Hierarchical Regression

Test name: Hierarchical Regression

Dataset: D:\DATA ANALYSIS\H Regression Tests and Models\Hierarchical Regression\dataset.csv

Rows in original dataset: 649

Columns in original dataset: 33

Rows used in hierarchical models: 649

Outcome variable: G3

Number of fitted blocks: 3

Final model predictors excluding intercept: 28

Final R squared: 0.8563

Final adjusted R squared: 0.8498

Final model F statistic: 131.9304

Final model p-value: 0.000000

Largest R squared change block: Block 2 (0.7297)

Final RMSE: 1.2238

Final MAE: 0.7700

Interpretation: hierarchical regression evaluates whether each added block explains extra variance beyond previous blocks.

Decision guide: a significant F-change p-value indicates that a block adds statistically meaningful explanatory power.

Reporting guide: report block order, R square, adjusted R square, R square change, F-change, p-value, and final coefficients.

Charts generated: 8

Hierarchical regression model fit and R-square change

block	model	n	predictor	r_square	adjusted	r_square	f_statisti	model_p	f_change	f_change	f_change	f_change	aic	bic	rmse	mae	purpose
1.0000	Block 1 -	649.0000	6.0000	0.1227	0.1145	0.1227	14.9603	0.0000		6.0000	642.0000		3291.994	3323.321	3.0237	2.2508	Controls fo
2.0000	Block 2 -	649.0000	11.0000	0.8524	0.8498	0.7297	334.3804	0.0000	629.7720	5.0000	637.0000	0.0000	2145.308	2199.011	1.2403	0.7794	Tests whet
3.0000	Block 3 -	649.0000	28.0000	0.8563	0.8498	0.0039	131.9304	0.0000	0.9902	17.0000	620.0000	0.4674	2161.921	2291.710	1.2238	0.7700	Tests whet

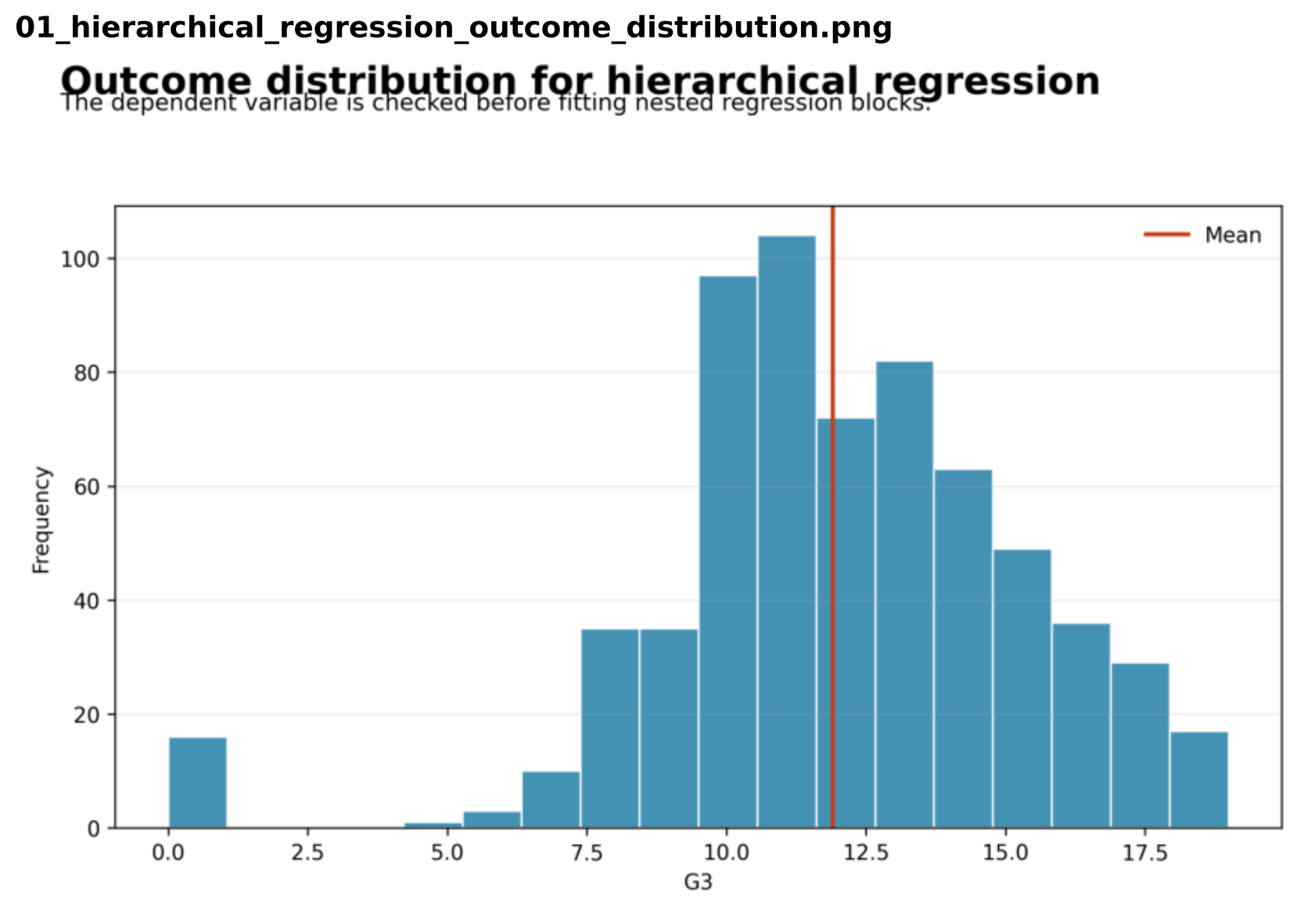
Final model coefficients

block	model	term	coefficient	standard_error	t_value	p_value	ci95_lower	ci95_upper	decision_alpha_0_
3.0000	Block 3 - Family	const	-0.0704	0.9220	-0.0763	0.9392	-1.8809	1.7402	Not statistically si
3.0000	Block 3 - Family	age	0.0399	0.0464	0.8608	0.3897	-0.0512	0.1311	Not statistically si
3.0000	Block 3 - Family	school_MS	-0.2171	0.1237	-1.7553	0.0797	-0.4600	0.0258	Not statistically si
3.0000	Block 3 - Family	sex_M	-0.1360	0.1168	-1.1647	0.2446	-0.3653	0.0933	Not statistically si
3.0000	Block 3 - Family	address_U	0.1469	0.1211	1.2130	0.2256	-0.0909	0.3847	Not statistically si
3.0000	Block 3 - Family	famsize_LE3	0.0496	0.1143	0.4341	0.6643	-0.1749	0.2741	Not statistically si
3.0000	Block 3 - Family	Pstatus_T	-0.1076	0.1593	-0.6750	0.4999	-0.4205	0.2054	Not statistically si
3.0000	Block 3 - Family	G1	0.1236	0.0375	3.2988	0.0010	0.0500	0.1972	Statistically signif
3.0000	Block 3 - Family	G2	0.8749	0.0349	25.1010	0.0000	0.8064	0.9433	Statistically signif
3.0000	Block 3 - Family	studytime	0.0436	0.0651	0.6700	0.5031	-0.0843	0.1715	Not statistically si
3.0000	Block 3 - Family	failures	-0.2206	0.0975	-2.2628	0.0240	-0.4120	-0.0291	Statistically signif
3.0000	Block 3 - Family	absences	0.0148	0.0116	1.2808	0.2007	-0.0079	0.0376	Not statistically si
3.0000	Block 3 - Family	Medu	-0.0520	0.0612	-0.8489	0.3963	-0.1722	0.0683	Not statistically si
3.0000	Block 3 - Family	Fedu	0.0311	0.0599	0.5183	0.6045	-0.0866	0.1487	Not statistically si

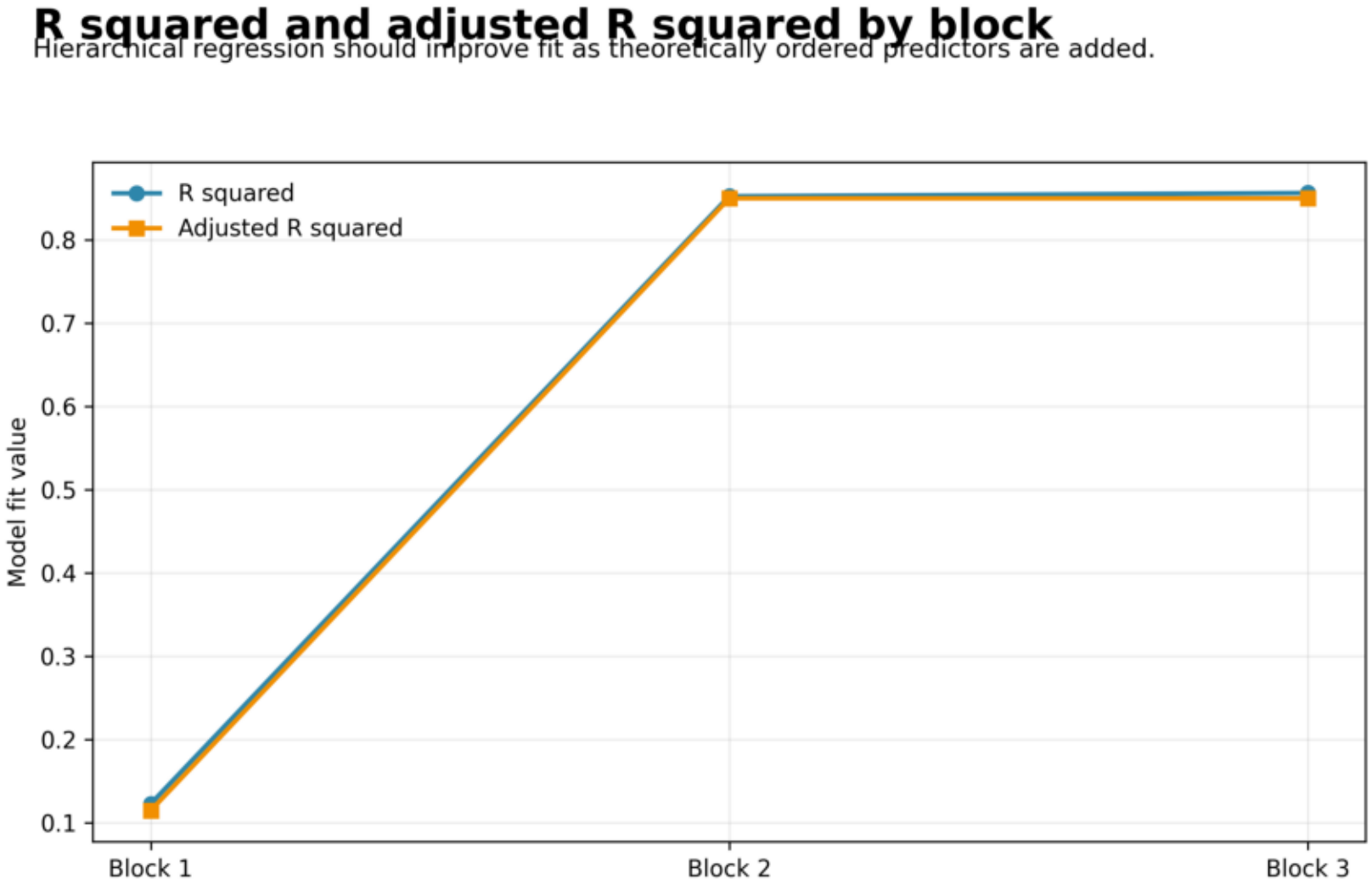
Block definitions

block	block_name	numeric_variables_used	categorical_variables_used	encoded_terms_added	purpose
1.0000	Block 1 - Background and	age	school, sex, address, fams	age, school_MS, sex_M, ad	Controls for student backgro
2.0000	Block 2 - Prior achievemer	G1, G2, studytime, failures		G1, G2, studytime, failures	Tests whether achievement
3.0000	Block 3 - Family, support,	Medu, Fedu, traveltime, fa	schoolsup, famsup, paid, a	Medu, Fedu, traveltime, fa	Tests whether additional fa

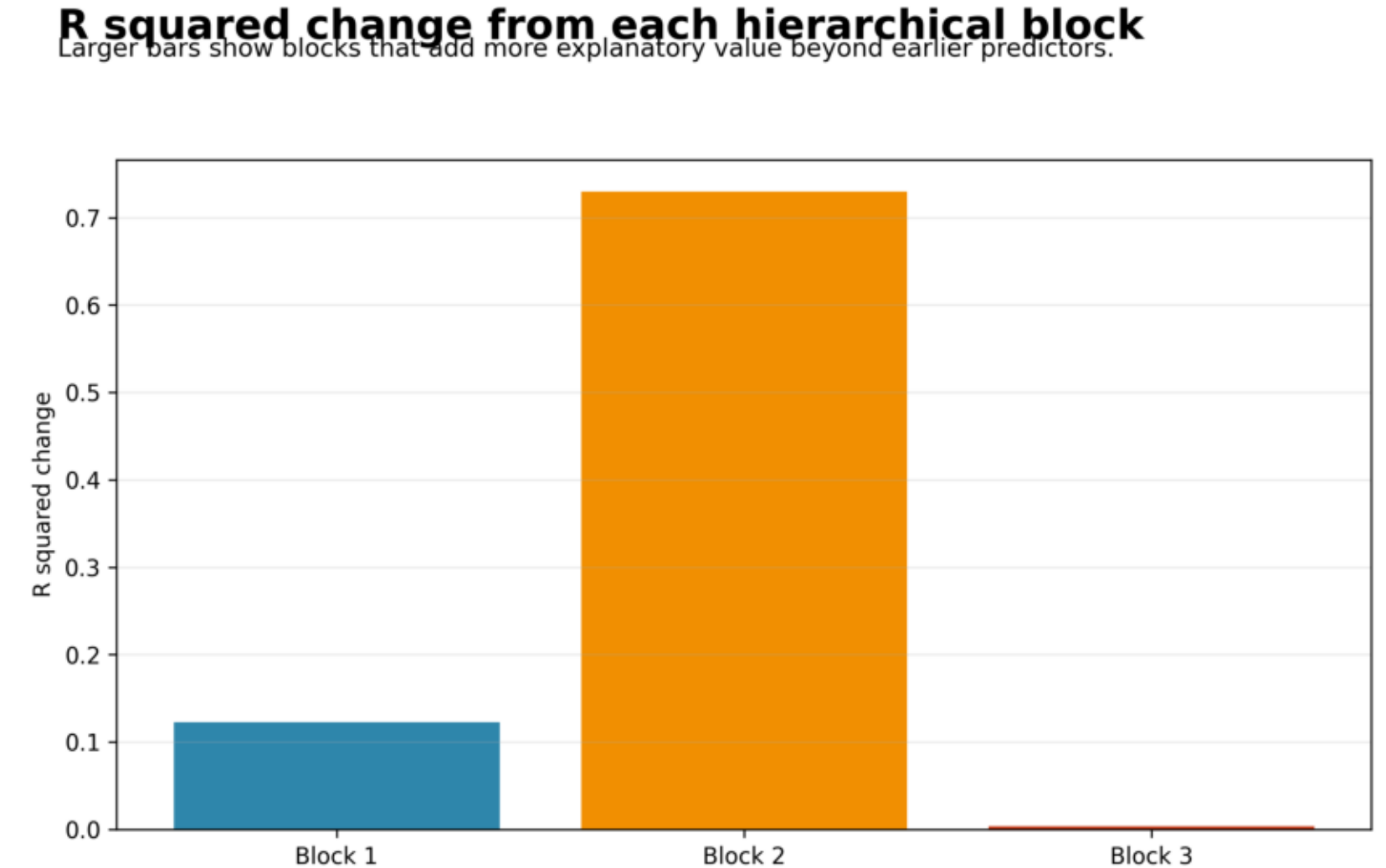
01_hierarchical_regression_outcome_distribution.png



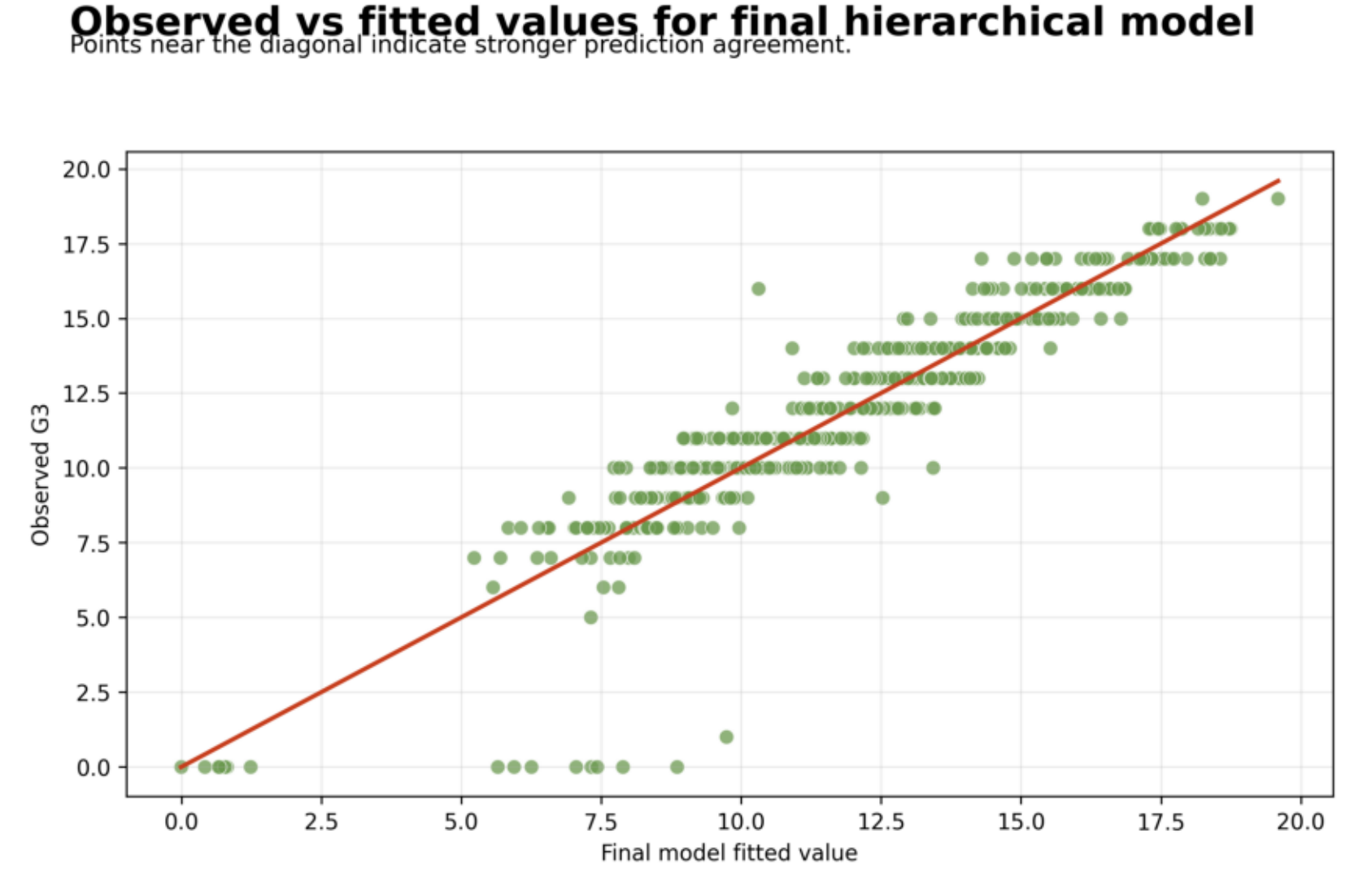
02_hierarchical_regression_r2_adjusted_r2_by_block.png



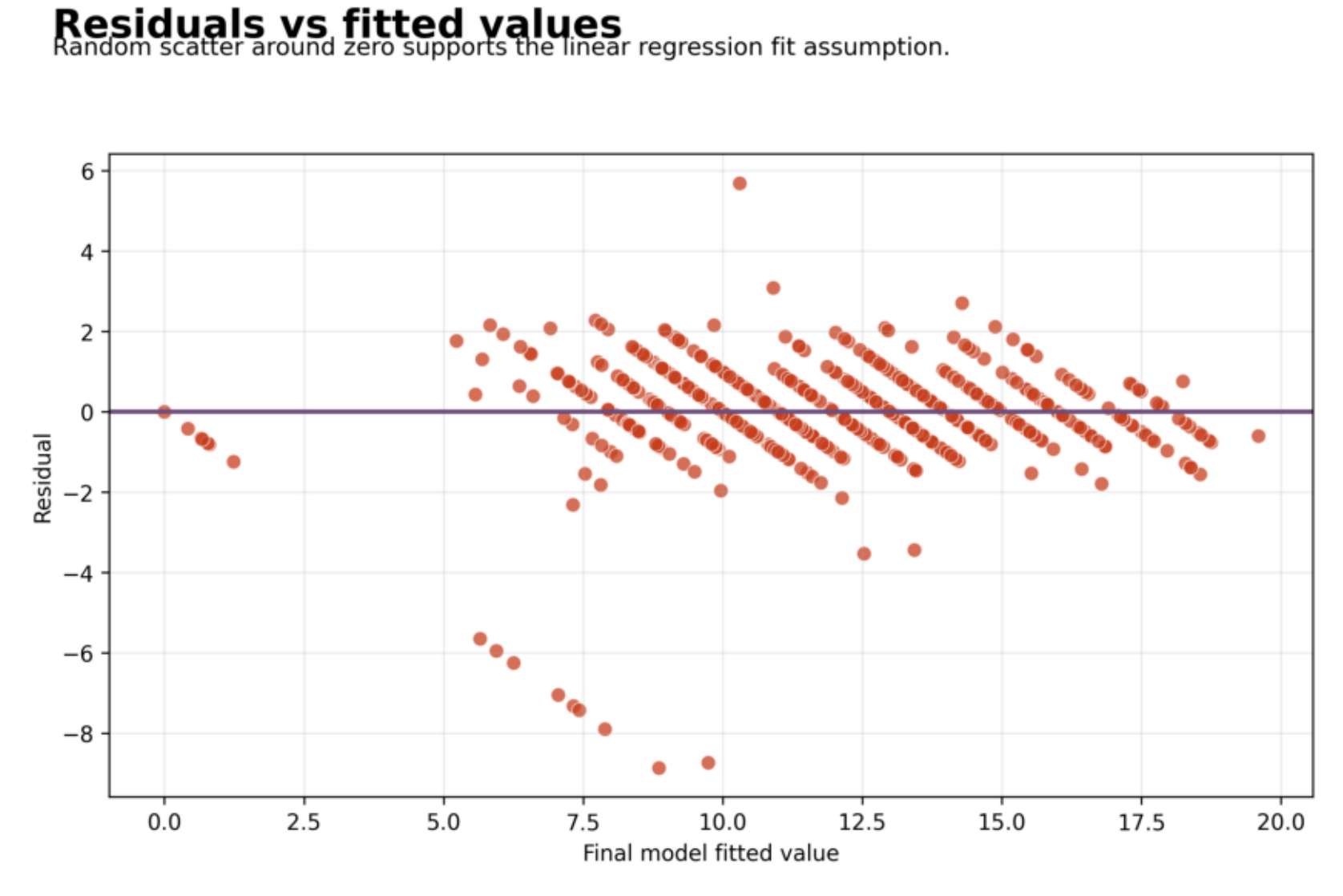
03_hierarchical_regression_r2_change.png



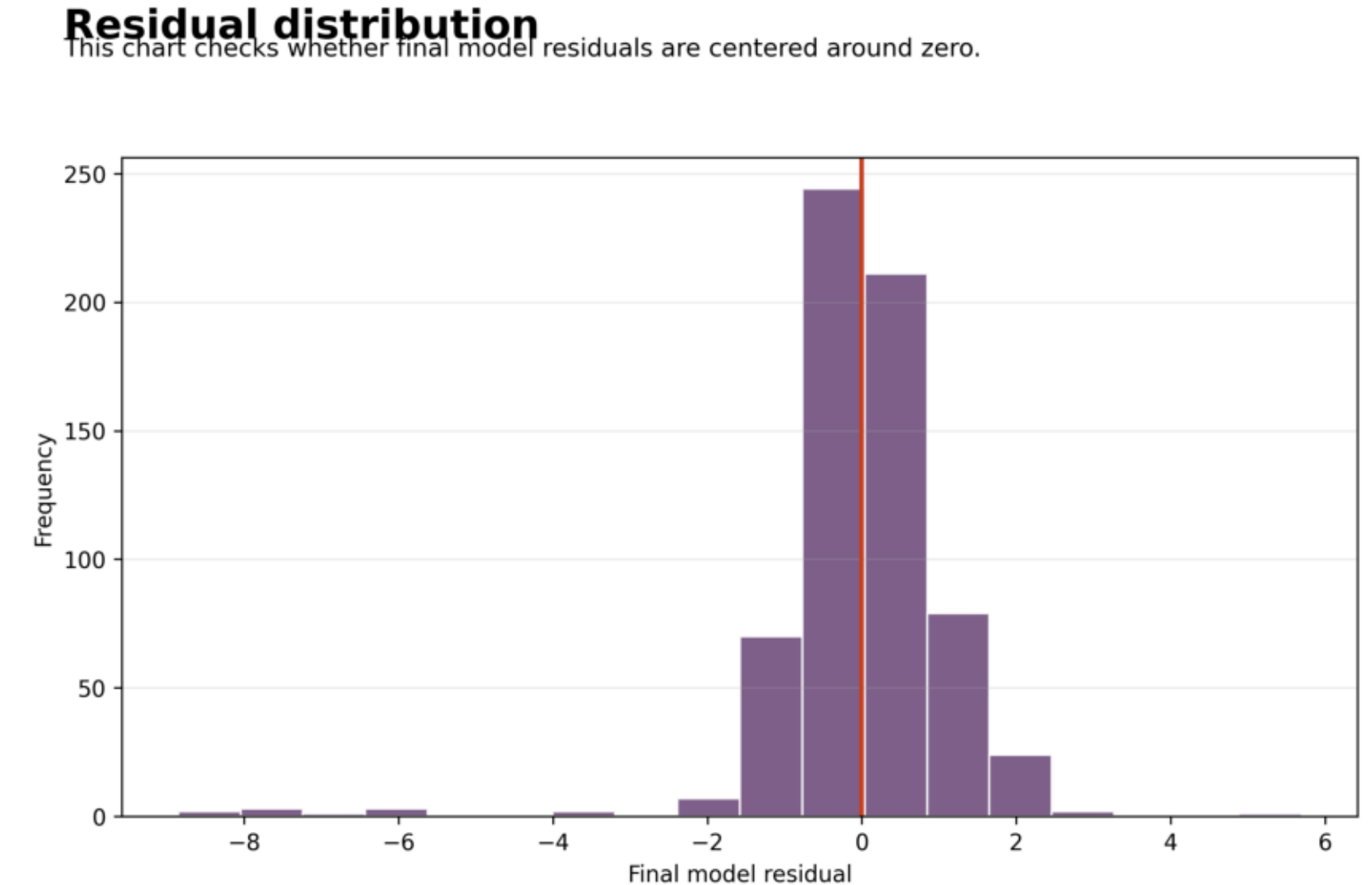
04_hierarchical_regression_observed_vs_fitted.png



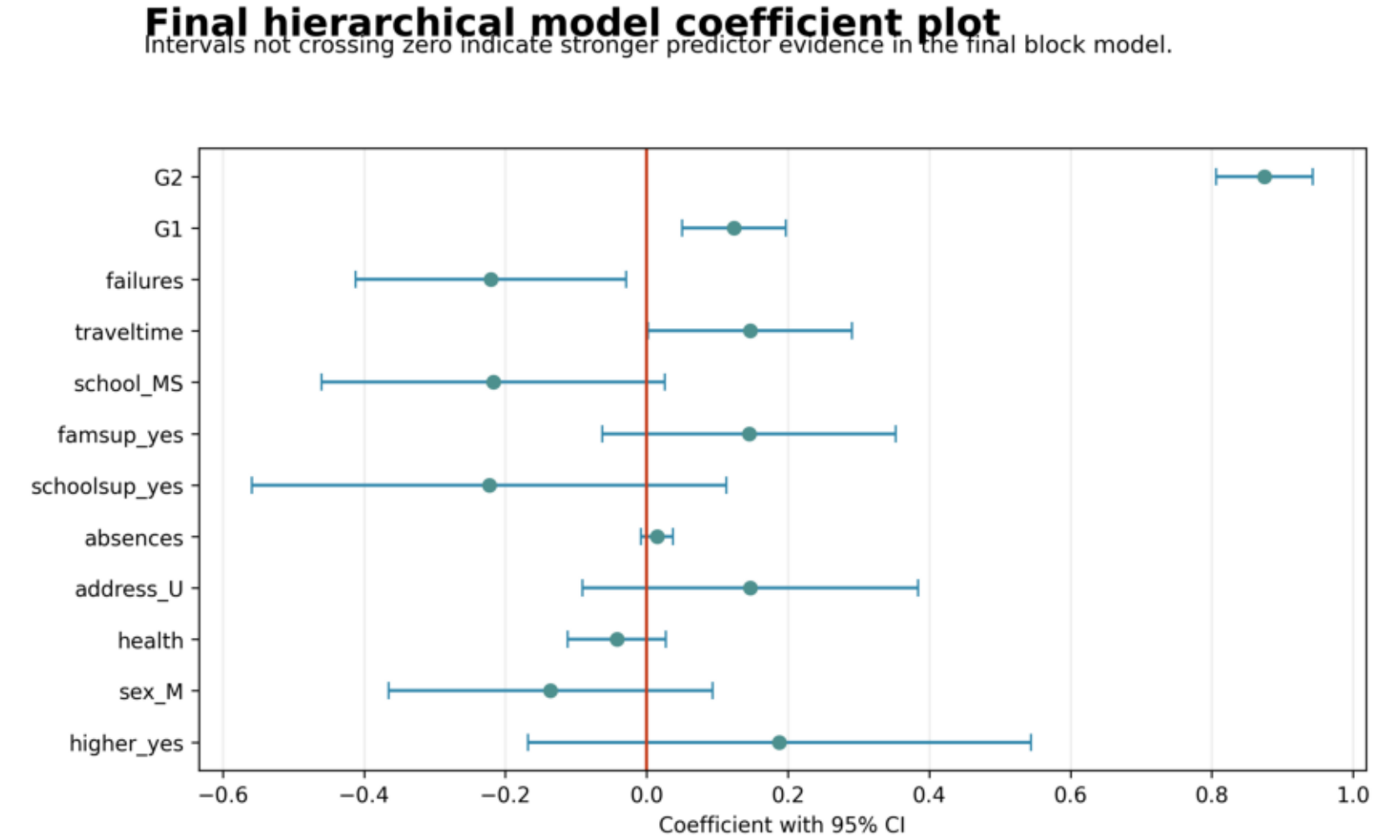
05_hierarchical_regression_residuals_vs_fitted.png



06_hierarchical_regression_residual_distribution.png



07_hierarchical_regression_final_coefficients.png



08_hierarchical_regression_prediction_error_by_block.png