ECON 634 Problem Set 6

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1. Below is what I got from running the OLS regression.

Parameter	Estimate	Standard Error
β_0	4.9133	0.063121
β_{educ}	0.073807	0.0035336
β_{exp}	0.039313	0.0021955
β_{SMSA}	0.16474	0.015692
β_{black}	-0.18822	0.017768
β_{south}	-0.12905	0.015229
σ^2_ϵ	0.14229	0.0036714

Table 1: OLS Estimation Results

2. The vector of interesting parameters is

$$\theta = [\beta_0 \quad \beta_{educ} \quad \beta_{exp} \quad \beta_{SMSA} \quad \beta_{black} \quad \beta_{south} \quad \sigma^2_\epsilon].$$

   Applying the Metropolis-Hastings Algorithm, I got the posterior distributions of the parameters of interest. Attached are the plots of the corresponding posterior distribution, where the yellow lines are the OLS estimates from above. We can adjust the scale of the parameter variance to reach a satisfactory acceptance rate within [20%, 25%].

3. The OLS estimation provides the point estimates of parameters while the Bayesian estimation gives the estimated distributions of parameters. The Bayesian posterior distributions are approximately normal with means close to the OLS estimates. However, in this problem, it's hard to tell the difference between the flat prior case and the given prior one by looking at the graphs.

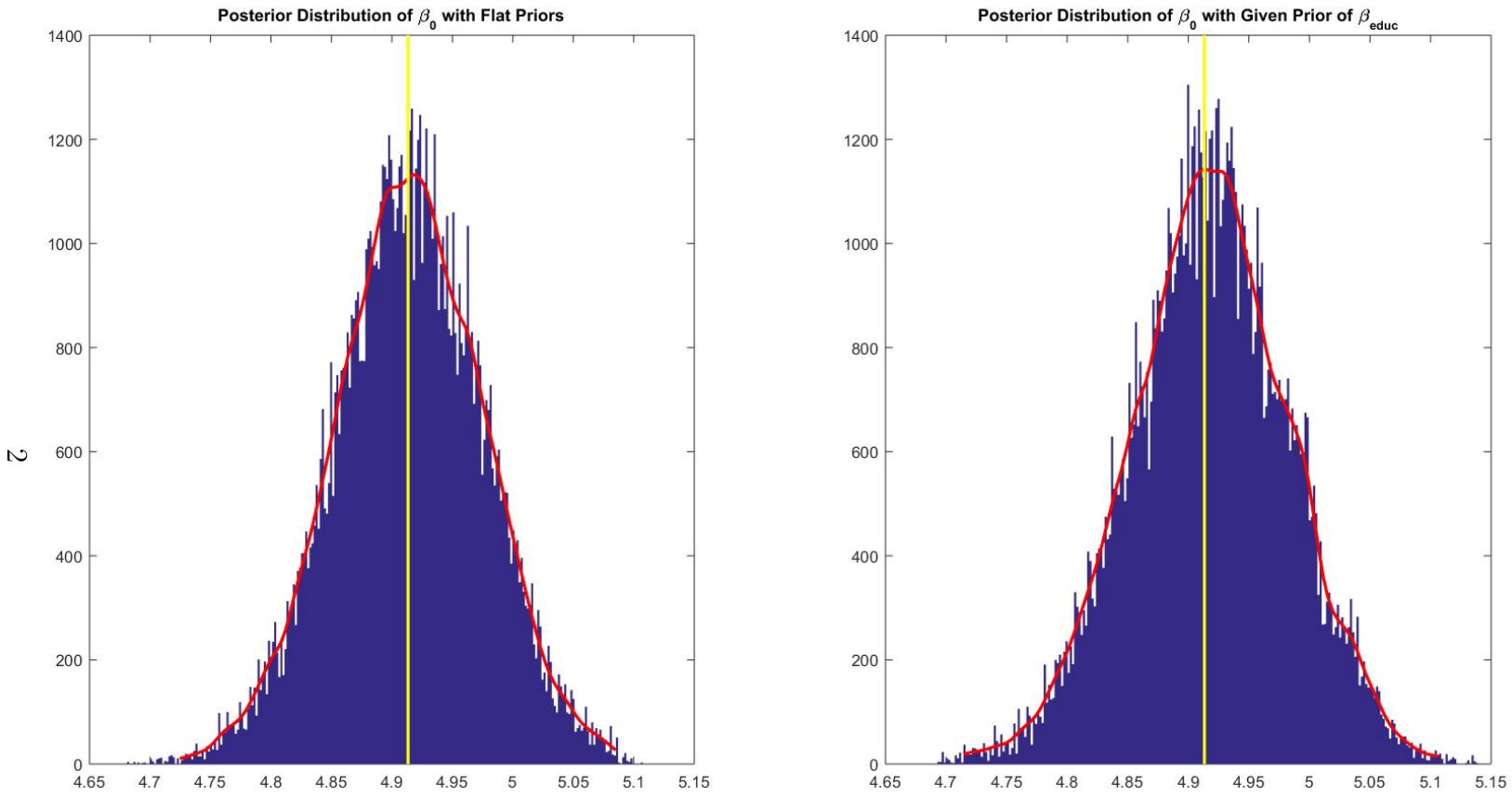

Figure 1: Posterior Distribution of β_0

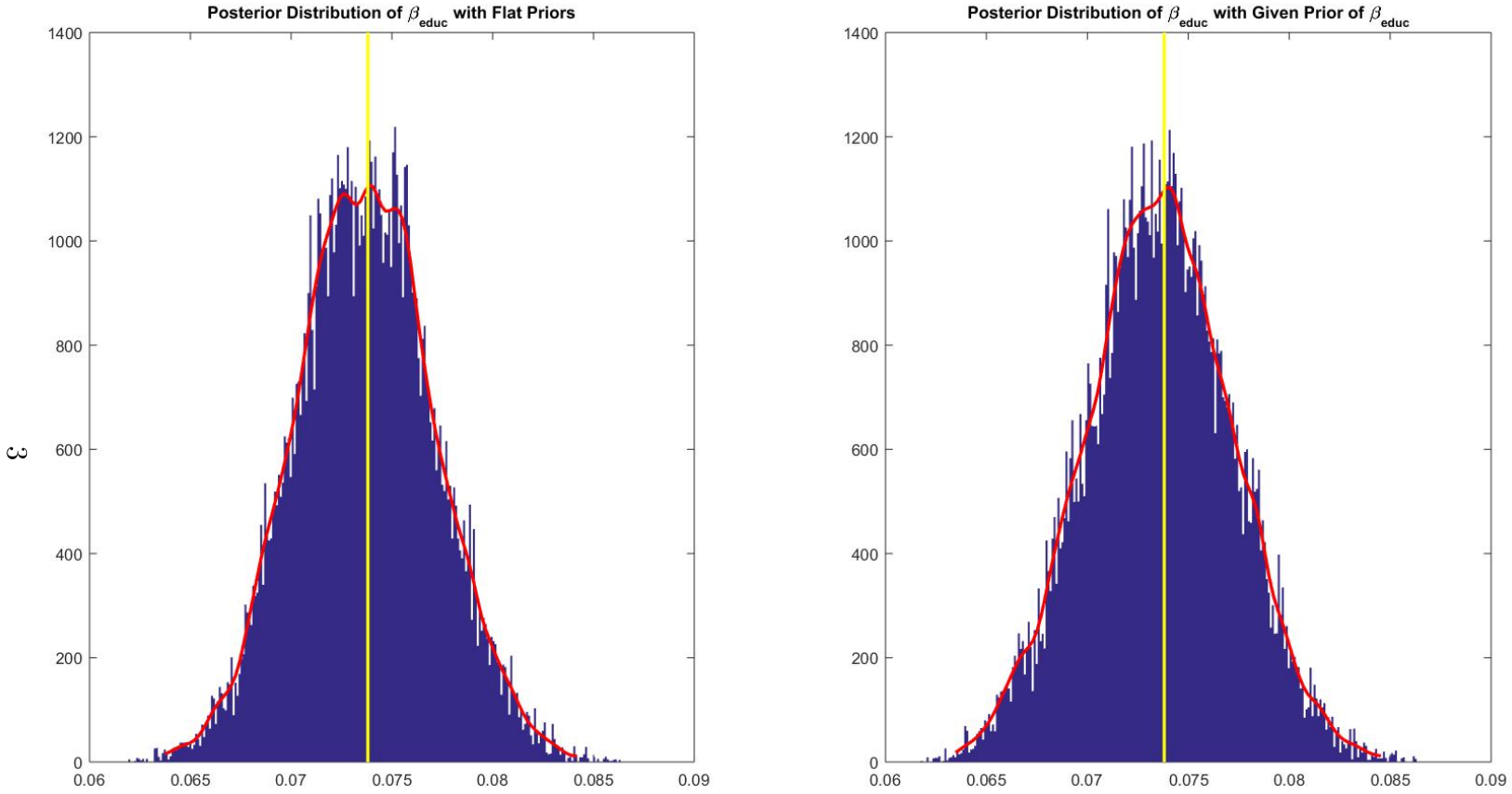

Figure 2: Posterior Distribution of β_{educ}

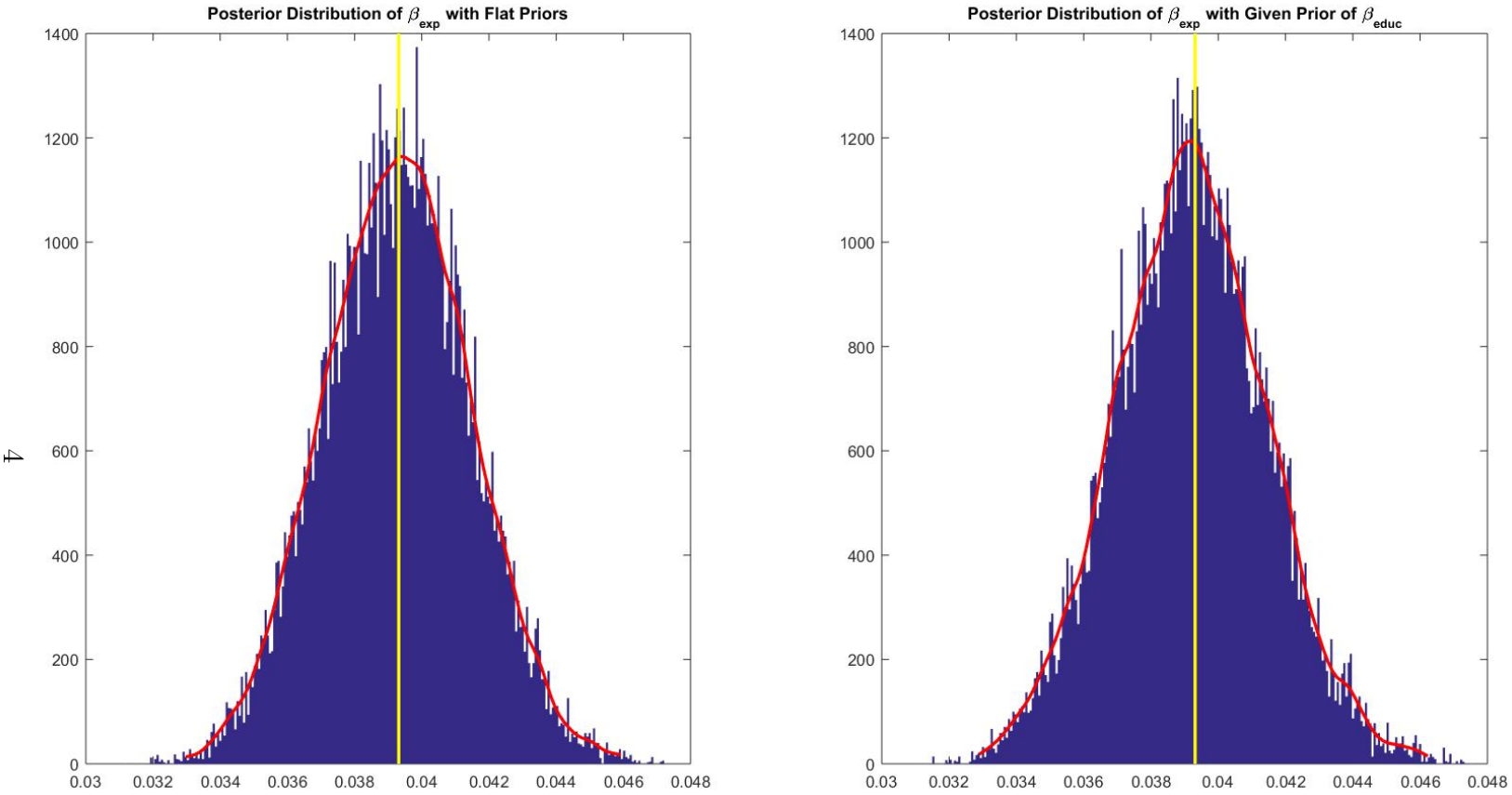

Figure 3: Posterior Distribution of β_{exp}

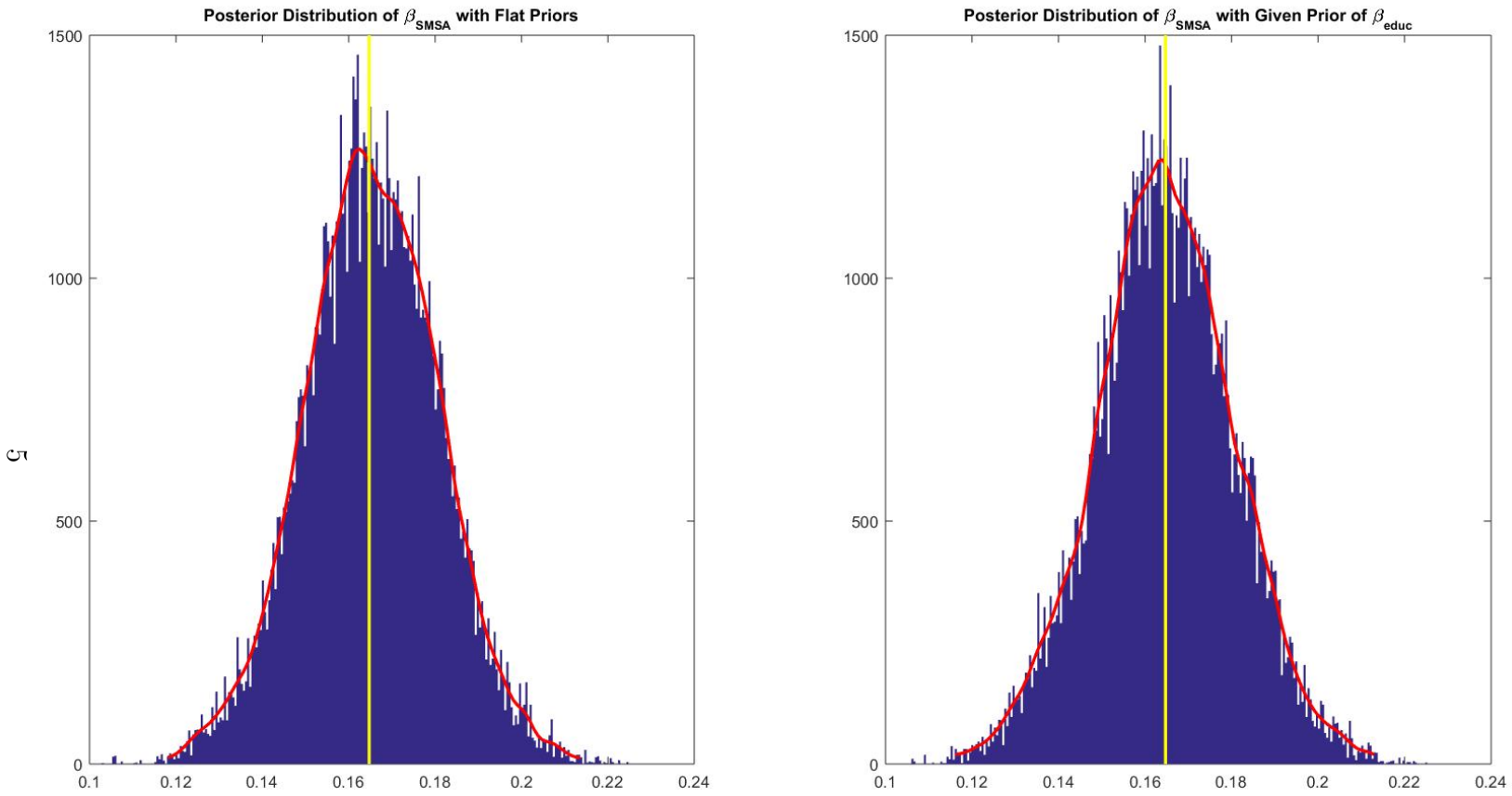

Figure 4: Posterior Distribution of β_{SMSA}

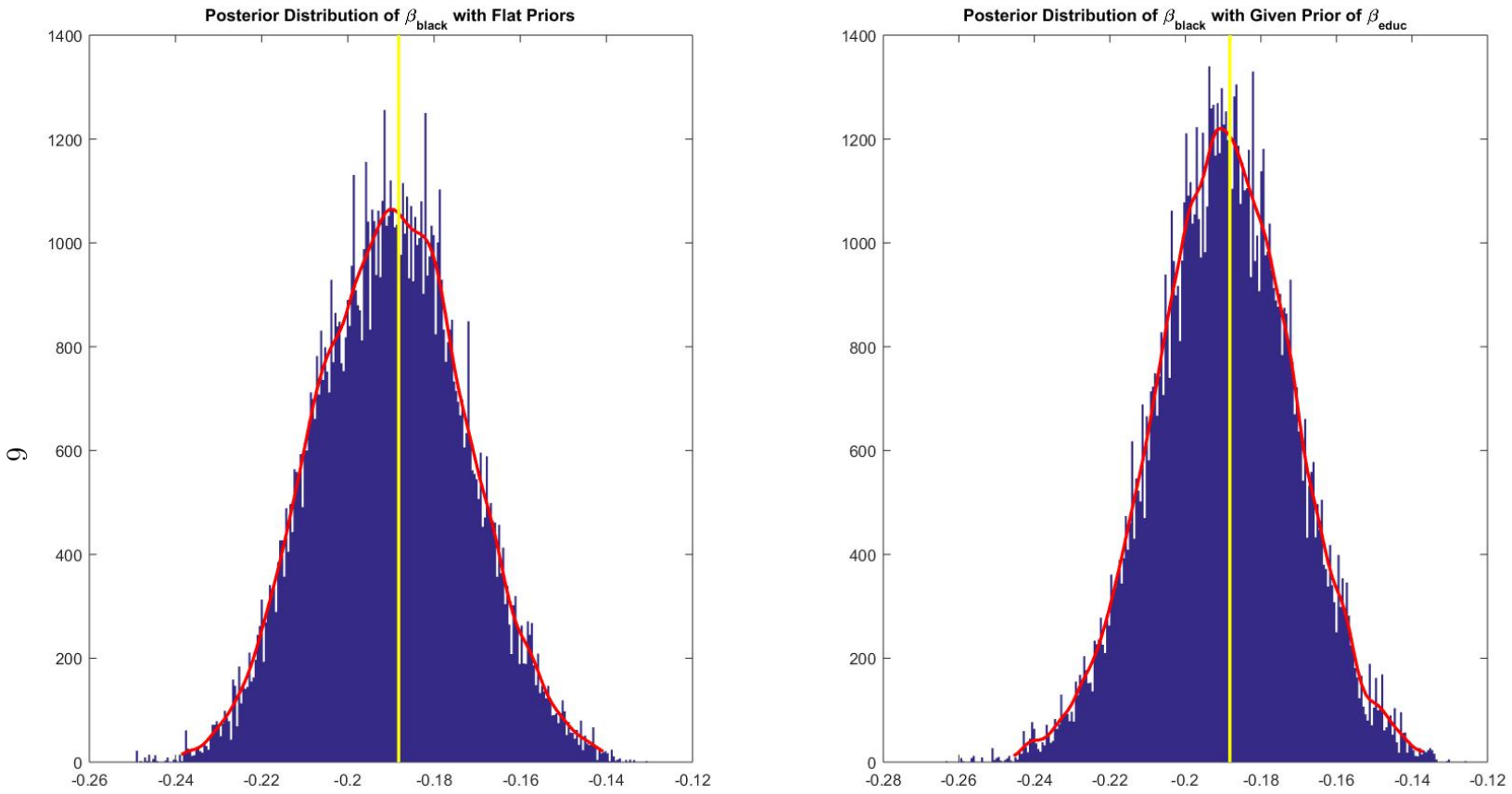

Figure 5: Posterior Distribution of β_{black}

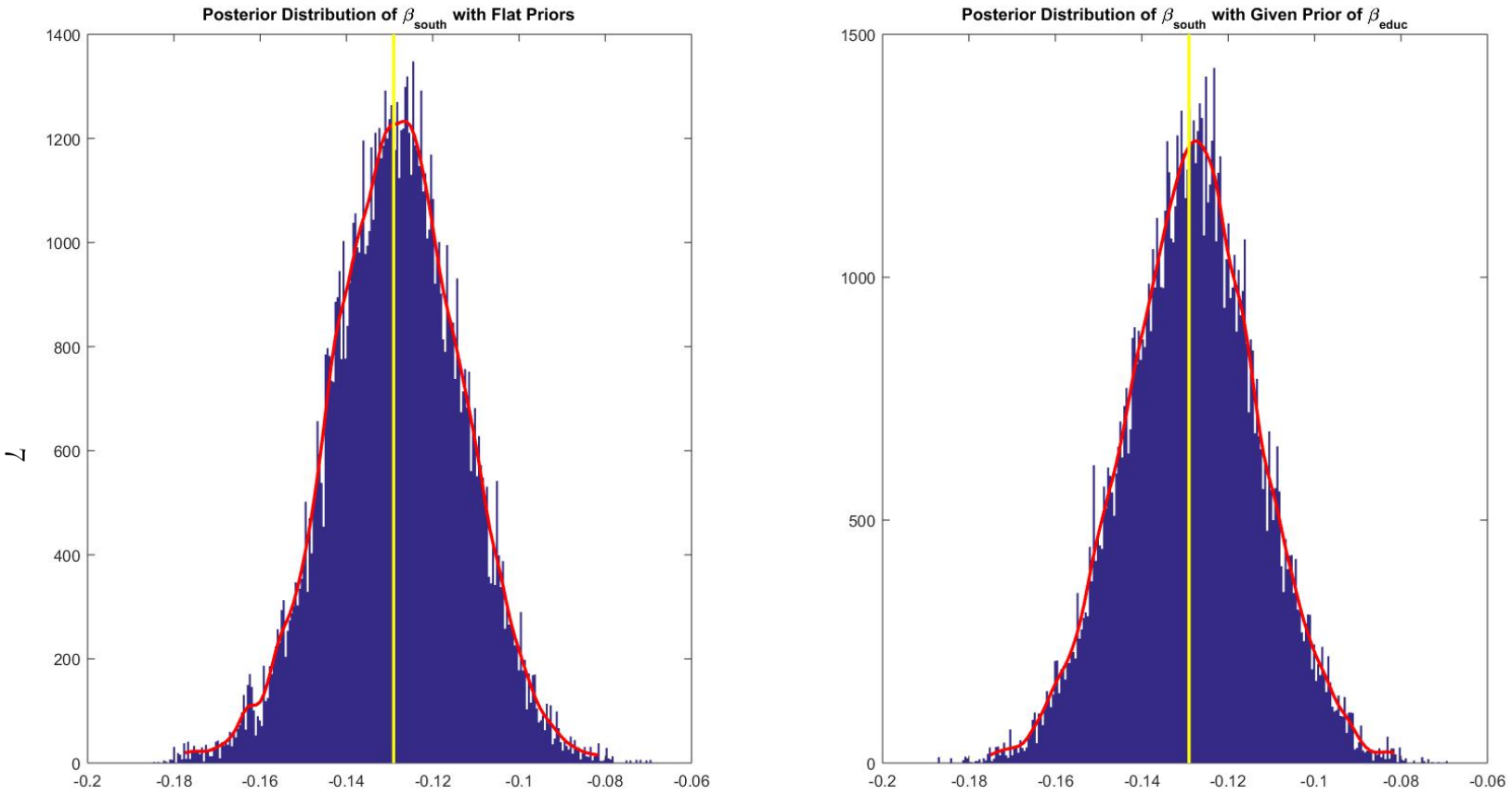

Figure 6: Posterior Distribution of β_{south}

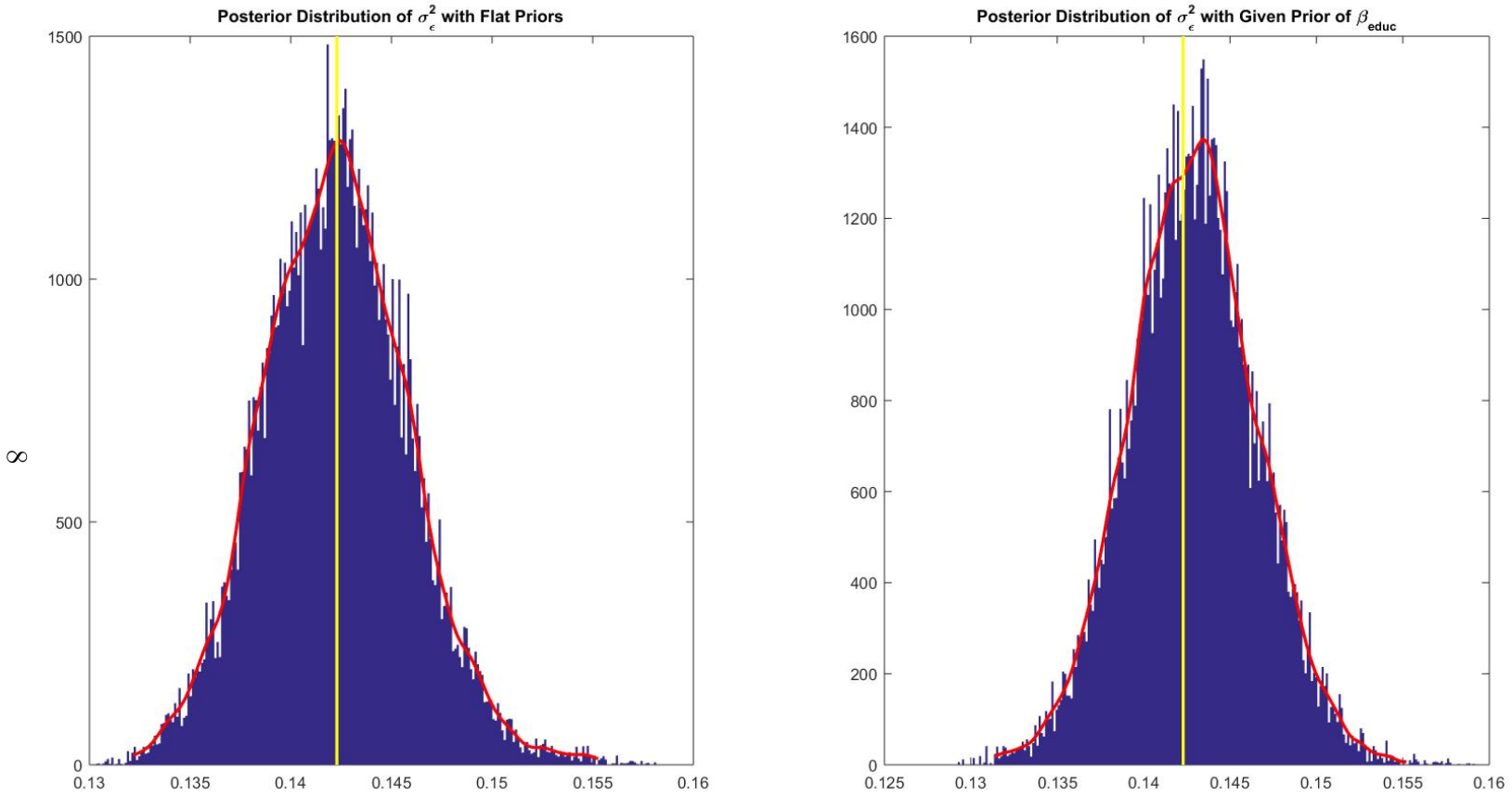

Figure 7: Posterior Distribution of σ_ϵ^2