X}_{ji}) + \ \varepsilon_{it} - \overline{\varepsilon_i}$$

where y_{it} represents program value and X_{jit} represents one of six independent variables. Due to heteroskedasticity in the data, robust standard errors were used. Multicollinearity in the independent variables was tested, but variance inflation factors indicated it did not pose a significant threat to model interpretation.

Data Collection

The following variables were implemented to analyze potential relationships between socioeconomic characteristics and a strong college football program valuation. To capture socioeconomic characteristics of the program's fan base, the independent variables are all at the state-level. Three election years of data (2004, 2008, and 2012) were collected and analyzed.

Program Value: The dependent variable represents football program valuations for programs at the 100 public universities in the Football Bowl Subdivision (FBS) (Brewer & Pedersen, 2013b). Program values represent consideration of two distinct valuation methods:

revenue multipliers and discounted cash flow analysis. In professional football, teams are valued primarily by their ability to generate revenue, which prospective buyers of teams prefer to consider as expense levels can vary quite significantly among franchises, rendering cash flow analysis less useful than in other industries. Thus, the first valuation method uses NFL-based revenue multiplies for FBS program value indication. The general value equation is given below:

$$Value\ Indication = Multiplier\ x\ Revenue$$

Football teams are valued on revenue, however, *given* their ability to cash flow. While financial losses are rare in the NFL, expenses sometimes exceed revenue in NCAA Division I football programs having less brand development. Therefore, valuing college football programs solely on revenues would fail to reflect the risks associated with running expense-intensive football program lacking a market sufficient to produce positive earnings. The second valuation method implements a constant growth model, using the cash flow in the year following the valuation year projected forward at a constant rate, a discount rate in the form of a weighted average cost of capital, and a growth rate. The general valuation model is given below:

$$Value\ Indication = \frac{CF_1}{k - g}$$

where CF_1 is the program's cash flow in the valuation year, k is the program's estimated weighted average cost of capital, and g is the projected growth rate.

The value (dependent) variable used in this report represents the average of these two valuation methods, both of which are invested capital indications that do not consider debt level or capital structure, and is denominated in millions of dollars. Note that if the resulting value indication was negative, the program was assigned a valuation of zero (0). Independent variables are discussed next.

Income: The income variable is the average per capita income in the program's state, denominated in thousands of dollars. Data was retrieved for each state and year from Stats Indiana (Stats Indiana, 2014).

Dmargin: For states denoted "Democrat," this political variable represents the magnitude of a state's Democratic tendency. This variable is an interaction term, using a "Democrat" dummy variable which is not used independently in the model. A state is considered "Democrat" in a particular election year if the Democratic candidate won the presidential popular vote in that state. For those states, this variable represents the difference between the percentage of Democratic votes and the percentage of Republican votes. Election data were retrieved from the Federal Election Commission (FEC, 2014).

Rmargin: This political variable is identical to the prior variable, except it measures the magnitude of a state's Republican tendency. This variable is an interaction term, using a "Republican" dummy variable which is not used individually in the model. For states voting for a Republican presidential candidate, this variable was calculated as the difference between the percentage of Republican votes and the percentage of Democratic votes. Election data were retrieved from the Federal Election Commission (FEC, 2014).

College: This education variable represents the percentage of adults in the state over age 25 having a bachelor's degree. Data was retrieved from the United States Census Bureau (Census Bureau, 2014).

Minority: This ethnic variable represents the minority composition of the state, measured as the non-white percentage of the population. Data was retrieved from the United States Census Bureau (Census Bureau, 2014).

Logenroll: This variable is the natural logarithm of the number of undergraduates at the program's school. While not a socioeconomic characteristic, this variable was used as a program-specific variable to capture differences in the values of programs residing in the same state (as all other variables were state-level characteristics, without a program-specific variable, predictions would be identical for programs located in the same state). Prior studies have found enrollment to be a positive and significant predictor of program valuation and revenues (Brewer & Pedersen, 2013a; McEvoy, Morse, & Shapiro, 2013). Data was retrieved from the Equity in Athletics Data Analysis (EADA) database (US Department of Education, 2014).

Summary statistics of the seven variables are given below:

Table 1. Summary Statistics

	Obs.	*Mean*	*SD*	*Min*	*Max*
Value	300	100.22	139.78	0	889
Minority	300	21.28	10.08	3.92	59.56
College	300	25.72	4.21	16.90	37.50
Income	300	37.12	6.00	25.27	60.22
Dmargin	300	4.54	7.67	0.00	45.26
Rmargin	300	9.36	11.23	0.00	48.04
Logenroll	300	9.75	0.41	8.47	10.83

Minority, College, and Income were considered exploratory variables, with no formal hypothesis stated concerning the magnitude or sign of their coefficients. Exploration on these three variables is justified because of the disparity between democratic and republican response rates to their family permissions to participate in football, and we are attempting to tease out additional potential factors that may underlie political affiliation differences. The following hypotheses are made for Dmargin, Rmargin, and Logenroll, respectively:

- H_1: The coefficient of Dmargin will be negative, indicating that higher Democratic tendency in the state has a negative relationship with FBS program values;

- H_2: The coefficient of Rmargin will be positive, indicating that higher Republican tendency in the state has a positive relationship with FBS program values;
- H_3: Drawing from previous literature, the coefficient of Logenroll will be positive, indicating that higher enrollment is associated with a higher FBS program value.

Results

The Hausman test was used to choose between a random effects model and a fixed effects model. The resulting test statistic was 30.73, which led to rejection of the null. Therefore, the random effects model was rejected as inconsistent, and a fixed effects model was selected as most appropriate for the panel data.

To test for potential heteroskedasticity across cross sections in the fixed effects model, I utilized Greene's modified Wald statistic for groupwise heteroskedasticity, given by:

$$W = \sum_{i=1}^{N_g} \frac{(\hat{\sigma_i}^2 - \hat{\sigma}^2)}{V_i}$$

where V_i is the estimated variance of $\hat{\sigma_i}^2$ (Baum, 2001). The null hypothesis is given by:

$$H_0: \sigma_i^2 = \sigma^2 \text{ for all i.}$$

The test showed that groupwise heteroskedasticity was present in the model, so robust standard errors were used.

The overall model was shown to be significant, with an F-statistic of 12.68 resulting in rejection of the null hypothesis that all coefficients were equal to zero. The following model was estimated:

Table 2. *Model Summary*

Variable	*B*	*Robust Std. Err.*	*t*	*p*
(Constant)	-436.326	355.510	-1.230	0.223
Minority	-1.366	4.372	-0.310	0.755

College**	18.366	6.538	2.810	0.006
Income**	5.279	1.799	2.930	0.004
Dmargin**	-2.337	0.827	-2.830	0.006
Rmargin	0.056	0.995	0.060	0.955
Logenroll	-9.512	33.179	-0.290	0.775
Number of obs.	300			
Number of groups	100			

**: $p < 0.01$

College, Income, Dmargin, and the constant all were significant at the $p < 0.01$ level, while Minority, Rmargin, and Logenroll were not shown to be significant.

Analysis of the variance in the model supported the use of fixed effects, as shown in Table 5: 89.39% of the model variance resulted from u_i, the program-level, time constant portion of the analysis; predictions from the model were highly correlated with u_i as well.

Table 3. *Fixed Effects Analysis*

$\sigma_{u:}$	158.12	Program-level, time constant portion of deviation
$\sigma_{e:}$	54.46	Idiosyncratic, time-varying portion of deviation
ρ:	89.39%	Fraction of overall variance resulting from program-level variance
Corr(u_i, Xb):	-0.5407	Correlation between program heterogeneity and predicted values

As a check on the independent variables, we considered potential correlation between the variables. Certainly, we would expect college and income to be correlated. High multicollineary would pose a significant threat to proper interpretation of the model coefficients. The correlation matrix of the six variables, shown in Table 4, did reveal significant relationships between a few of the variables: Income and College, Dmargin and College, and Dmargin and Income all had correlations above 0.5.

Table 4. Correlation Matrix

	minority	*college*	*income*	*Dmargin*	*Rmargin*	*logenroll*
Minority	1.000					

College	0.097	1.000				
Income	0.075	**0.695**	1.000			
Dmargin	0.296	**0.526**	**0.560**	1.000		
Rmargin	-0.151	-0.386	-0.368	-0.495	1.000	
Logenroll	-0.065	0.362	0.273	0.159	-0.377	1.000

To test for significant multicollinearity among these variables, variance inflation factors (VIFs) were calculated. As shown in Table 5, none of the variables had a VIF above 2.5:

Table 5. *Variance Inflation Factors*

Variable	*VIF*	*√VIF*	*Tolerance*	*R Squared*
minority	1.12	1.06	0.8892	0.1108
college	2.19	1.48	0.4576	0.5424
income	2.17	1.47	0.4608	0.5392
Dmargin	1.92	1.39	0.5198	0.4802
Rmargin	1.52	1.23	0.6586	0.3414
logenroll	1.3	1.14	0.7716	0.2284

As 5, 10, or even 20 are often suggested as maximum thresholds of acceptance for VIFs (Snee, 1977, Greene, 2008), multicollinearity does not seem to pose a threat in this model.

Conclusions

The fixed effects model suggests that certain state-level socioeconomic variables are significantly associated with FBS program values. Model results suggest the following:

- The significance of the College variable ($p < 0.01$) indicates that as a state's population becomes more educated, FBS program valuations in that state increase as well.
- The significance of the Income variable ($p < 0.01$) indicates that as state income rises, FBS program valuations rise as well.

- The significance of the Dmargin variable ($p < 0.01$) suggests that within Democratic-leaning states during presidential election years, the higher the Democratic proportion of the vote, the lower FBS program values.

In contrast to Dmargin, Rmargin was found to be insignificant. The implication seems to be that, if a state leans Republican, the magnitude of the political tendency has no bearing on program values. Some explanation for this may lie within closer examination of the geographic locations of the most valuable program outside of the Southeast. For instance, the Ohio State University and the University of Michigan host two of college football's most valuable franchises. Yet, they reside in states that generally are relatively split between Republicans and Democrats. However, they each have around 10 million people in population, which implies they are home to approximately 5 million Republicans, each. In contrast with this, the states of Alabama and Louisiana are home to significantly less population, but a higher proportion of Republicans, and the football programs at Louisiana State University and the University of Alabama are very valuable. Therefore, while additional research would be necessary to demonstrate whether there is anything to all of this, it may simply be the case that having a state wherein enough Republicans live generally yields a highly valuable football program.

Conversely, if a state leans Democratic, then a greater magnitude of the tendency is associated with greater declines in FBS program value. Explanations for this may be associated with population density and Democratic party affiliation, and preferences for entertainment, or presence of an NFL franchise nearby. Again, more research would be necessary to explore these possibilities.

The Minority variable was not significant in the model. This could indicate that ethnic backgrounds do not relate to FBS program value. Clearly, the results of our study suggest

precisely that; we found no evidence between ethnicity of states and FBS value levels of programs in those states. However, since Minority is measured simply as the non-white percentage of the population, it would not reveal information about preferences among various specific minority ethnic groups. Therefore, it could be that ethnic diversity of the state population does not relate to FBS program values, or perhaps relationships do exist between particular ethnic groups and program values, but their population levels are insufficient to affect program values. In any event, results here reveal no evidence to suggest ethnicity is related to FBS program value.

The Logenroll variable was not found to be significant, in contrast with results of prior studies (Brewer & Pedersen, 2010; McEvoy, Morse, & Shapiro, 2013). Logenroll was found to be significant across cross-sections of the data, however, so perhaps this particular variable was not well-suited to fixed-effects estimation. Nonetheless, in this analysis, it is possible that host university enrollment is less important to valuation versus political affiliation of the host state's population. Further research in this area could focus on additional socioeconomic variables, such as population and population density.

As the number of NCAA Division I football programs continues its rise – up from 117 programs in 2011 to 127 programs in 2014, thus with more and more universities considering capital investment of millions of dollars in resources to fund a start-up football venture (Equity in Athletics Data Analysis Cutting Tool, 2014), a more thorough understanding of FBS program valuation drivers is needed. This study provide some additional direction about those value drivers heretofore left unmentioned or unanalyzed.

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Appendix – Stata Output

```
. tsset schoolid election

. tsset schoolid election
       panel variable:  schoolid (strongly balanced)
        time variable:  election, 1 to 3
                delta:  1 unit

. rename income raw_income

. gen income =raw_income/1000

. gen value = valuation/1000000

. gen demvote=(rep_demratio<1)

. gen repvote=(rep_demratio>1)

. gen Dmargin=demvote*(_dem_st-_rep_st)*100

. gen Rmargin=repvote*(_rep_st-_dem_st)*100

. gen logenroll = log(enrollment)

. display "Hausman test:"
Hausman test:

. xtreg value minority college income Dmargin Rmargin logenroll,fe

Fixed-effects (within) regression               Number of obs      =       300
Group variable: schoolid                        Number of groups   =       100

R-sq:  within  = 0.3476                         Obs per group: min =         3
       between = 0.0017                                        avg =       3.0
       overall = 0.0020                                        max =         3

                                                F(6,194)           =     17.23
corr(u_i, Xb)  = -0.5407                        Prob > F           =    0.0000
```

value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
minority	-1.365998	4.33947	-0.31	0.753	-9.924594	7.192599
college	18.36969	7.824987	2.35	0.020	2.936719	33.80265
income	5.278658	1.734421	3.04	0.003	1.857917	8.6994
Dmargin	-2.337101	1.084469	-2.16	0.032	-4.475964	-.1982387
Rmargin	.0560772	.9711193	0.06	0.954	-1.85923	1.971384
logenroll	-9.51191	38.3612	-0.25	0.804	-85.17045	66.14663
_cons	-436.3259	364.2792	-1.20	0.232	-1154.782	282.1301
sigma_u	158.1192					
sigma_e	54.463854					
rho	.89393907	(fraction of variance due to u_i)				

F test that all u_i=0: F(99, 194) = 11.77 Prob > F = 0.0000

```
. estimates store fixed

. xtreg value minority college income Dmargin Rmargin logenroll,re

Random-effects GLS regression                   Number of obs      =       300
Group variable: schoolid                        Number of groups   =       100

R-sq:  within  = 0.2853                         Obs per group: min =         3
       between = 0.2649                                        avg =       3.0
       overall = 0.2631                                        max =         3

                                                Wald chi2(6)       =    110.05
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

value	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
minority	1.324253	1.097024	1.21	0.227	-.8258734	3.47438
college	-5.087071	3.10571	-1.64	0.101	-11.17415	1.000008
income	8.685331	1.120588	7.75	0.000	6.489019	10.88164
Dmargin	-3.66639	.9479489	-3.87	0.000	-5.524336	-1.808445
Rmargin	1.358596	.7599832	1.79	0.074	-.1309435	2.848136
logenroll	119.1175	24.62337	4.84	0.000	70.85657	167.3784
_cons	-1277.535	232.9352	-5.48	0.000	-1734.08	-820.9904
sigma_u	102.55935					
sigma_e	54.463854					
rho	.78002445	(fraction of variance due to u_i)				

```
. estimates store random

. hausman fixed random, sigmamore
```

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
minority	-1.365998	1.324253	-2.690251	4.404908
college	18.36969	-5.087071	23.45676	7.573555
income	5.278658	8.685331	-3.406672	1.42694
Dmargin	-2.337101	-3.66639	1.329289	.6231881
Rmargin	.0560772	1.358596	-1.302519	.6741109
logenroll	-9.51191	119.1175	-128.6294	31.6865

```
                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)
                          =       30.73
                Prob>chi2 =      0.0000

. xtreg value minority college income Dmargin Rmargin logenroll,fe

Fixed-effects (within) regression               Number of obs      =       300
Group variable: schoolid                        Number of groups   =       100

R-sq:  within  = 0.3476                         Obs per group: min =         3
       between = 0.0017                                        avg =       3.0
       overall = 0.0020                                        max =         3

                                                F(6,194)           =     17.23
corr(u_i, Xb)  = -0.5407                        Prob > F           =    0.0000
```

value	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
minority	-1.365998	4.33947	-0.31	0.753	-9.924594	7.192599
college	18.36969	7.824987	2.35	0.020	2.936719	33.80265
income	5.278658	1.734421	3.04	0.003	1.857917	8.6994
Dmargin	-2.337101	1.084469	-2.16	0.032	-4.475964	-.1982387
Rmargin	.0560772	.9711193	0.06	0.954	-1.85923	1.971384
logenroll	-9.51191	38.3612	-0.25	0.804	-85.17045	66.14663
_cons	-436.3259	364.2792	-1.20	0.232	-1154.782	282.1301
sigma_u	158.1192					
sigma_e	54.463854					
rho	.89393907	(fraction of variance due to u_i)				

F test that all u_i=0: F(99, 194) = 11.77 Prob > F = 0.0000

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (100)  =   5.7e+05
Prob>chi2 =      0.0000


. xtreg value minority college income Dmargin Rmargin logenroll,fe robust

Fixed-effects (within) regression               Number of obs      =       300
Group variable: schoolid                        Number of groups   =       100

R-sq:  within  = 0.3476                         Obs per group: min =         3
       between = 0.0017                                        avg =       3.0
       overall = 0.0020                                        max =         3

                                                F(6,99)            =     12.68
corr(u_i, Xb)  = -0.5407                        Prob > F           =    0.0000

                              (Std. Err. adjusted for 100 clusters in schoolid)
```

value	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
minority	-1.365998	4.372331	-0.31	0.755	-10.04165	7.309656
college	18.36969	6.537727	2.81	0.006	5.397417	31.34196
income	5.278658	1.799103	2.93	0.004	1.708847	8.84847
Dmargin	-2.337101	.8270162	-2.83	0.006	-3.978081	-.6961215
Rmargin	.0560772	.9947885	0.06	0.955	-1.917799	2.029953
logenroll	-9.51191	33.17908	-0.29	0.775	-75.34641	56.32259
_cons	-436.3259	355.5102	-1.23	0.223	-1141.735	269.0834
sigma_u	158.1192					
sigma_e	54.463854					
rho	.89393907	(fraction of variance due to u_i)				

```
. corr minority college income Dmargin Rmargin logenroll
(obs=300)
```

	minority	college	income	Dmargin	Rmargin	logenr~l
minority	1.0000					
college	0.0965	1.0000				
income	0.0748	0.6945	1.0000			
Dmargin	0.2958	0.5259	0.5595	1.0000		
Rmargin	-0.1511	-0.3861	-0.3679	-0.4947	1.0000	
logenroll	-0.0654	0.3619	0.2726	0.1585	-0.3774	1.0000

```
. collin minority college income Dmargin Rmargin logenroll
(obs=300)

  Collinearity Diagnostics
```

Variable	VIF	SQRT VIF	Tolerance	R-Squared
minority	1.12	1.06	0.8892	0.1108
college	2.19	1.48	0.4576	0.5424
income	2.17	1.47	0.4608	0.5392
Dmargin	1.92	1.39	0.5198	0.4802
Rmargin	1.52	1.23	0.6586	0.3414
logenroll	1.30	1.14	0.7716	0.2284
Mean VIF	1.70			

	Eigenval	Cond Index
1	5.5425	1.0000
2	1.0116	2.3408
3	0.2785	4.4615
4	0.1463	6.1540
5	0.0127	20.9228
6	0.0078	26.6735
7	0.0007	89.5826
Condition Number		89.5826

Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)
Det(correlation matrix) 0.1713

```
. sum value minority college income Dmargin Rmargin logenroll
```

Variable	Obs	Mean	Std. Dev.	Min	Max
value	300	100.2187	139.7788	0	889
minority	300	21.27743	10.0777	3.924594	59.555
college	300	25.724	4.20613	16.9	37.5
income	300	37.12001	5.995789	25.271	60.223
Dmargin	300	4.541355	7.672887	0	45.26443
Rmargin	300	9.357842	11.23254	0	48.04087
logenroll	300	9.754857	.4071591	8.467162	10.82763