Fixed Effects Regression

Test name: Fixed Effects Regression

Dataset: D:/DATA ANALYSIS/H Regression Tests and Models/Fixed Effects Regression/dataset.csv

Rows in original dataset: 649

Columns in original dataset: 33

Rows used in fixed effects models: 649

Outcome variable: G3

Numeric predictors: G1, G2, studytime, failures, absences, age, Medu, Fedu

Fixed effect variables: school, sex, address, higher

Pooled formula: G3 ~ G1 + G2 + studytime + failures + absences + age + Medu + Fedu

One−way fixed effects formula: G3 ~ G1 + G2 + studytime + failures + absences + age + Medu + Fedu + factor(school)

Multi−way fixed effects formula: G3 ~ G1 + G2 + studytime + failures + absences + age + Medu + Fedu + factor(school) + factor(sex) + factor(address) + factor(higher)

Best adjusted R squared model: Multi−way fixed effects 0.8499

Multi−way fixed effects R squared: 0.8527

Multi−way fixed effects adjusted R squared: 0.8499

Multi−way fixed effects RMSE: 1.2392

Interpretation: numeric coefficients estimate outcome change after controlling for fixed effect groups.

Decision guide: compare adjusted R squared and nested F−test p−values to decide whether fixed effects improve model fit.

Reporting guide: state outcome, numeric predictors, fixed effect variables, model comparison, adjusted R squared, F−test, and key coefficients.

Charts generated: 8

Model comparison

model	n	df_model	df_residual	r_squared	adjusted_r_squared	rmse	mae	f_statistic	f_p_value	aic	bic
Pooled OLS	649	8	640	0.8507772	0.8489119	1.247020	0.7800189	456.1111	1.454898e−258	2148.325	2193.079
One−way fixed effects	649	9	639	0.8514081	0.8493152	1.244381	0.7788884	406.8187	8.307231e−258	2147.575	2196.805
Multi−way fixed effects	649	12	636	0.8526519	0.8498717	1.239162	0.7774224	306.6924	4.384615e−255	2148.120	2210.776

Nested fixed effects tests

smaller_model	larger_model	f_value	df_difference	p_value	decision_alpha_0_05
Pooled OLS	One−way fixed effects	2.712942	1	0.10002889	No significant improvement detected
One−way fixed effects	Multi−way fixed effects	1.789584	3	0.14786417	No significant improvement detected
Pooled OLS	Multi−way fixed effects	2.022938	4	0.08964412	No significant improvement detected

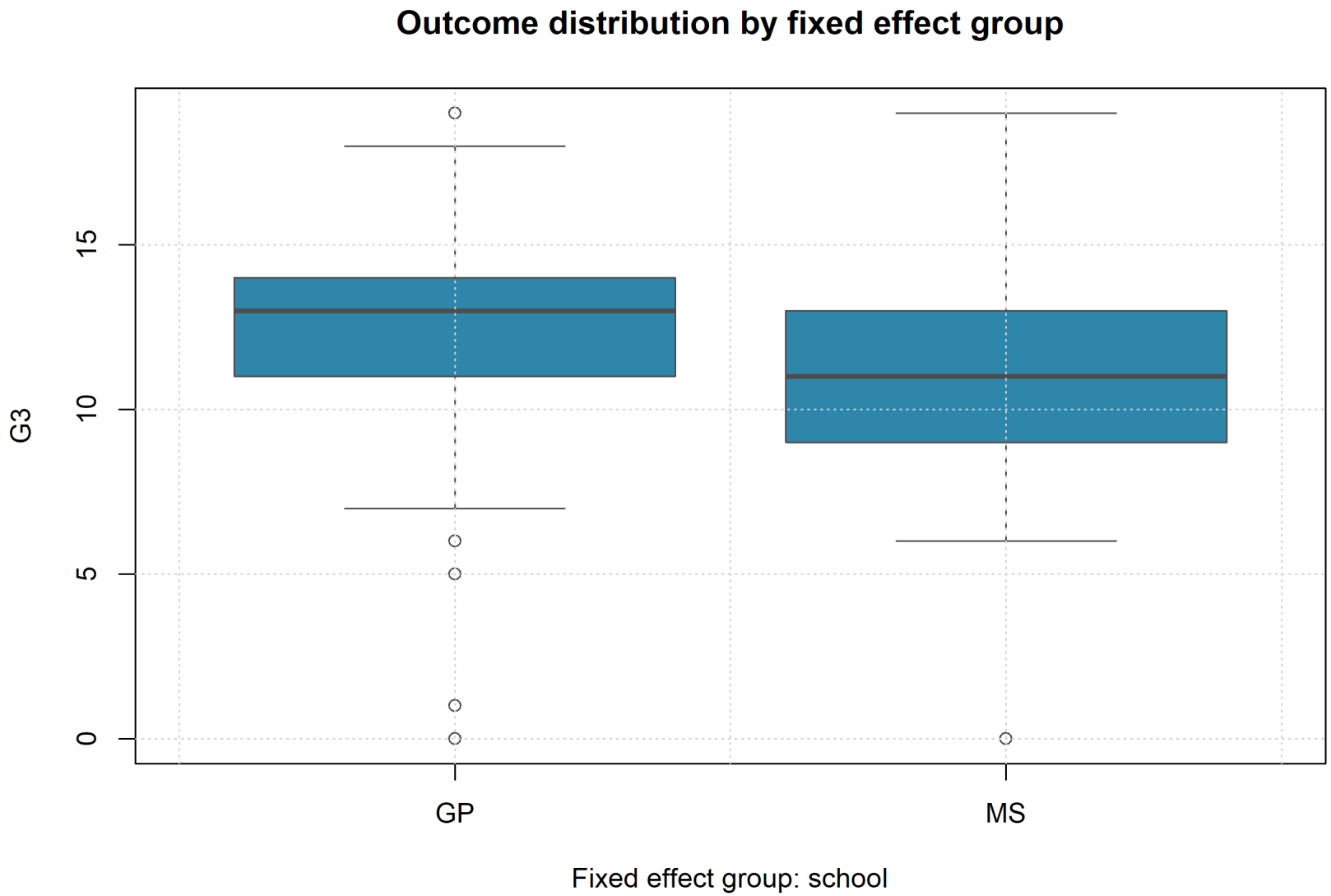
Multi−way fixed effects coefficients

model	term	coefficient	standard_error	t_value	p_value	ci95_lower	ci95_upper	term_type	decision_alpha_0_05
Multi−way fixed effects	(Intercept)	−0.42144574	0.81854400	−0.5148724	6.068210e−01	−2.02882138	1.18592990	Numeric/intercept	Not statistically significant
Multi−way fixed effects	G1	0.13126625	0.03689750	3.5575922	4.021142e−04	0.05881060	0.20372190	Numeric/intercept	Statistically significant
Multi−way fixed effects	G2	0.87916562	0.03433775	25.6034742	6.515170e−100	0.81173655	0.94659468	Numeric/intercept	Statistically significant
Multi−way fixed effects	studytime	0.05841356	0.06366240	0.9175521	3.592012e−01	−0.06660034	0.18342747	Numeric/intercept	Not statistically significant
Multi−way fixed effects	failures	−0.21784637	0.09582309	−2.2734225	2.333330e−02	−0.40601427	−0.02967847	Numeric/intercept	Statistically significant
Multi−way fixed effects	absences	0.01815998	0.01120413	1.6208291	1.055499e−01	−0.00384158	0.04016154	Numeric/intercept	Not statistically significant
Multi−way fixed effects	age	0.03105104	0.04436132	0.6999576	4.842097e−01	−0.05606132	0.11816340	Numeric/intercept	Not statistically significant
Multi−way fixed effects	Medu	−0.05357436	0.05883535	−0.9105811	3.628611e−01	−0.16910939	0.06196068	Numeric/intercept	Not statistically significant
Multi−way fixed effects	Fedu	0.01710963	0.05921622	0.2889349	7.727254e−01	−0.09917331	0.13339257	Numeric/intercept	Not statistically significant
Multi−way fixed effects	factor(school)MS	−0.17593404	0.11921352	−1.4757893	1.404954e−01	−0.41003375	0.05816566	Fixed effect	Not statistically significant
Multi−way fixed effects	factor(sex)M	−0.18873392	0.10461451	−1.8040893	7.169031e−02	−0.39416554	0.01669770	Fixed effect	Not statistically significant
Multi−way fixed effects	factor(address)U	0.10771966	0.11517852	0.9352409	3.500191e−01	−0.11845650	0.33389582	Fixed effect	Not statistically significant

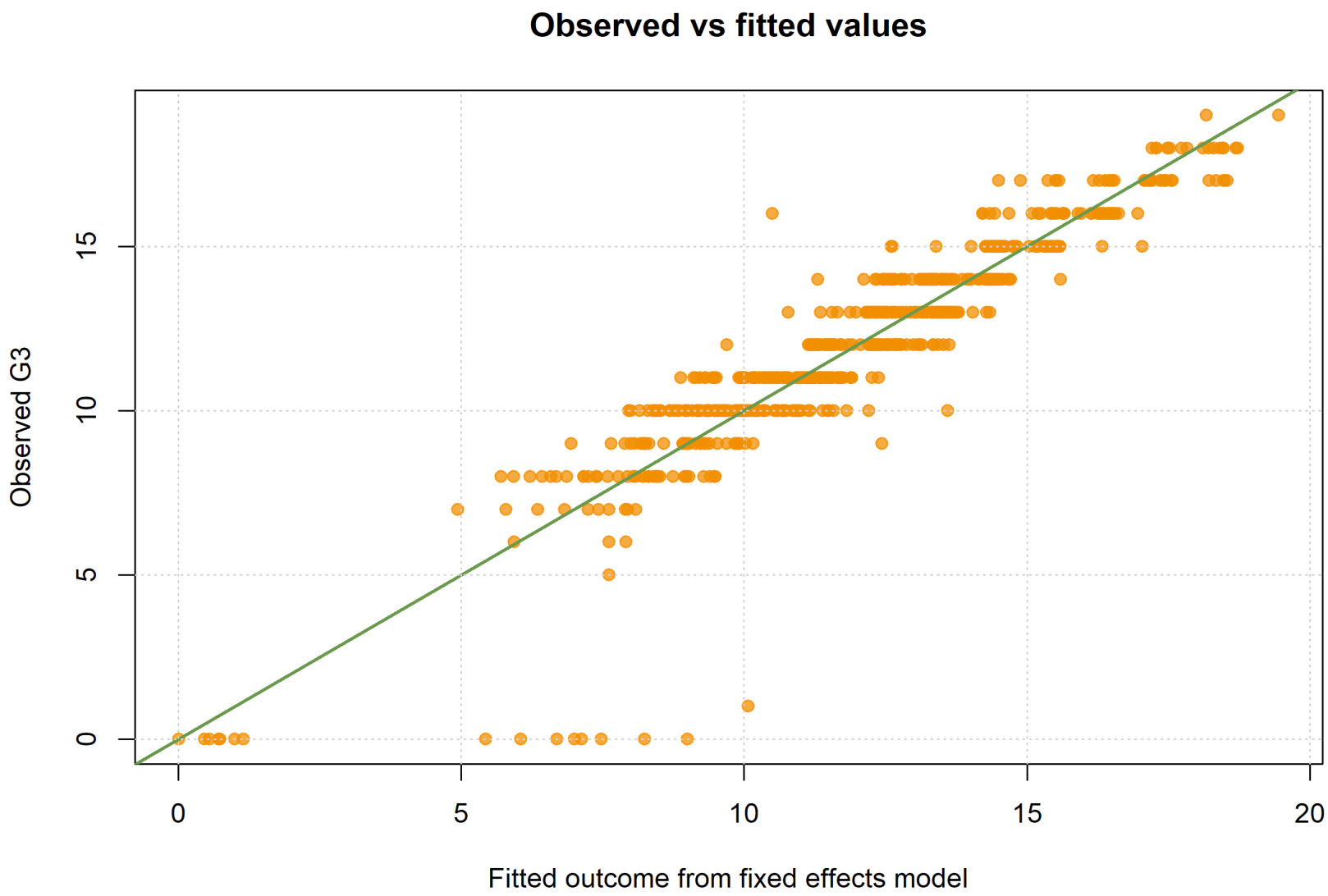
Fixed effect group summary

school	n	outcome_mean	fitted_mean	residual_mean
GP	423	12.57683	12.57683	8.78034e−17
MS	226	10.65044	10.65044	−5.27547e−17

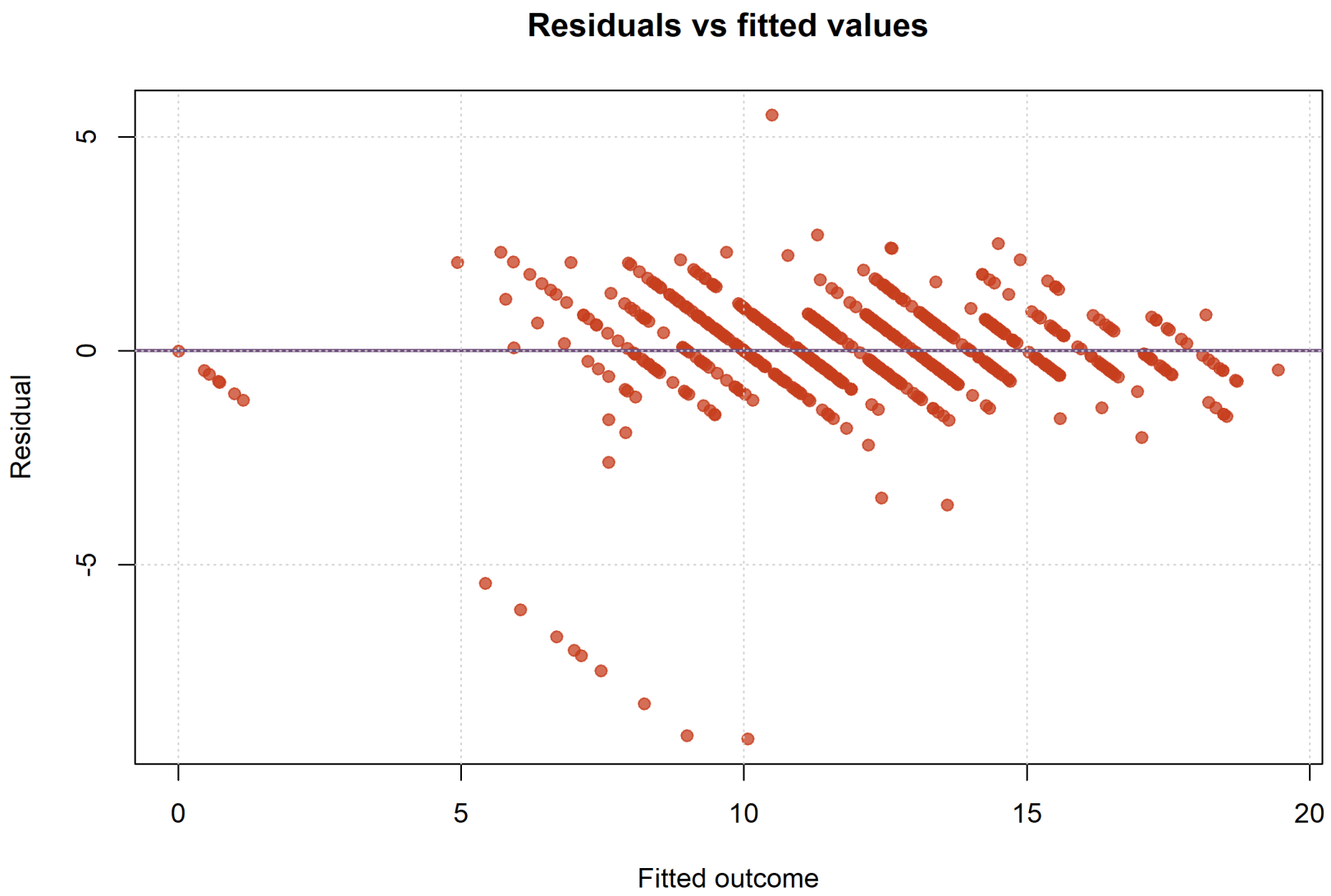
01_fixed_effect_outcome_distribution.png



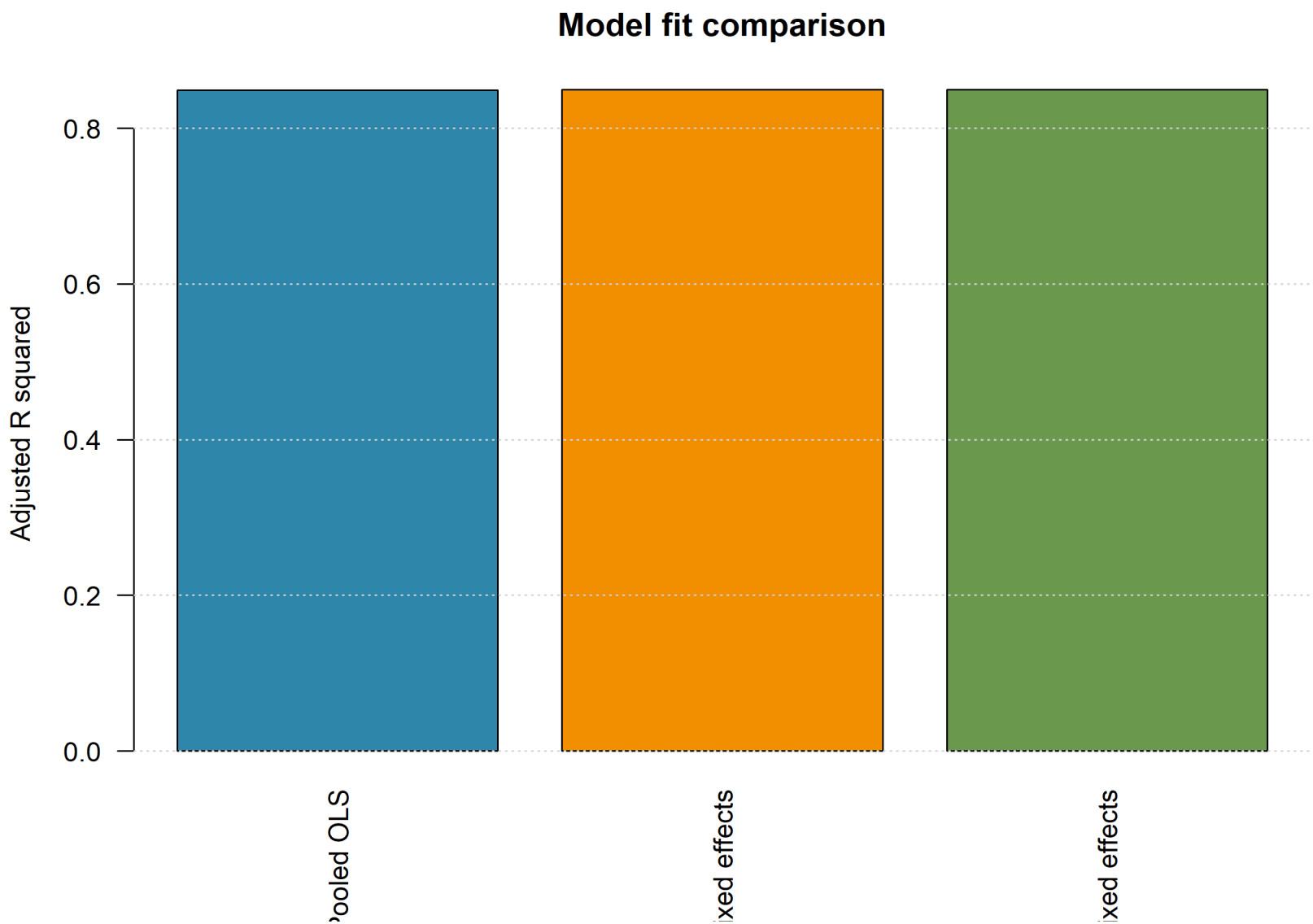
02_fixed_effect_observed_vs_fitted.png



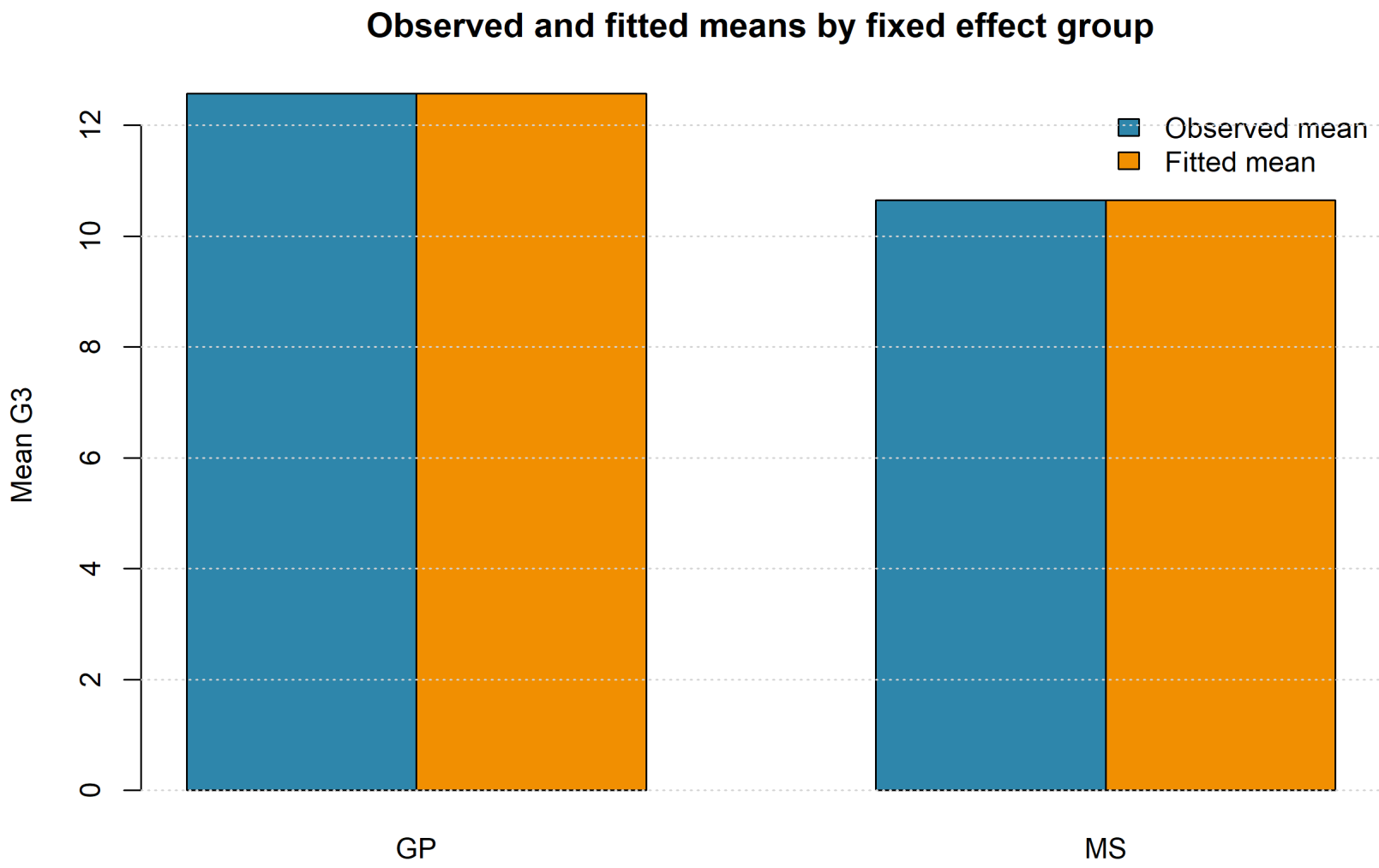
03_fixed_effect_residuals_vs_fitted.png



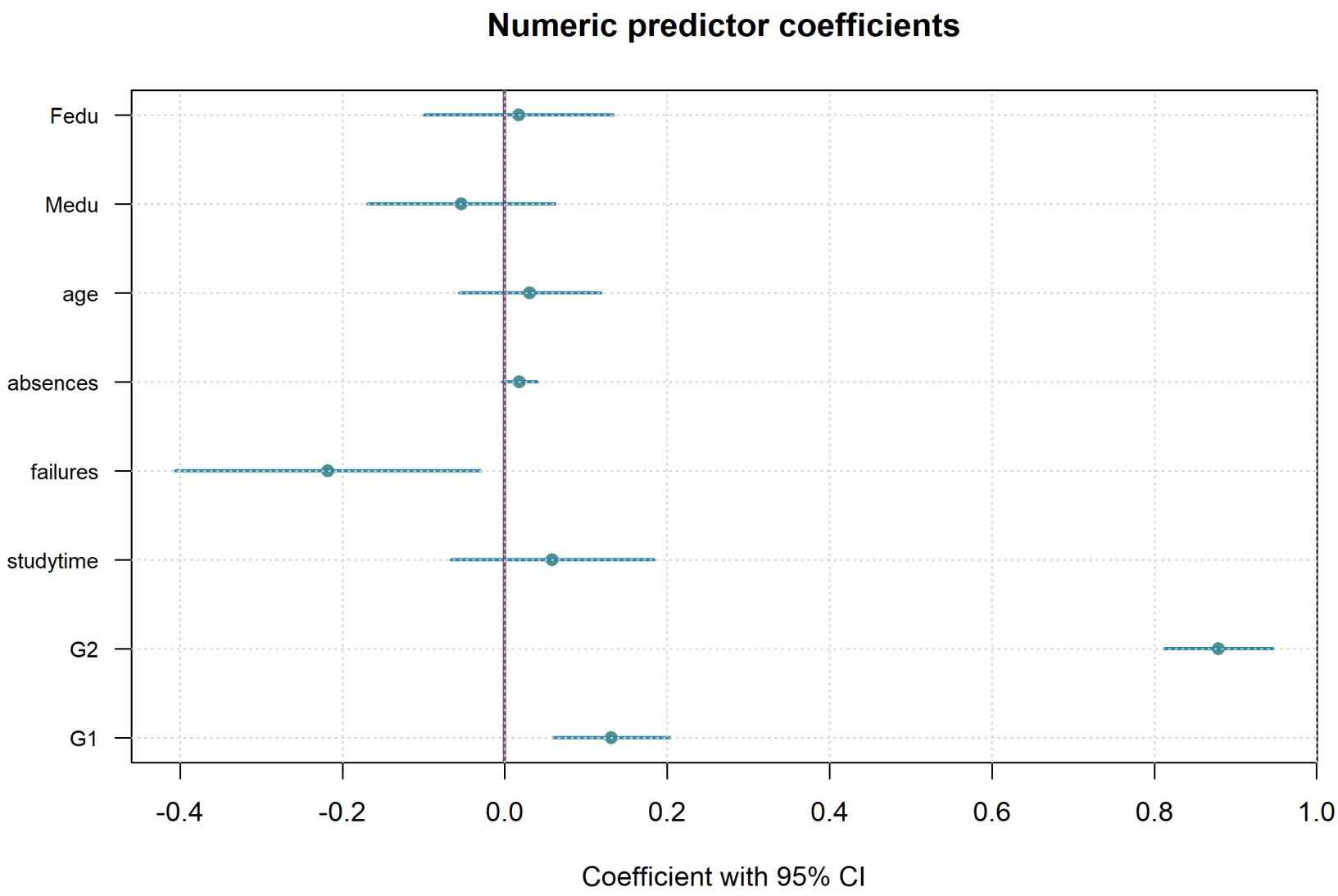
04_fixed_effect_adjusted_r_squared_comparison.png



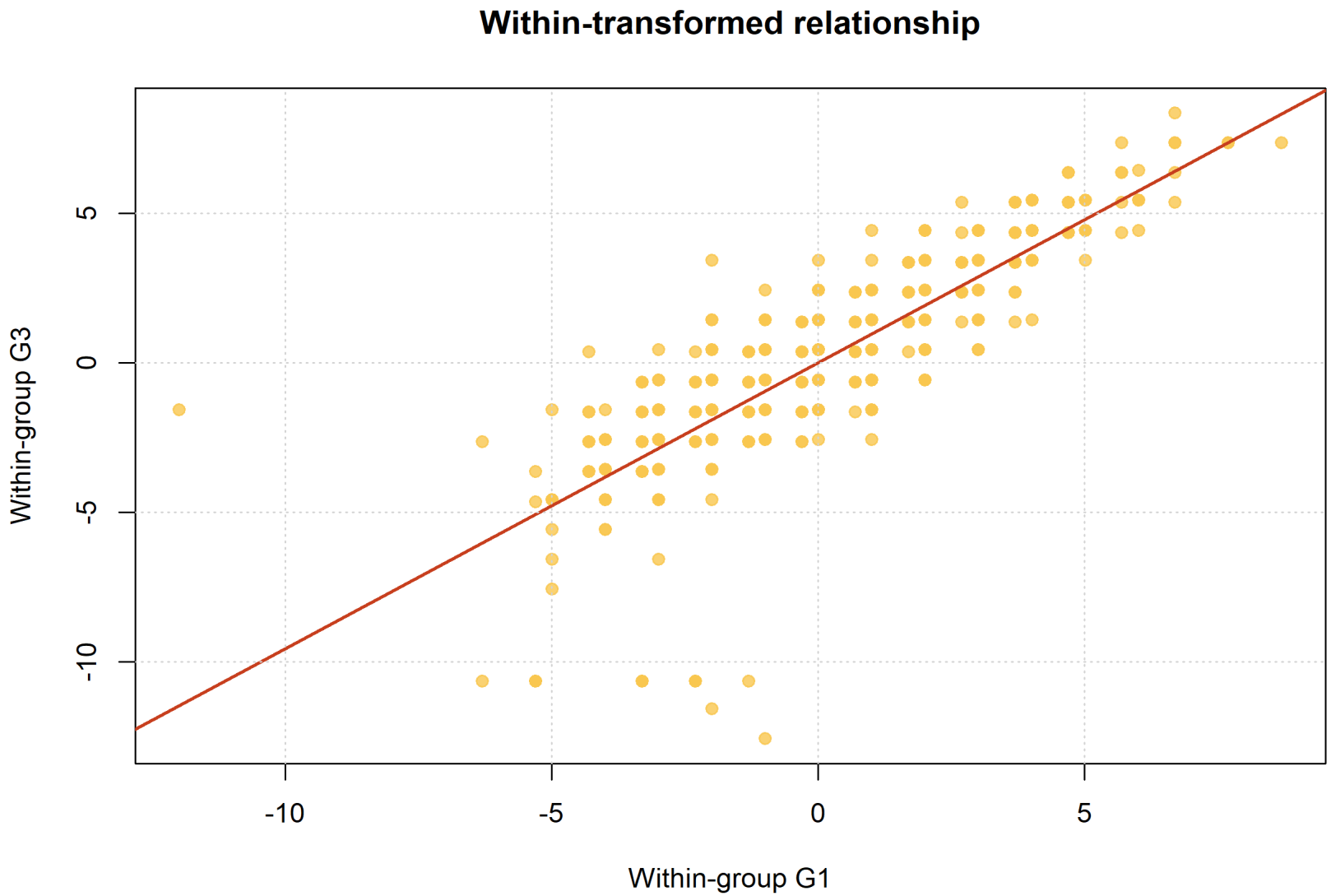
05_fixed_effect_group_means.png



06_fixed_effect_numeric_coefficients.png



07_fixed_effect_within_transformed_relationship.png



08_fixed_effect_group_coefficients.png