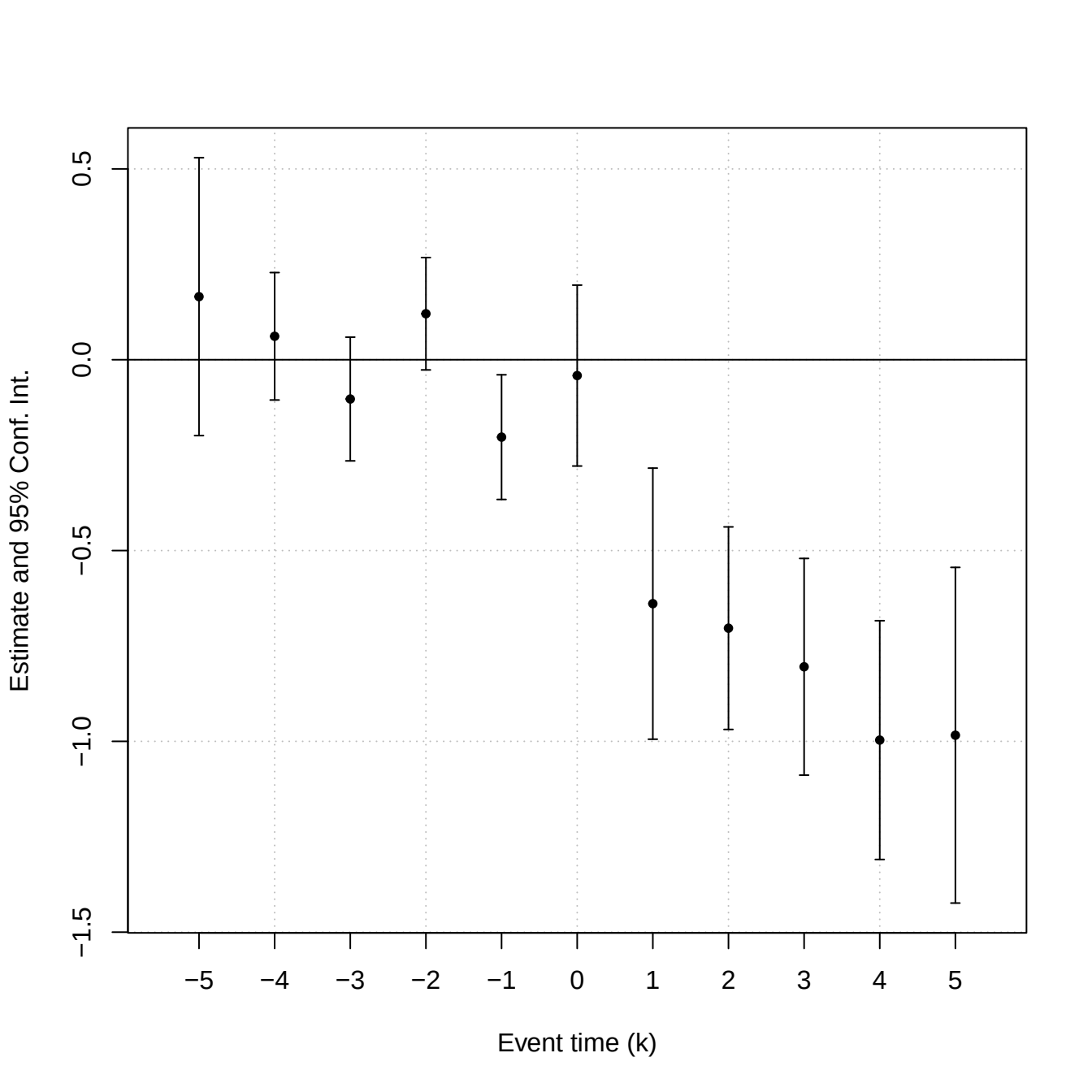
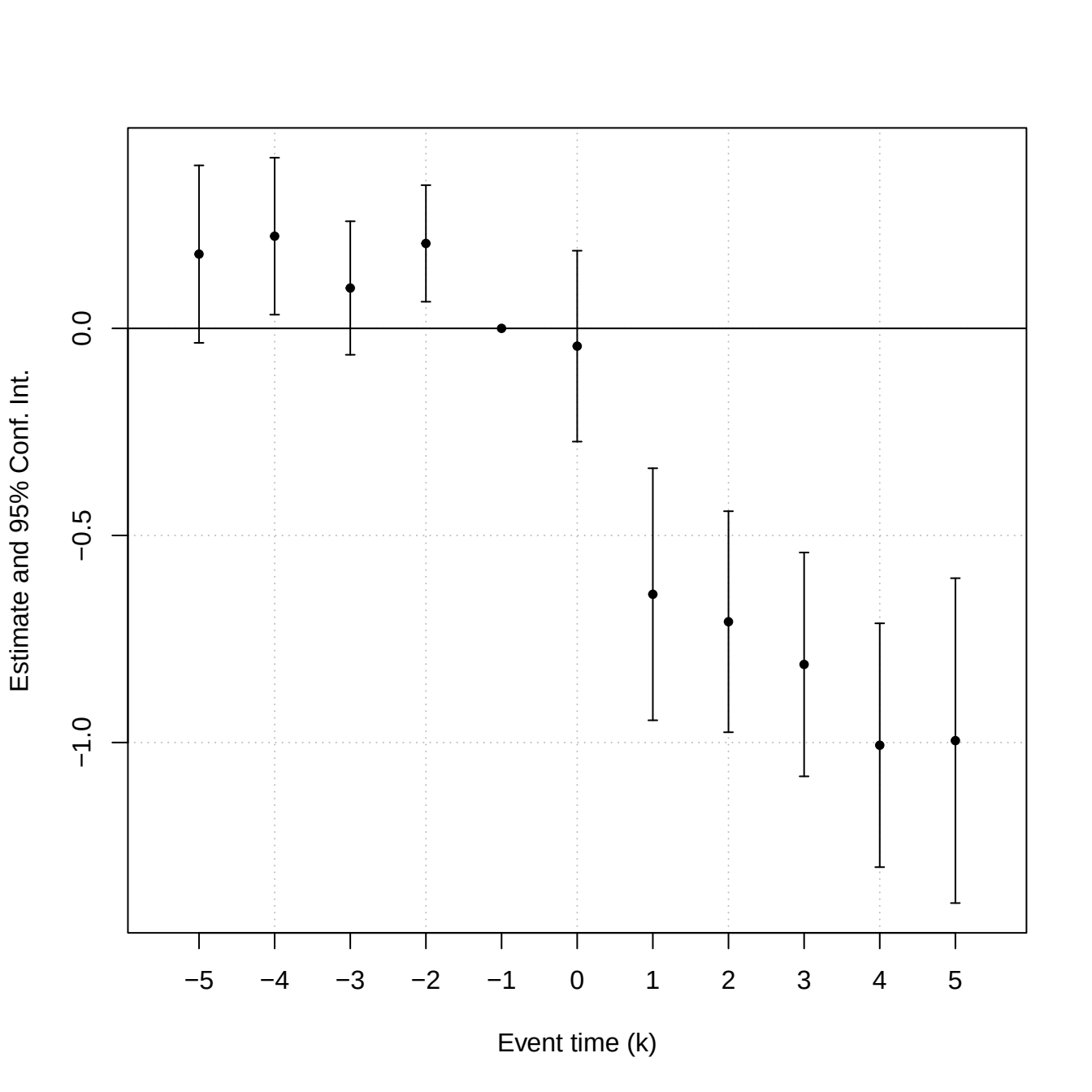
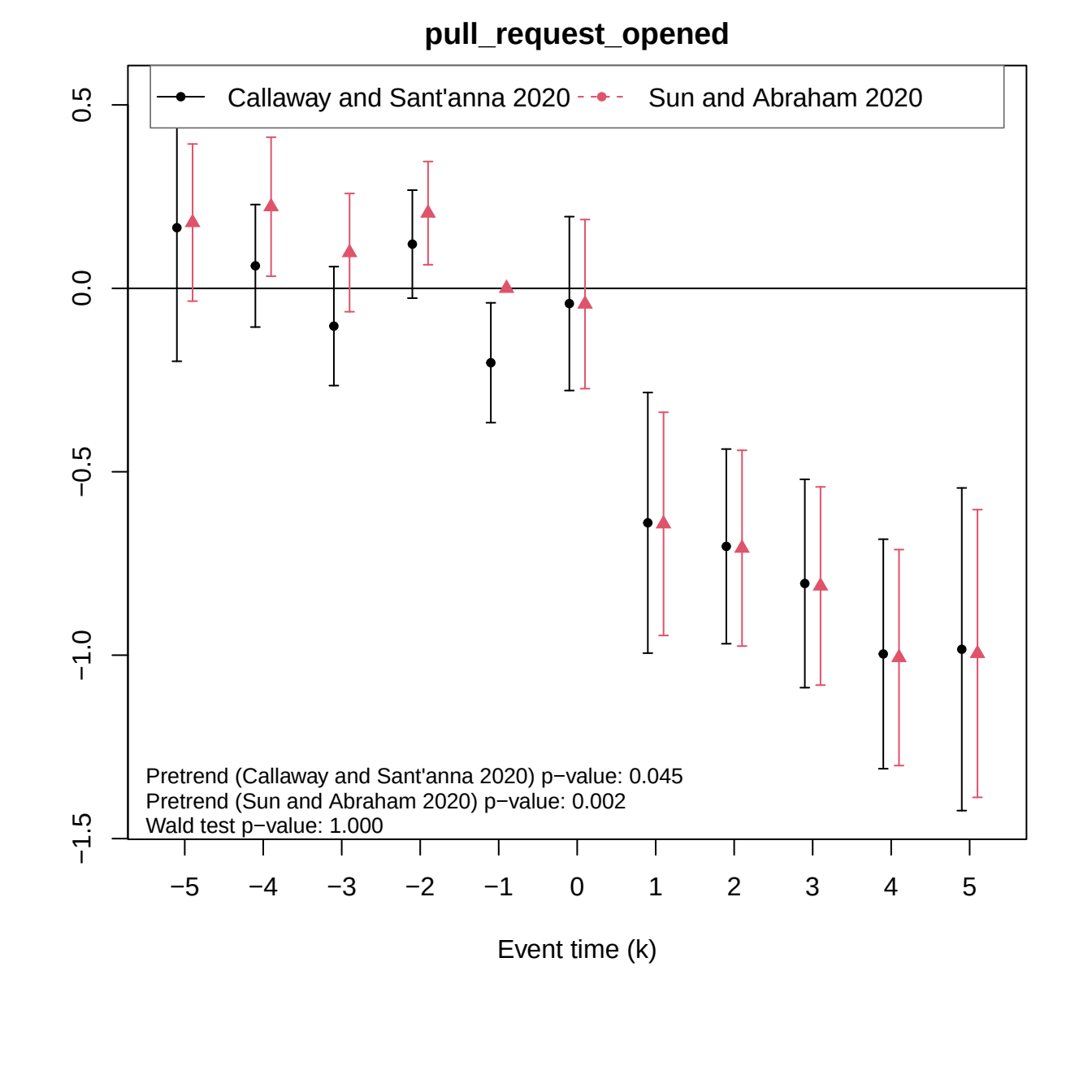
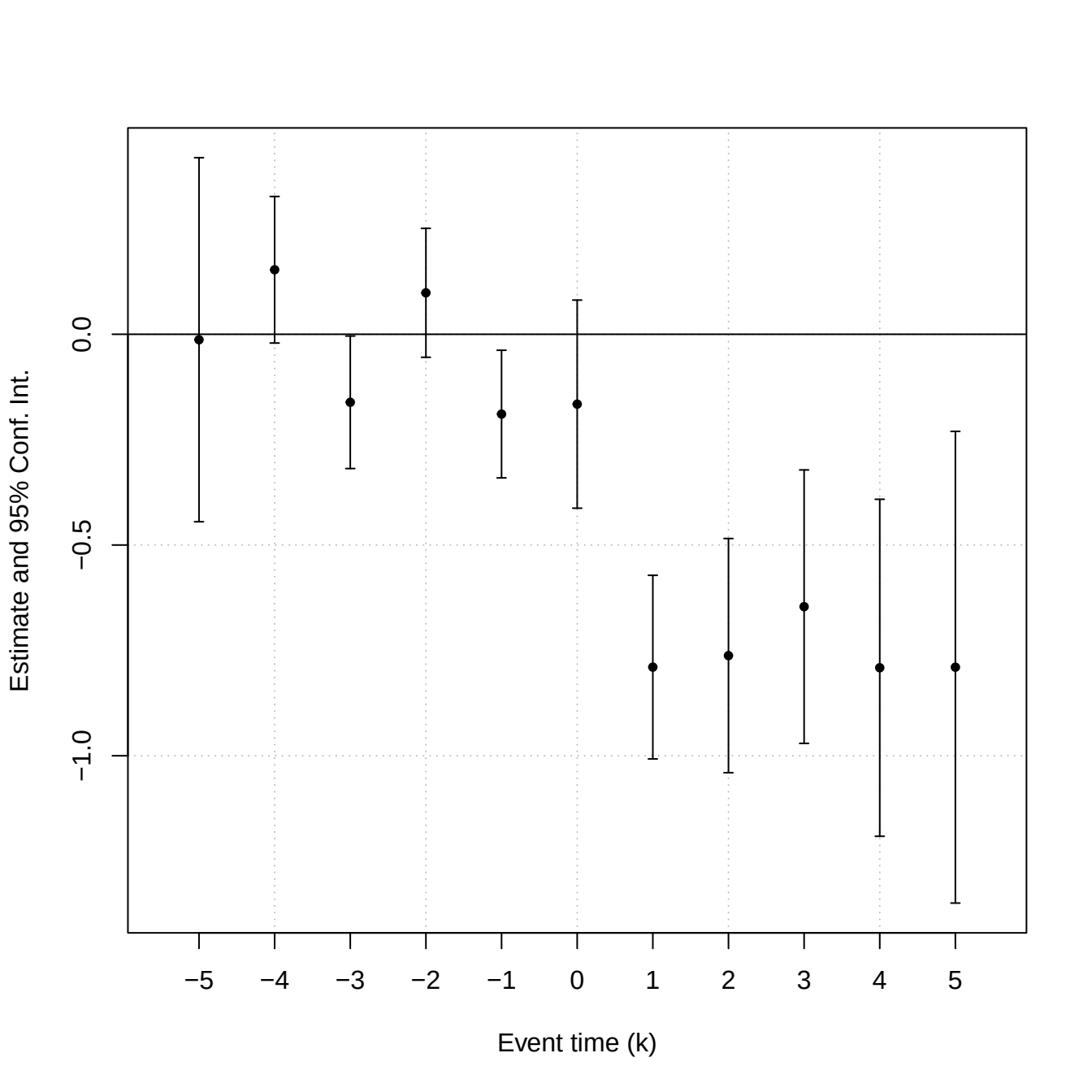
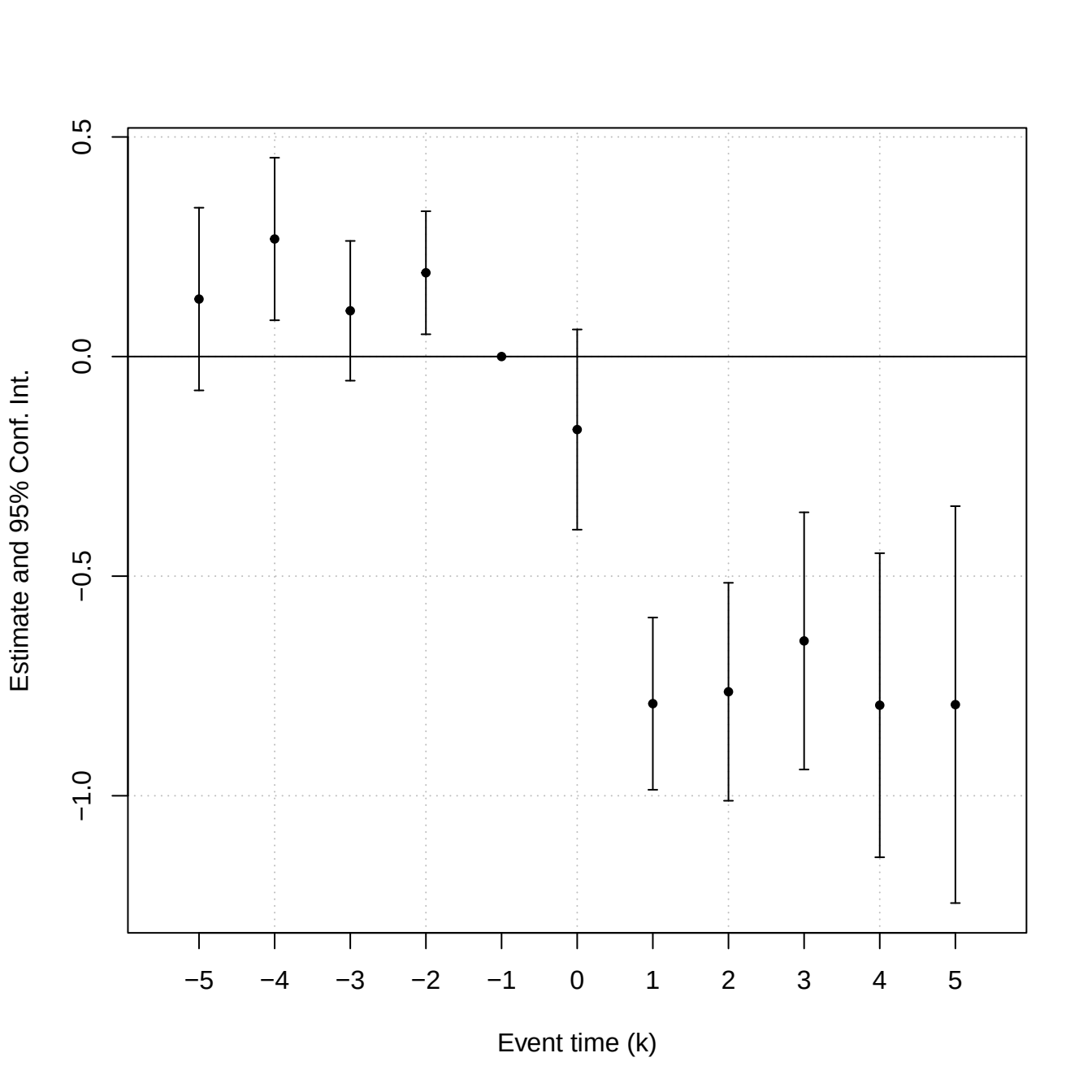
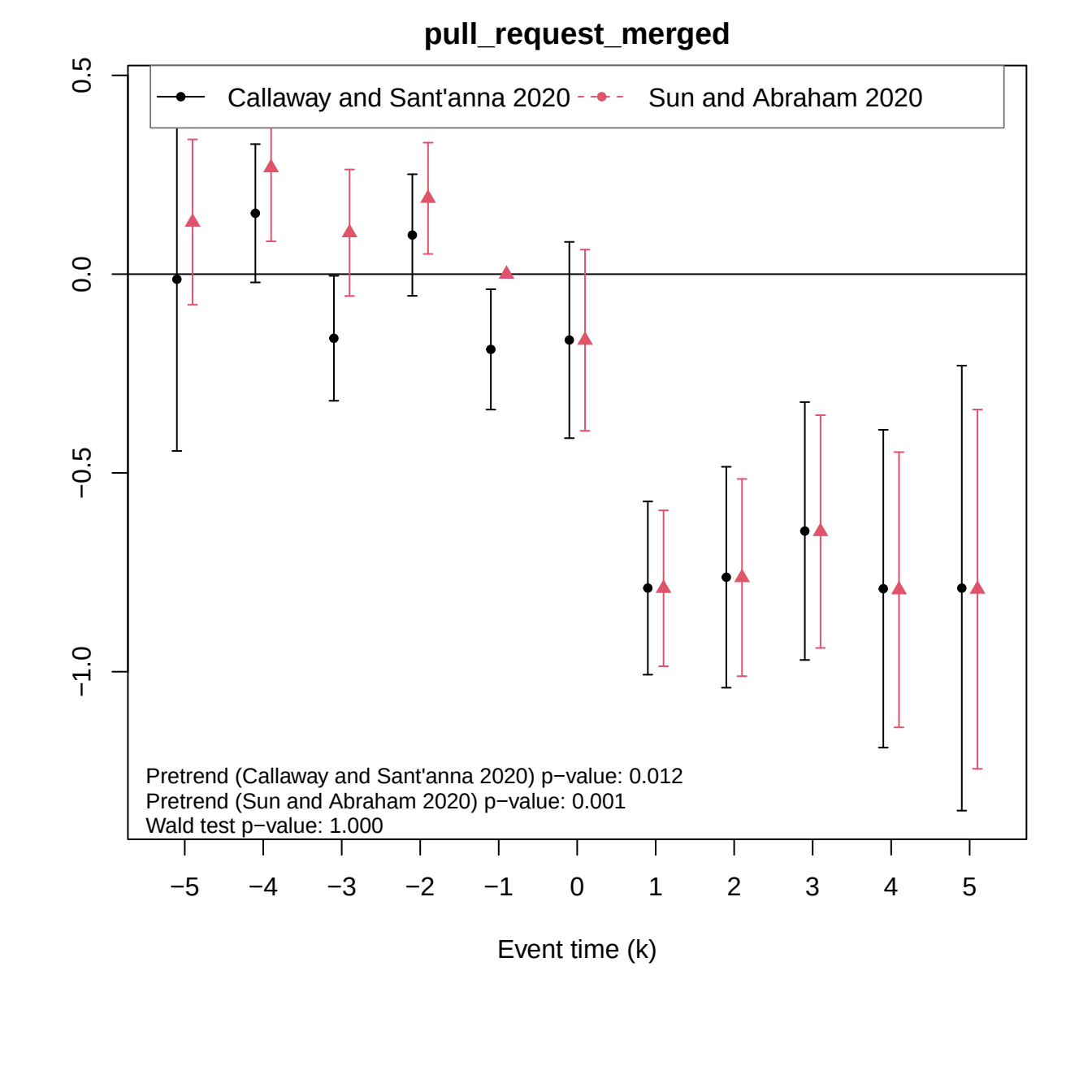

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

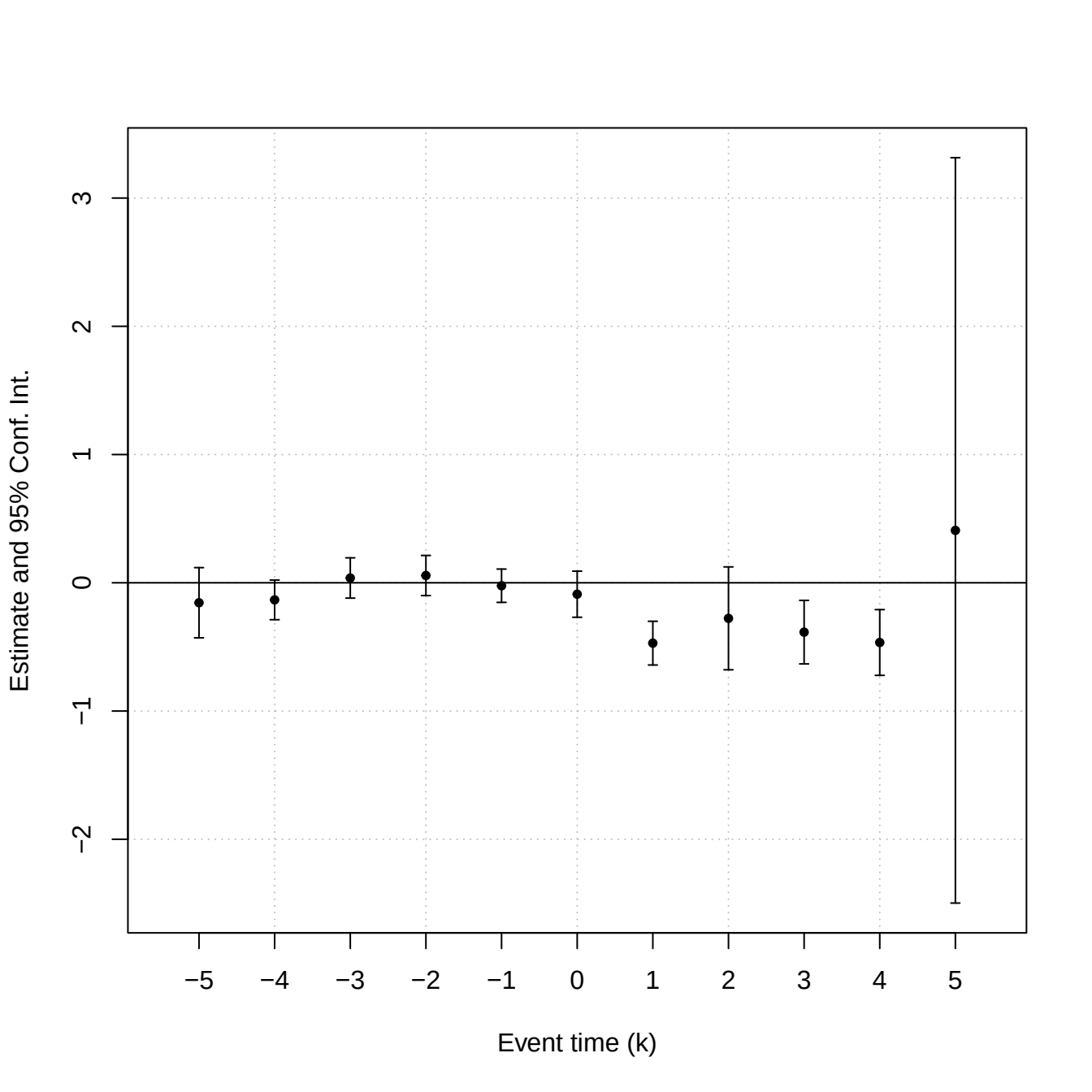

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

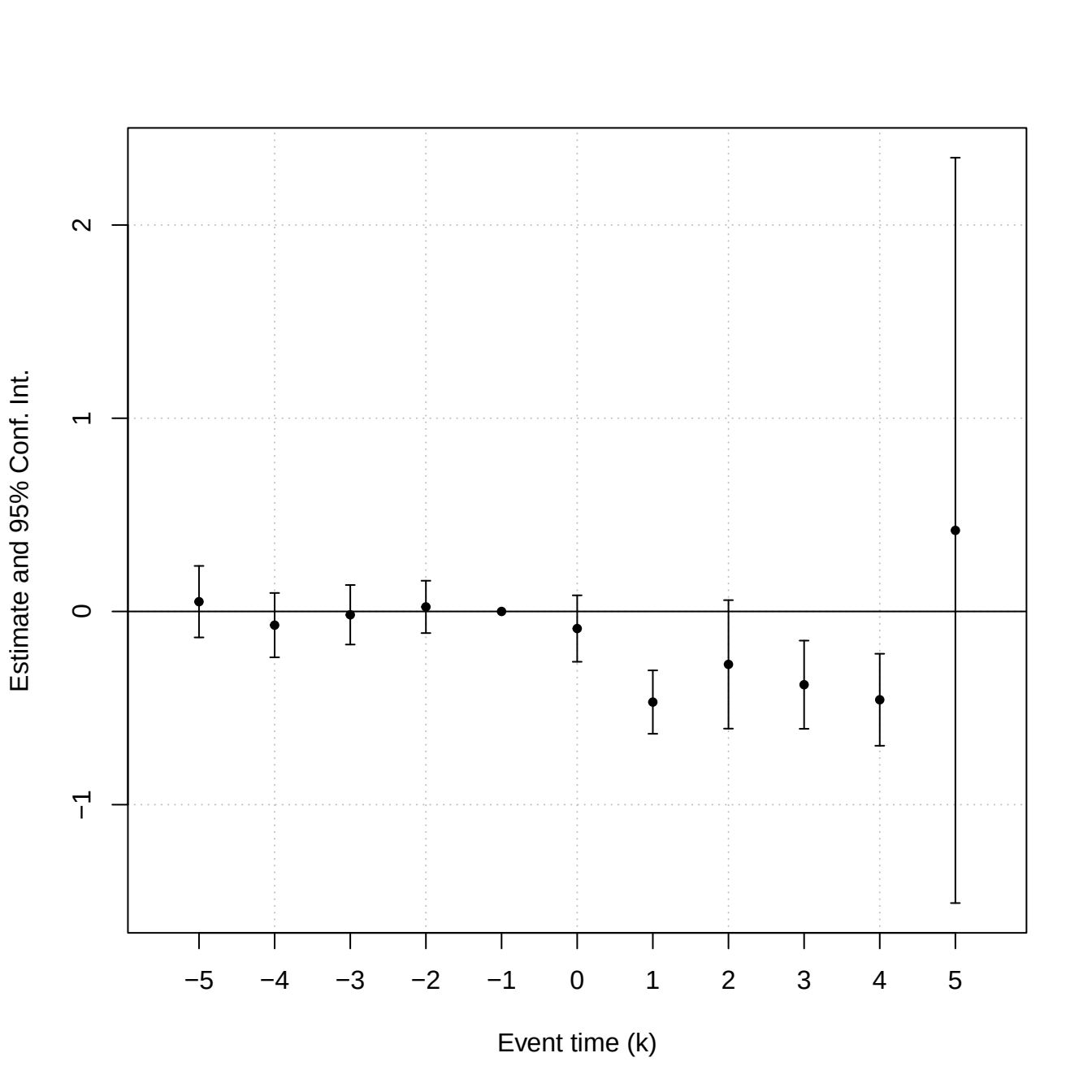

pull_request_opened
Callaway and Sant'anna 2020
Sun and Abraham 2020
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (Callaway and Sant'anna 2020) p−value: 0.045
Pretrend (Sun and Abraham 2020) p−value: 0.002
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

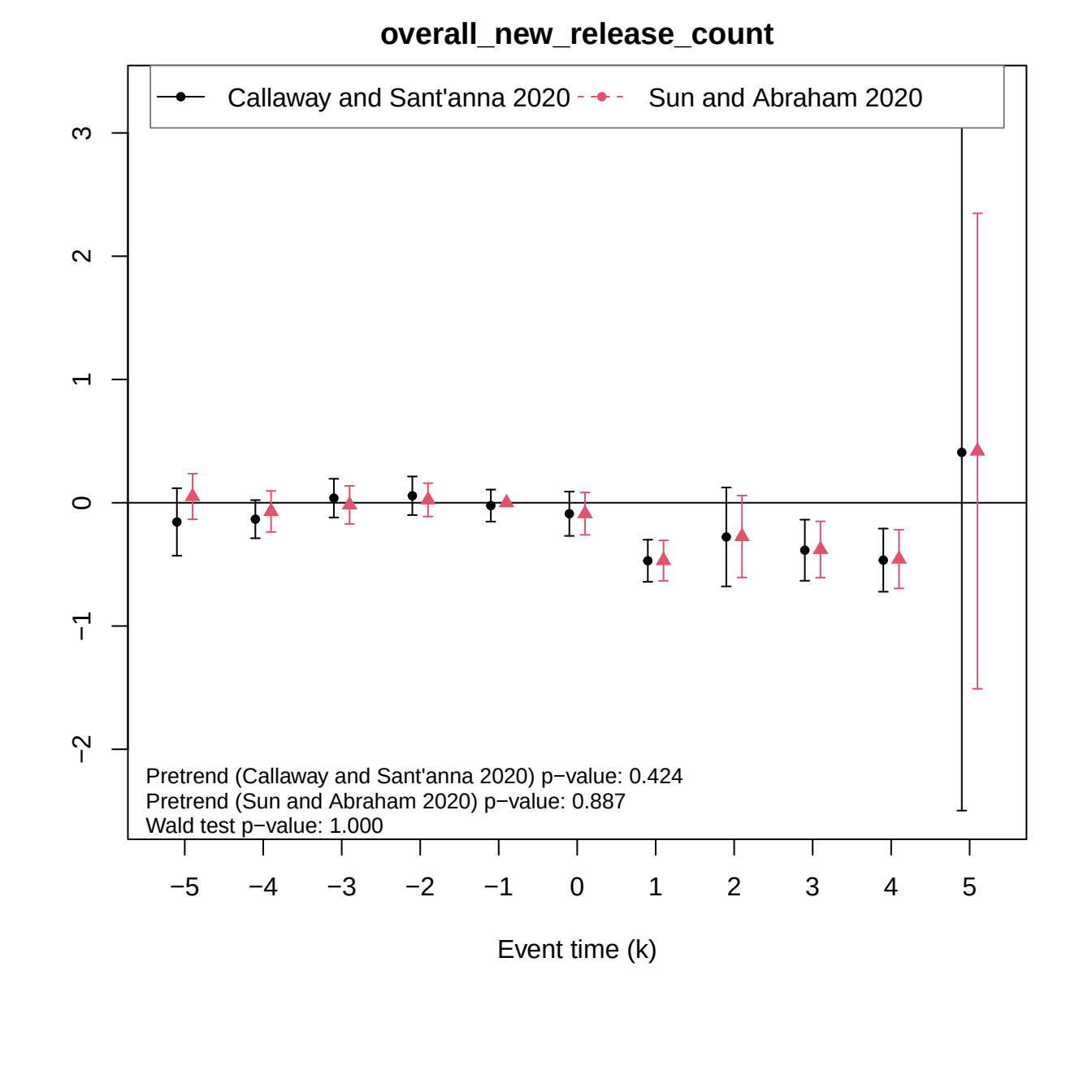

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

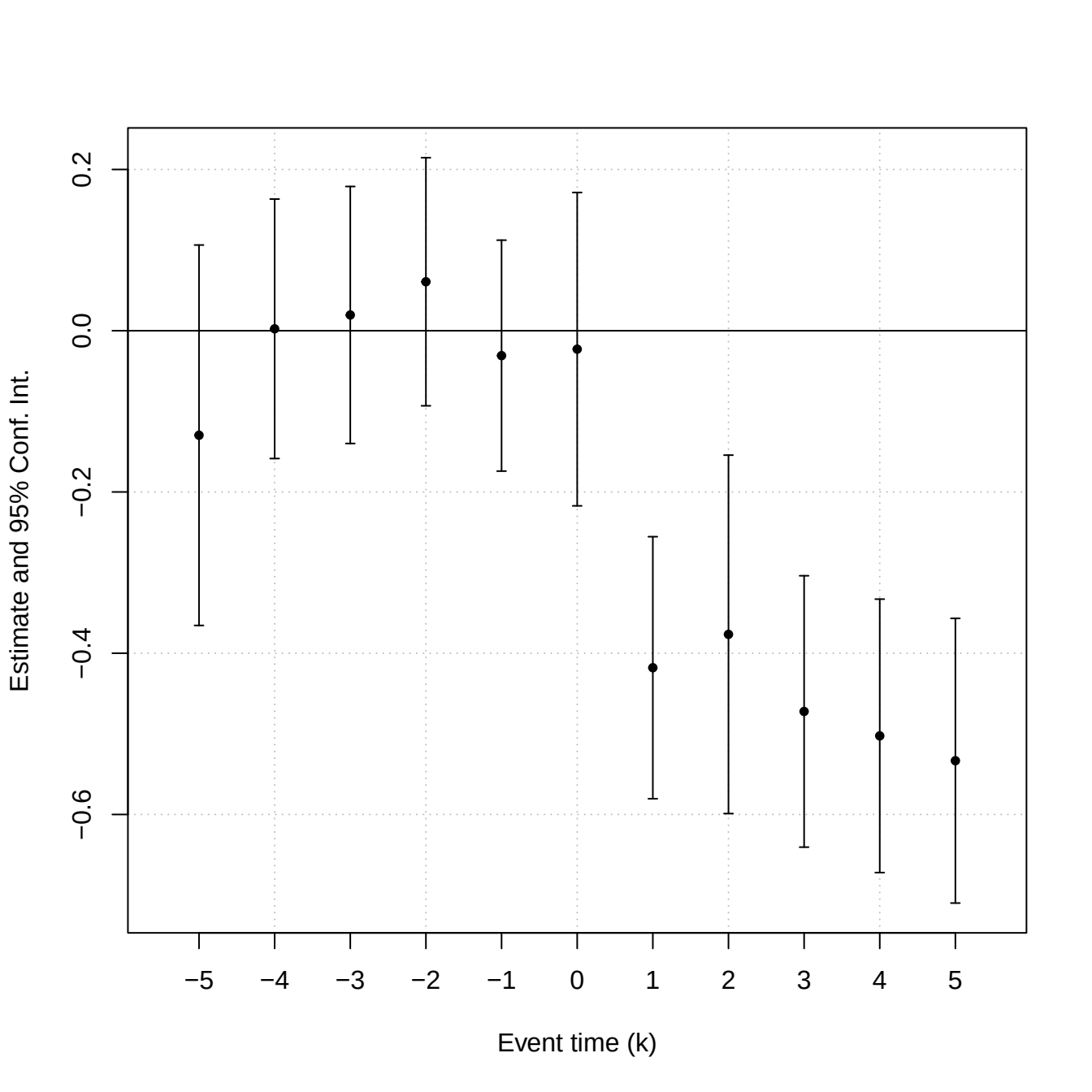

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

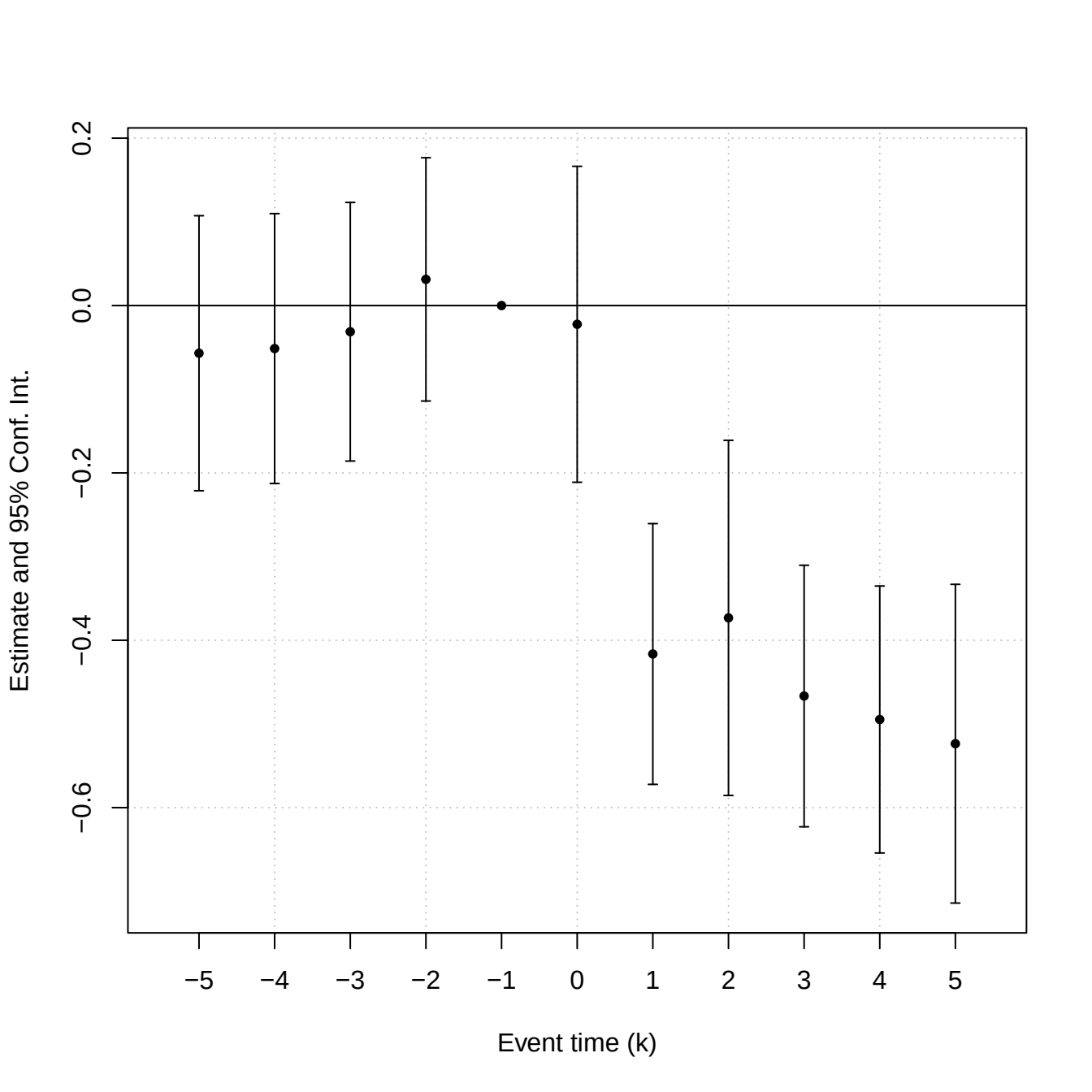

pull_request_merged
Callaway and Sant'anna 2020
Sun and Abraham 2020
0.5
0.0
−0.5
−1.0
Pretrend (Callaway and Sant'anna 2020) p−value: 0.012
Pretrend (Sun and Abraham 2020) p−value: 0.001
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

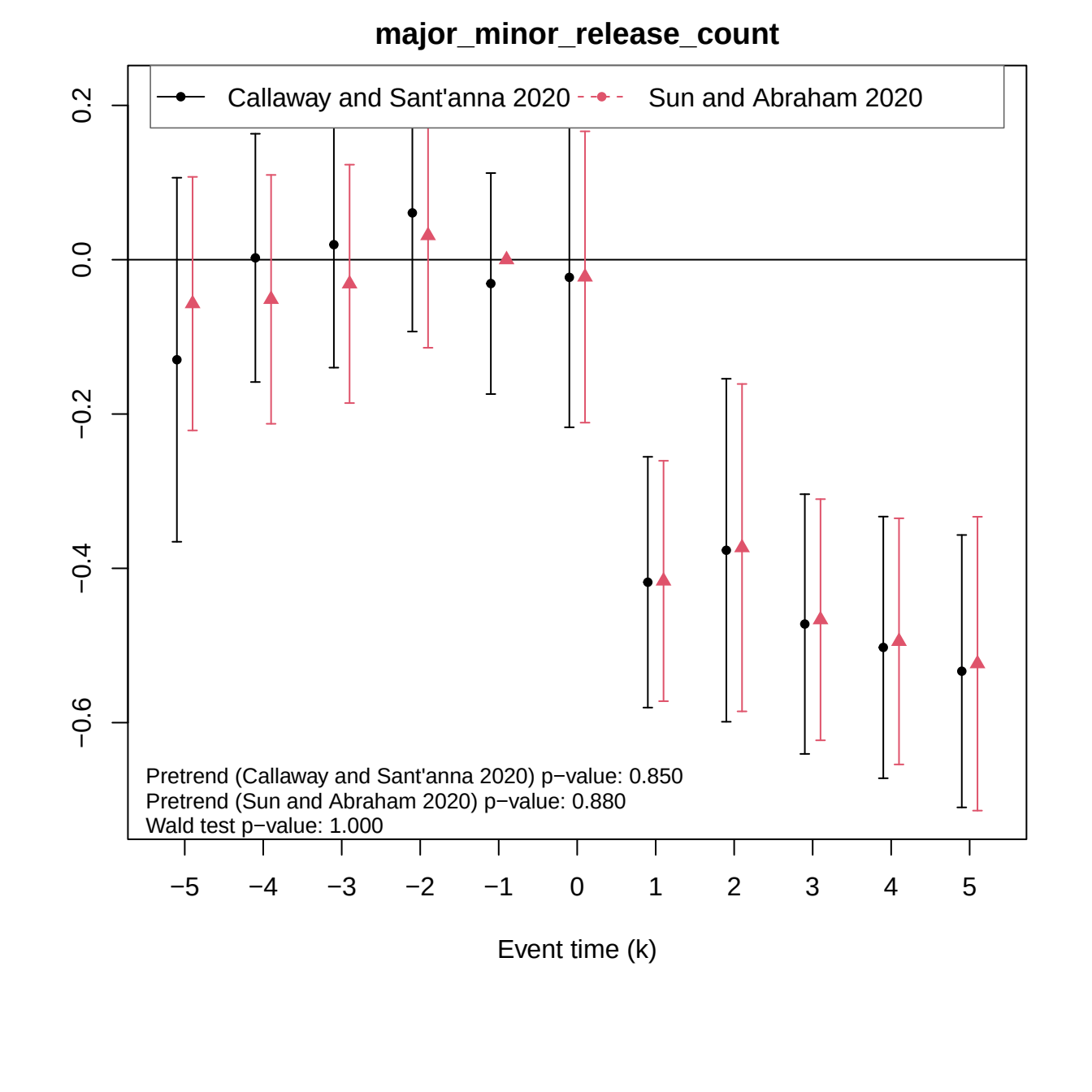

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

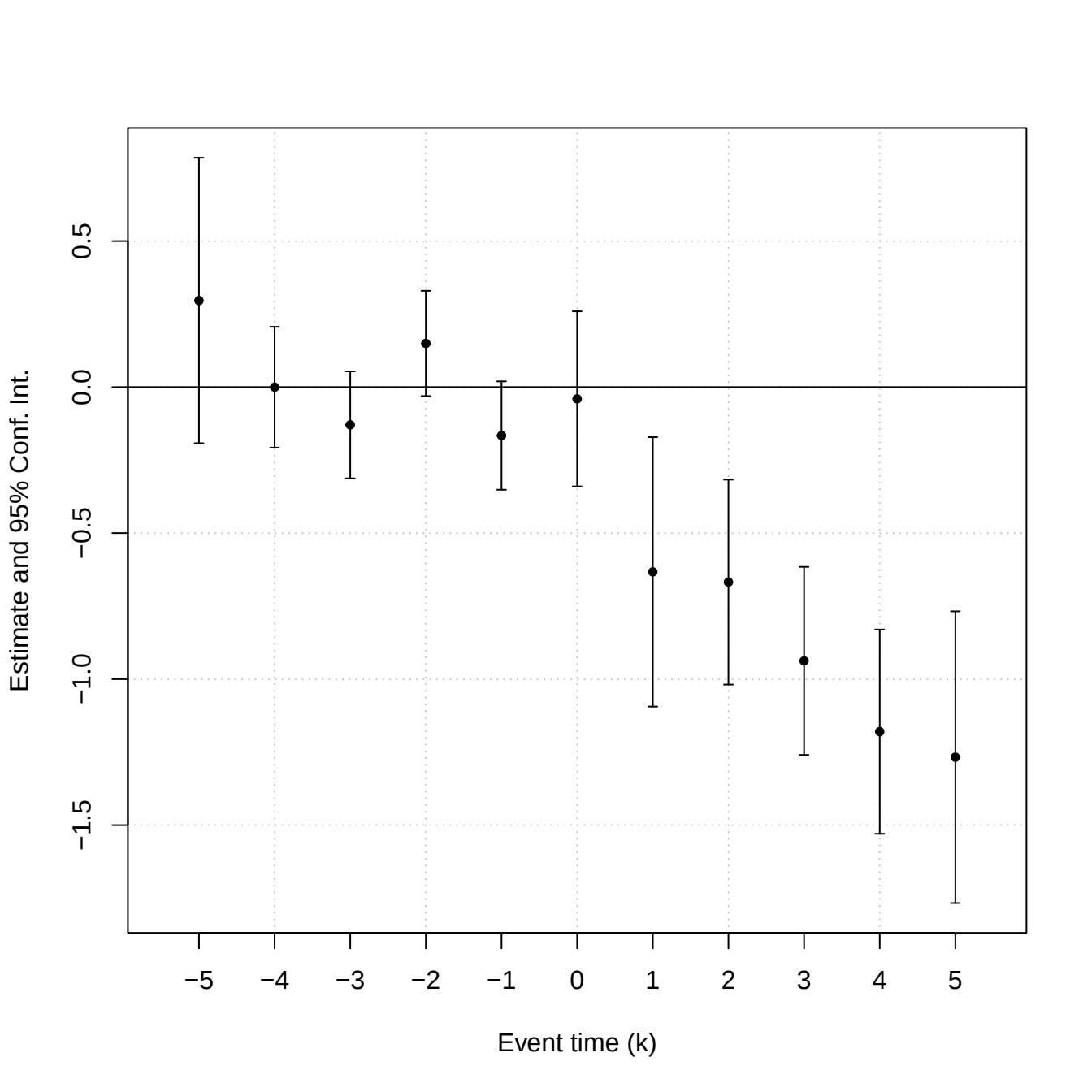

Estimate and 95% Conf. Int.
2
1
0
−1
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

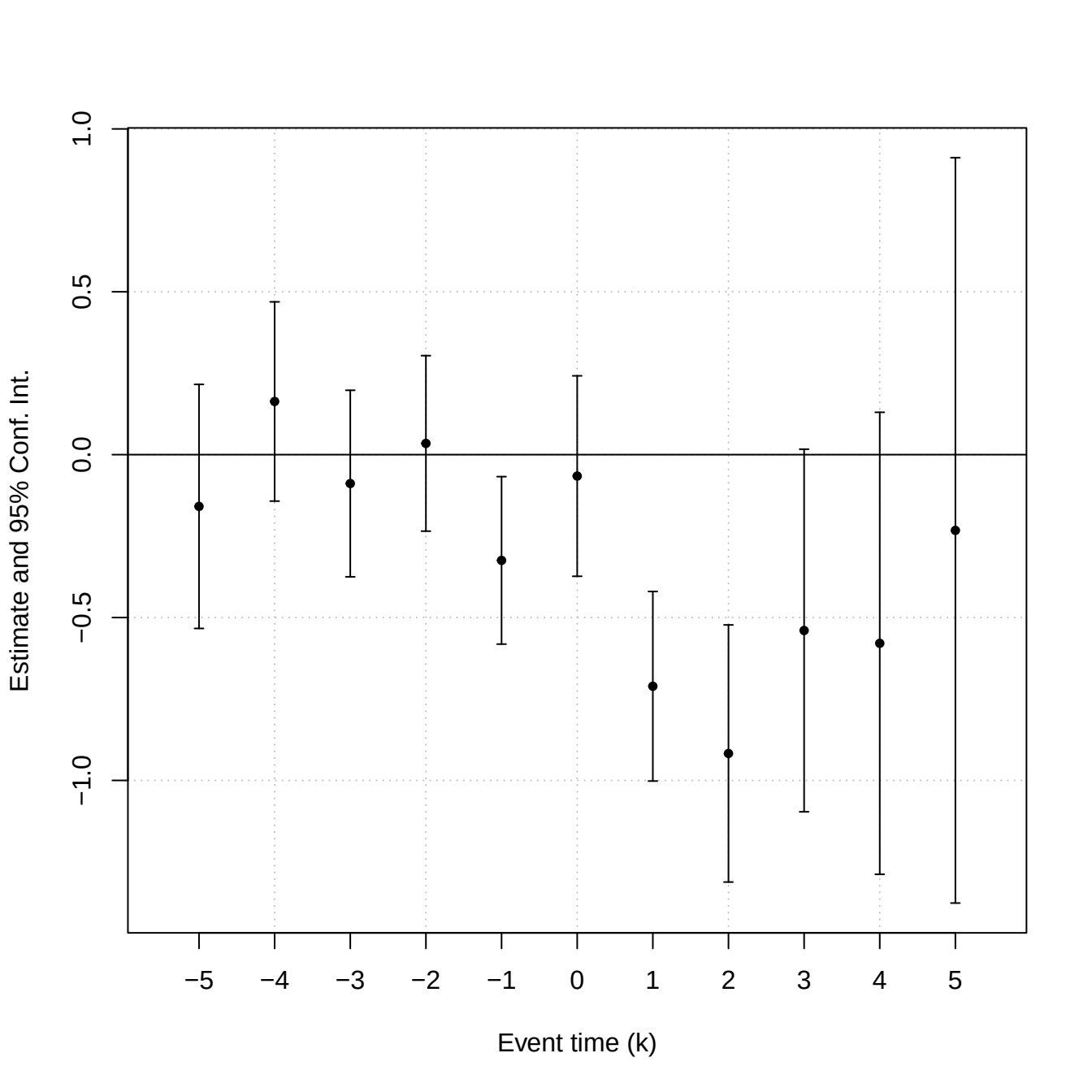

overall_new_release_count
Callaway and Sant'anna 2020
Sun and Abraham 2020
3
2
1
0
−1
−2
Pretrend (Callaway and Sant'anna 2020) p−value: 0.424
Pretrend (Sun and Abraham 2020) p−value: 0.887
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

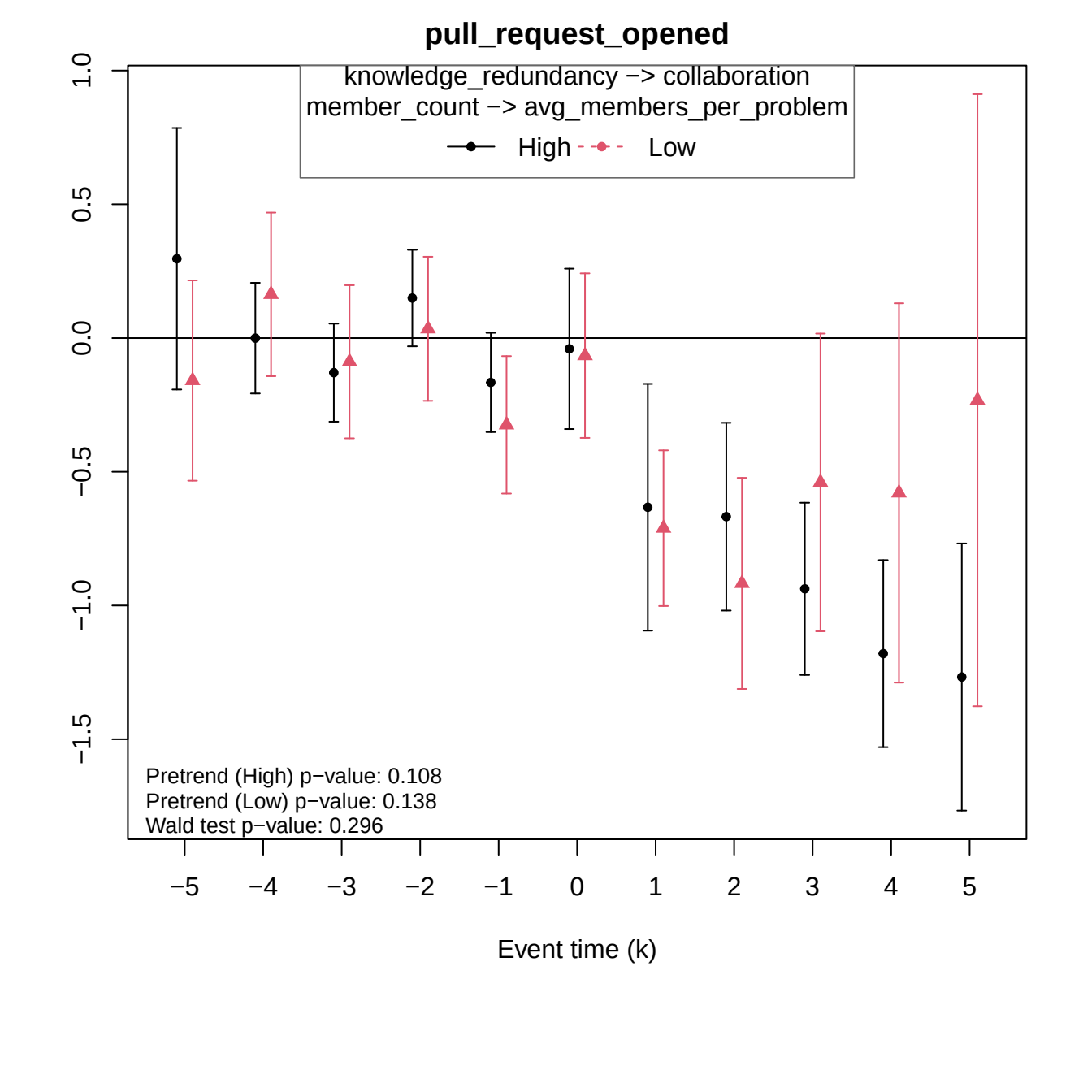

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

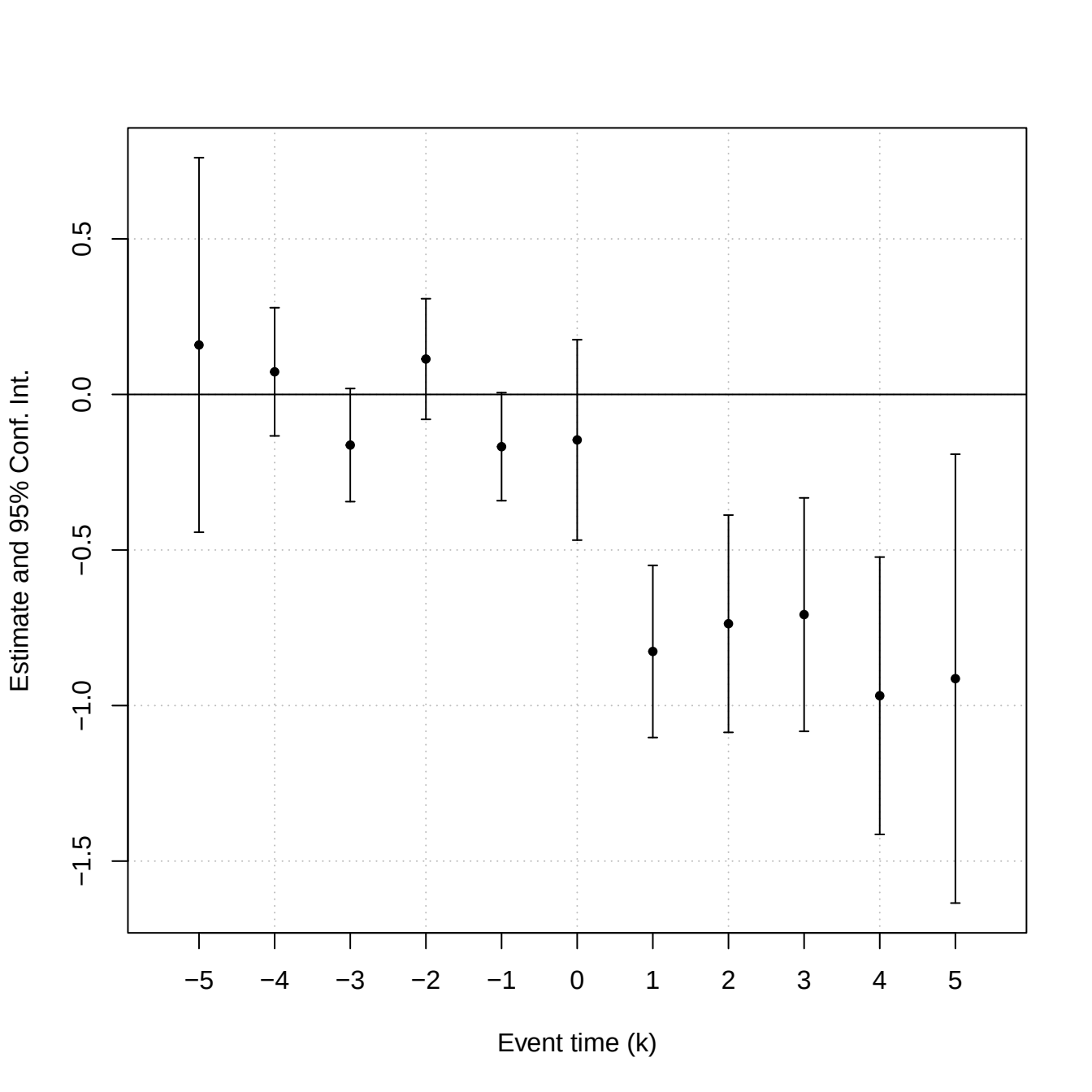

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

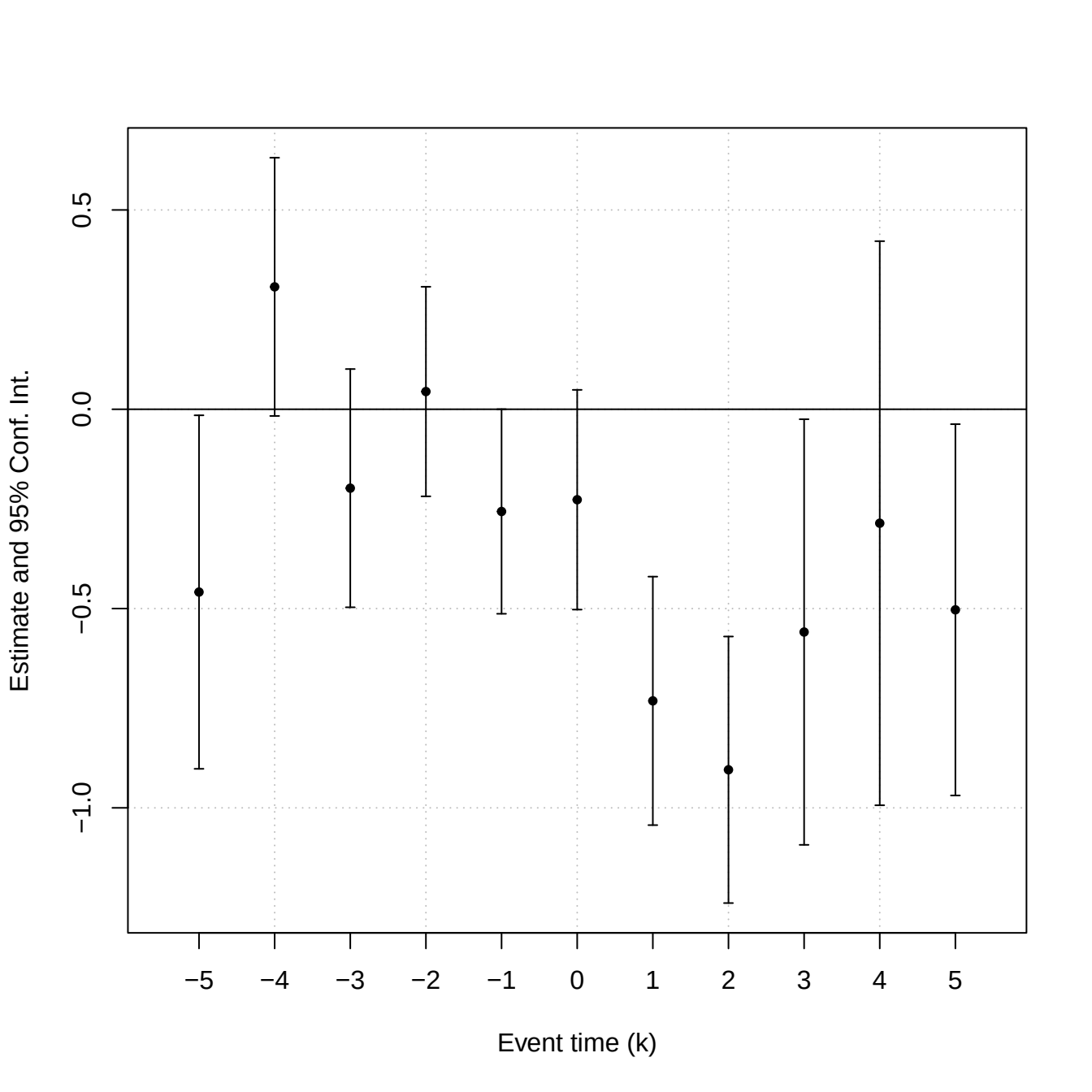

major_minor_release_count
Callaway and Sant'anna 2020
Sun and Abraham 2020
0.2
0.0
−0.2
−0.4
−0.6
Pretrend (Callaway and Sant'anna 2020) p−value: 0.850
Pretrend (Sun and Abraham 2020) p−value: 0.880
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

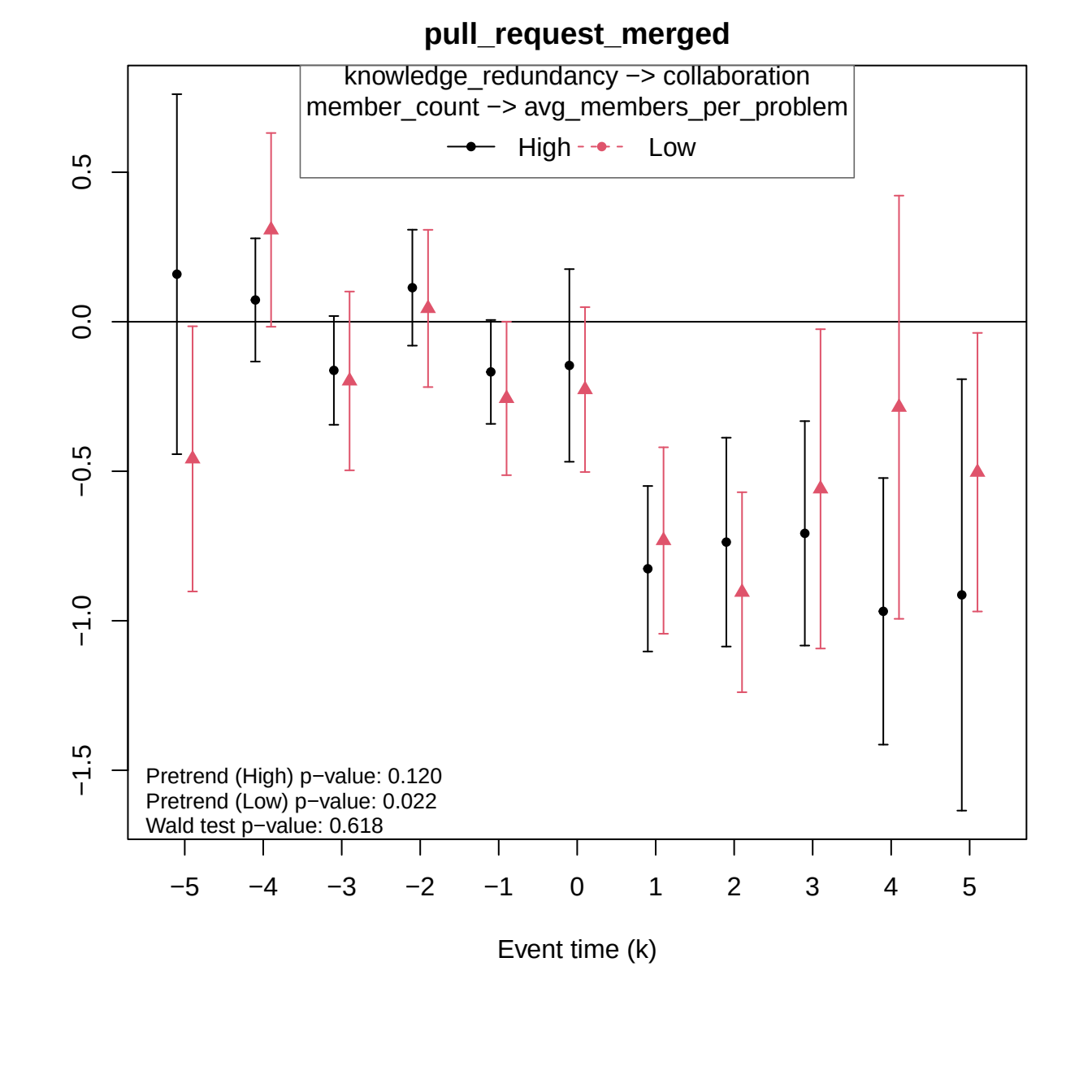

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

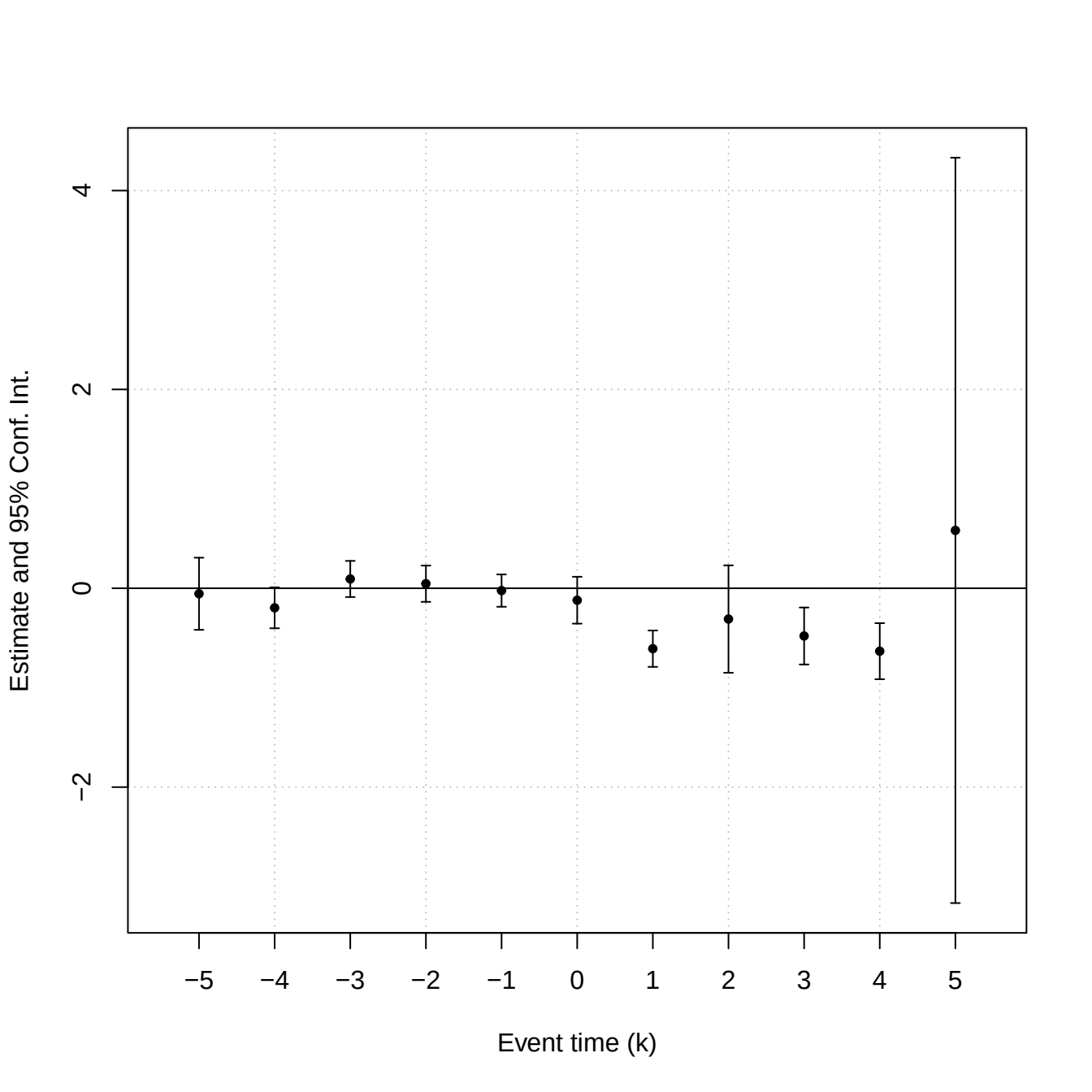

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

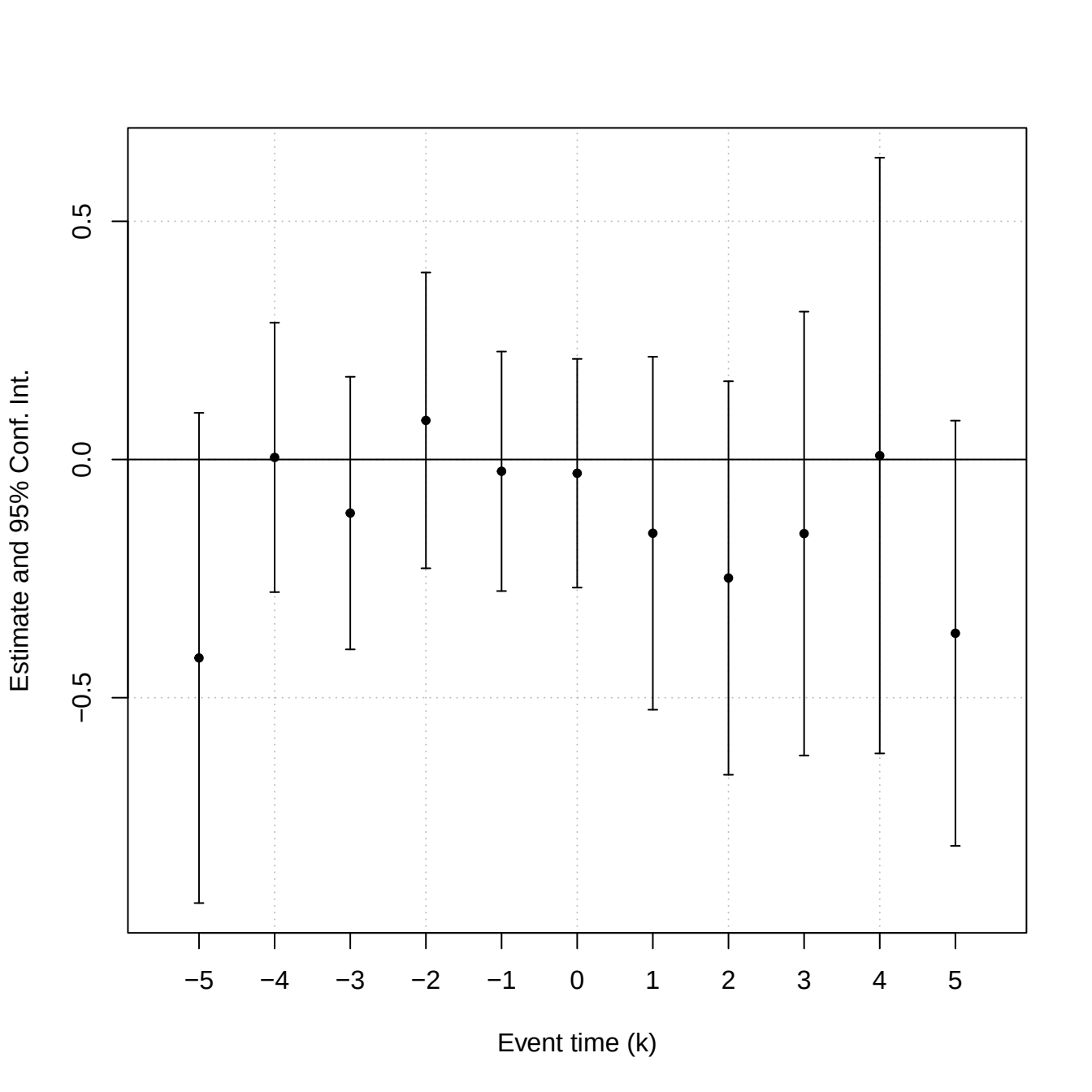

pull_request_opened
knowledge_redundancy −> collaboration
member_count −> avg_members_per_problem
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.108
Pretrend (Low) p−value: 0.138
Wald test p−value: 0.296
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

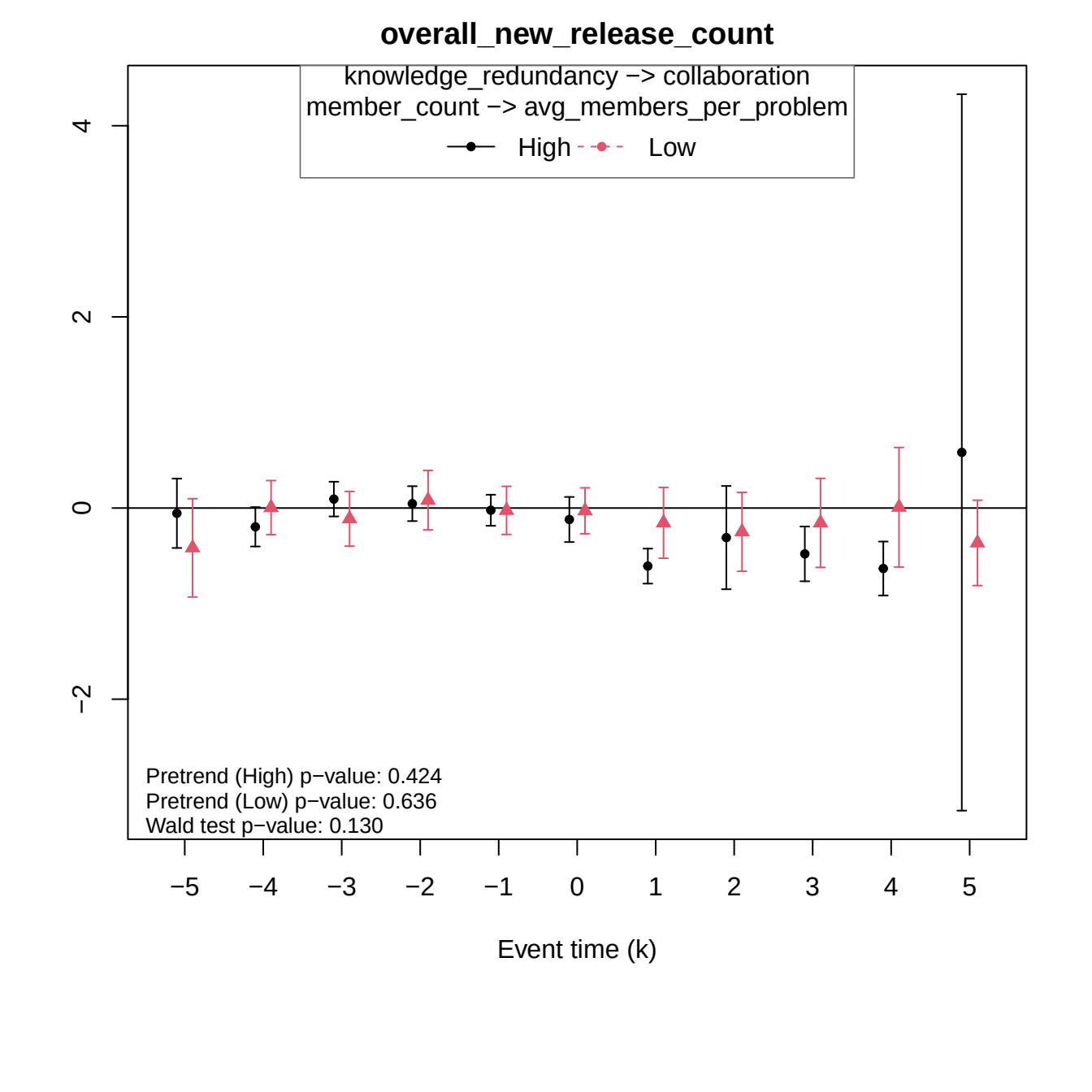

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

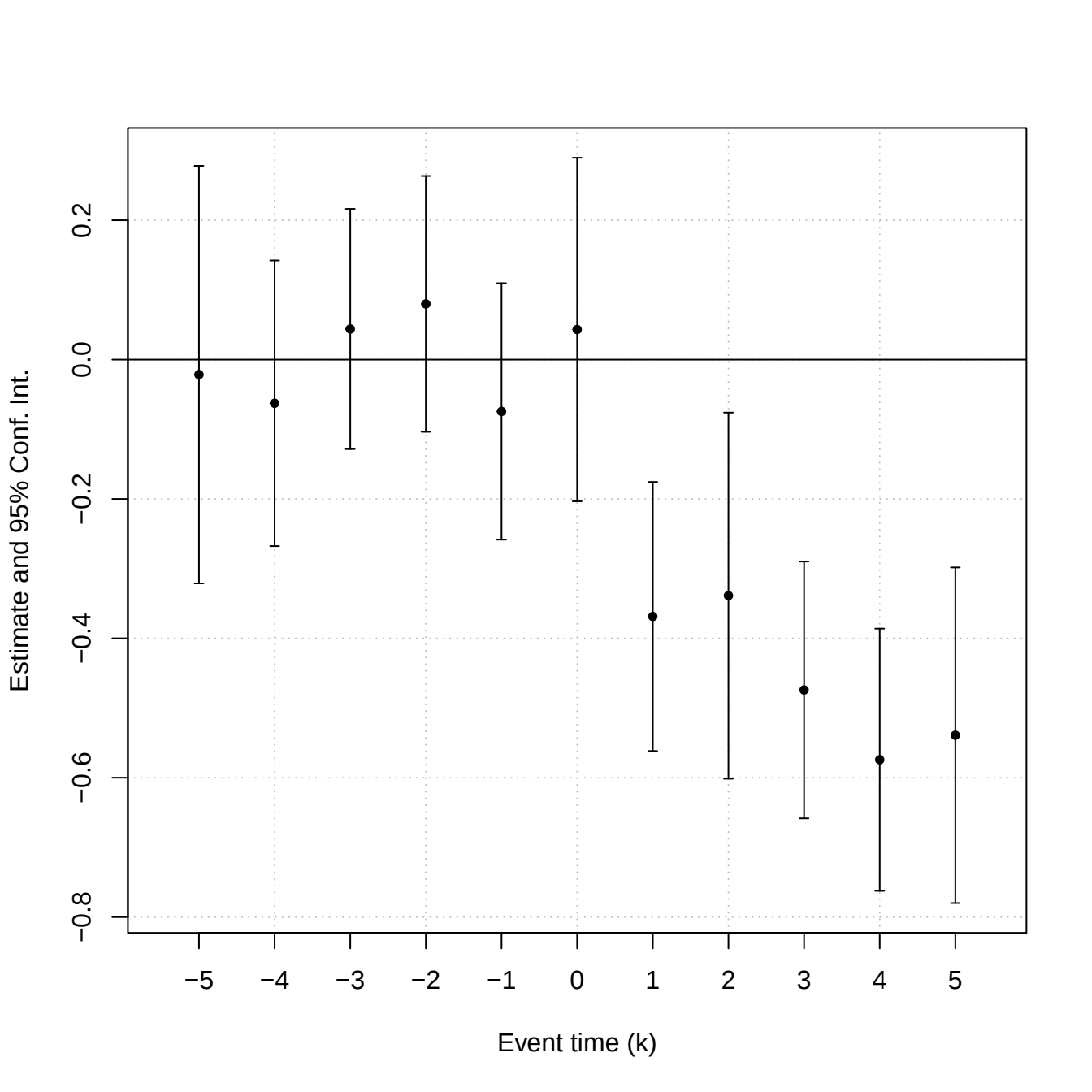

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

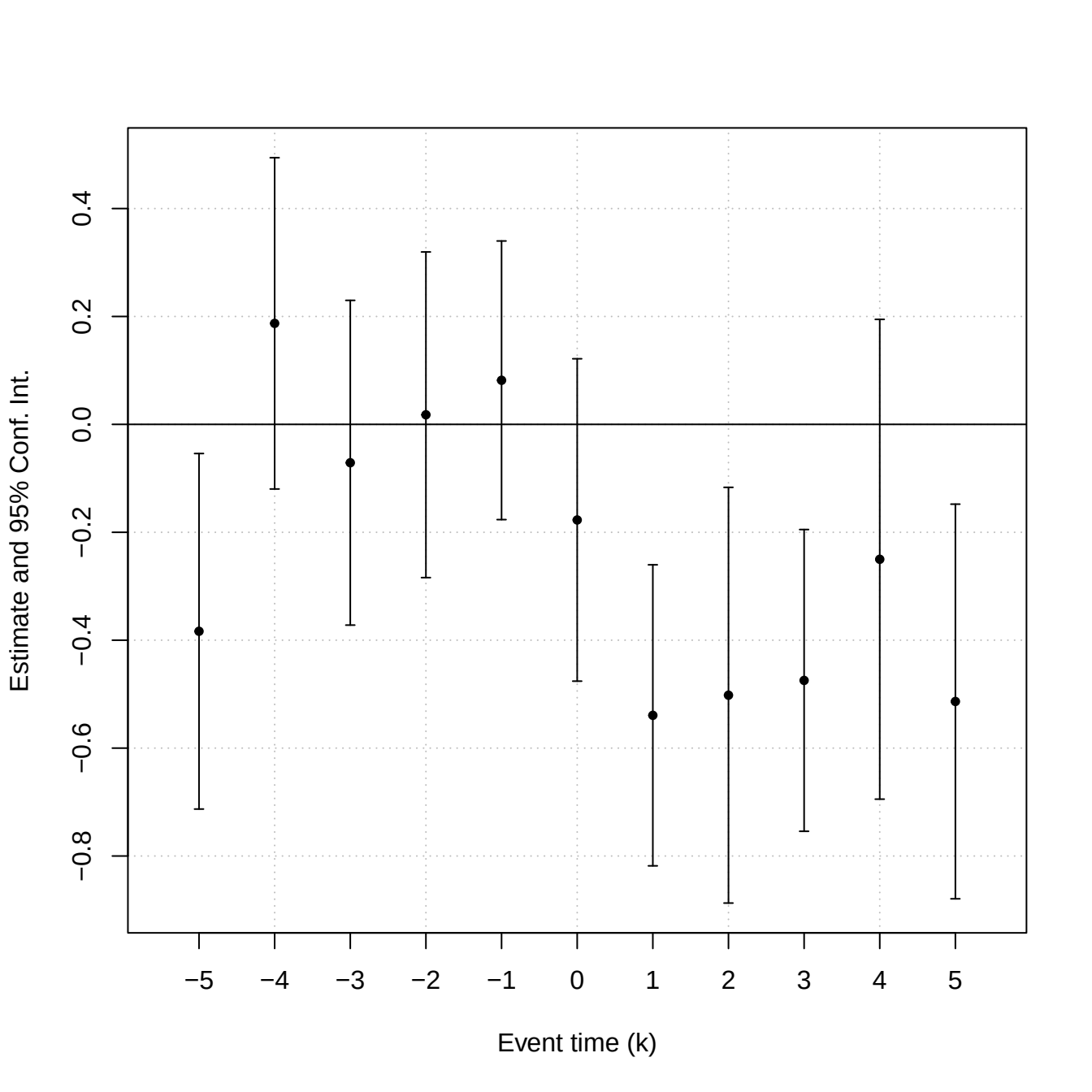

pull_request_merged
knowledge_redundancy −> collaboration
member_count −> avg_members_per_problem
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.120
Pretrend (Low) p−value: 0.022
Wald test p−value: 0.618
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

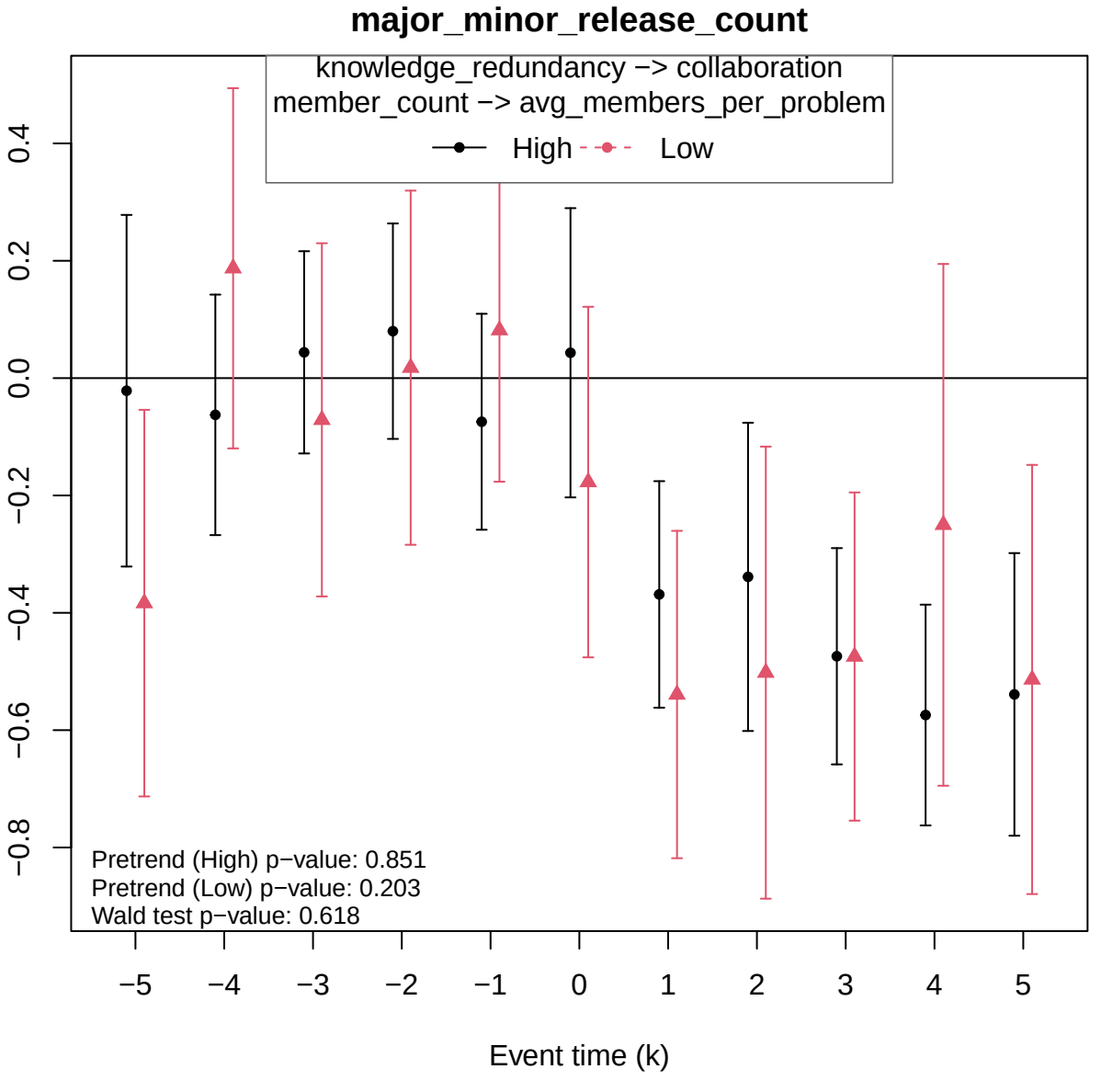

Estimate and 95% Conf. Int.
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

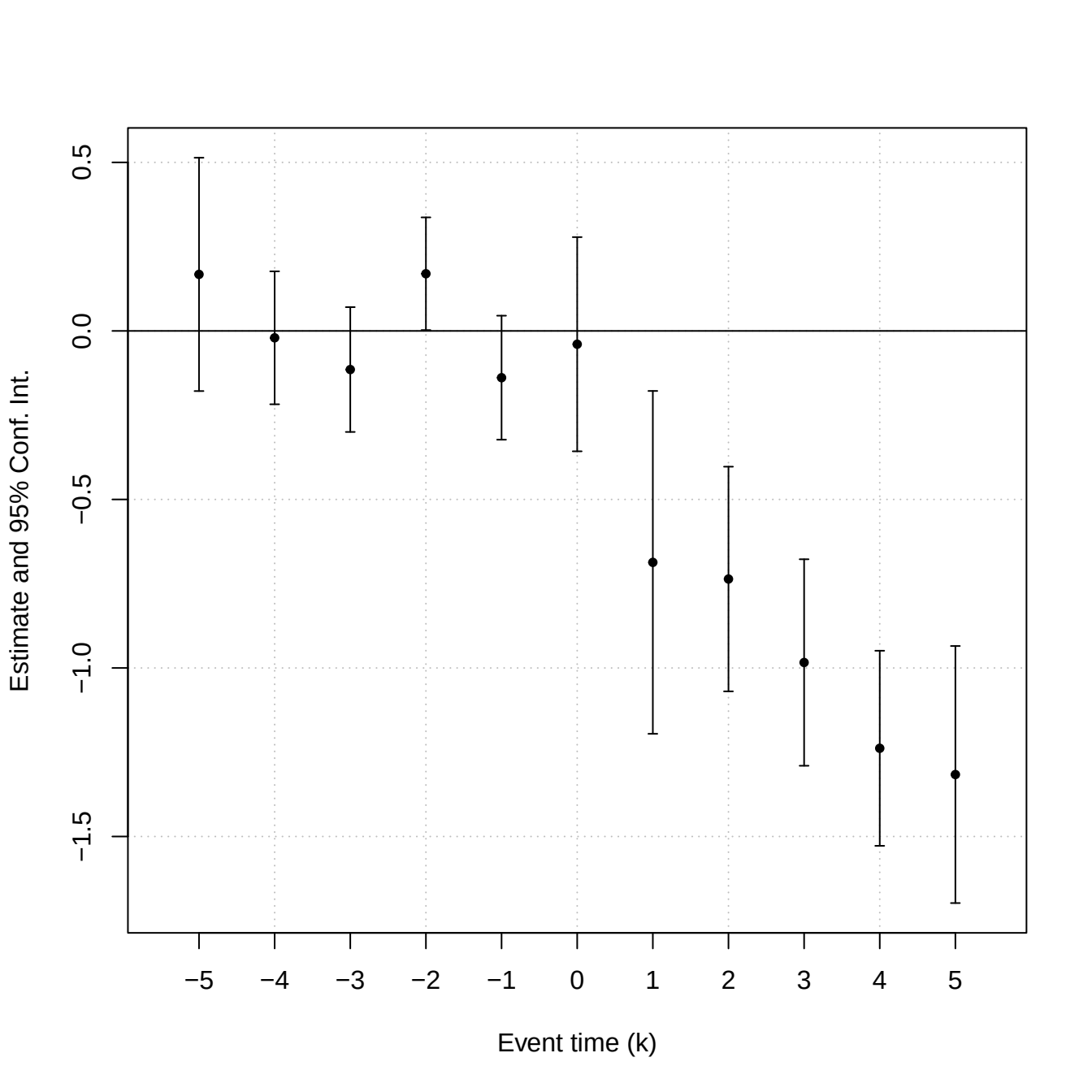

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

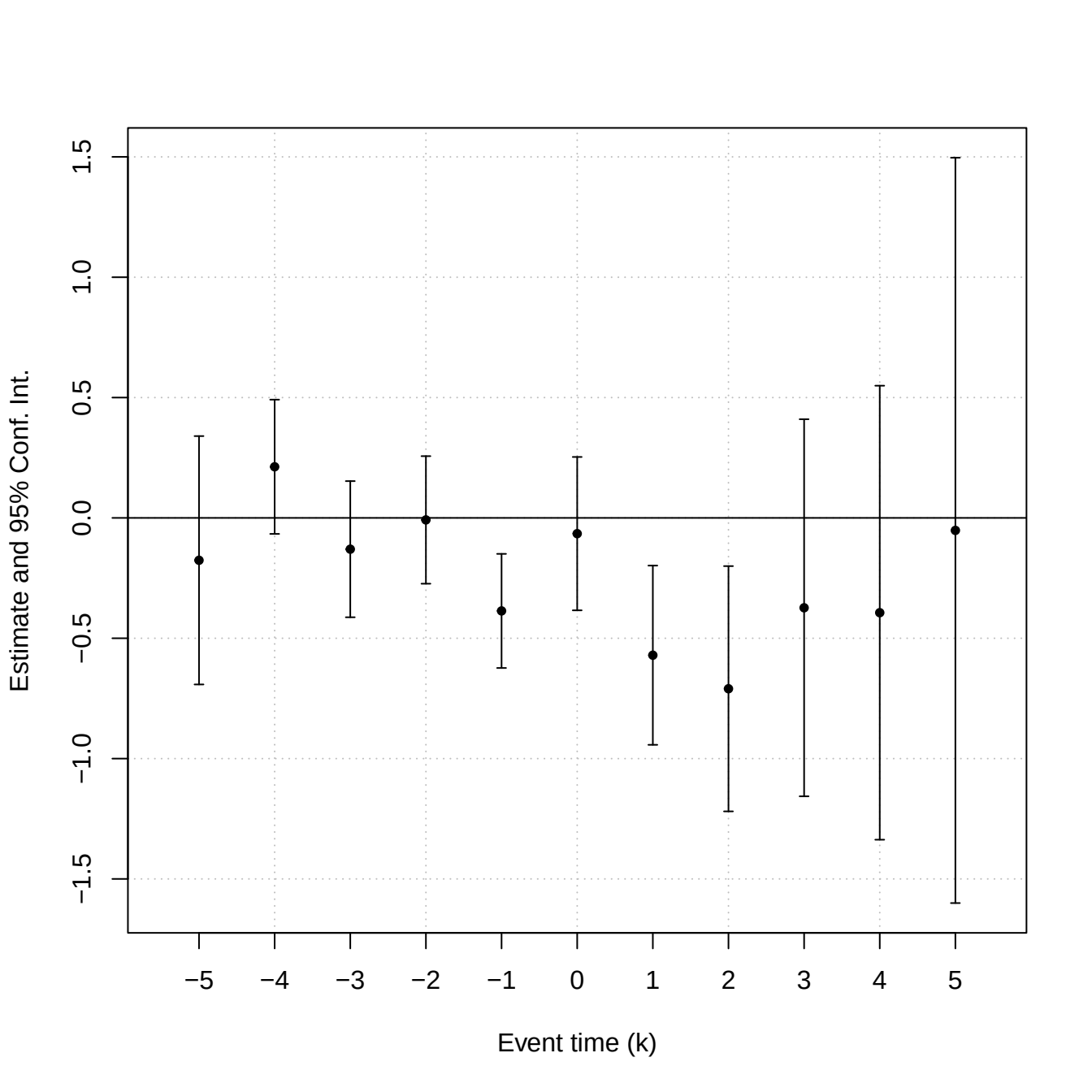

overall_new_release_count
knowledge_redundancy −> collaboration
member_count −> avg_members_per_problem
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.424
Pretrend (Low) p−value: 0.636
Wald test p−value: 0.130
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

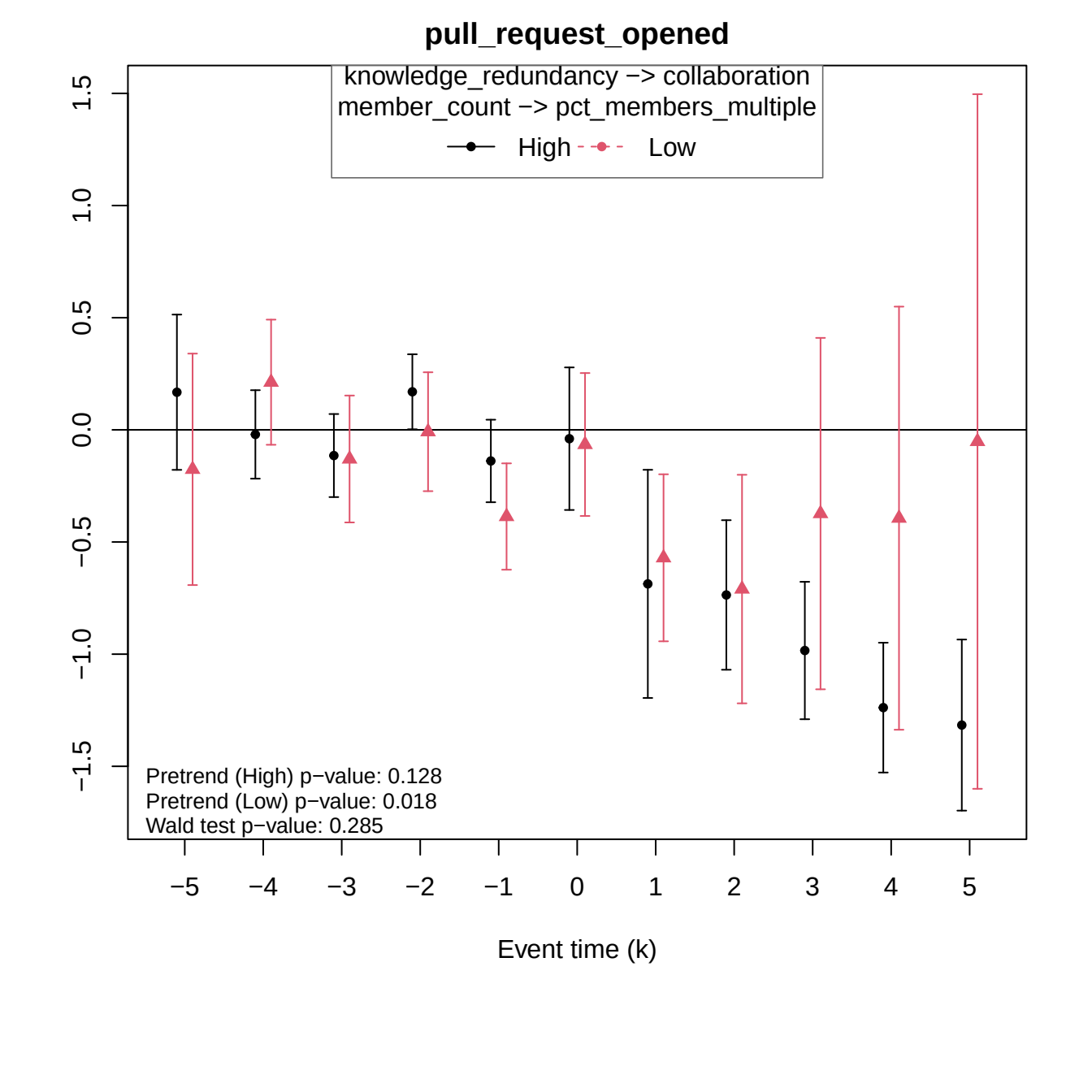

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

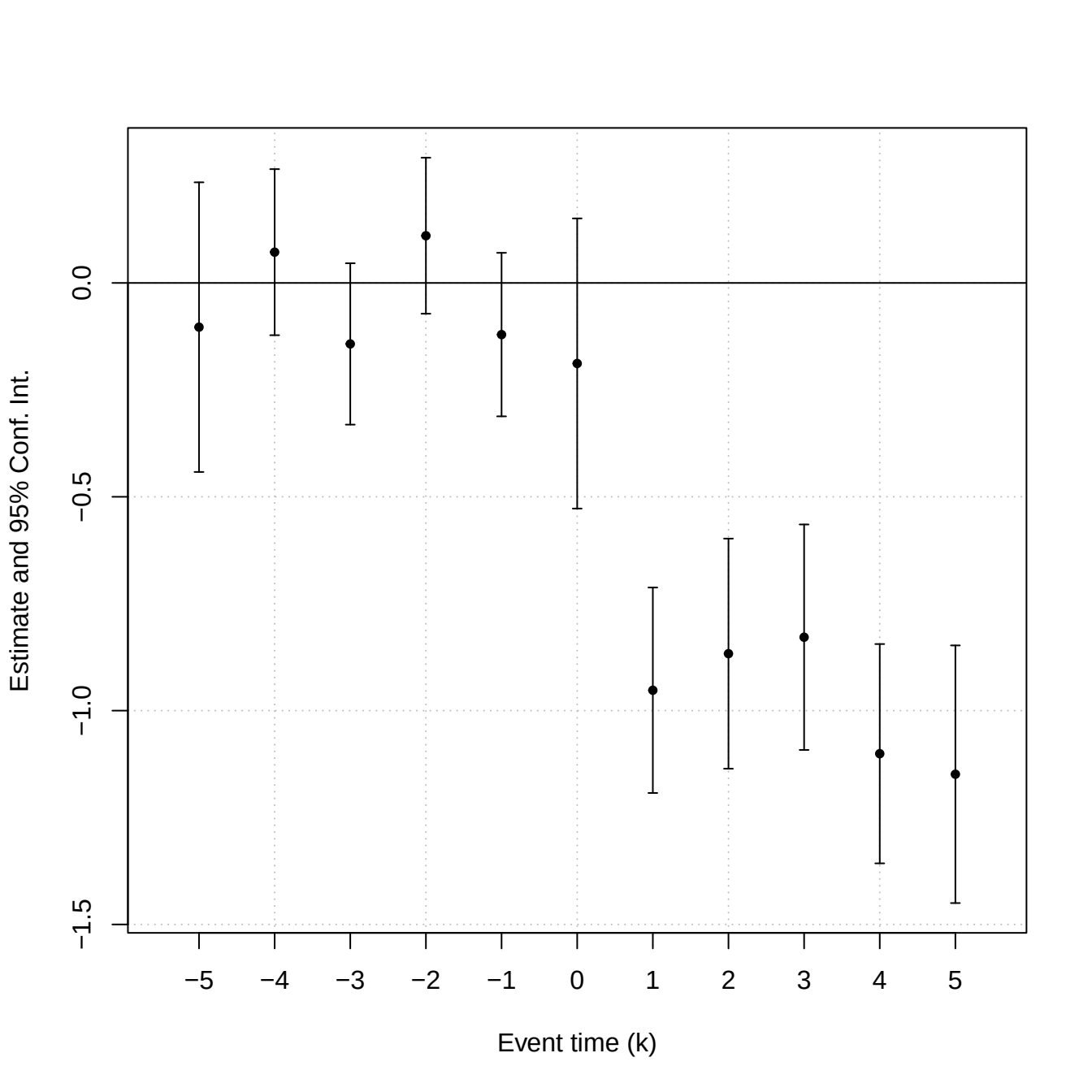

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

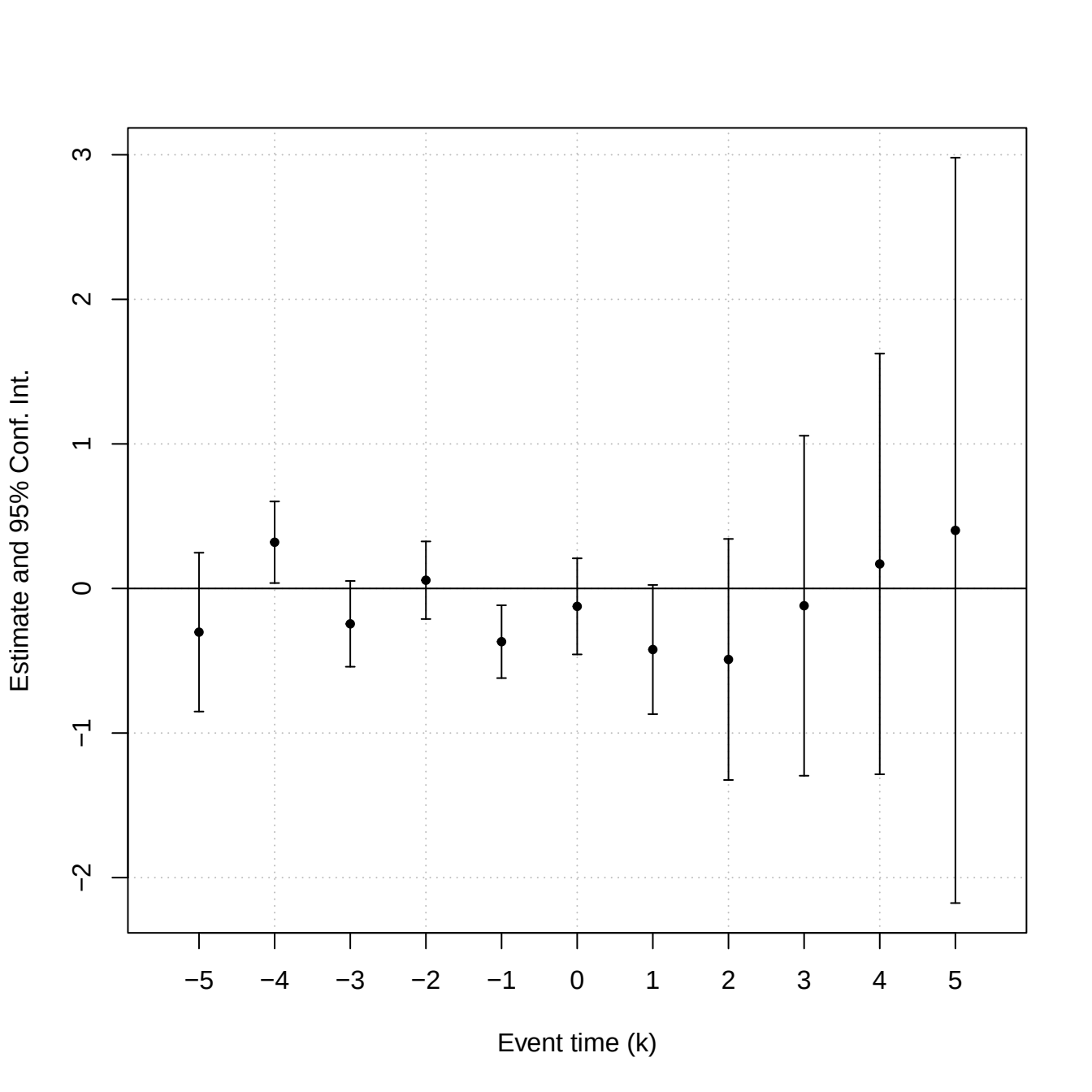

major_minor_release_count
knowledge_redundancy −> collaboration
member_count −> avg_members_per_problem
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.851
Pretrend (Low) p−value: 0.203
Wald test p−value: 0.618
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

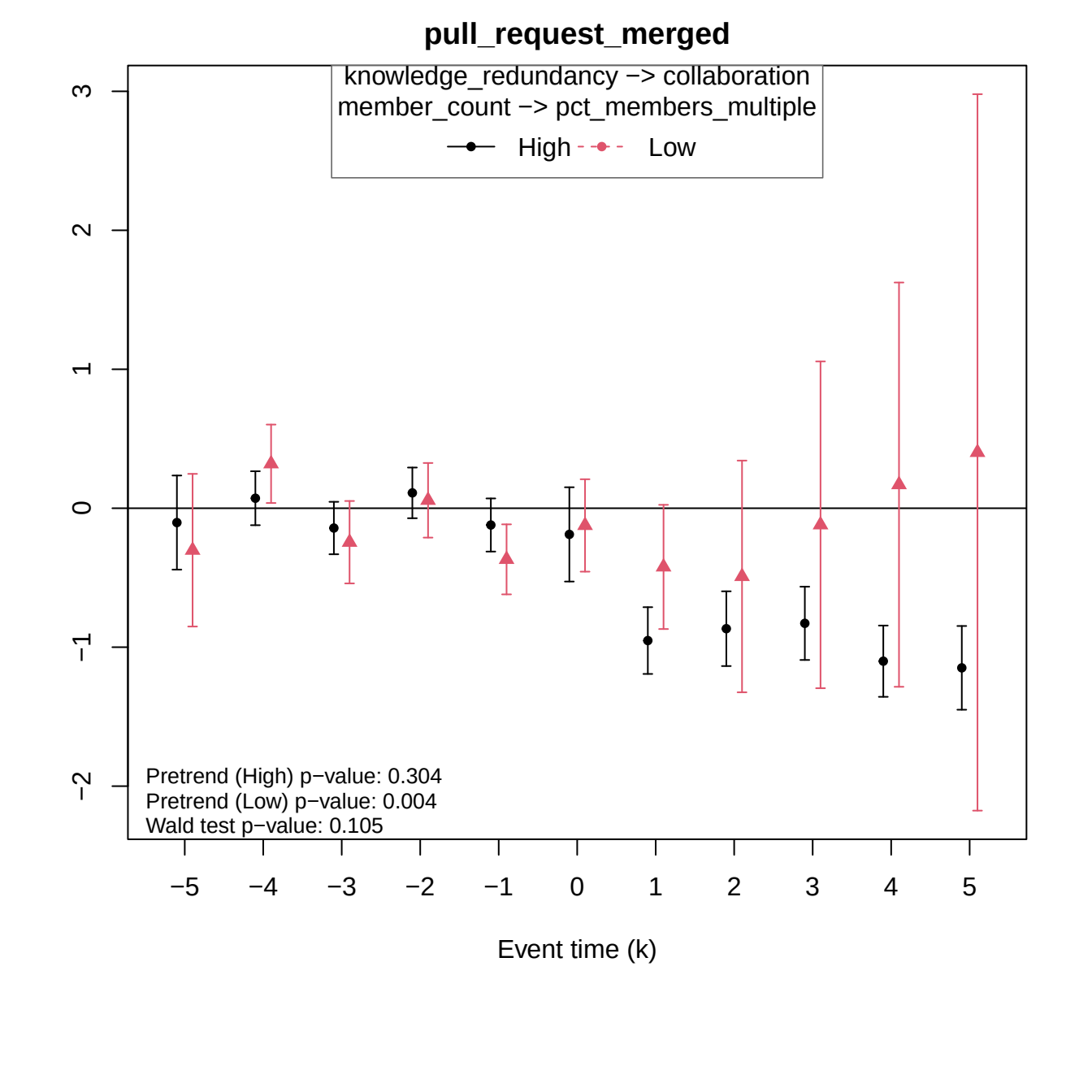

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

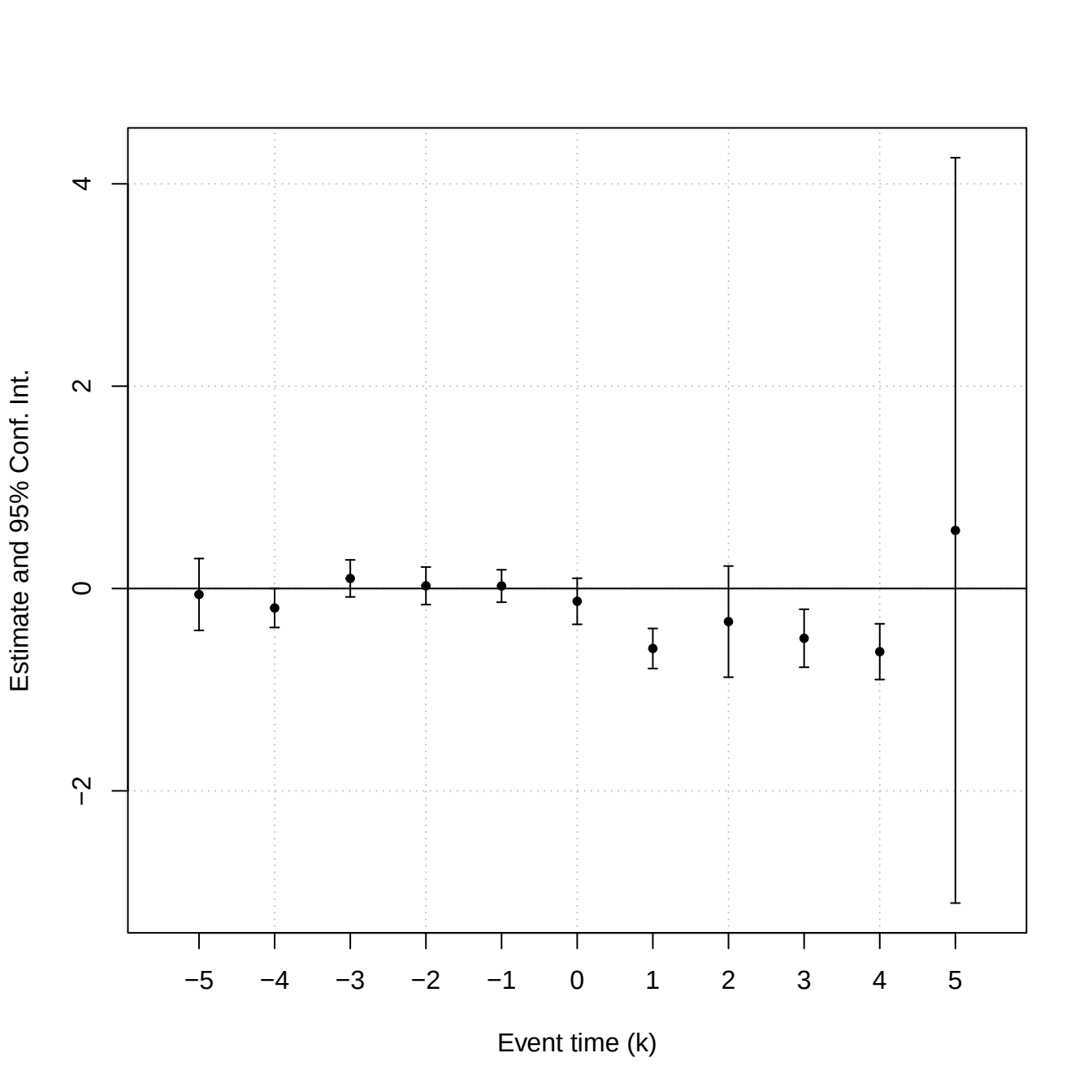

Estimate and 95% Conf. Int.
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

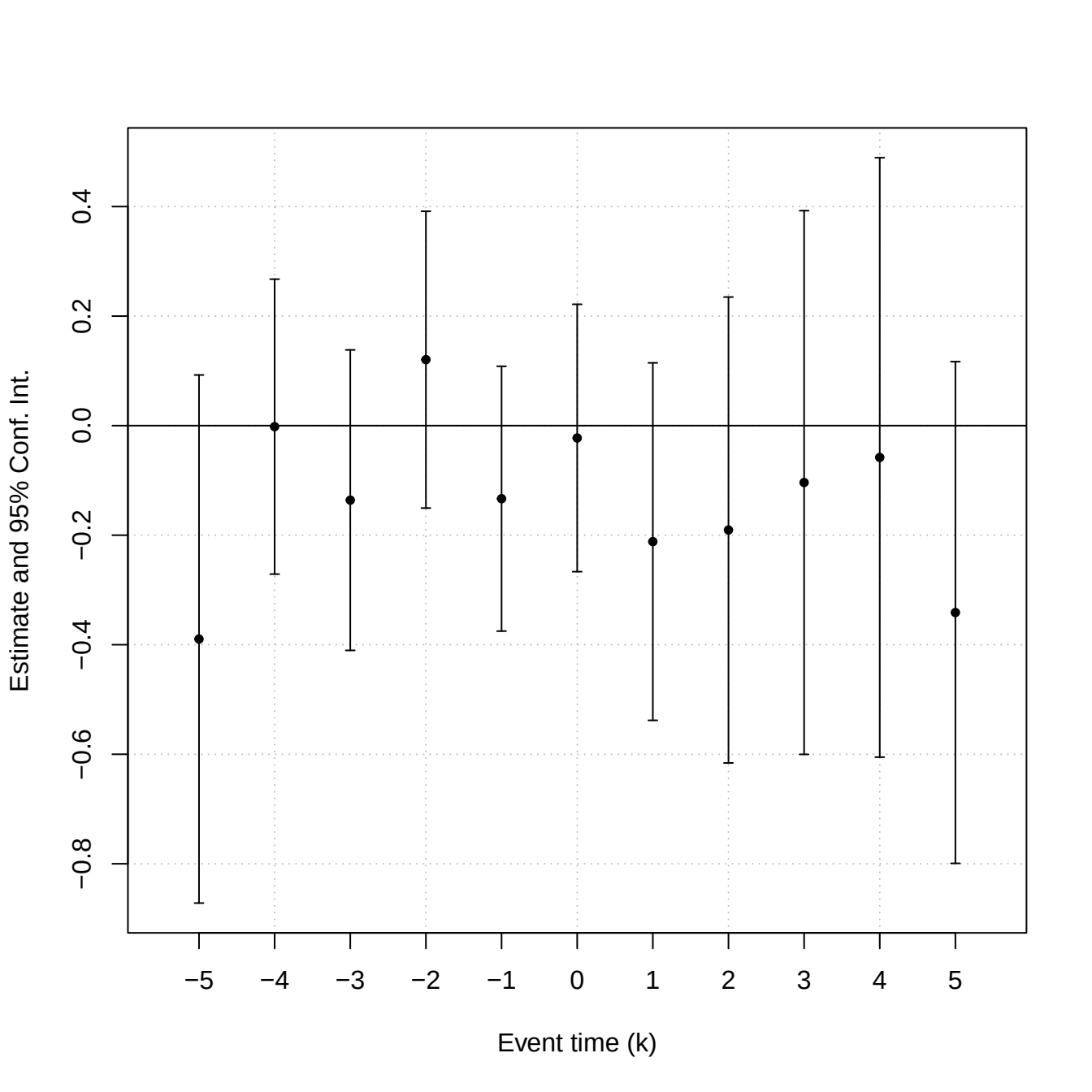

pull_request_opened
knowledge_redundancy −> collaboration
member_count −> pct_members_multiple
High
Low
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.128
Pretrend (Low) p−value: 0.018
Wald test p−value: 0.285
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

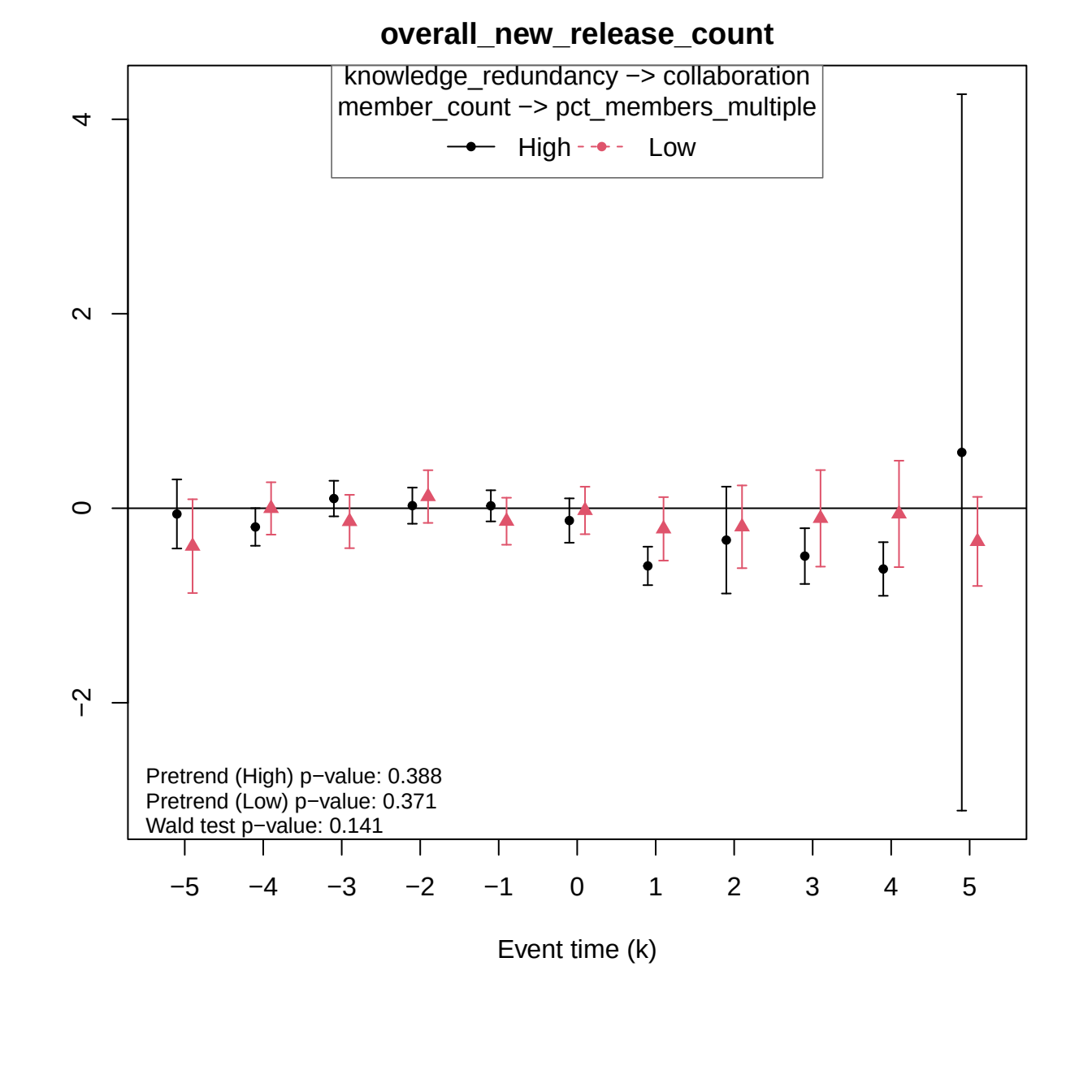

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

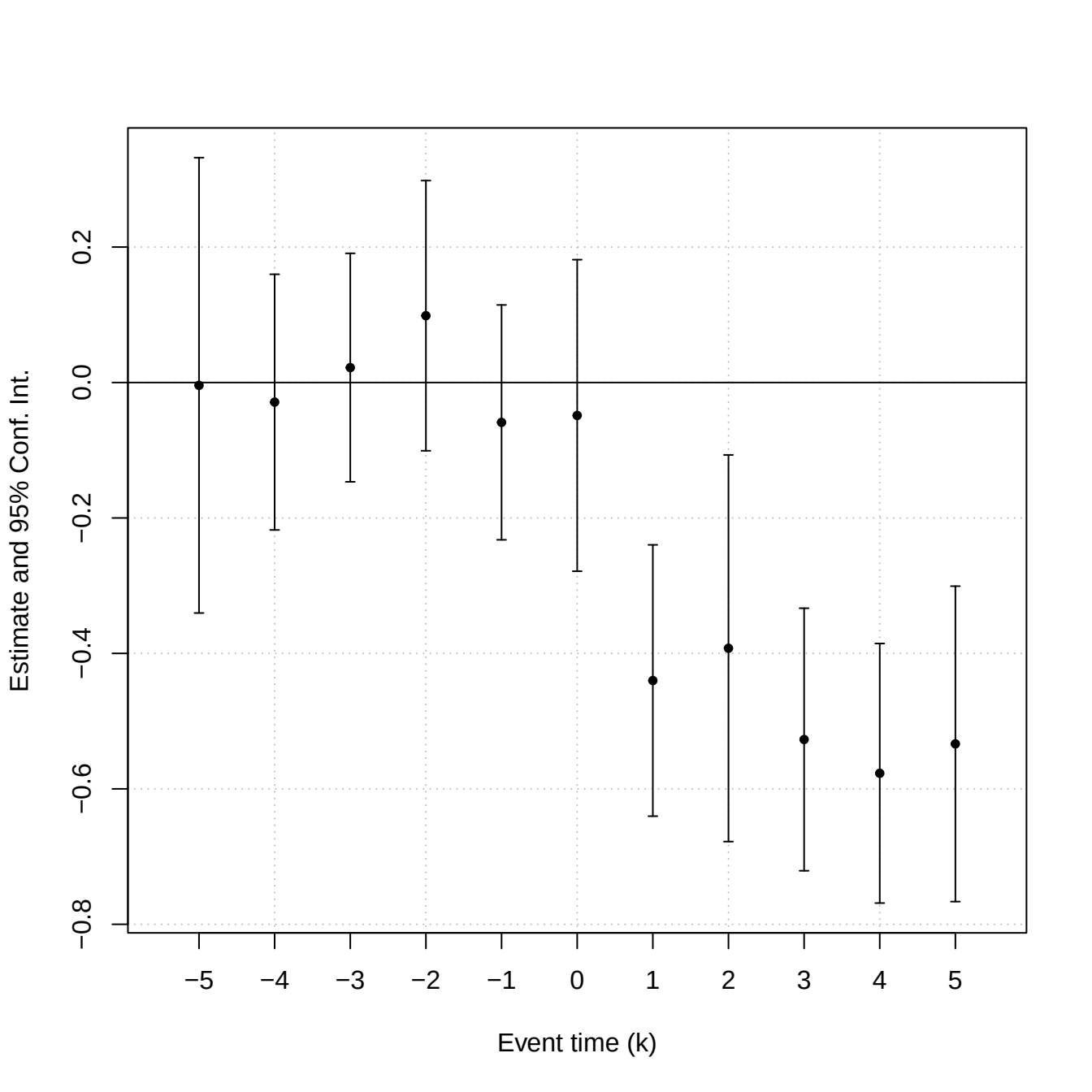

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

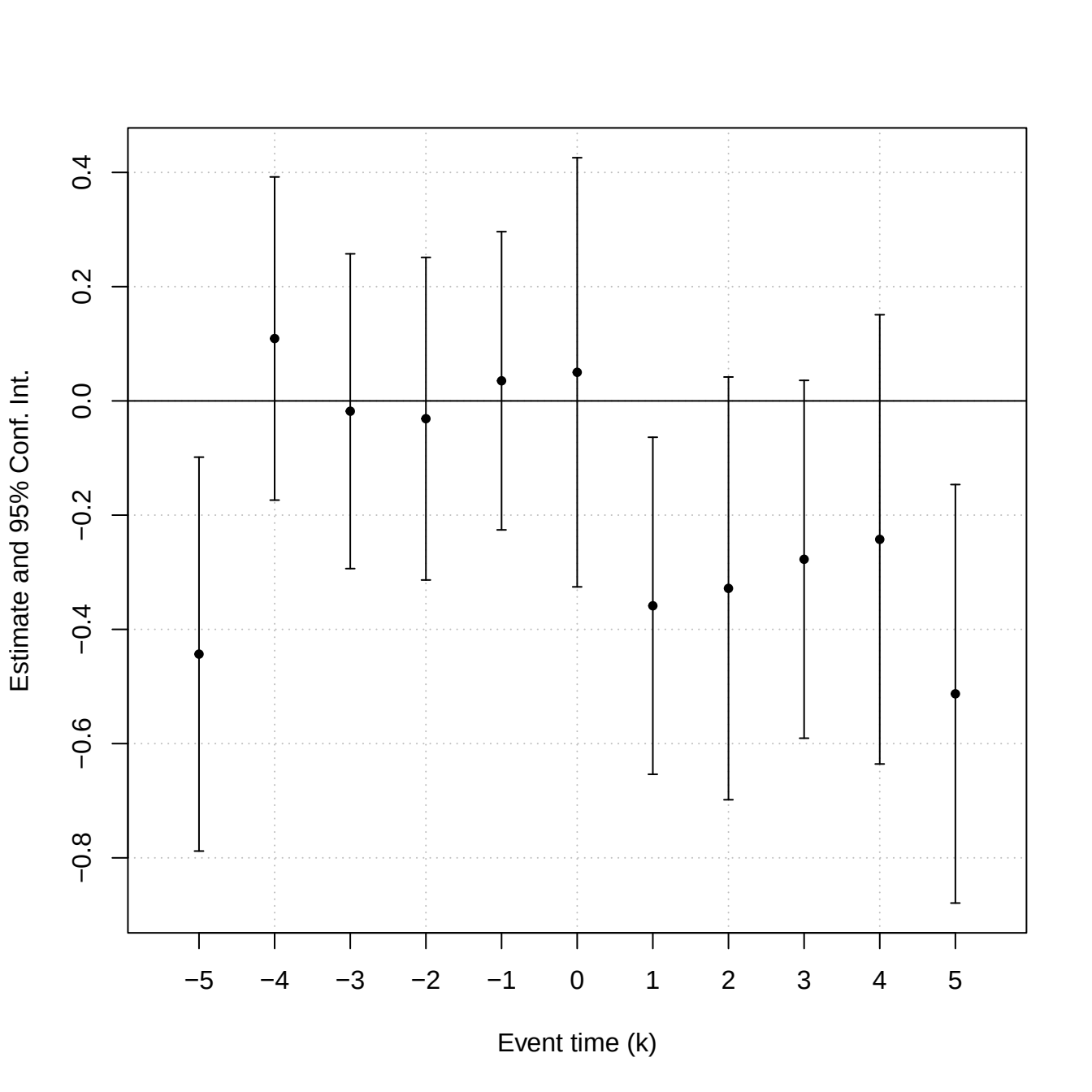

pull_request_merged
knowledge_redundancy −> collaboration
member_count −> pct_members_multiple
High
Low
3
2
1
0
−1
−2
Pretrend (High) p−value: 0.304
Pretrend (Low) p−value: 0.004
Wald test p−value: 0.105
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

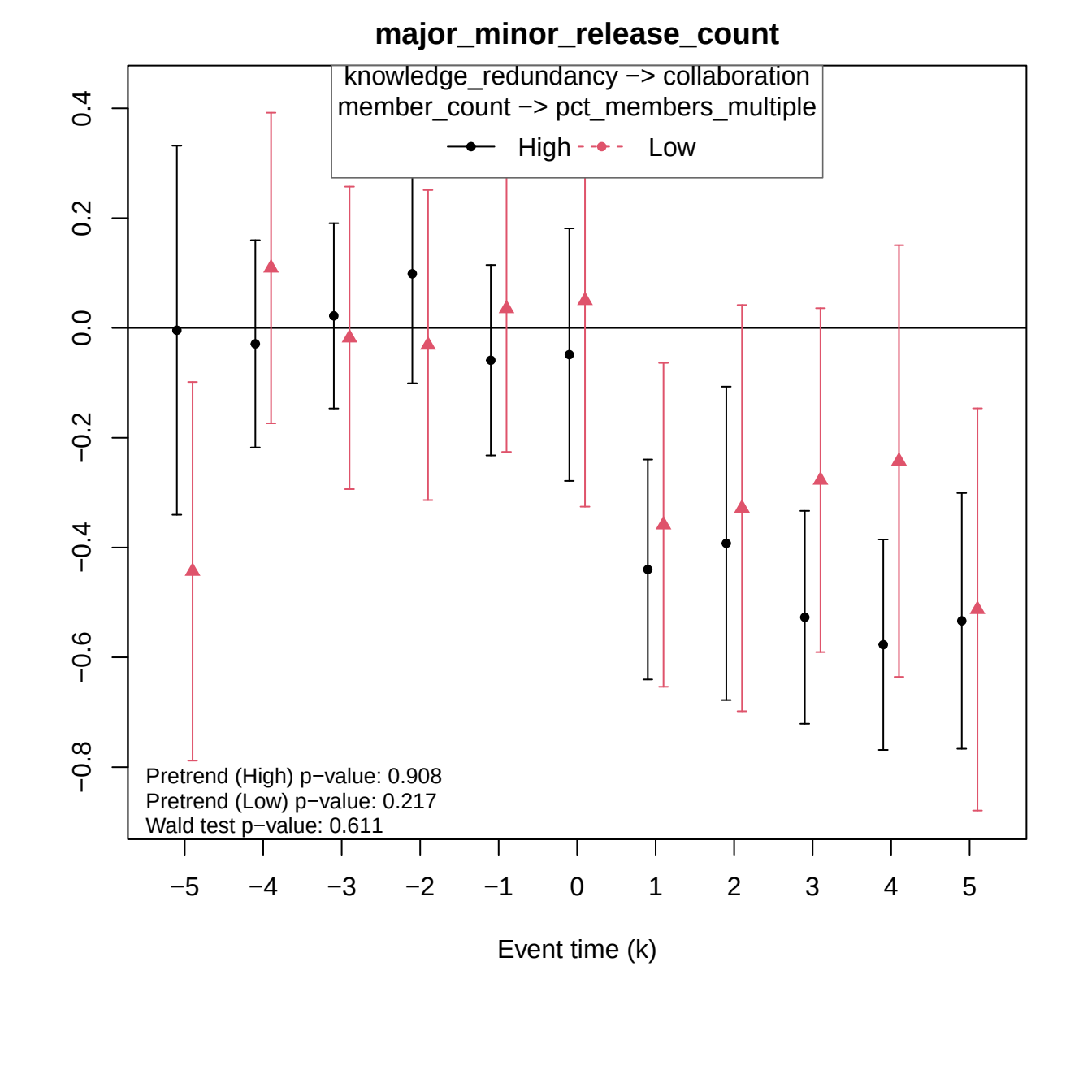

Estimate and 95% Conf. Int.
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

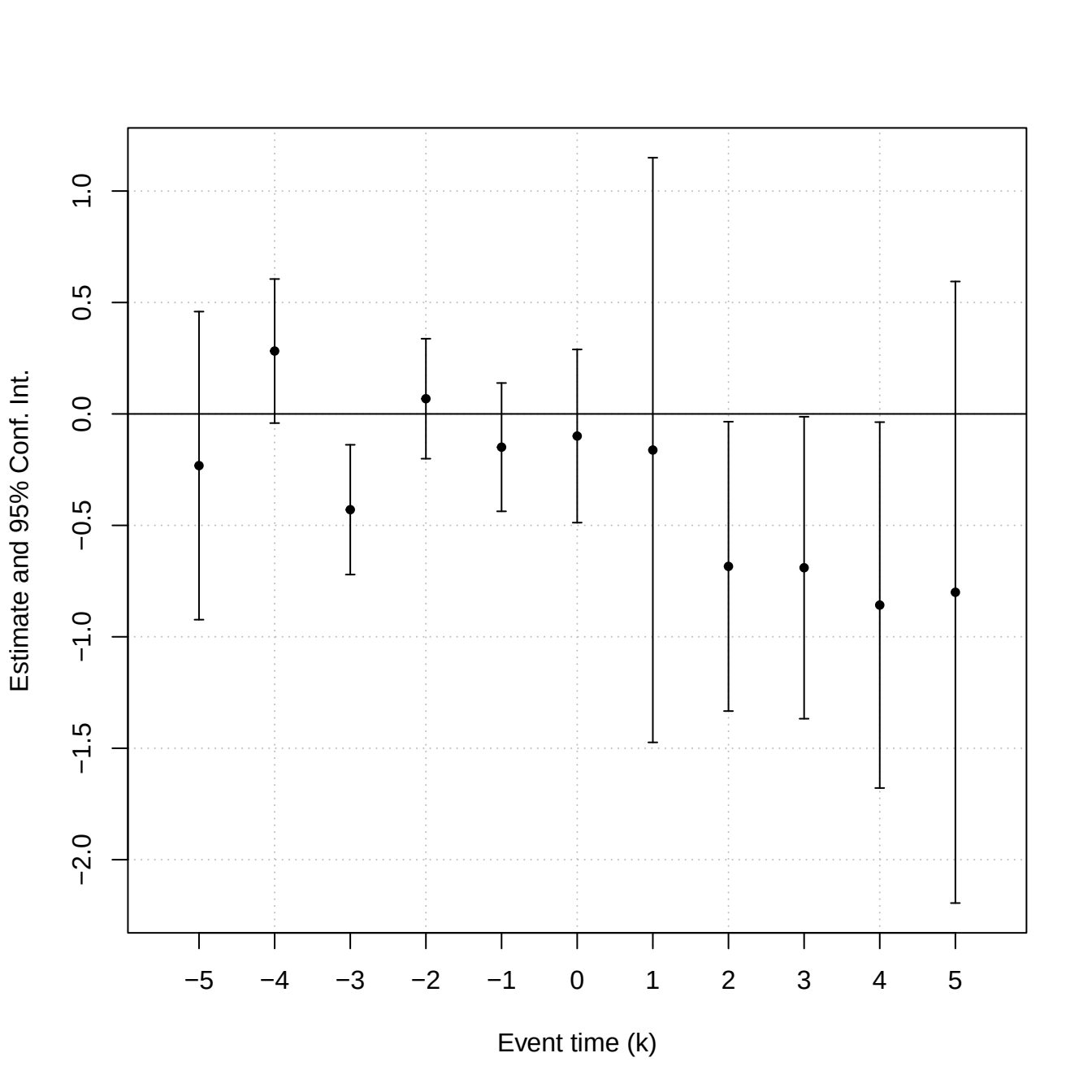

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

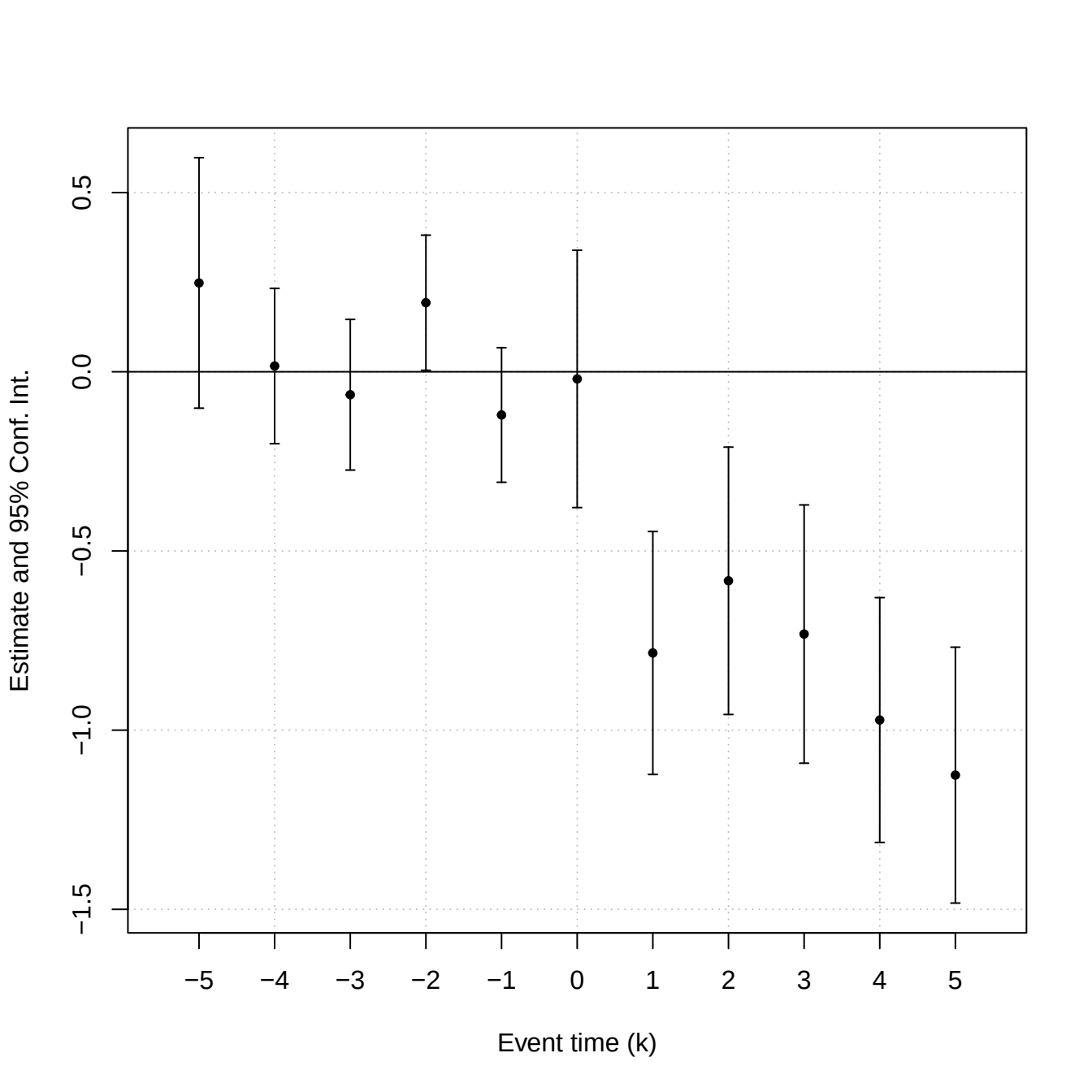

overall_new_release_count
knowledge_redundancy −> collaboration
member_count −> pct_members_multiple
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.388
Pretrend (Low) p−value: 0.371
Wald test p−value: 0.141
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

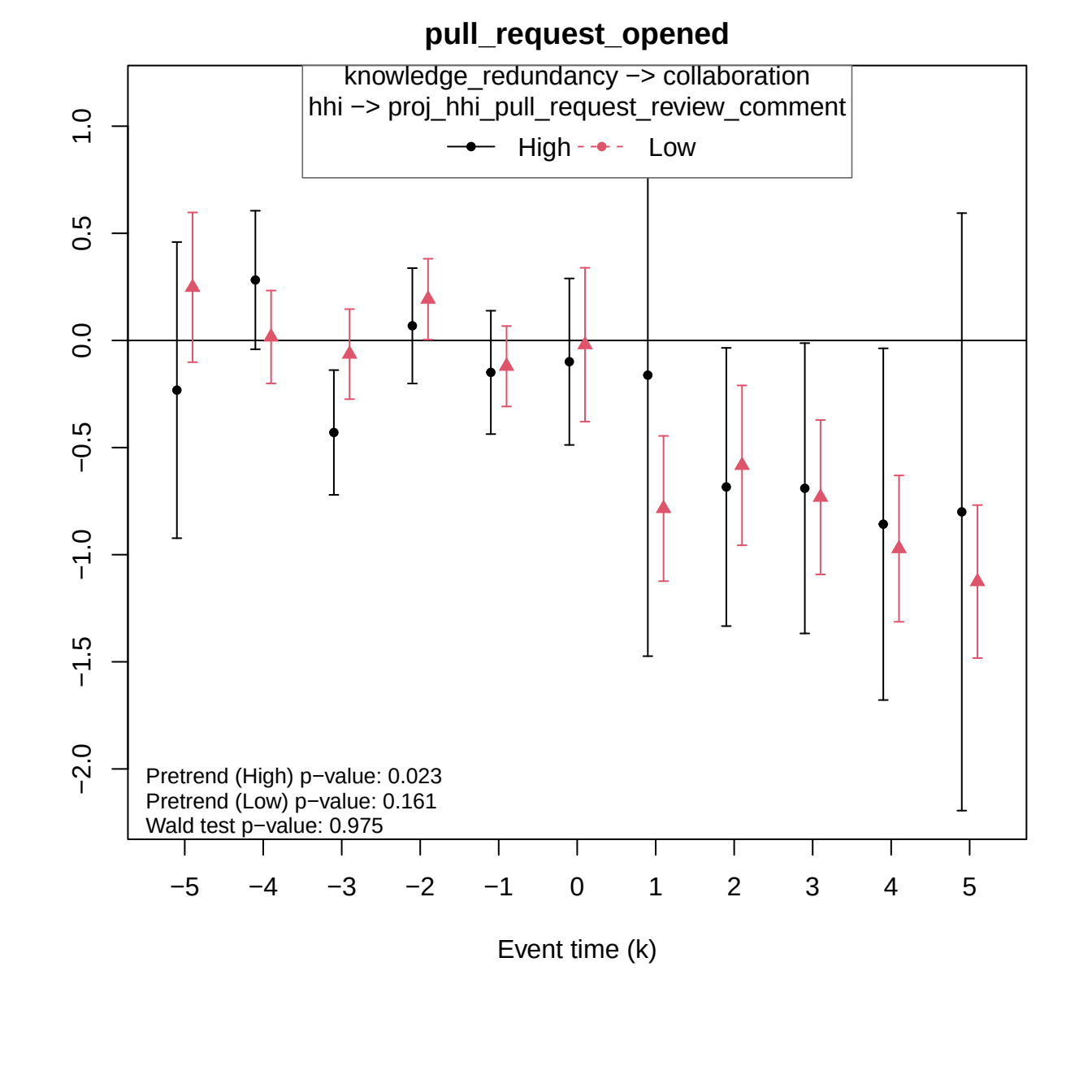

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

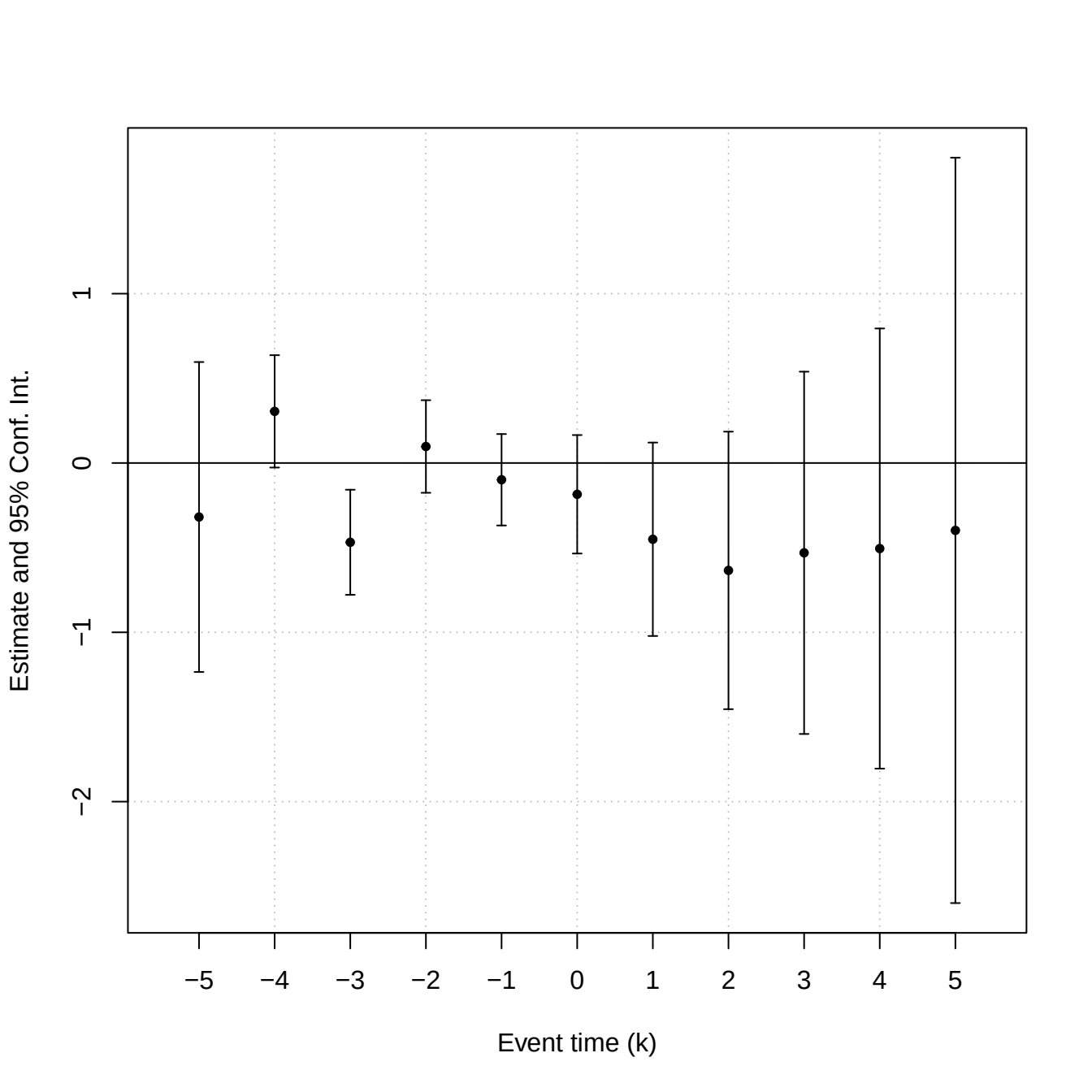

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

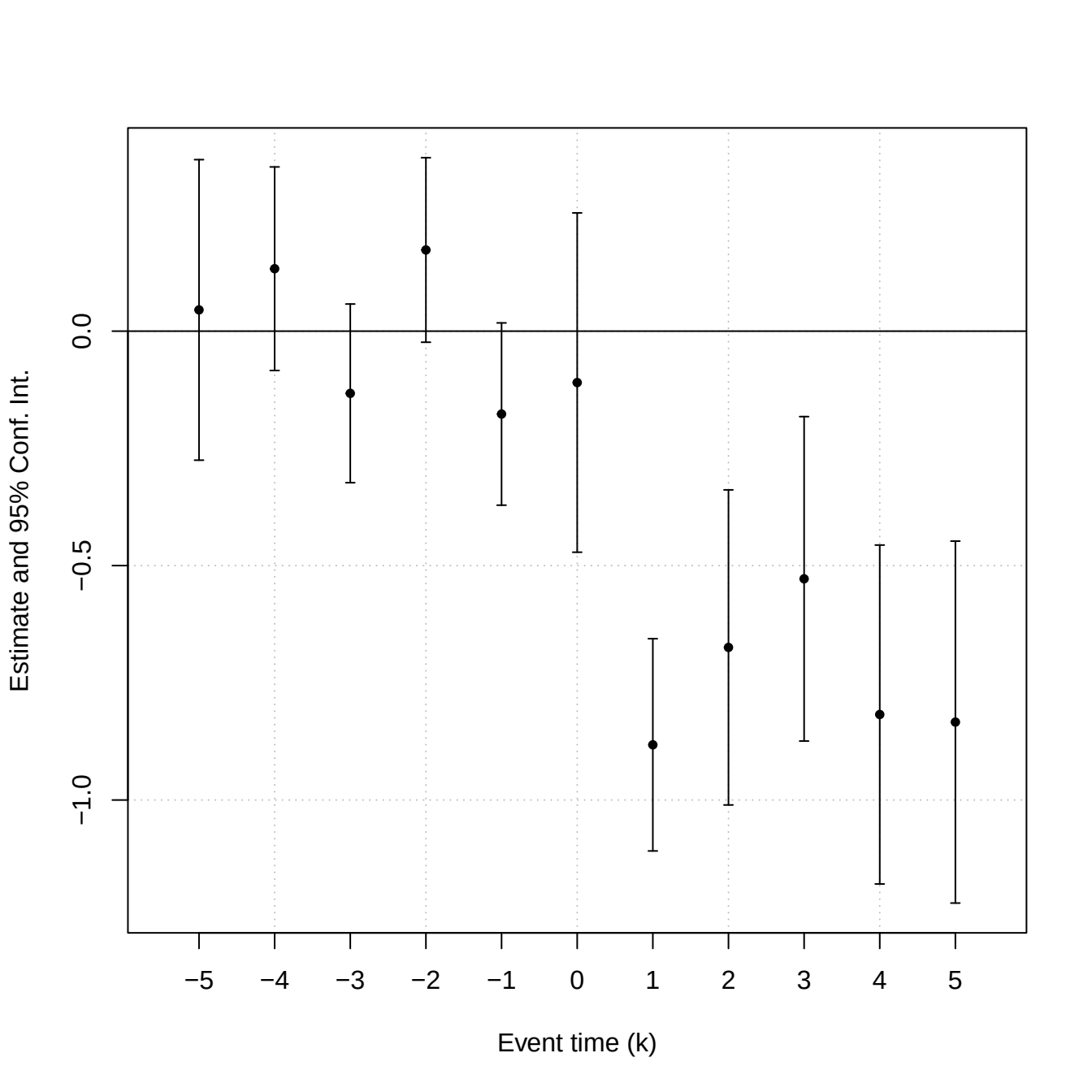

major_minor_release_count
knowledge_redundancy −> collaboration
member_count −> pct_members_multiple
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.908
Pretrend (Low) p−value: 0.217
Wald test p−value: 0.611
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

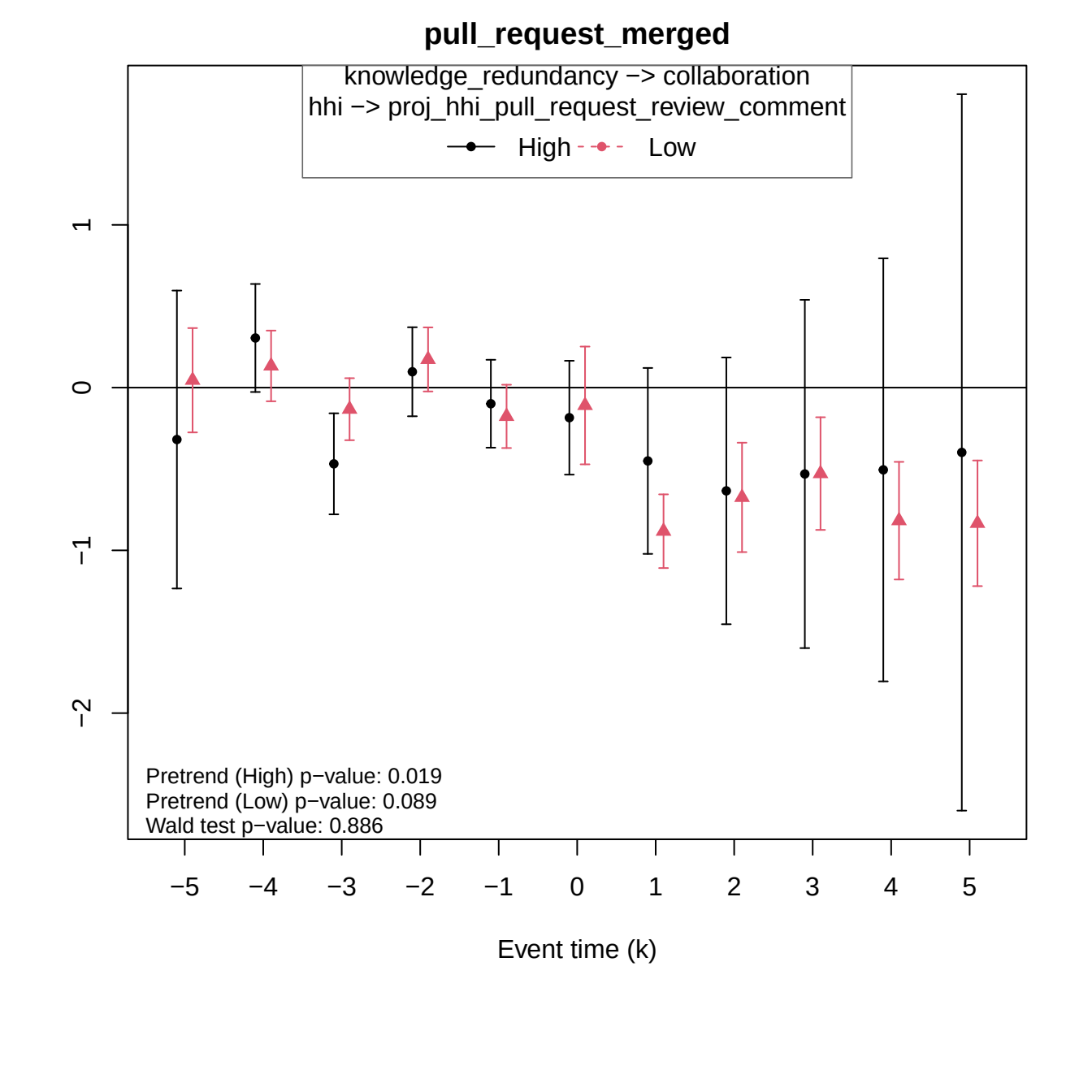

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

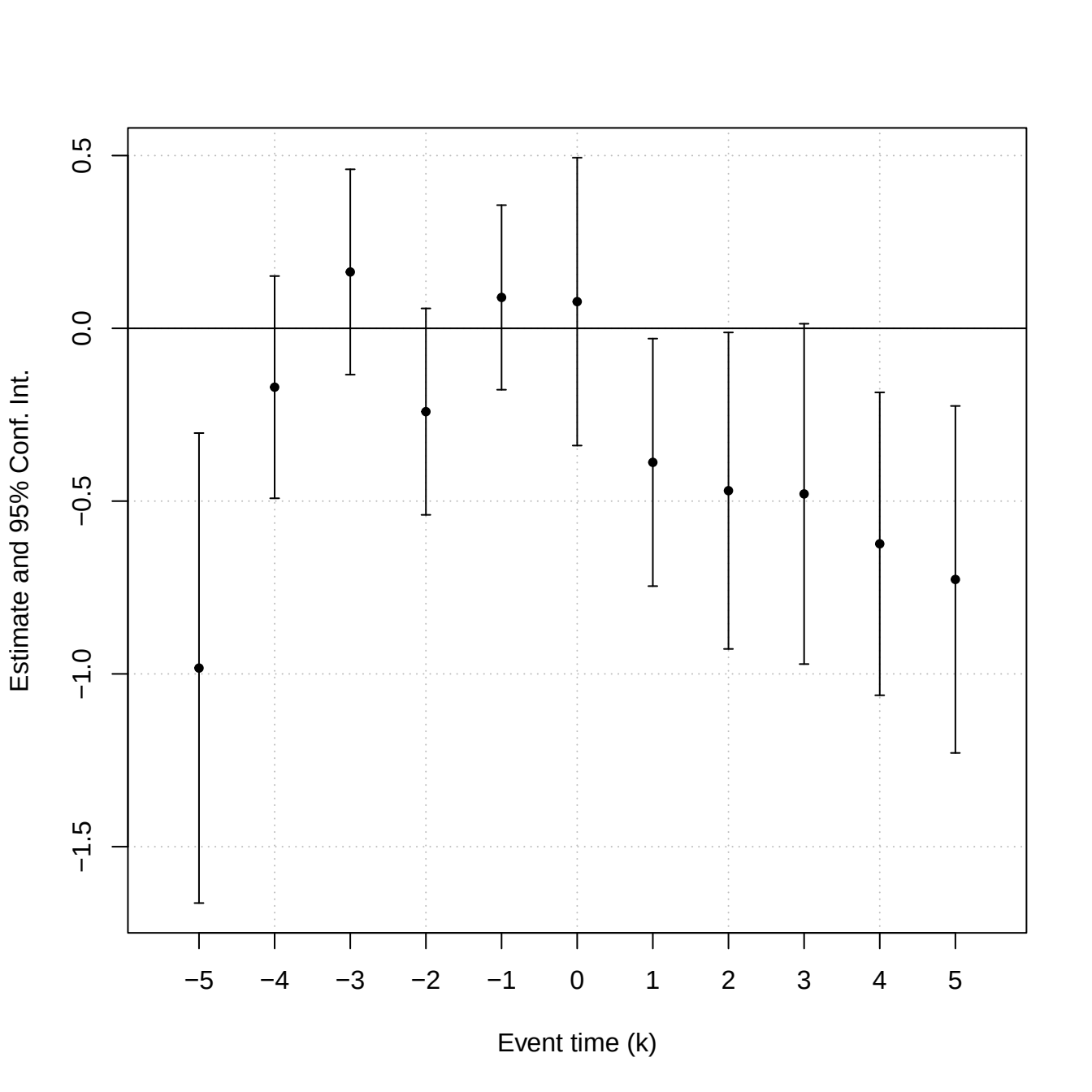

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

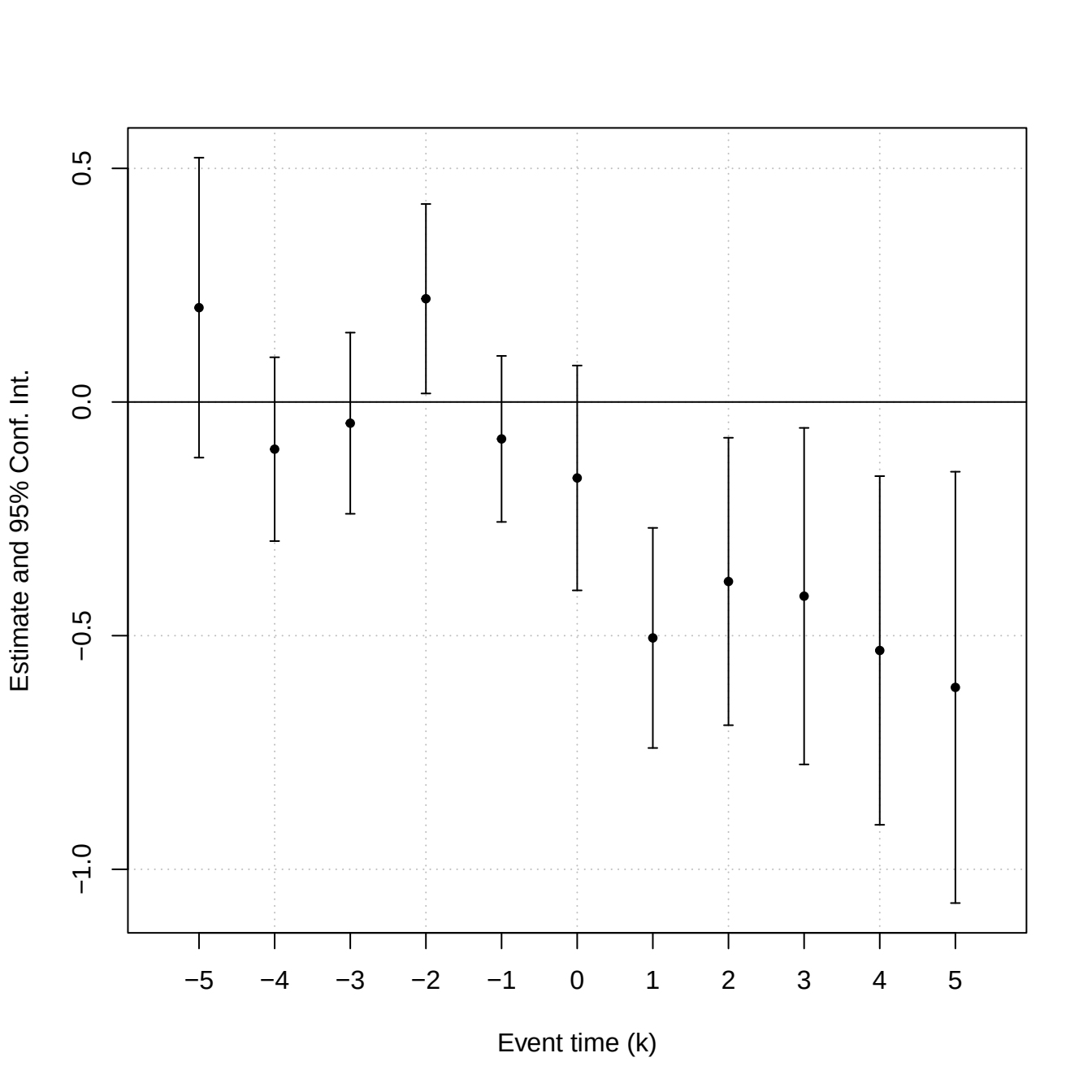

pull_request_opened
knowledge_redundancy −> collaboration
hhi −> proj_hhi_pull_request_review_comment
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.023
Pretrend (Low) p−value: 0.161
Wald test p−value: 0.975
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

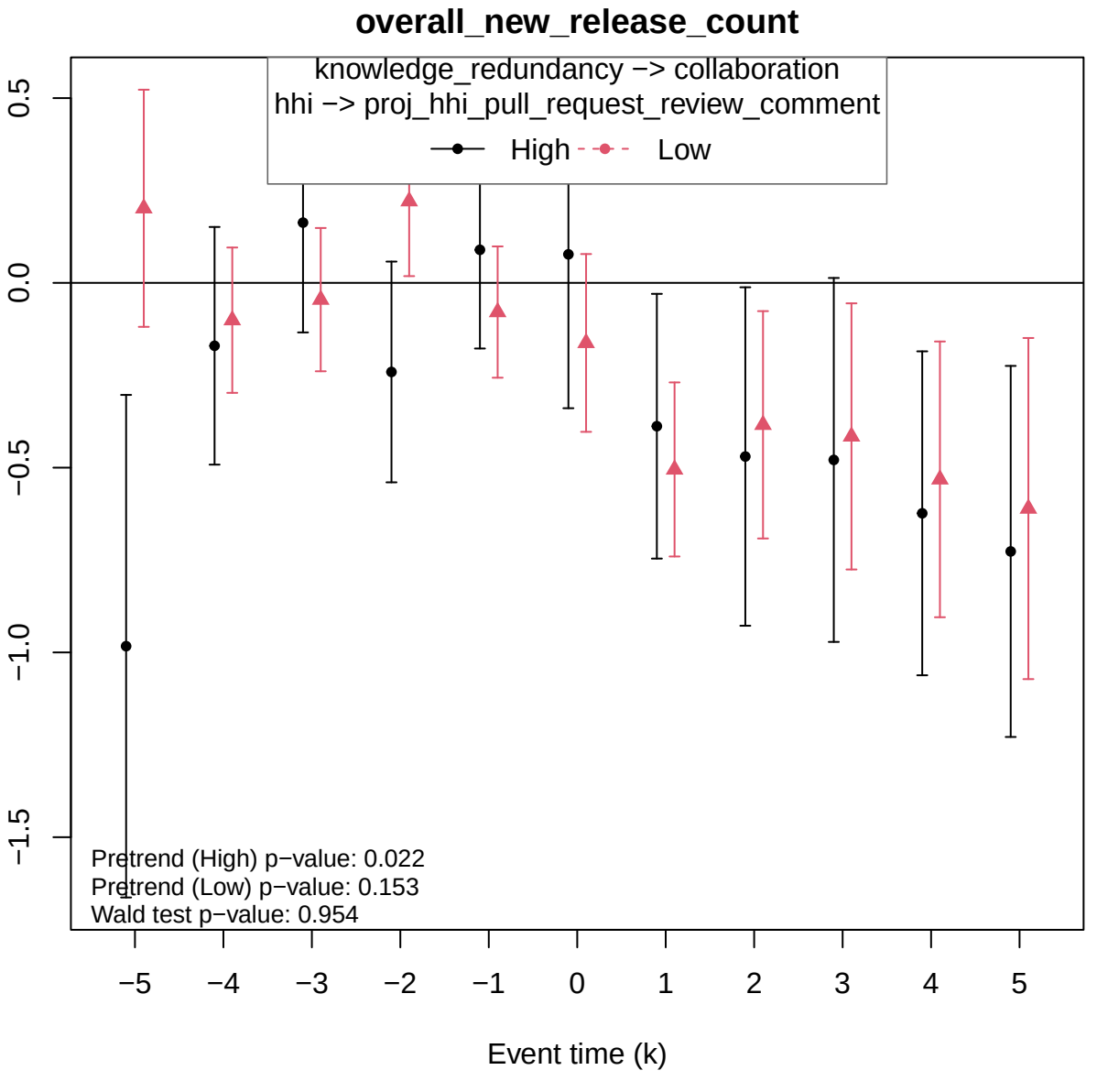

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

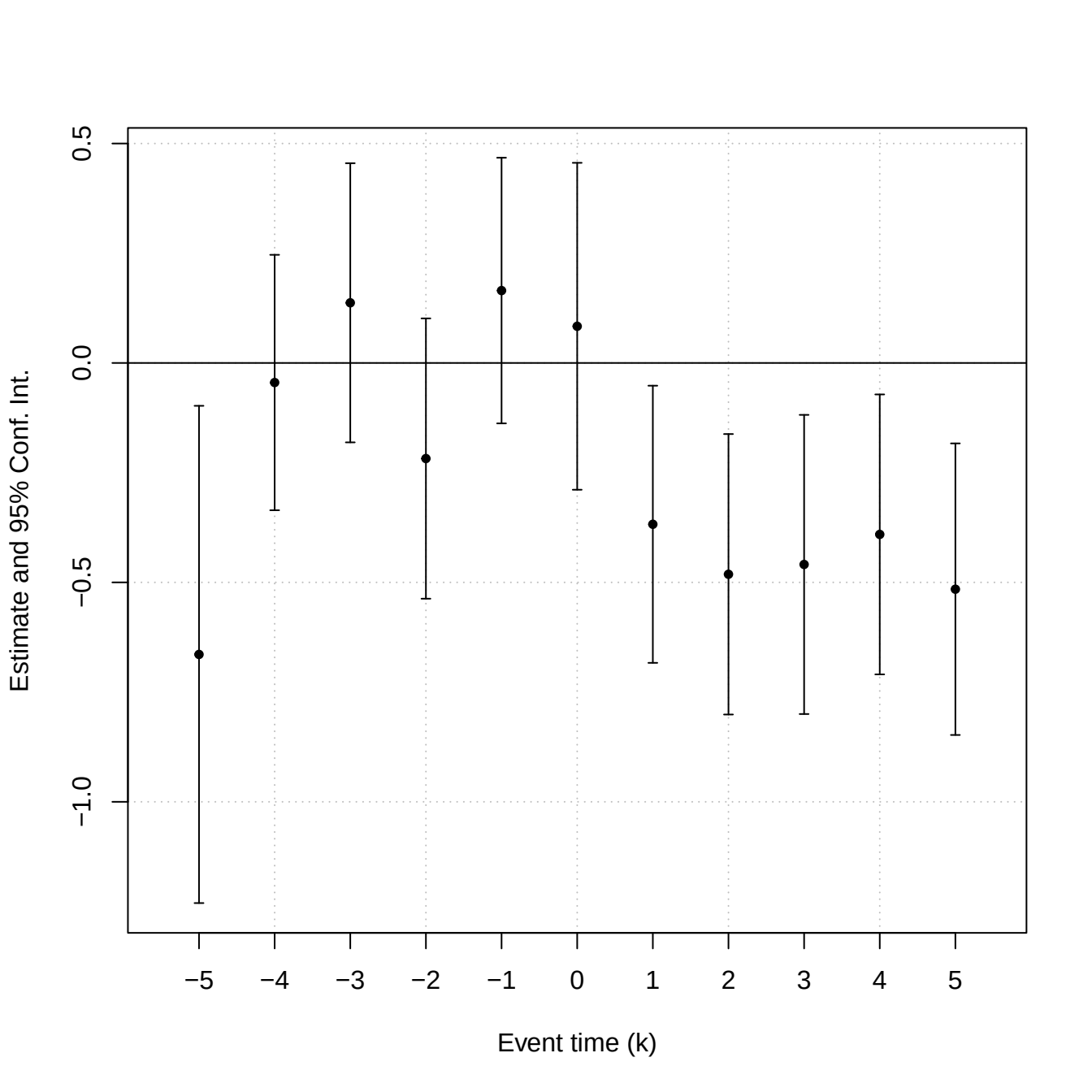

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

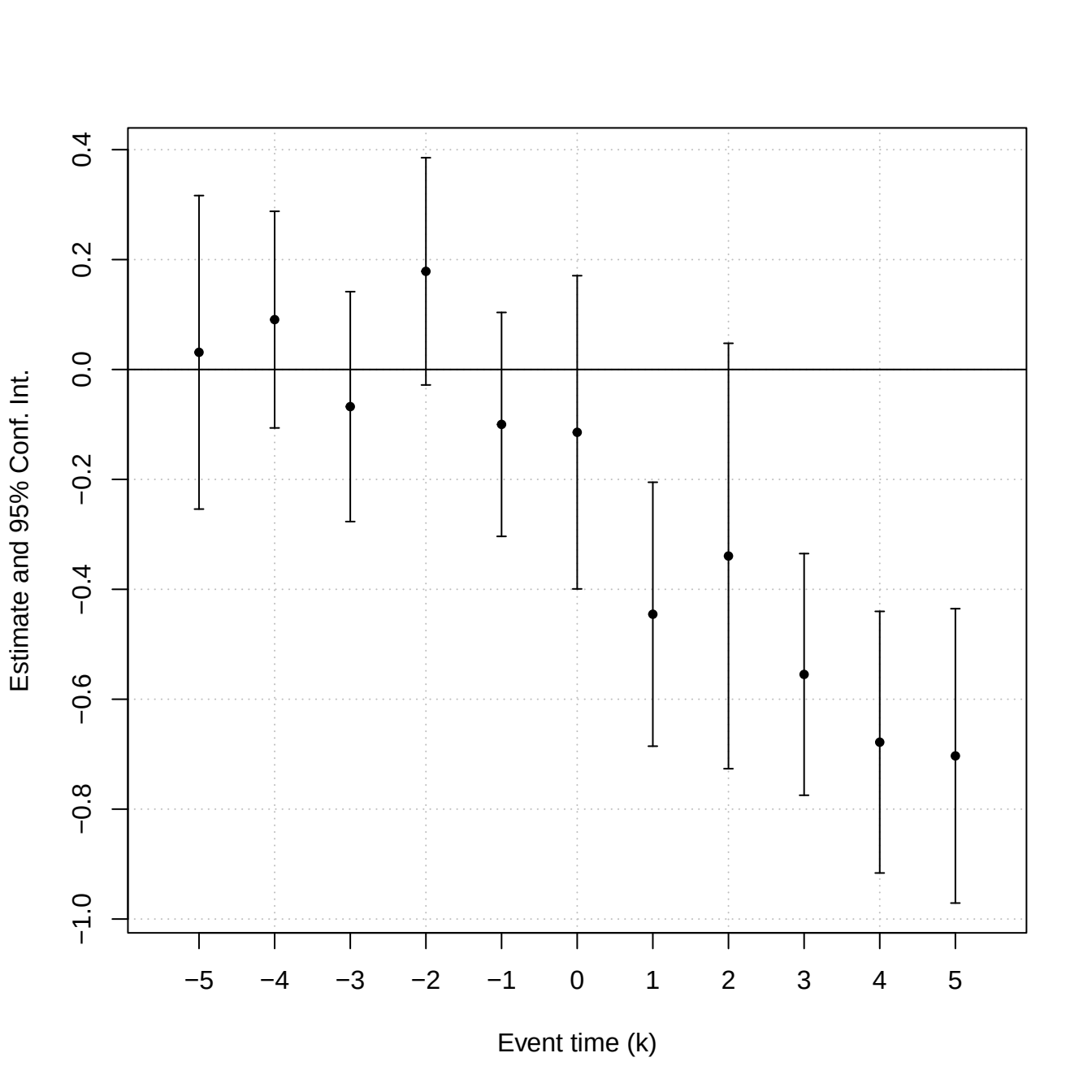

pull_request_merged
knowledge_redundancy −> collaboration
hhi −> proj_hhi_pull_request_review_comment
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.019
Pretrend (Low) p−value: 0.089
Wald test p−value: 0.886
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

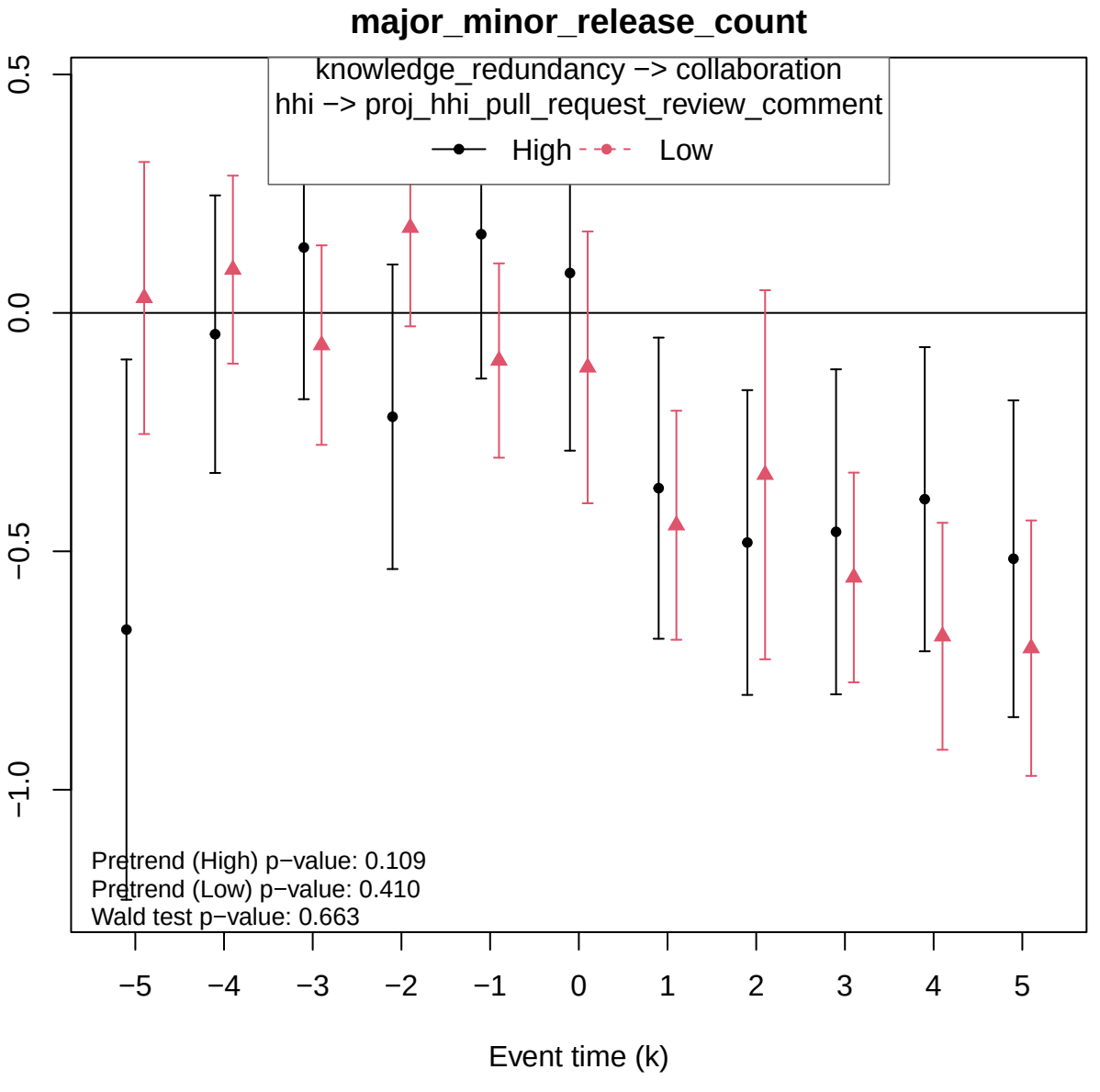

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

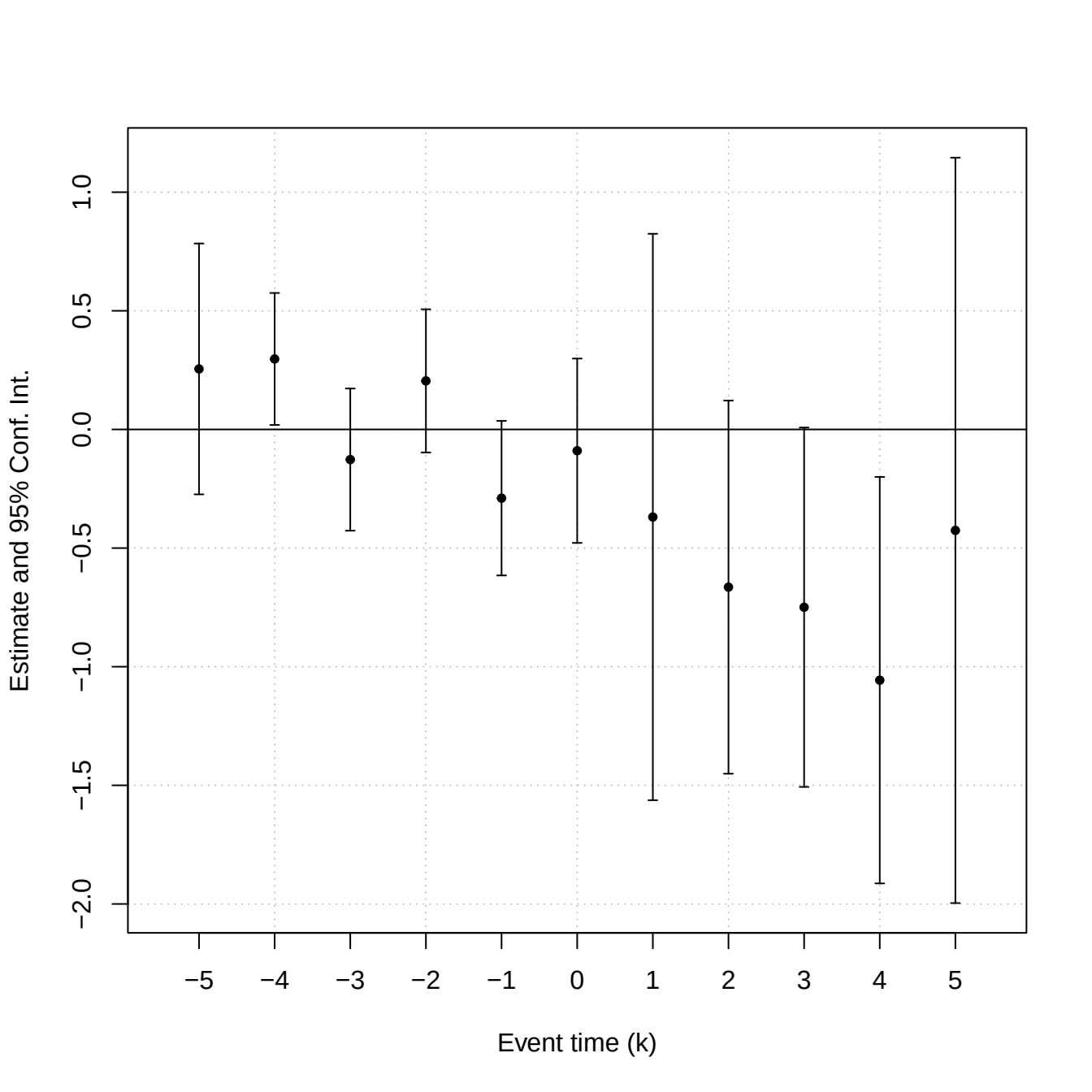

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

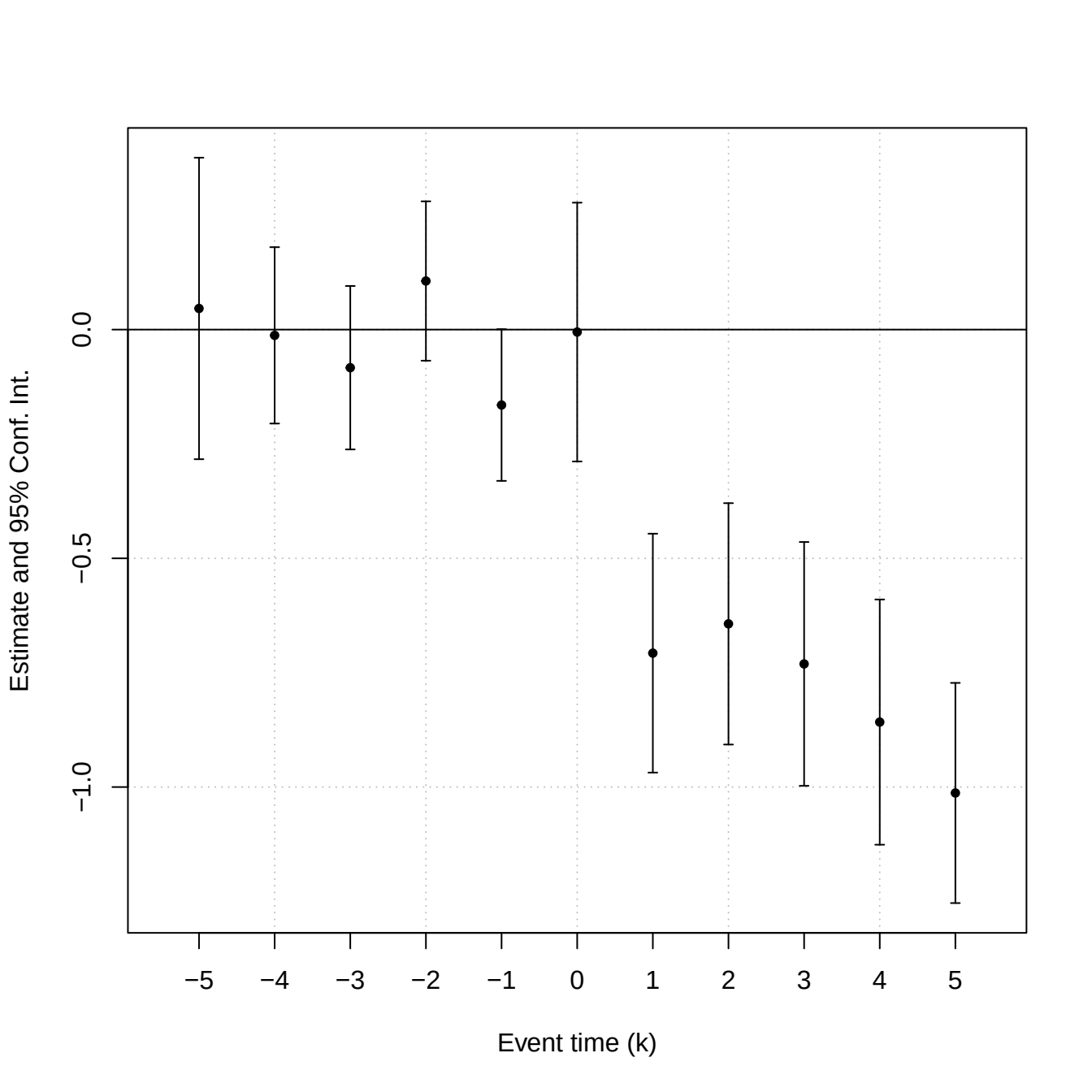

overall_new_release_count
knowledge_redundancy −> collaboration
hhi −> proj_hhi_pull_request_review_comment
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.022
Pretrend (Low) p−value: 0.153
Wald test p−value: 0.954
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

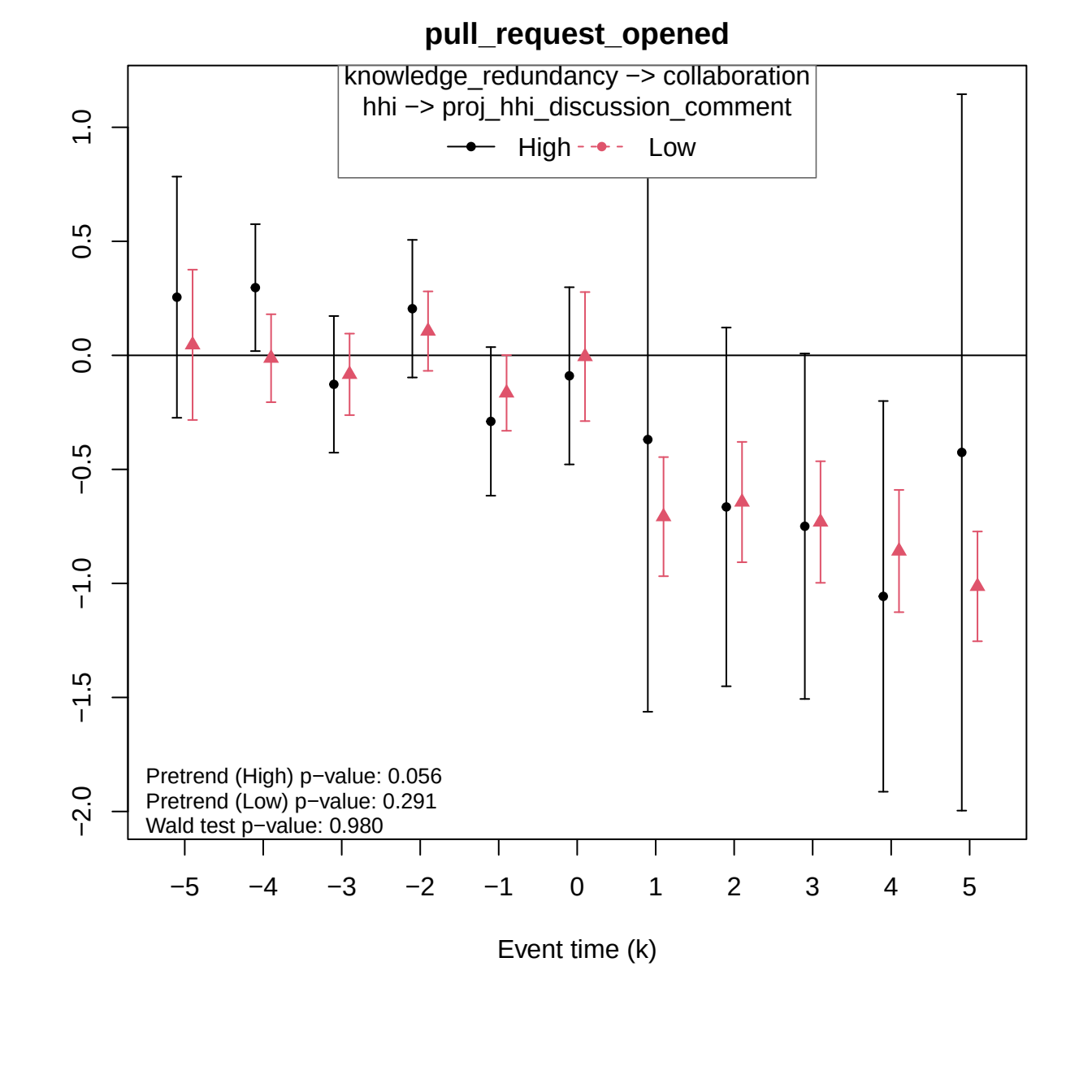

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

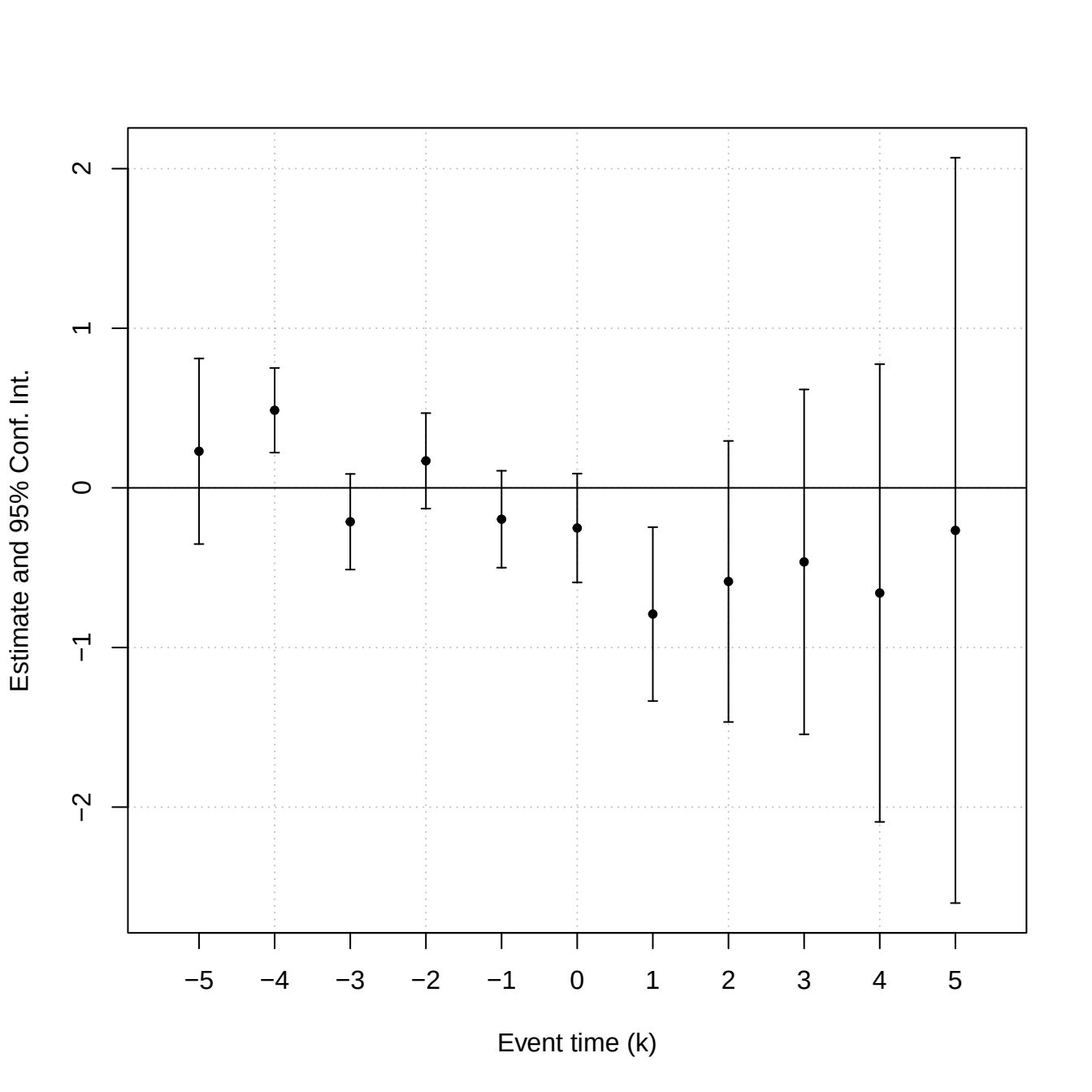

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

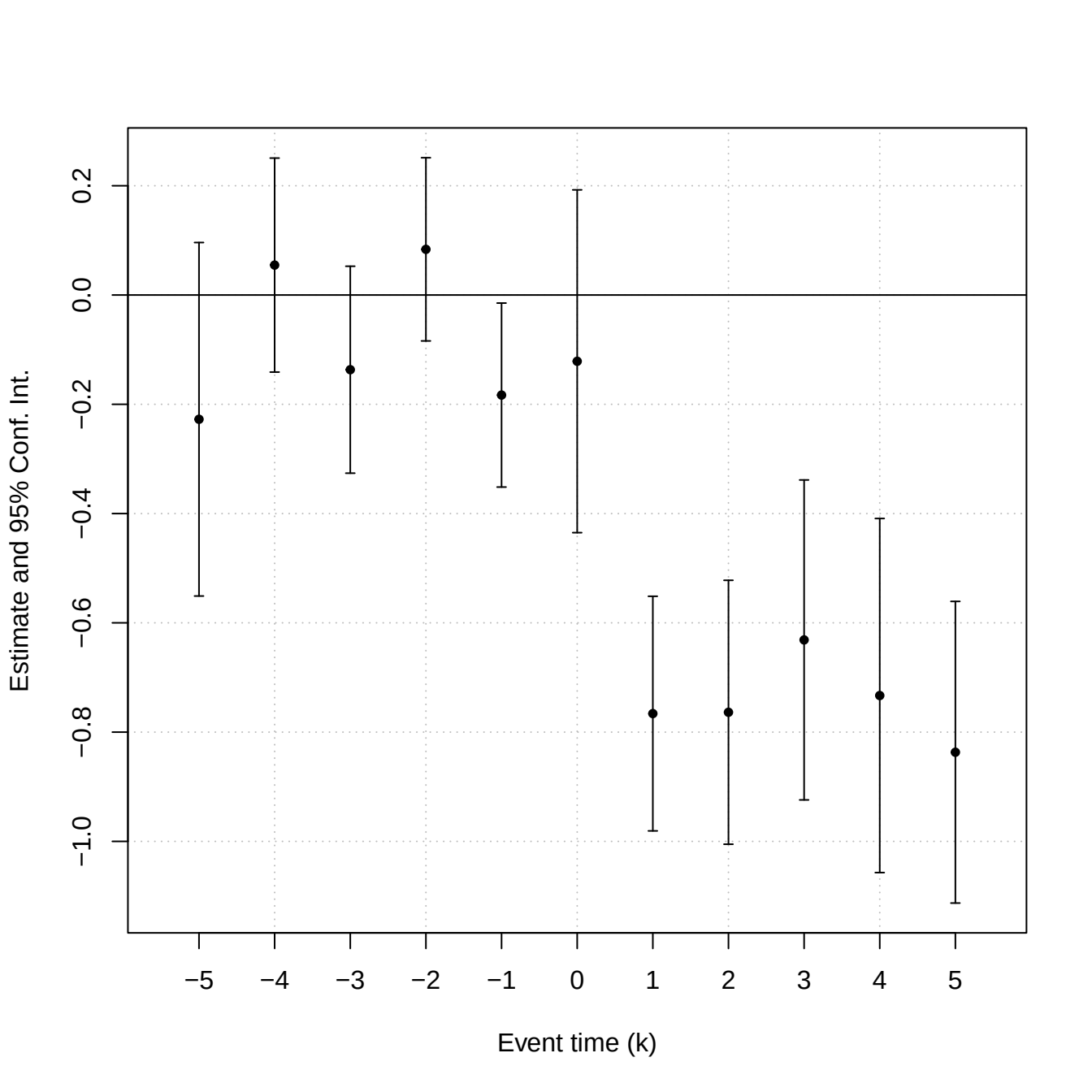

major_minor_release_count
knowledge_redundancy −> collaboration
hhi −> proj_hhi_pull_request_review_comment
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.109
Pretrend (Low) p−value: 0.410
Wald test p−value: 0.663
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

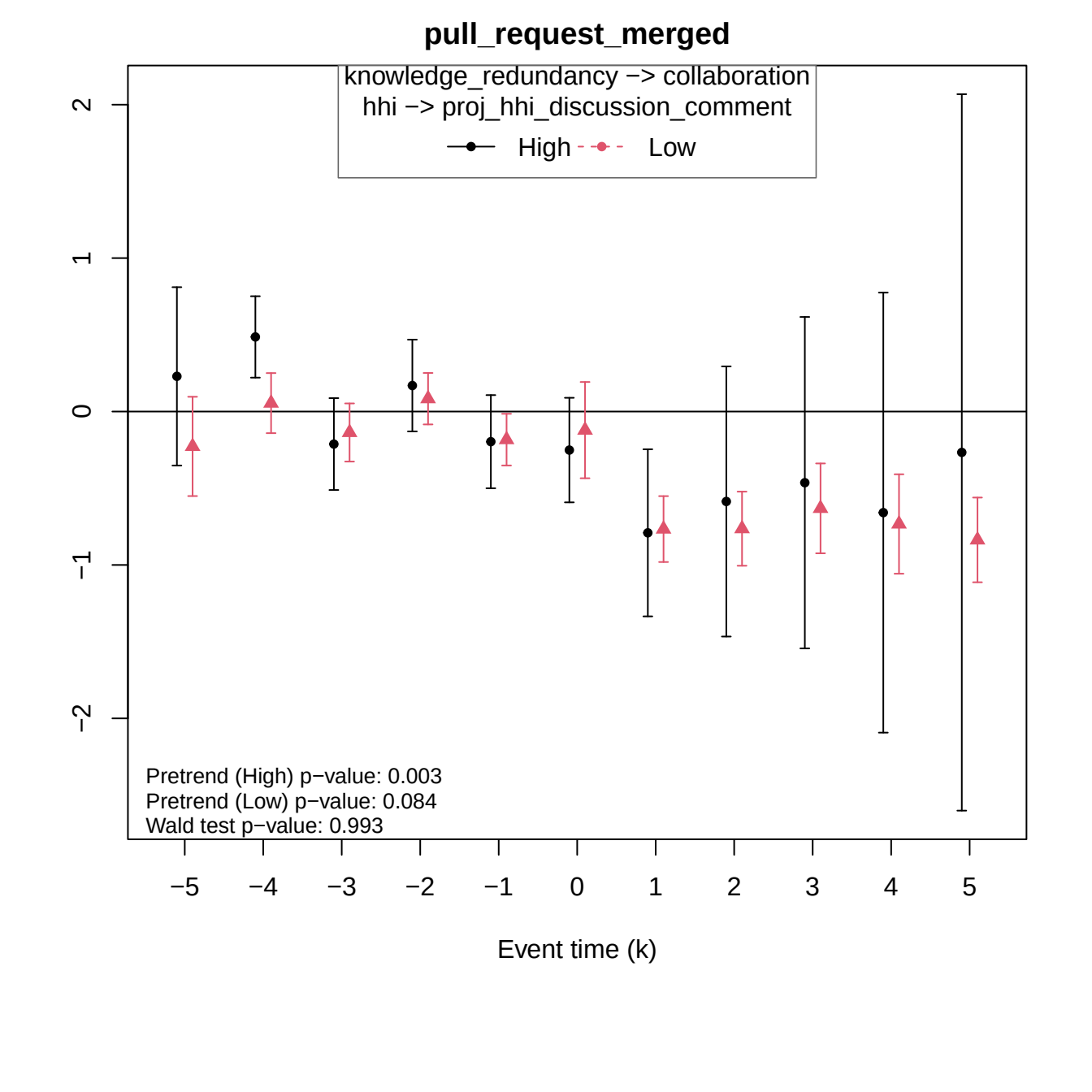

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

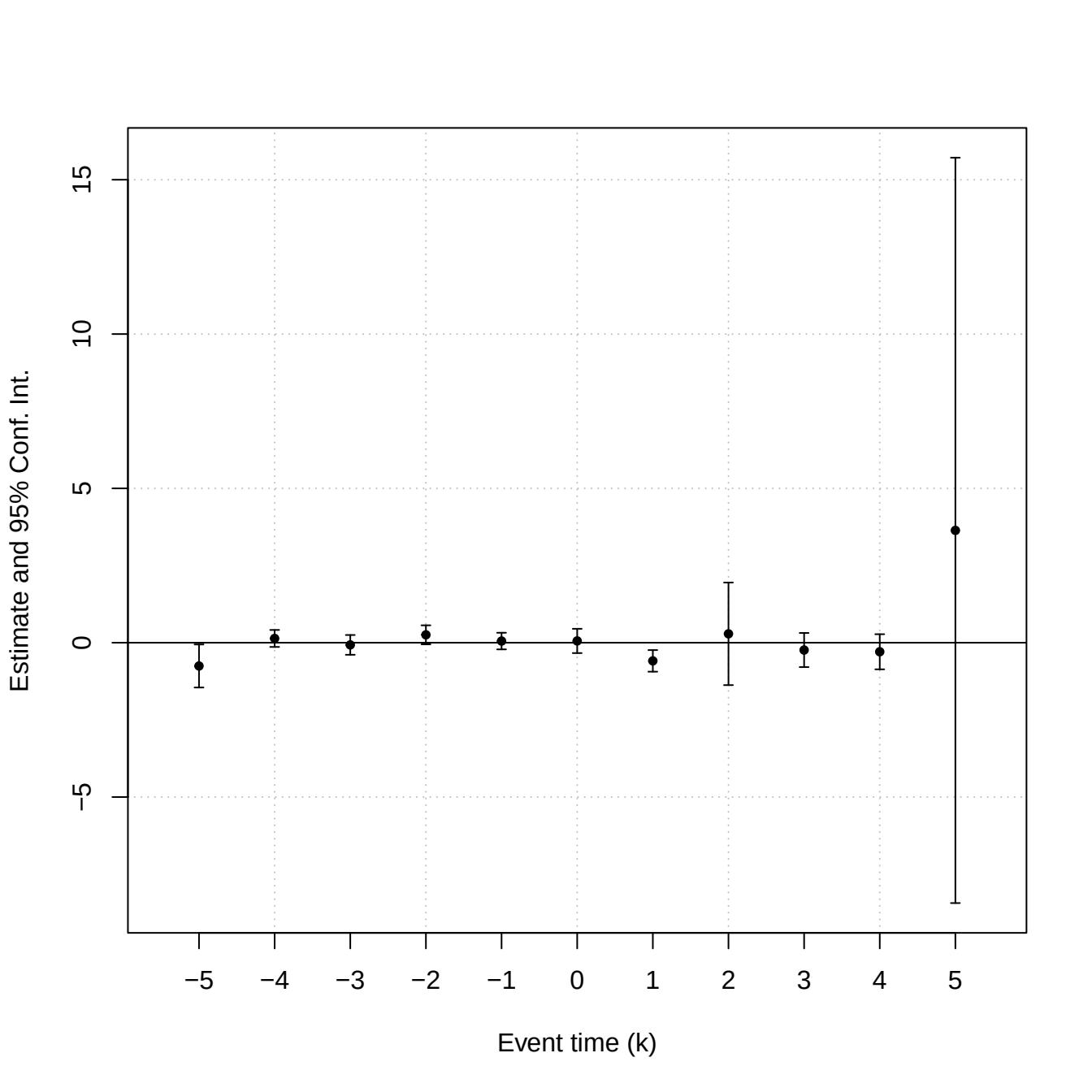

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

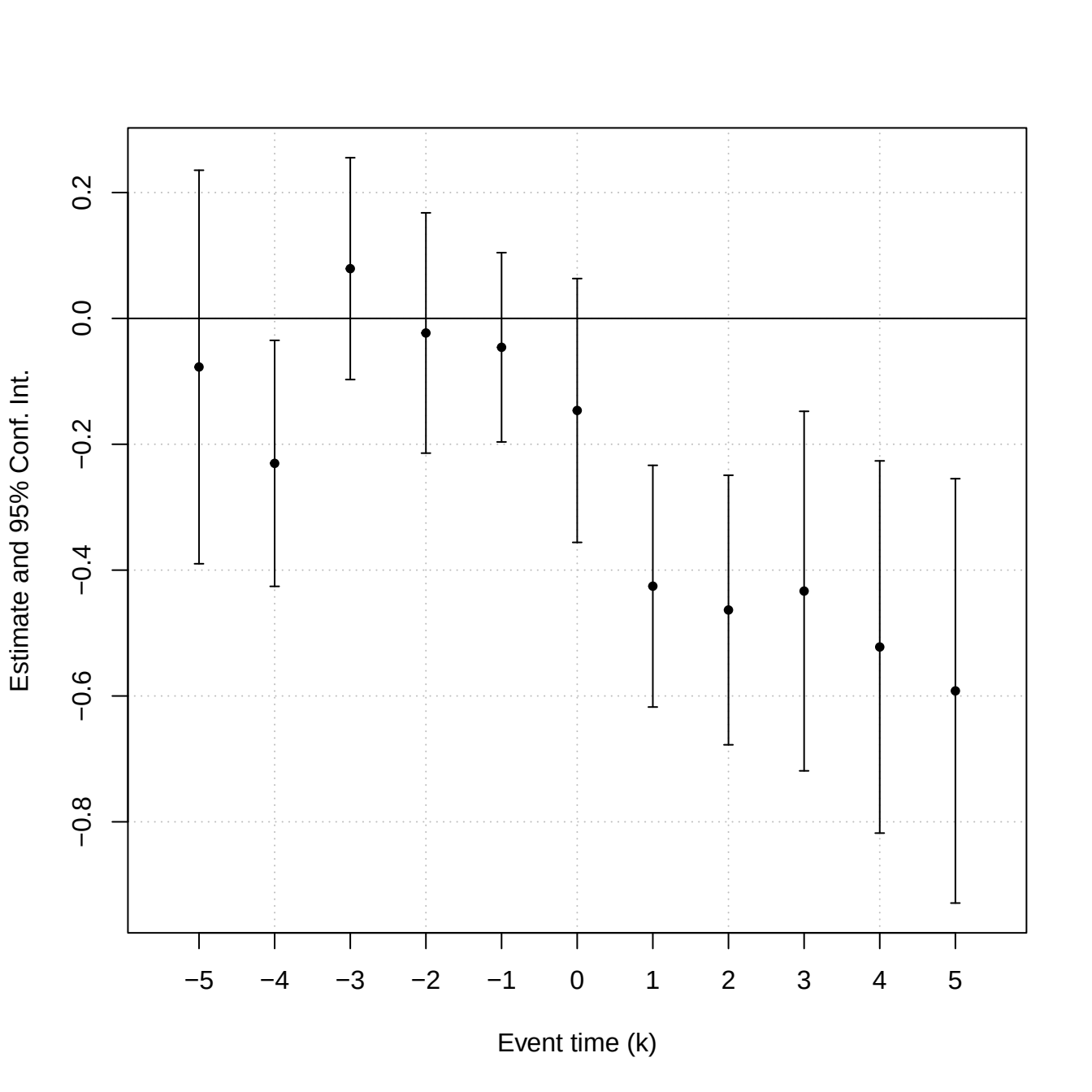

pull_request_opened
knowledge_redundancy −> collaboration
hhi −> proj_hhi_discussion_comment
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.056
Pretrend (Low) p−value: 0.291
Wald test p−value: 0.980
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

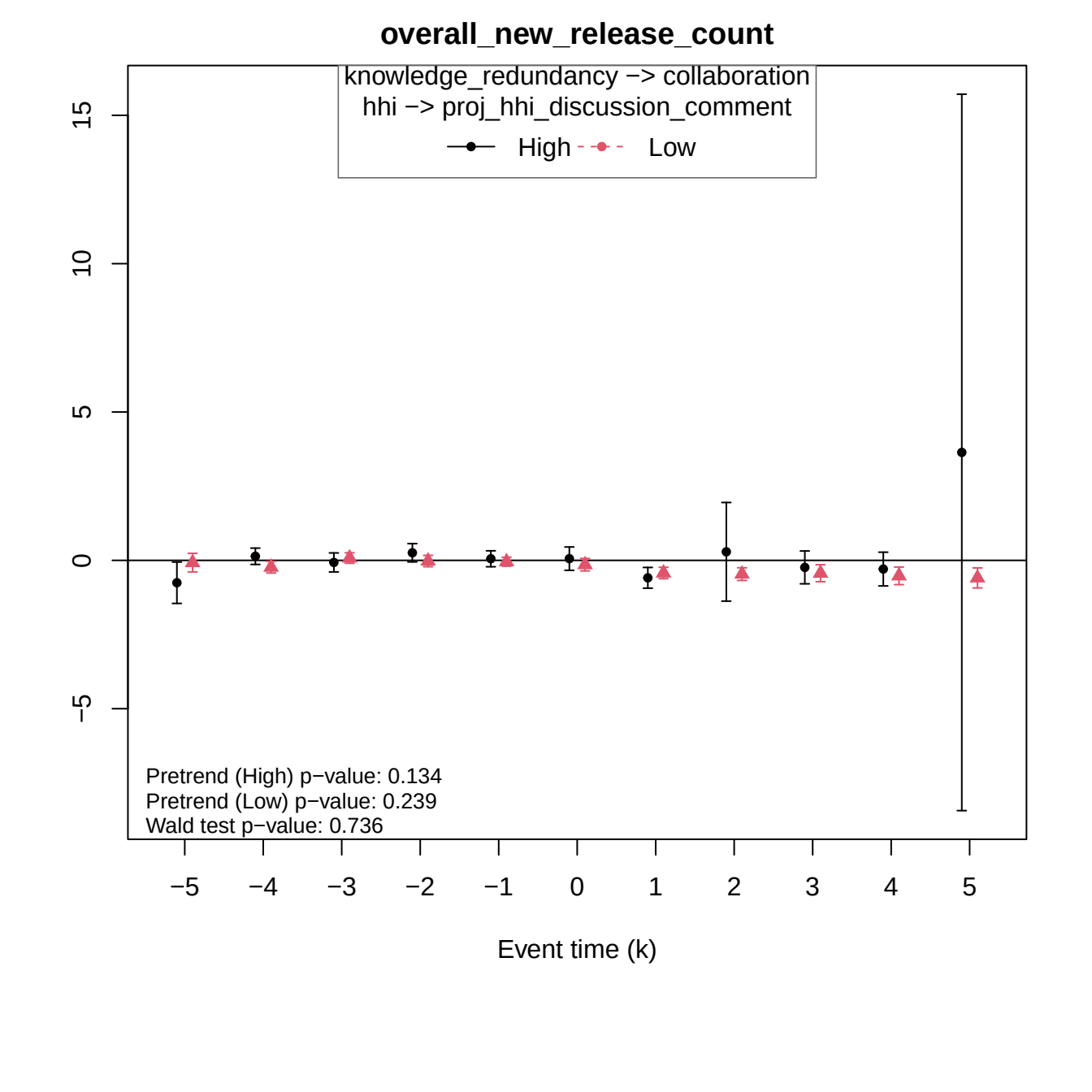

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

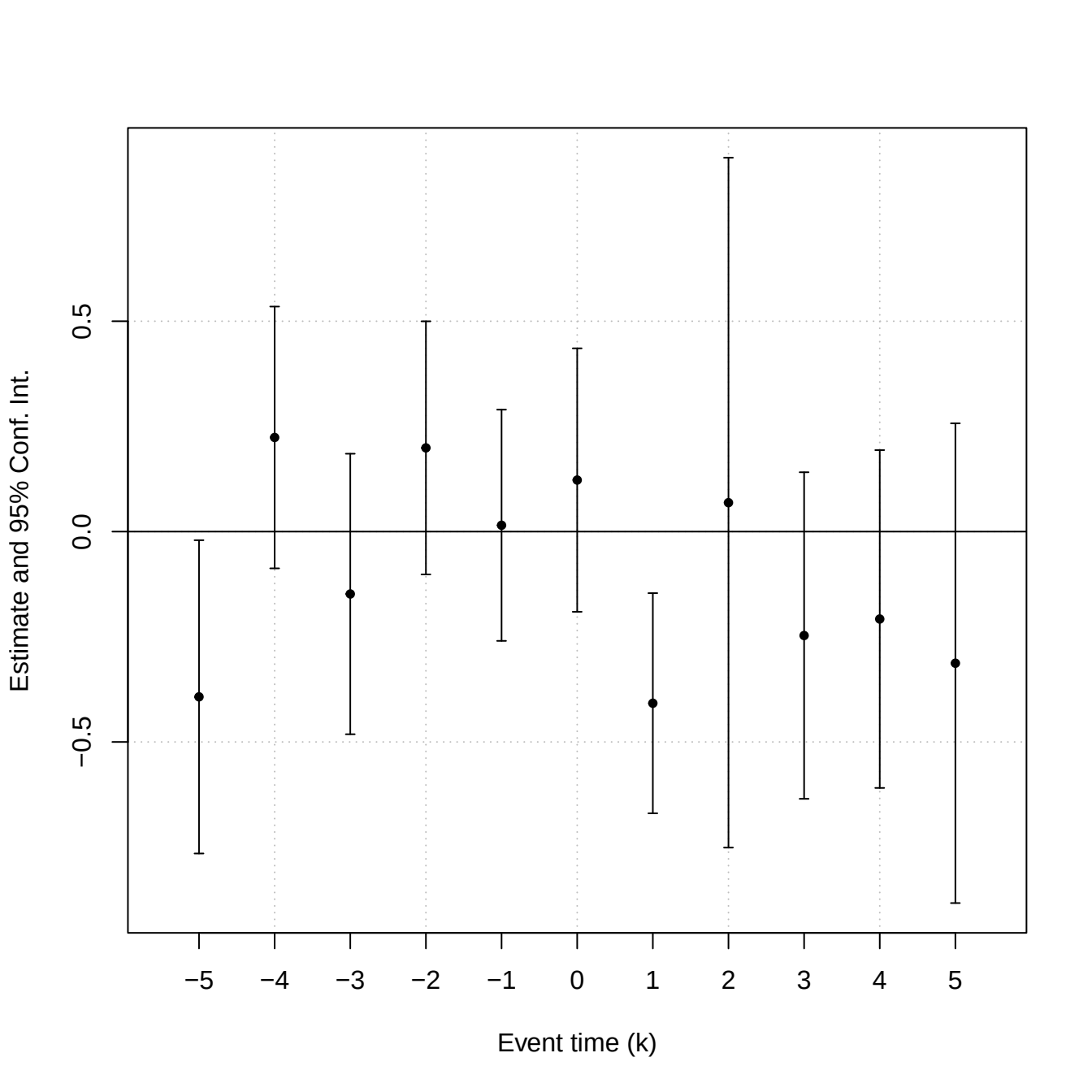

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

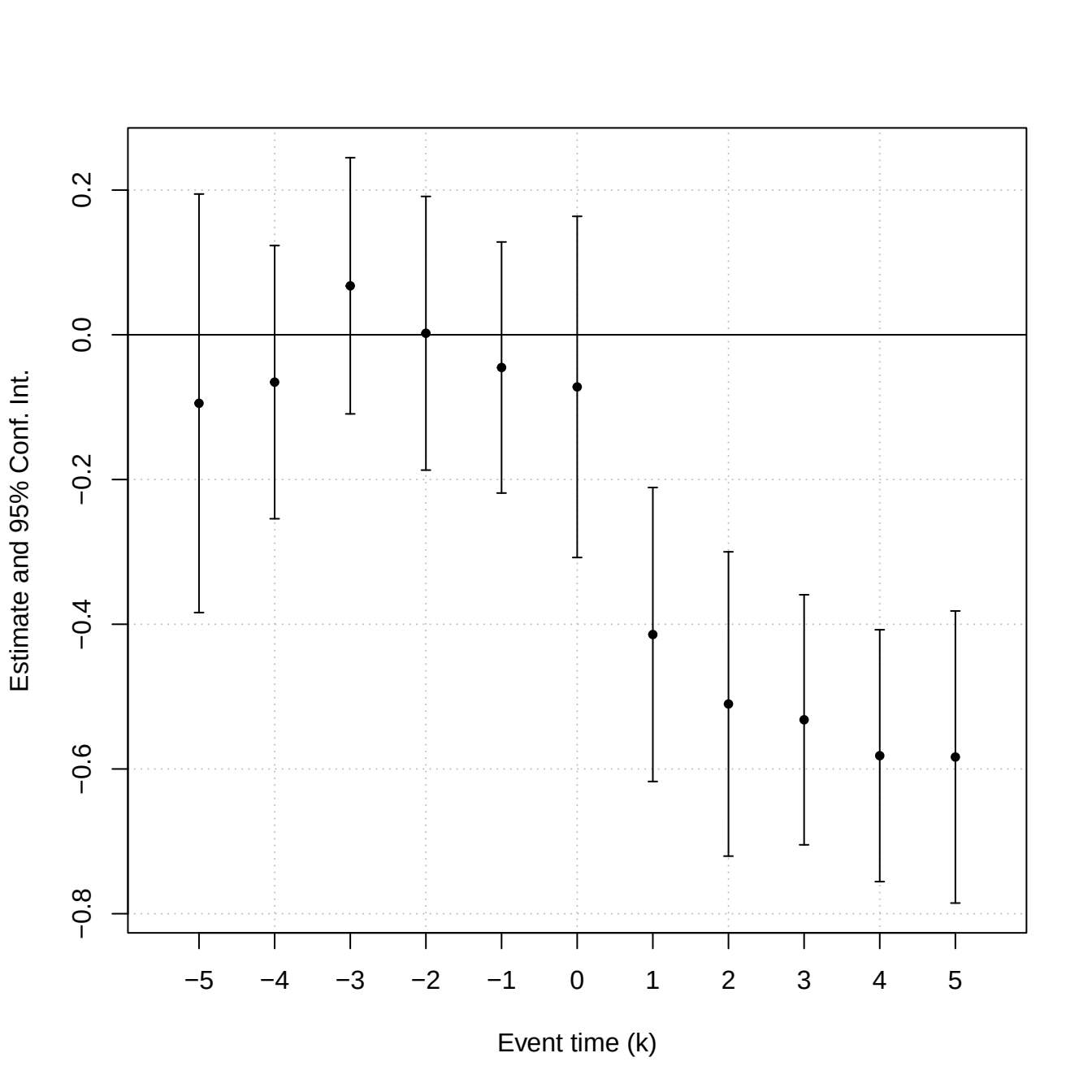

pull_request_merged
knowledge_redundancy −> collaboration
hhi −> proj_hhi_discussion_comment
High
Low
2
1
0
−1
−2
Pretrend (High) p−value: 0.003
Pretrend (Low) p−value: 0.084
Wald test p−value: 0.993
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

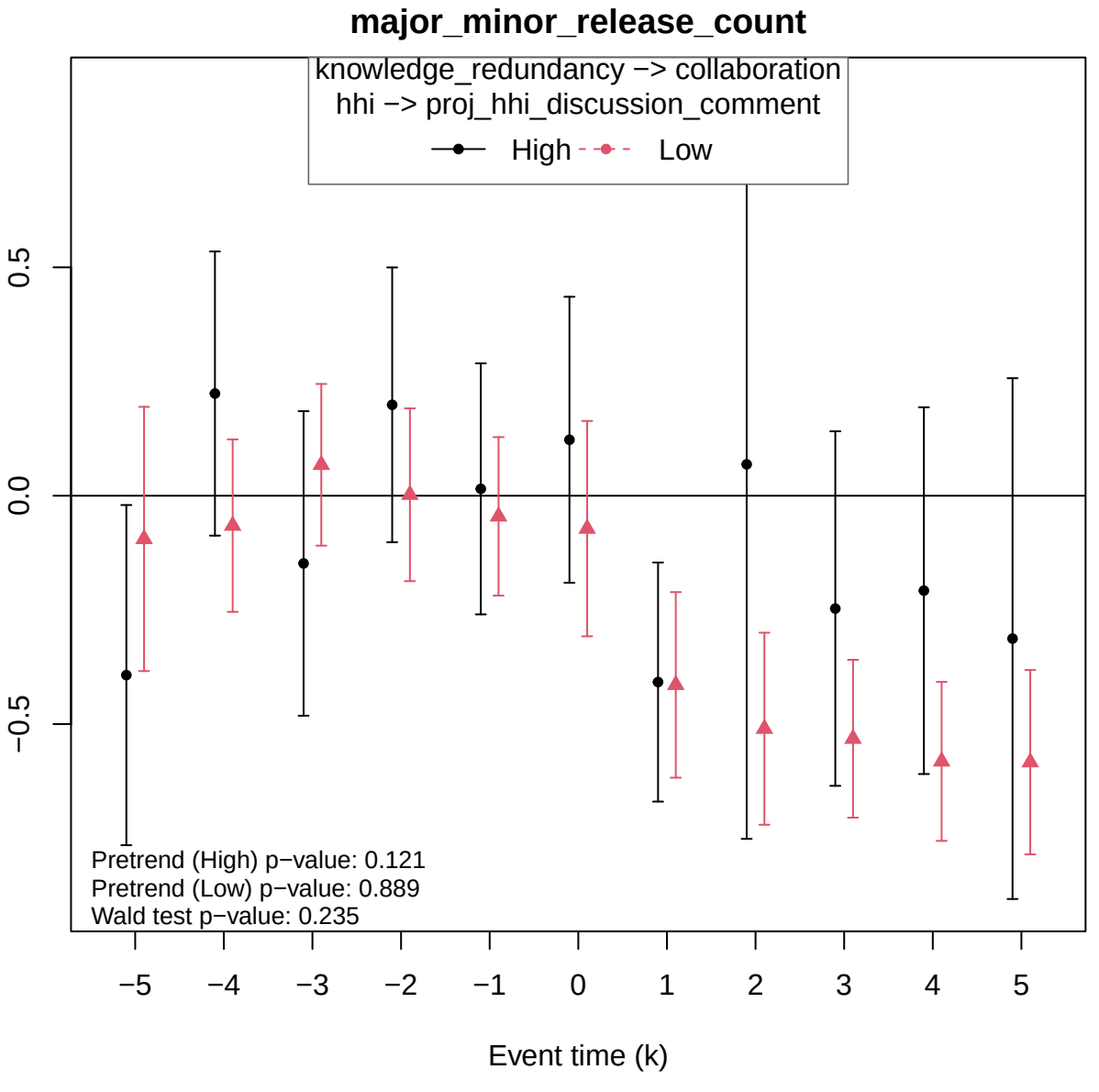

Estimate and 95% Conf. Int.
15
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

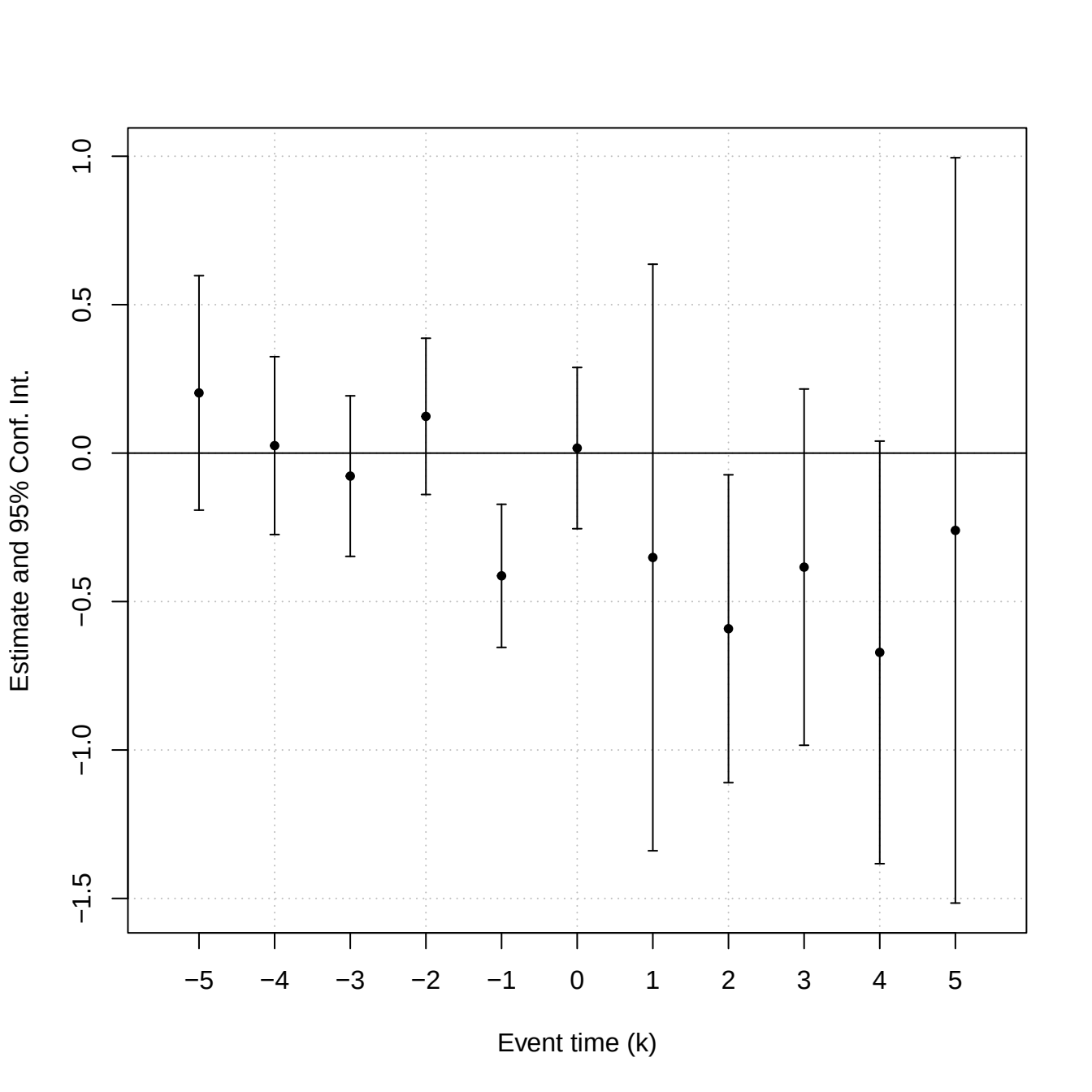

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

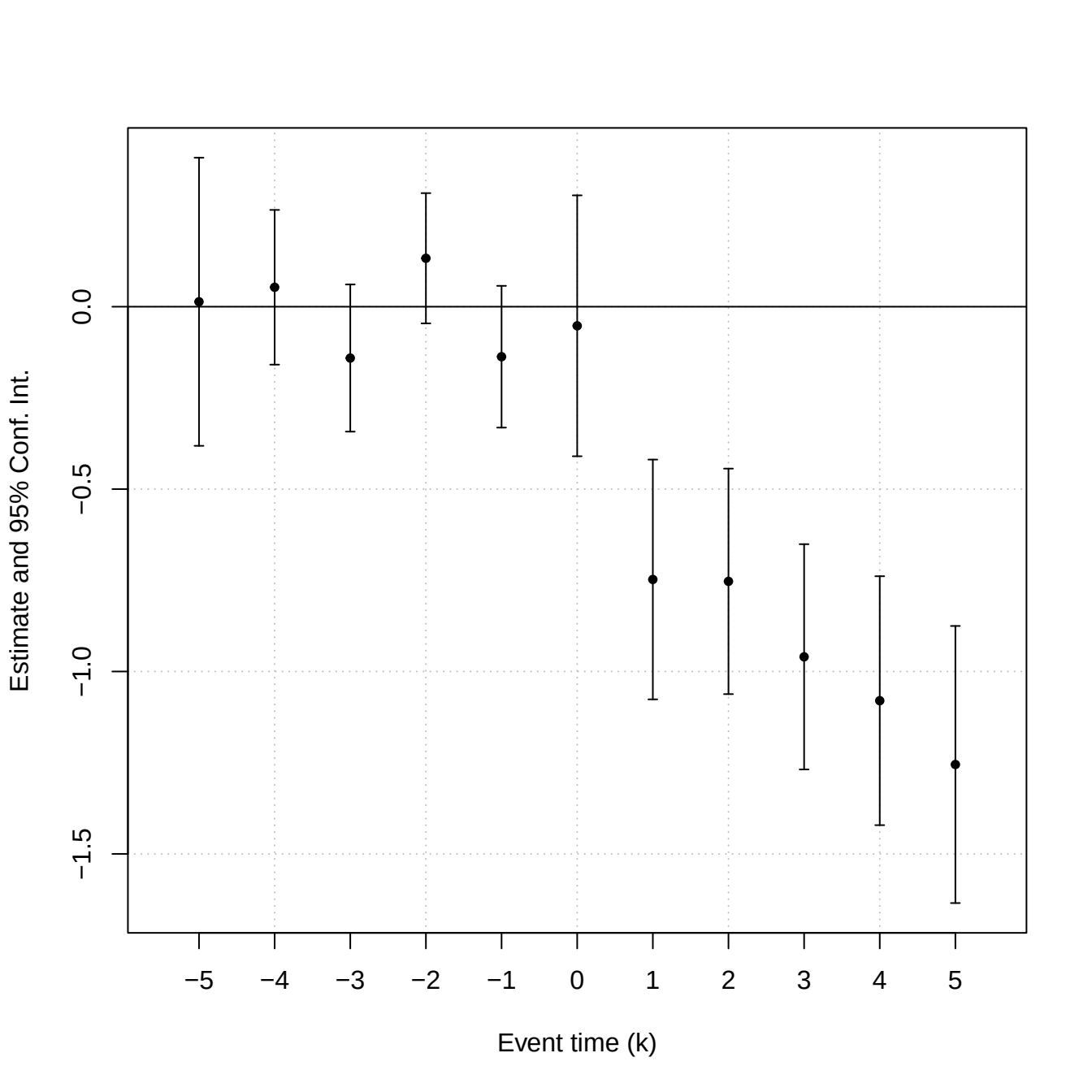

overall_new_release_count
knowledge_redundancy −> collaboration
hhi −> proj_hhi_discussion_comment
High
Low
15
10
5
0
−5
Pretrend (High) p−value: 0.134
Pretrend (Low) p−value: 0.239
Wald test p−value: 0.736
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

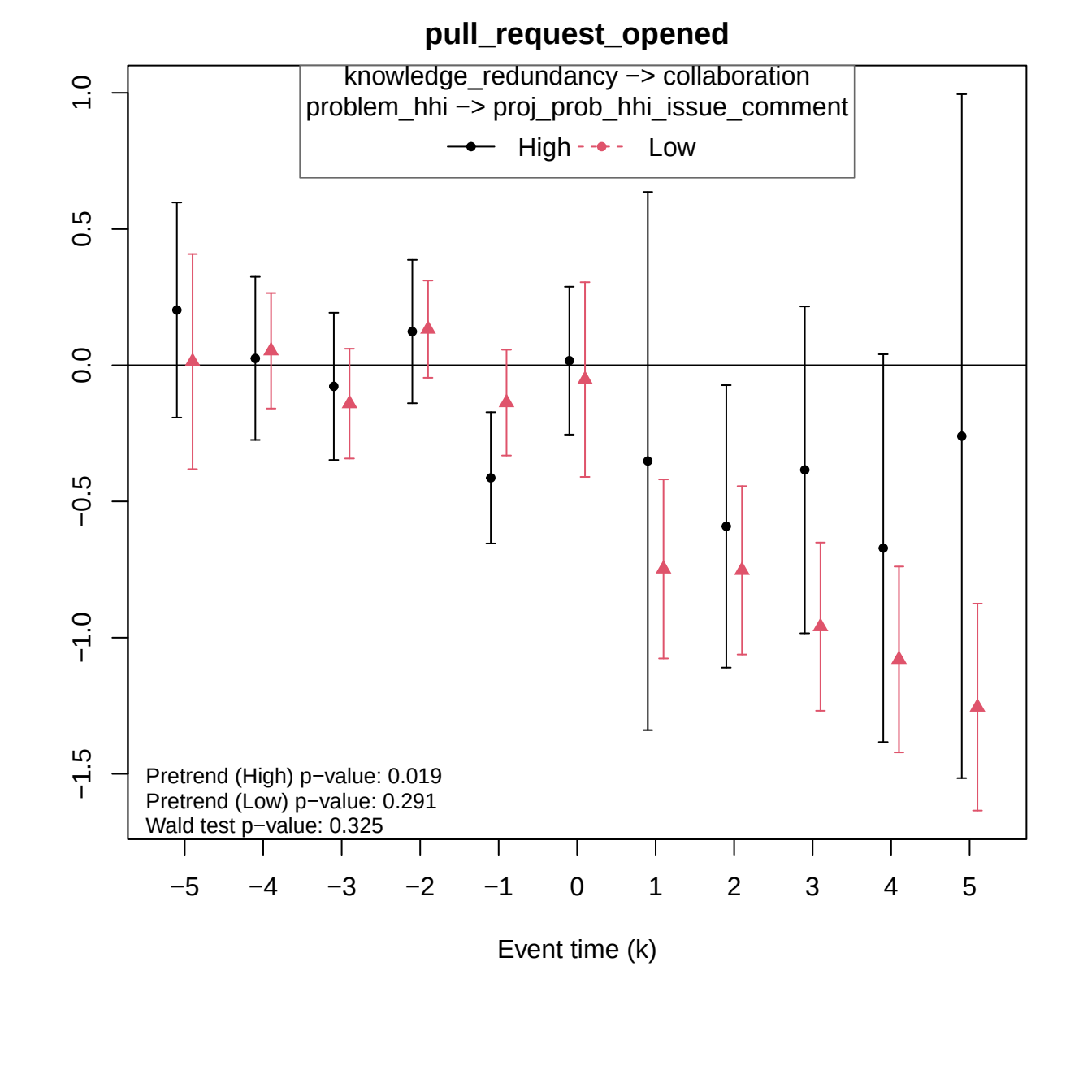

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

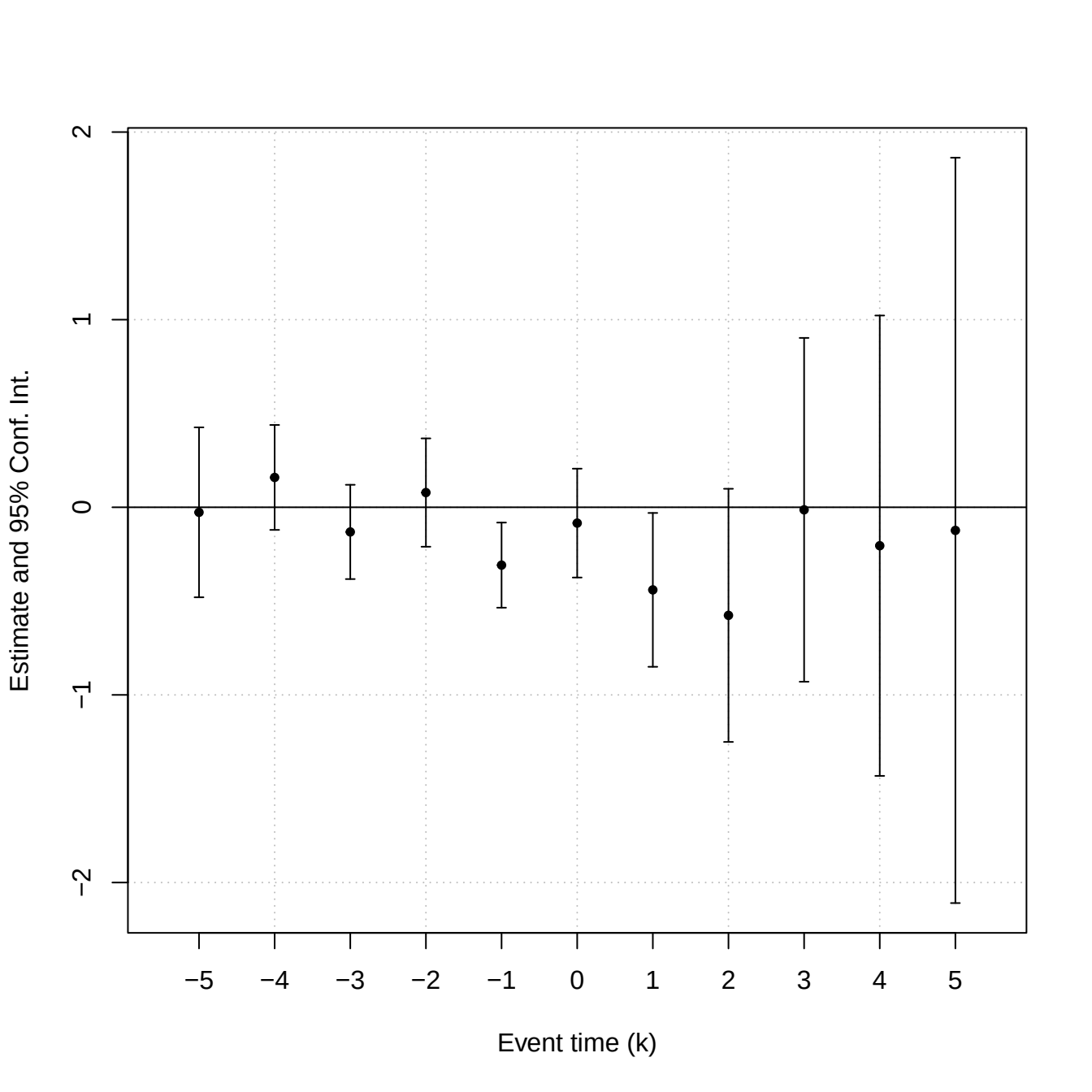

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

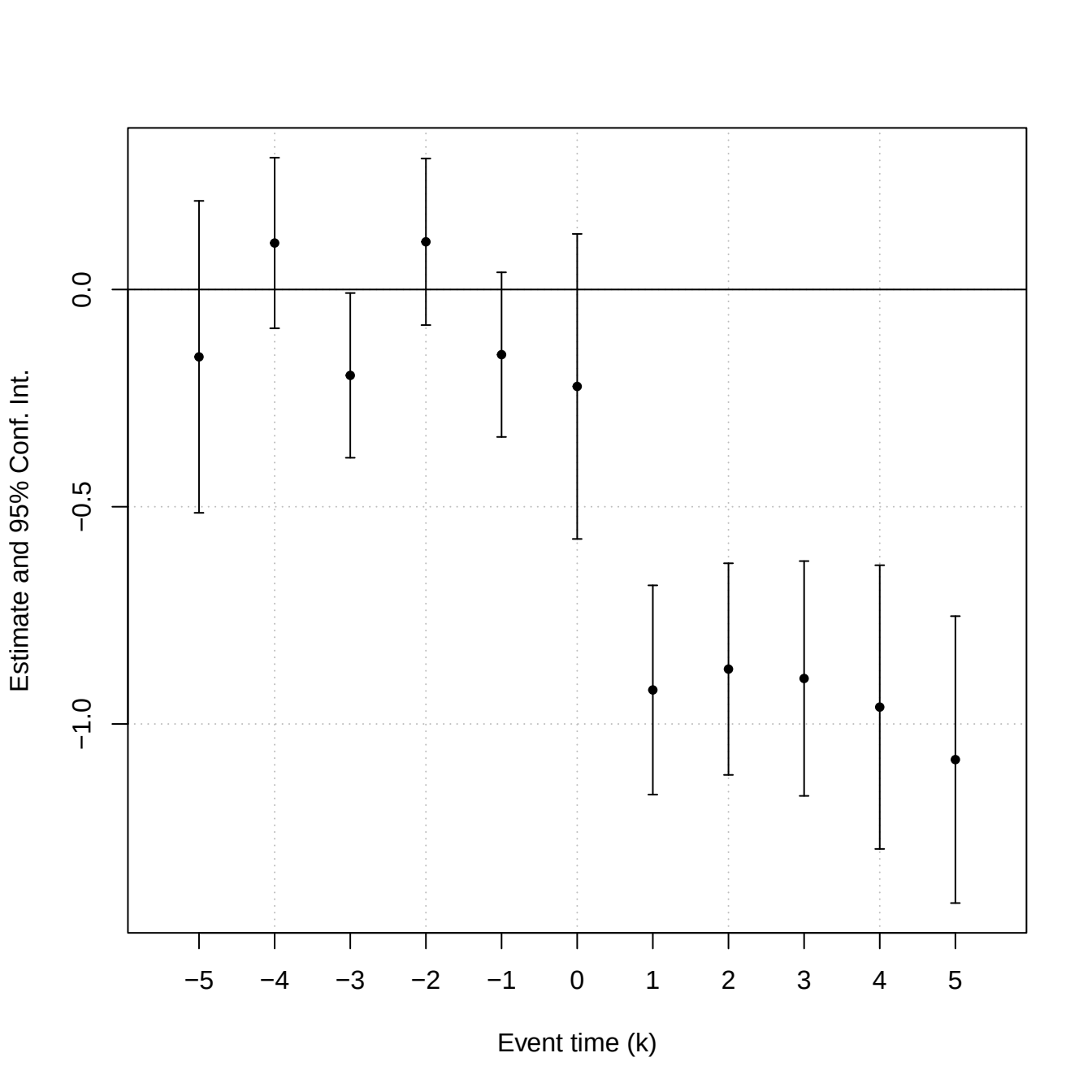

major_minor_release_count
knowledge_redundancy −> collaboration
hhi −> proj_hhi_discussion_comment
High
Low
0.5
0.0
−0.5
Pretrend (High) p−value: 0.121
Pretrend (Low) p−value: 0.889
Wald test p−value: 0.235
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

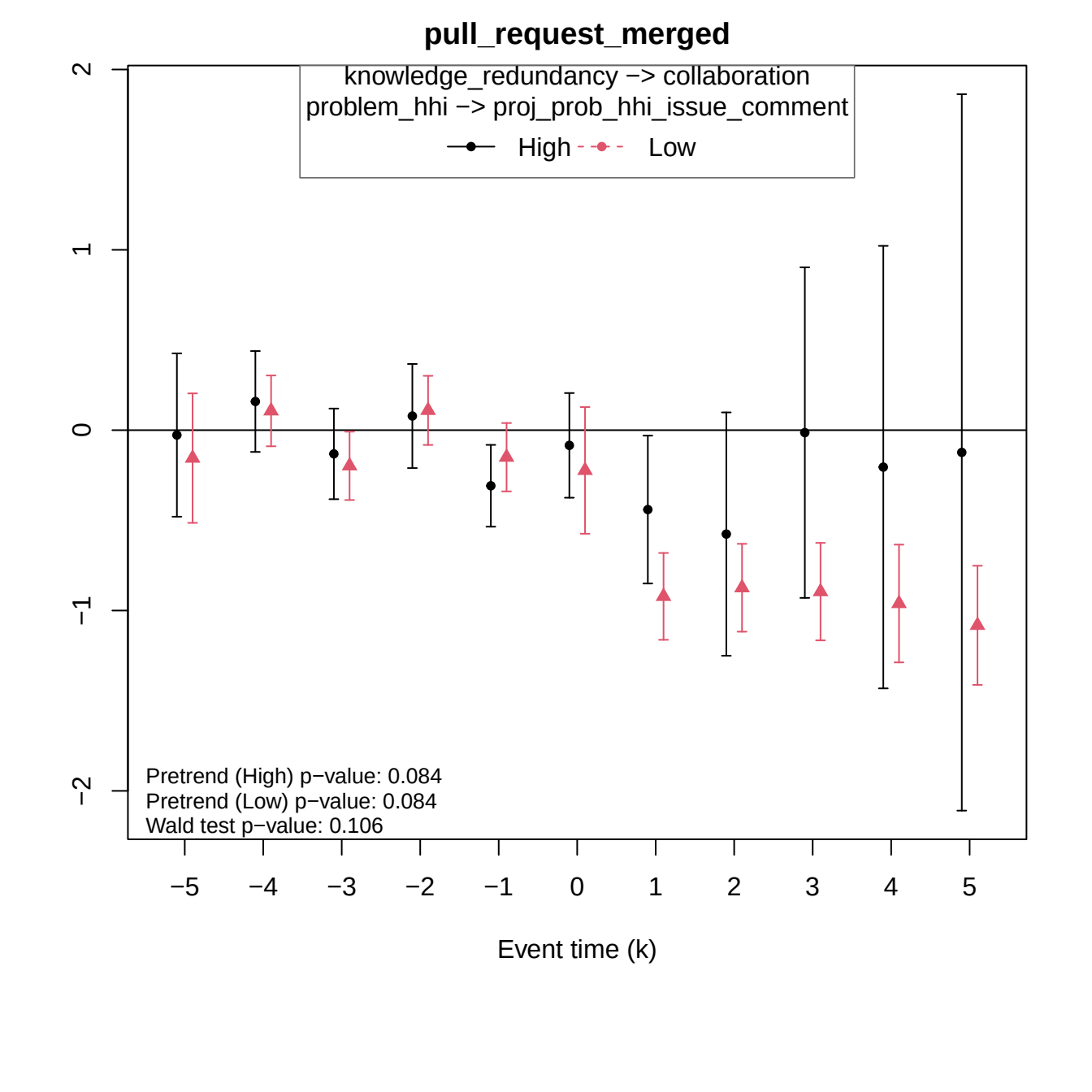

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

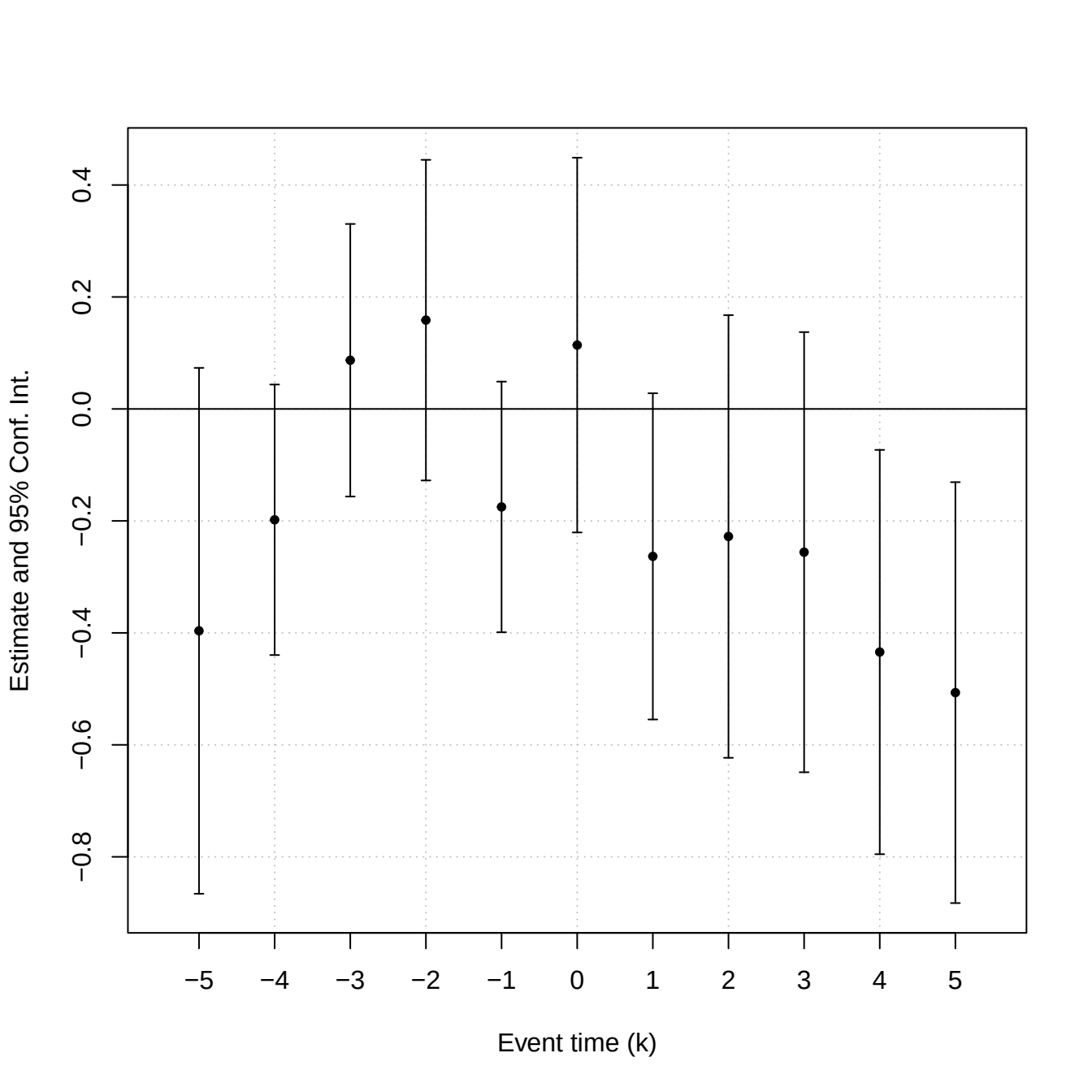

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

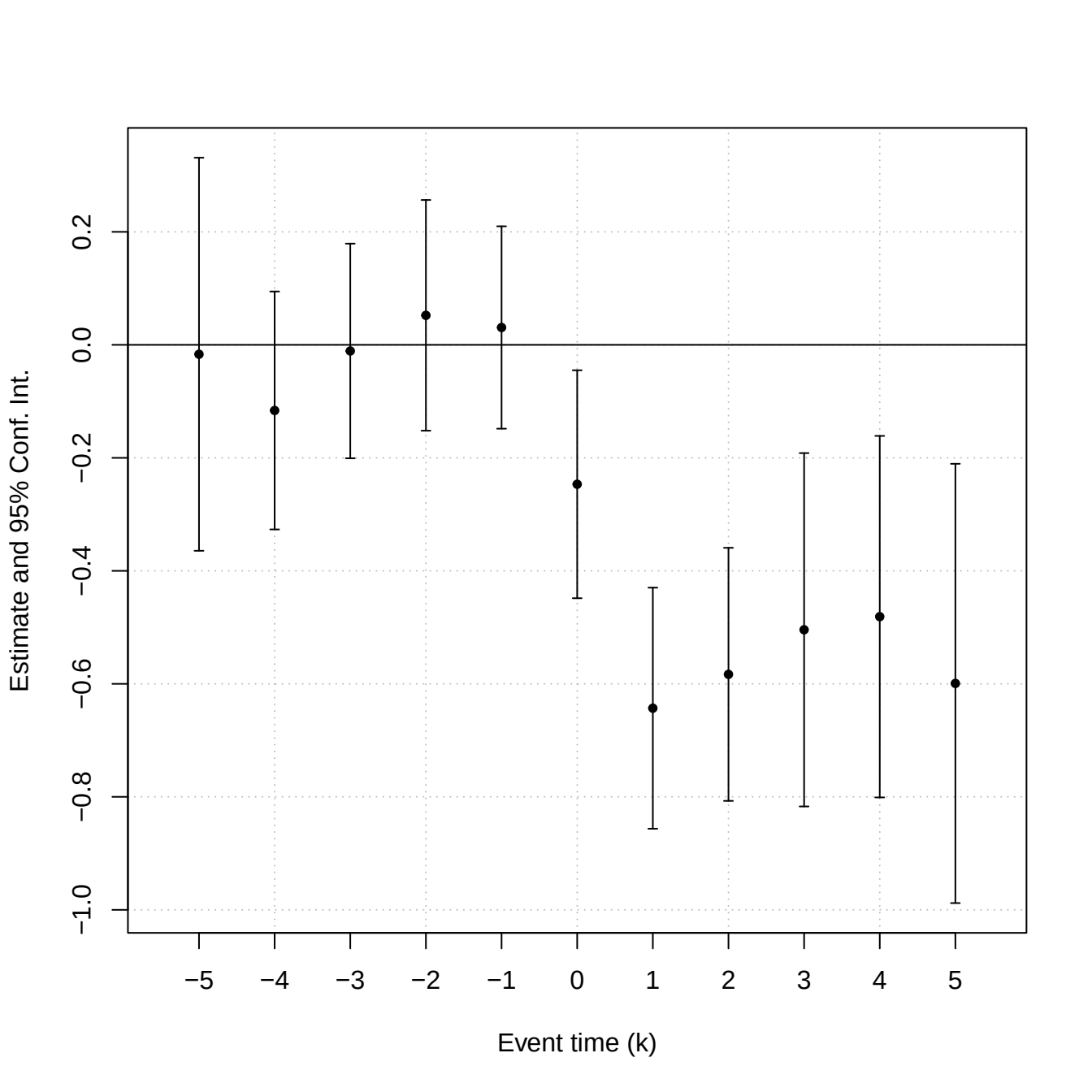

pull_request_opened
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_issue_comment
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.019
Pretrend (Low) p−value: 0.291
Wald test p−value: 0.325
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

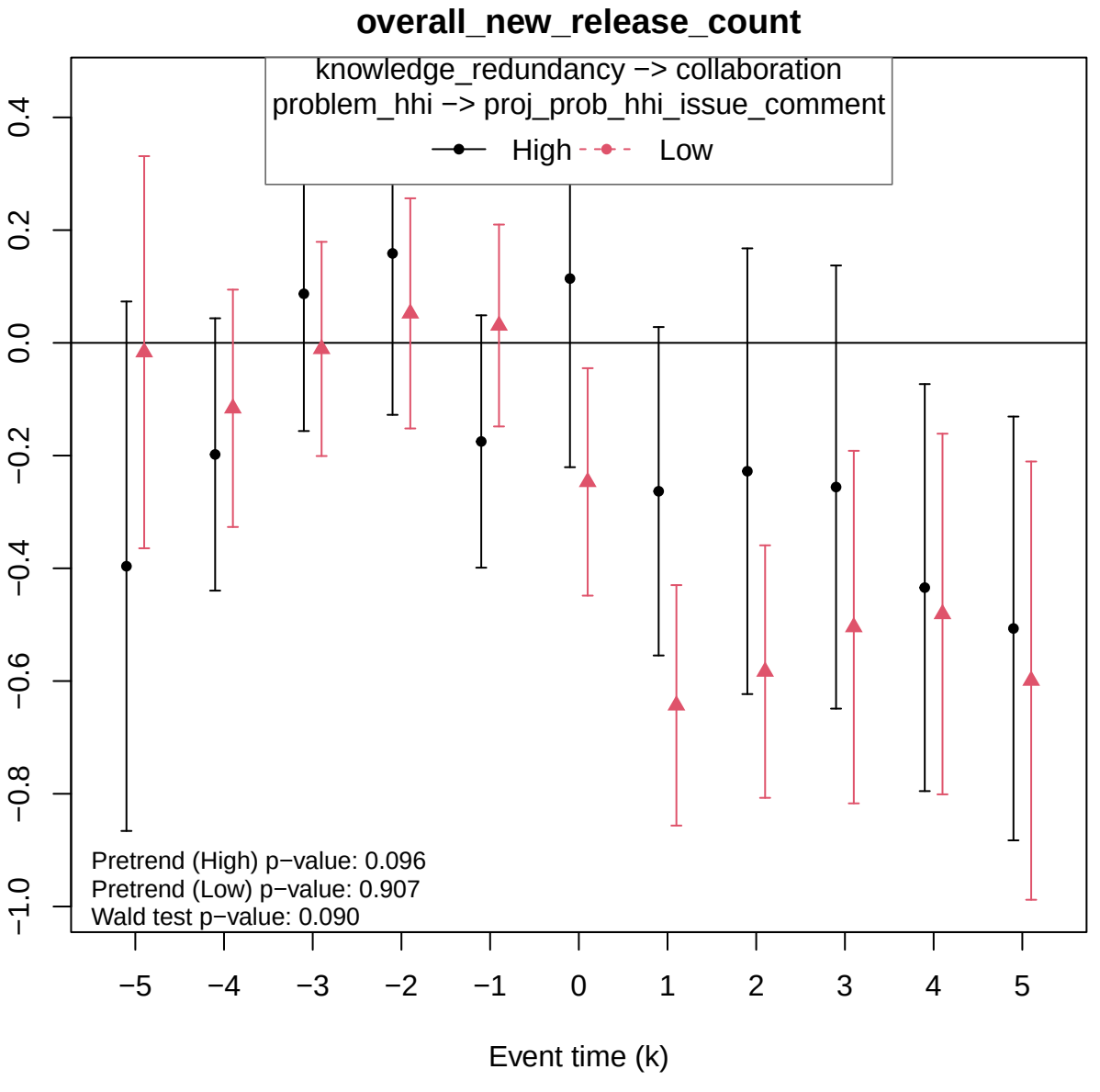

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

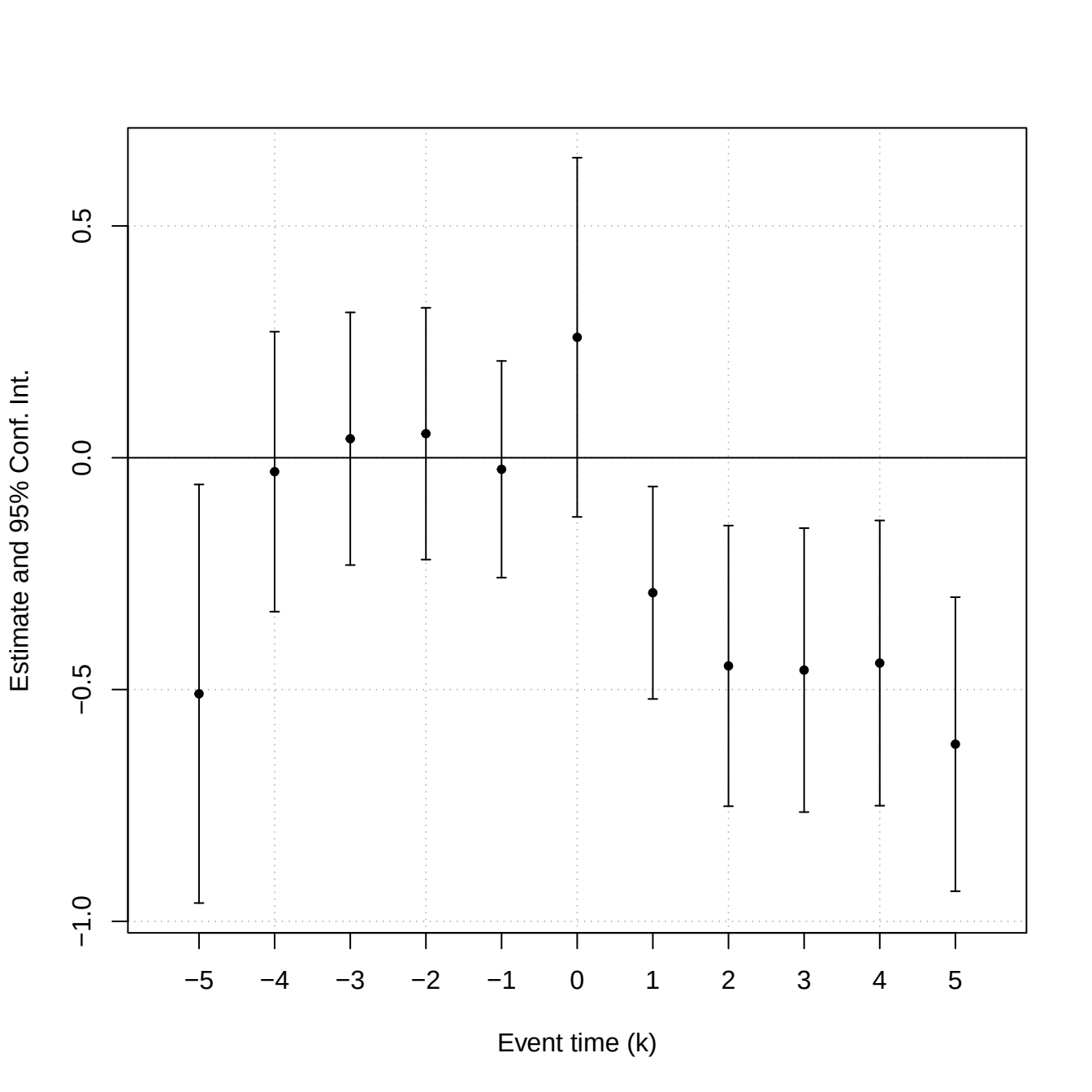

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

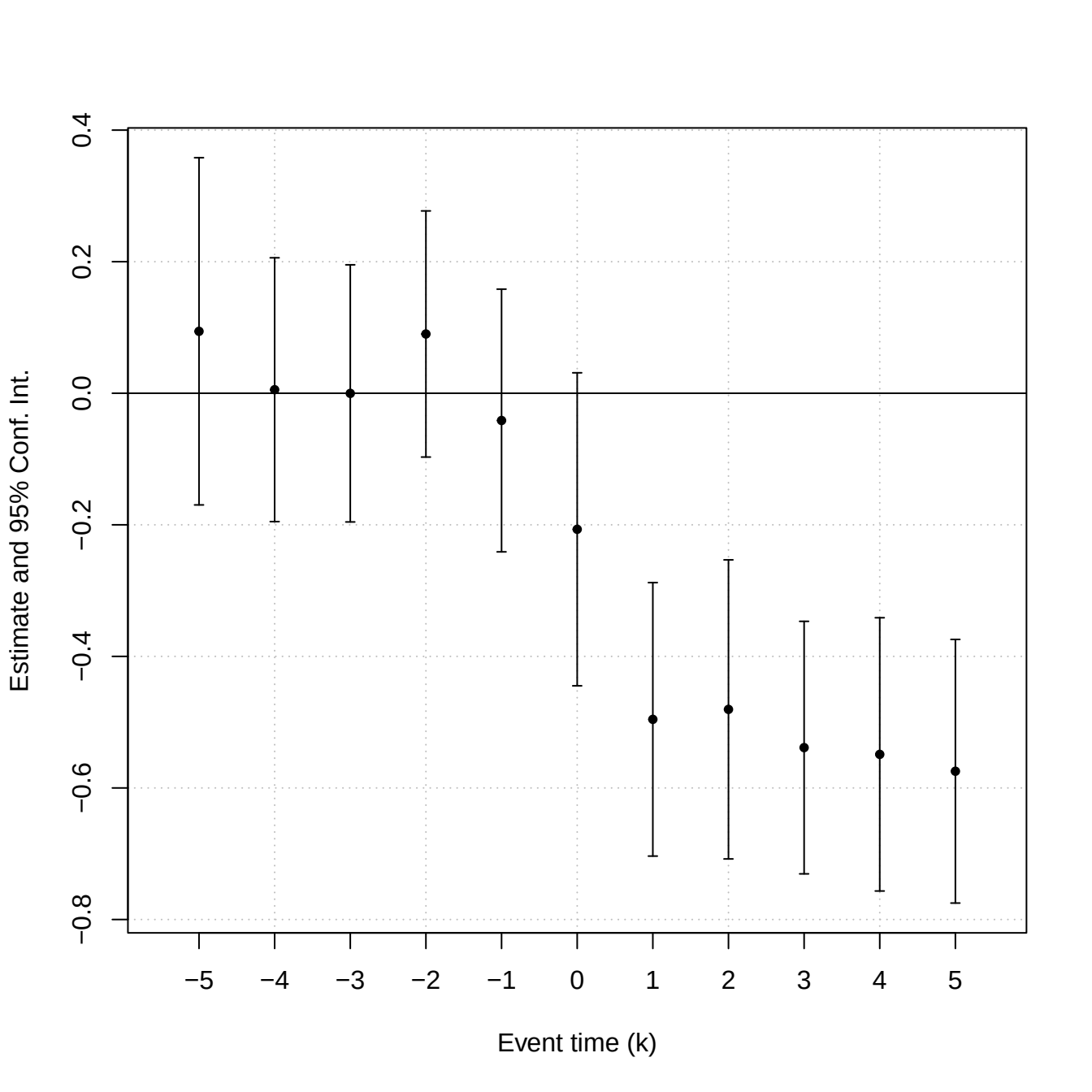

pull_request_merged
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_issue_comment
High
Low
Pretrend (High) p−value: 0.084
Pretrend (Low) p−value: 0.084
Wald test p−value: 0.106
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

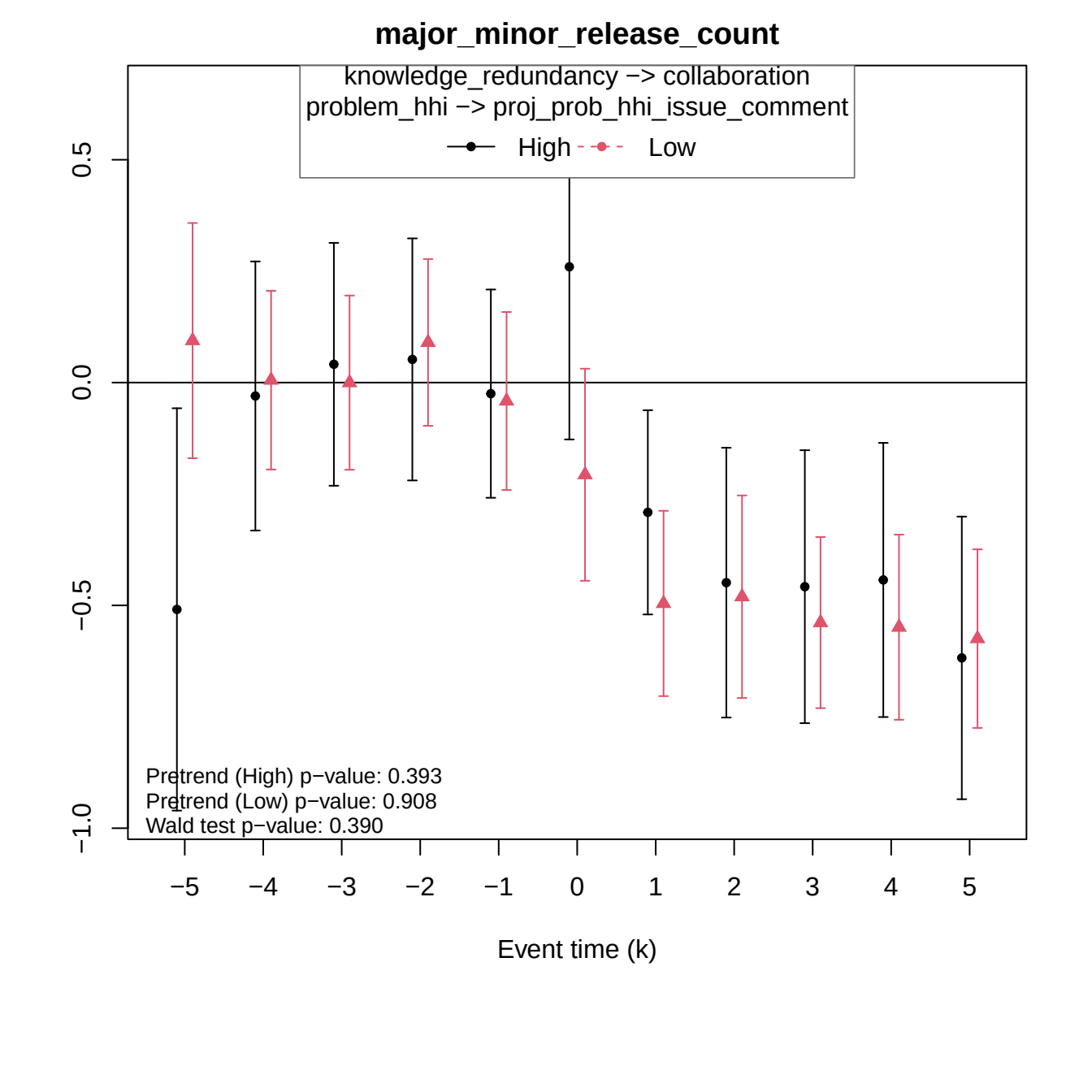

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

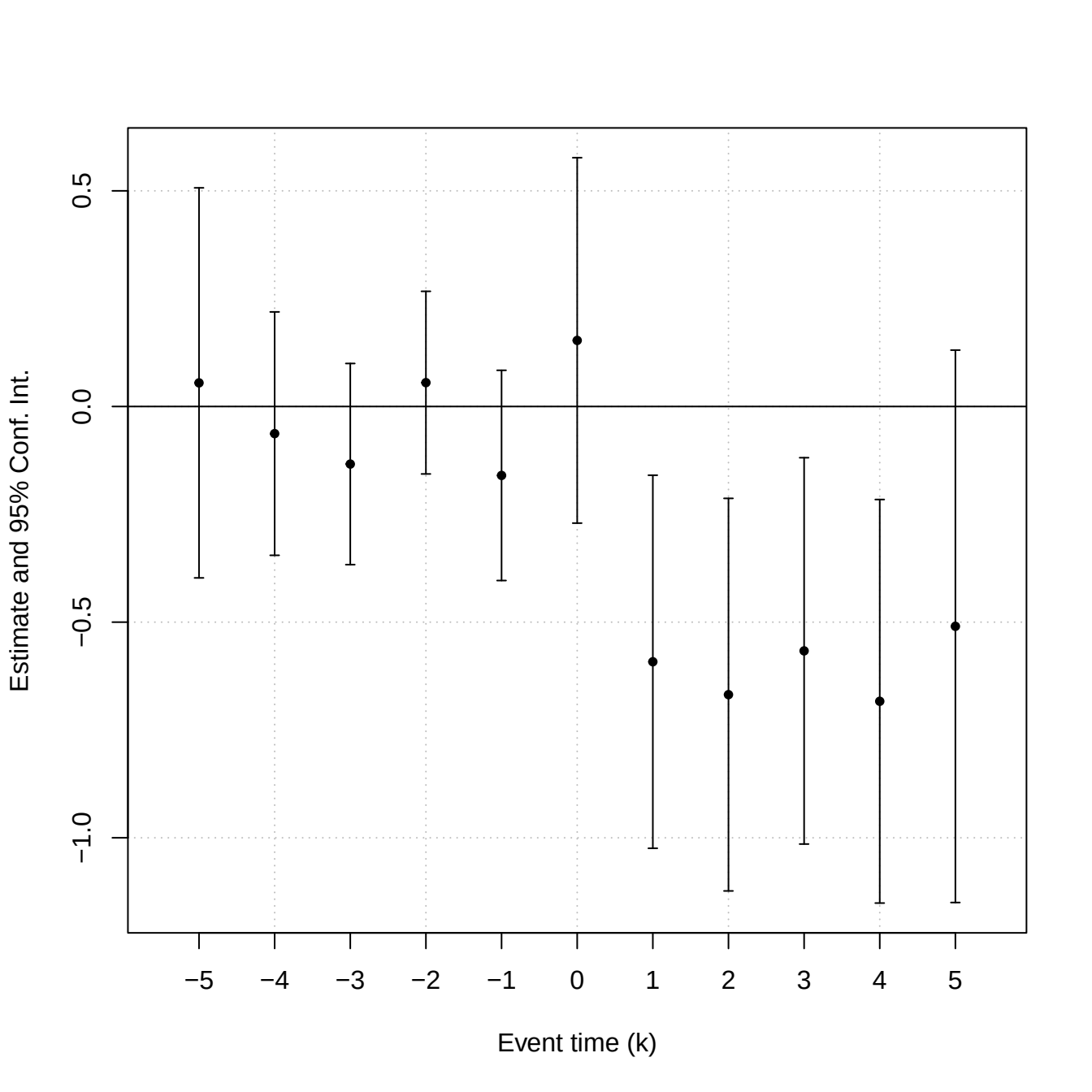

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

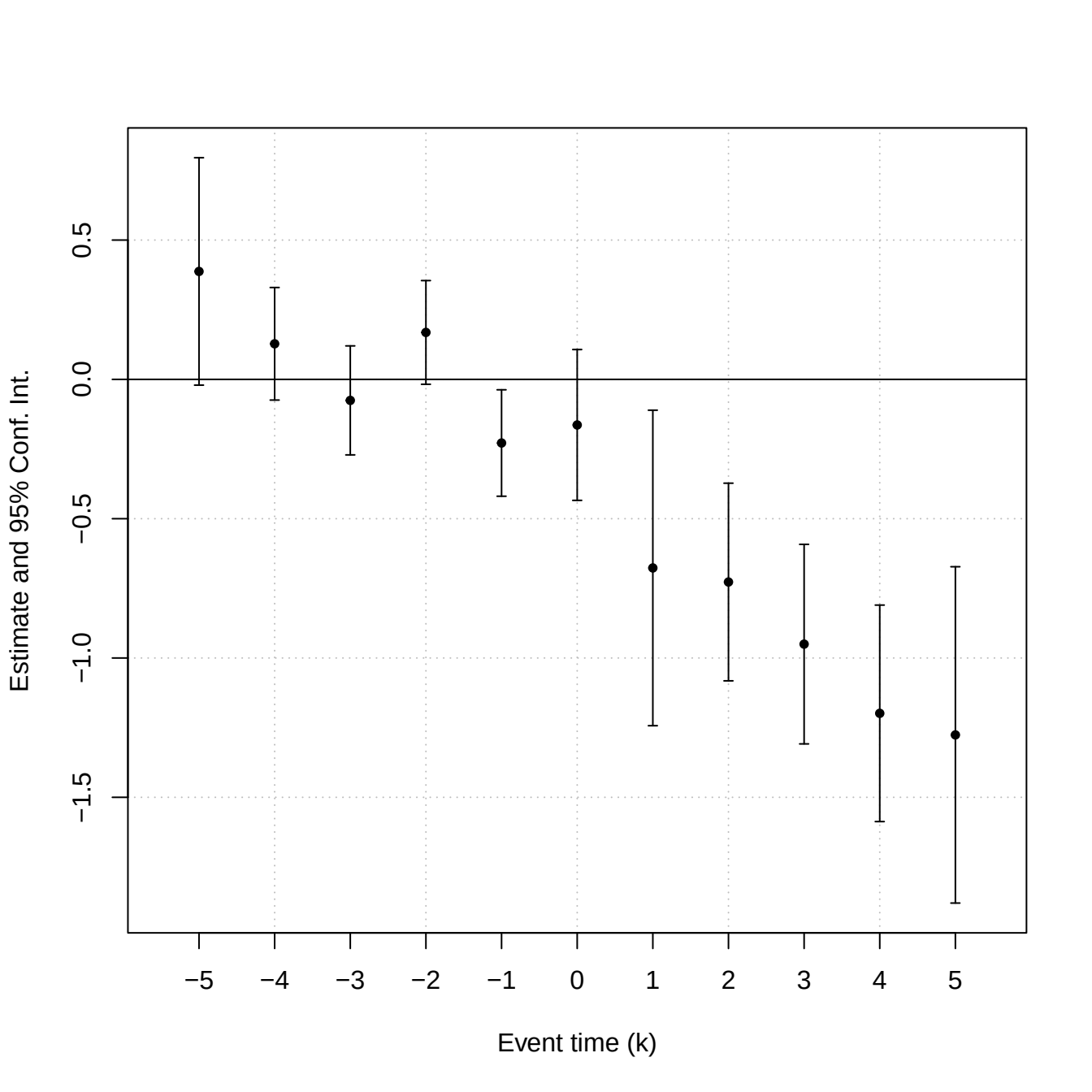

overall_new_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_issue_comment
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Pretrend (High) p−value: 0.096
Pretrend (Low) p−value: 0.907
Wald test p−value: 0.090
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

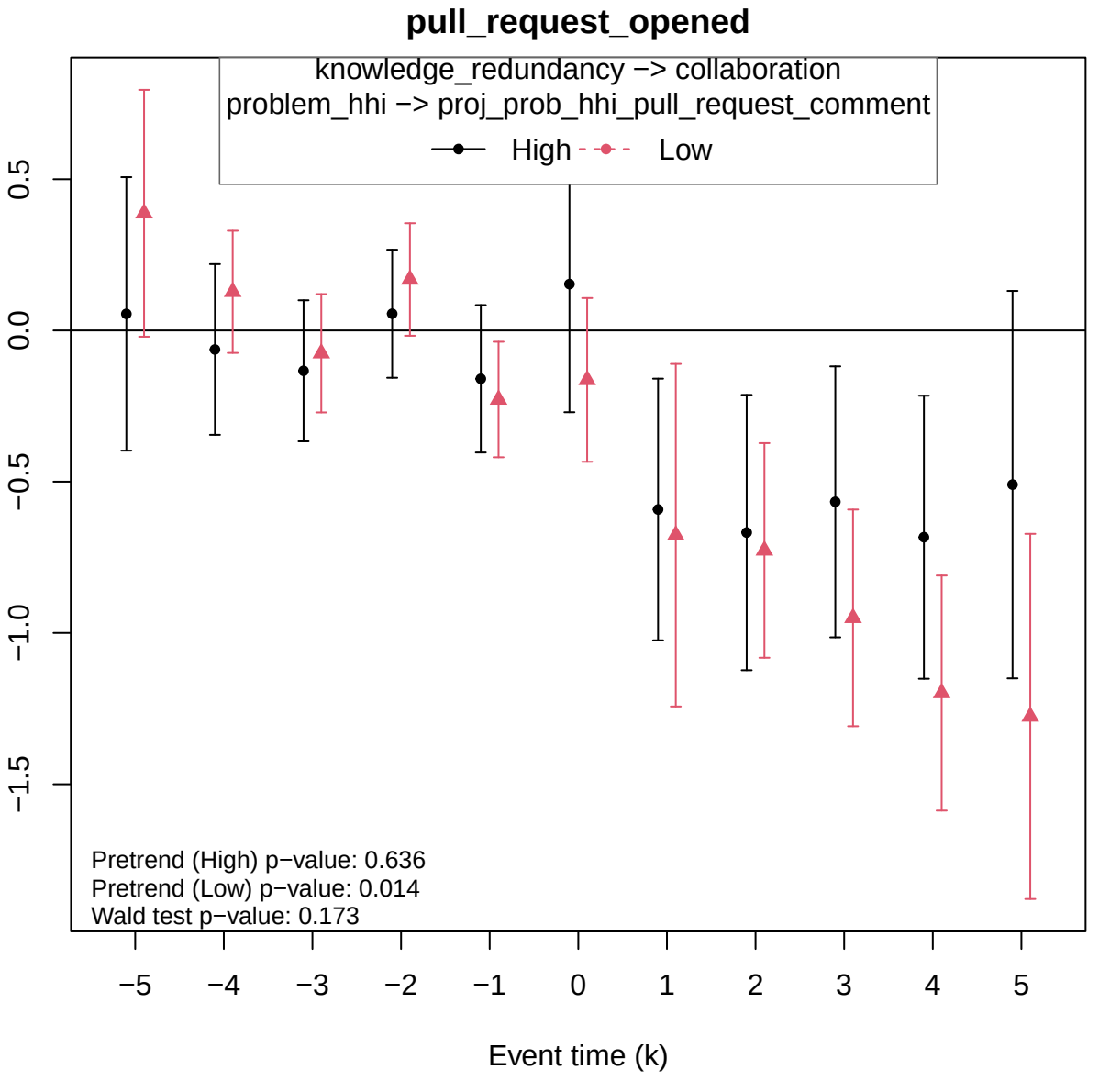

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

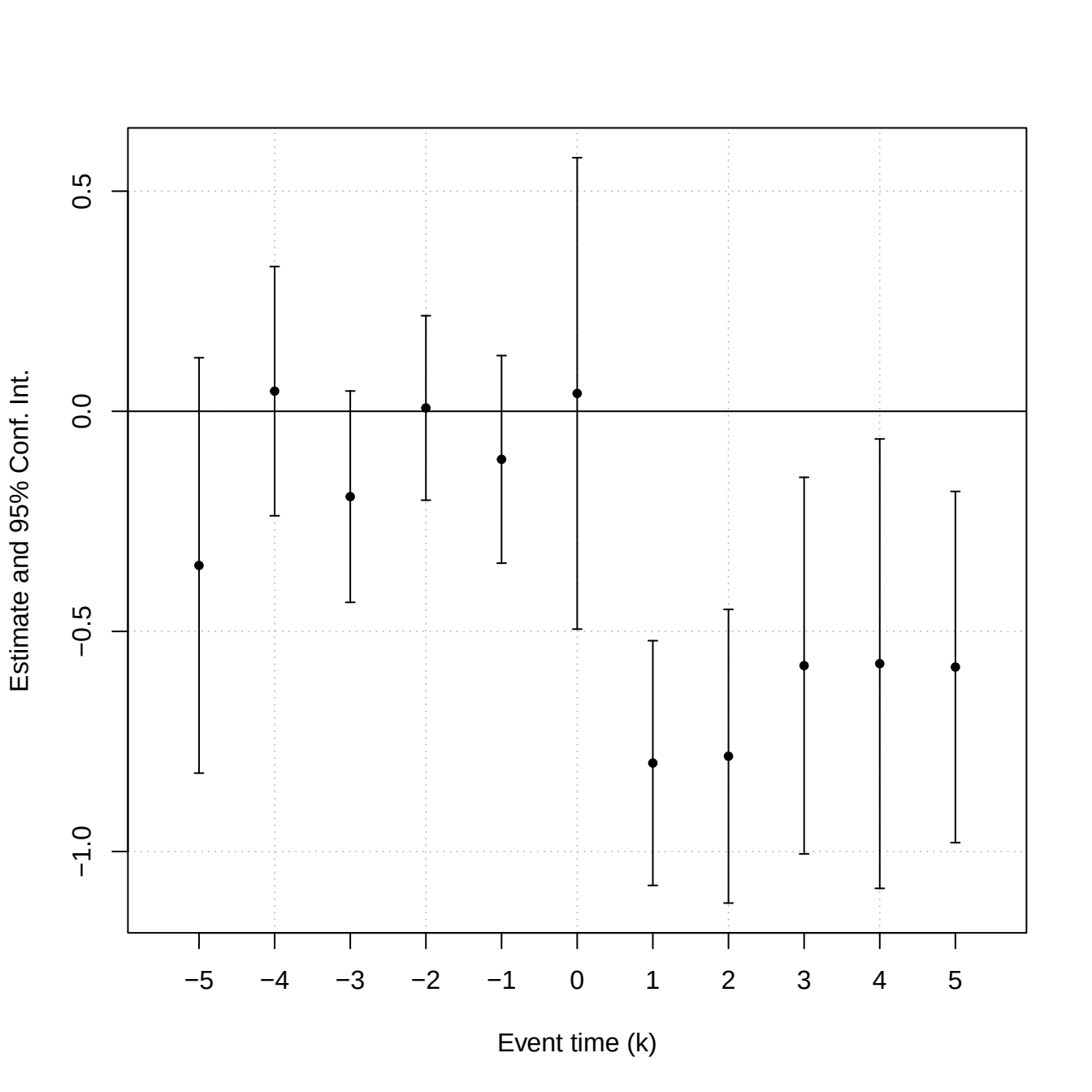

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

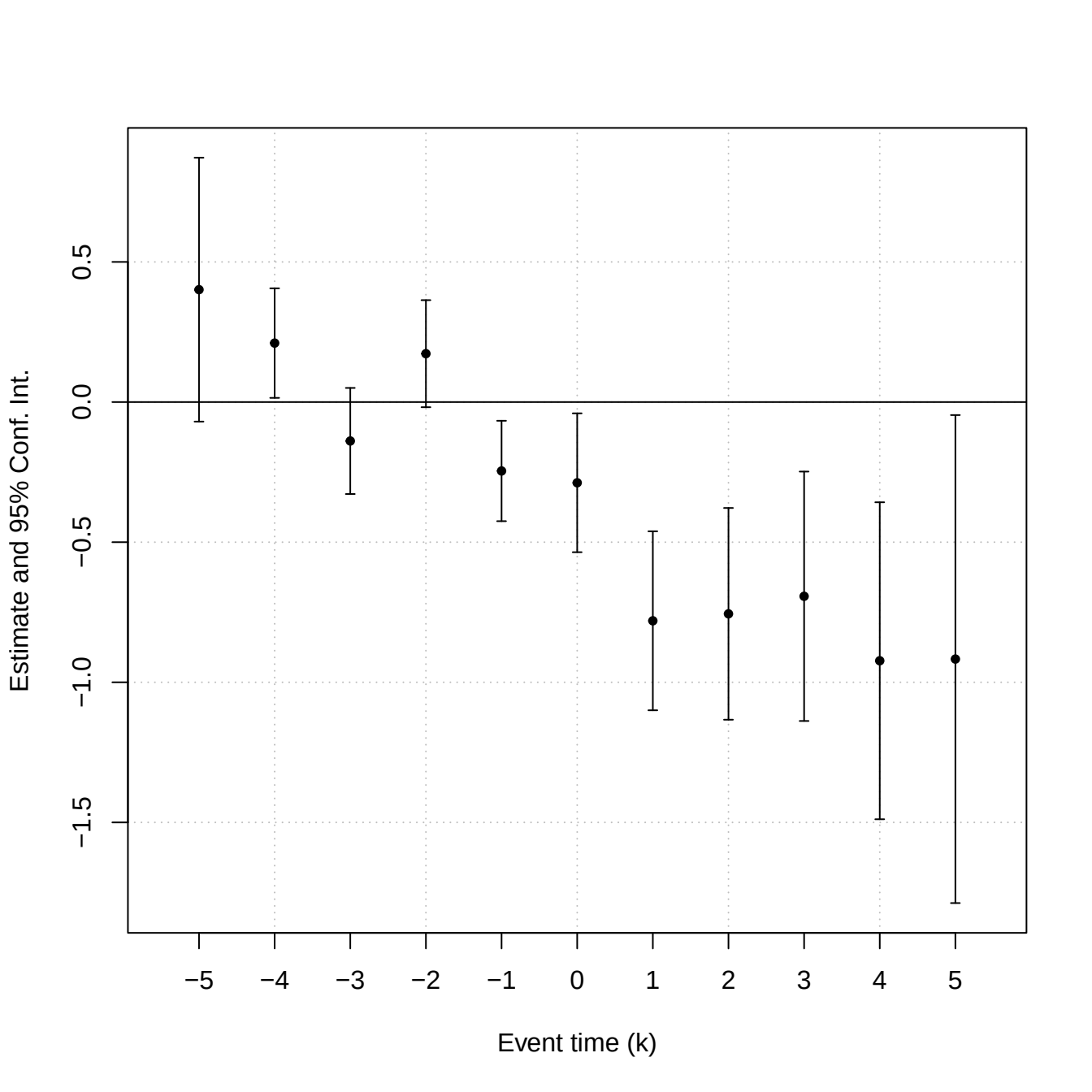

major_minor_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_issue_comment
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.393
Pretrend (Low) p−value: 0.908
Wald test p−value: 0.390
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

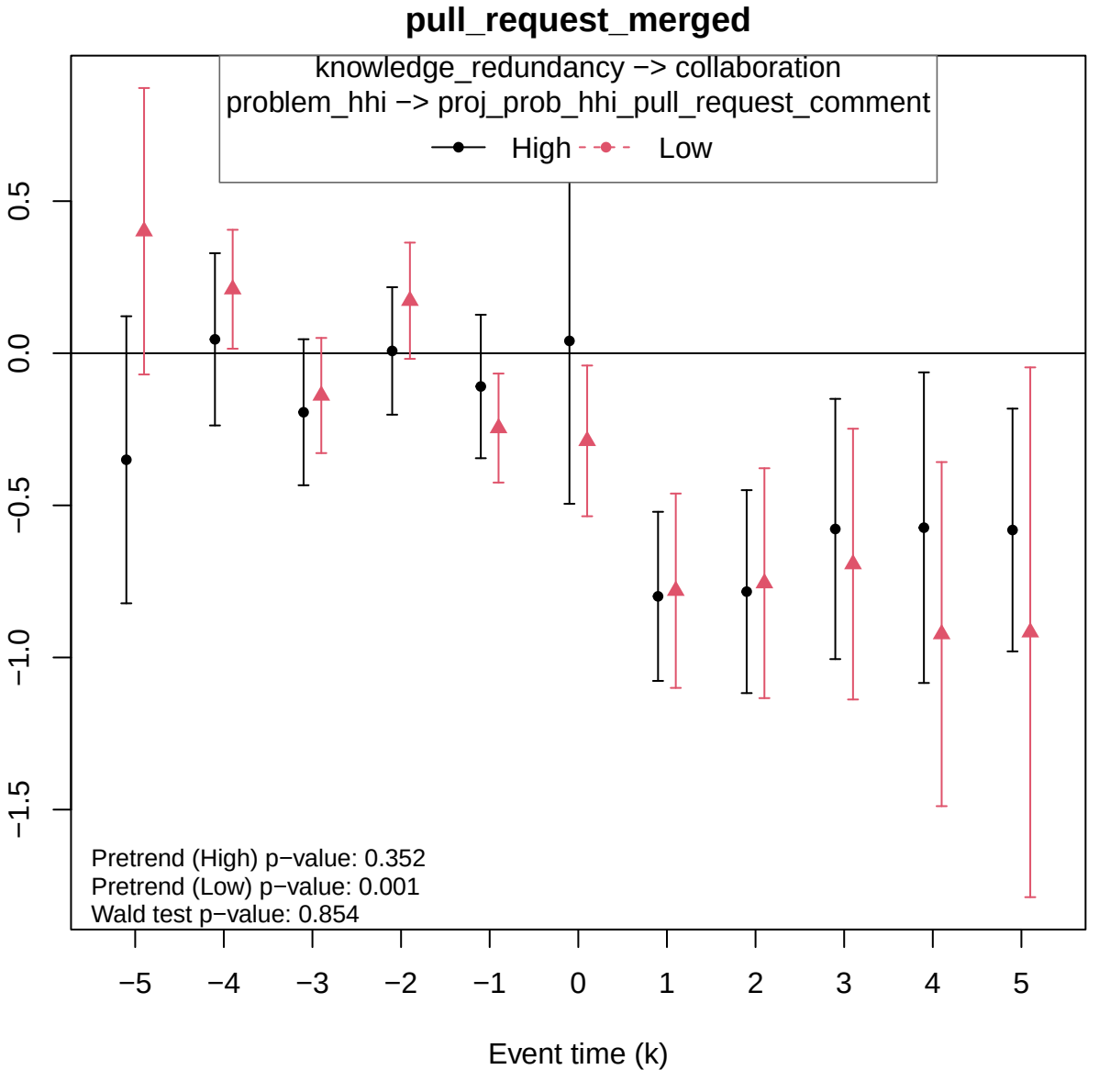

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

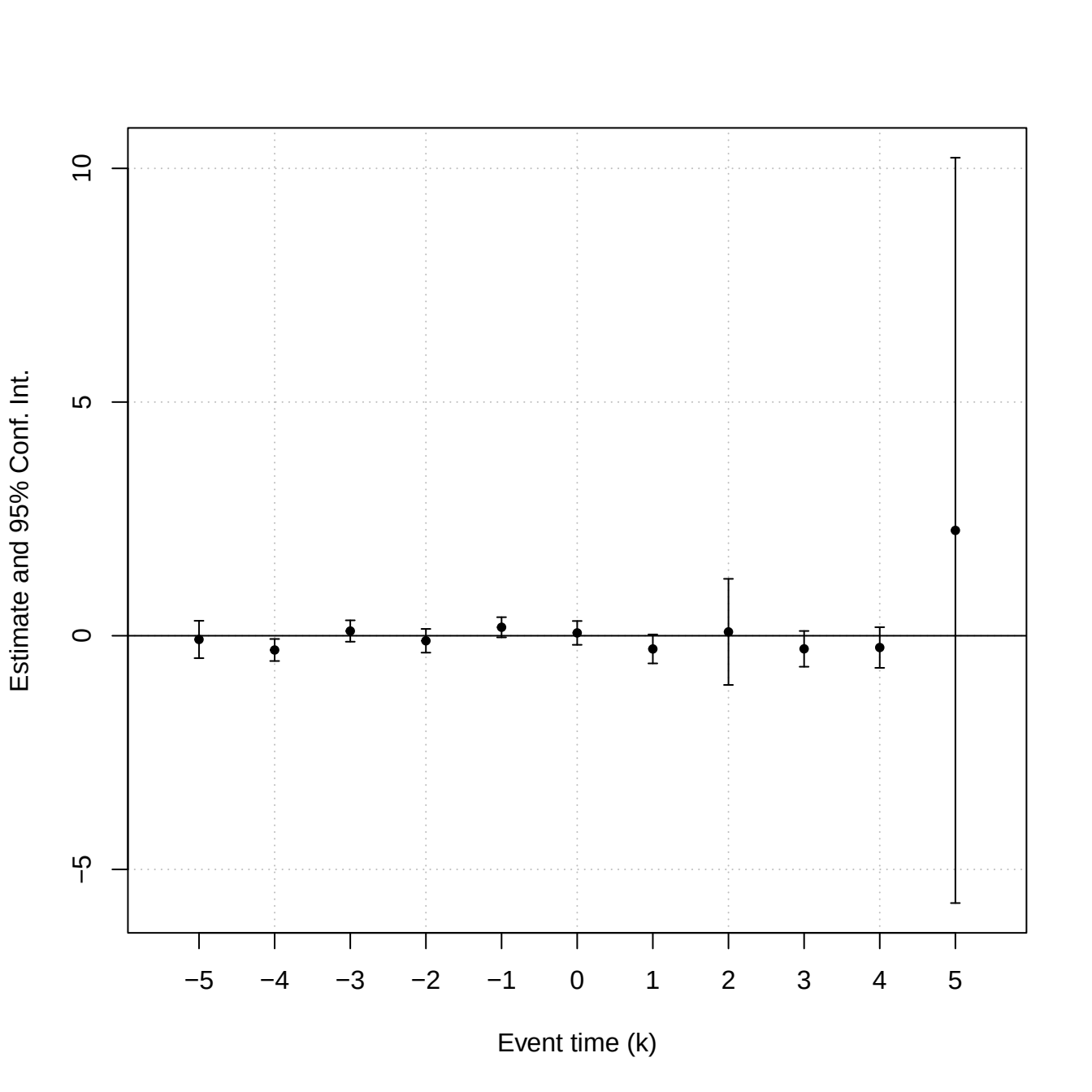

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

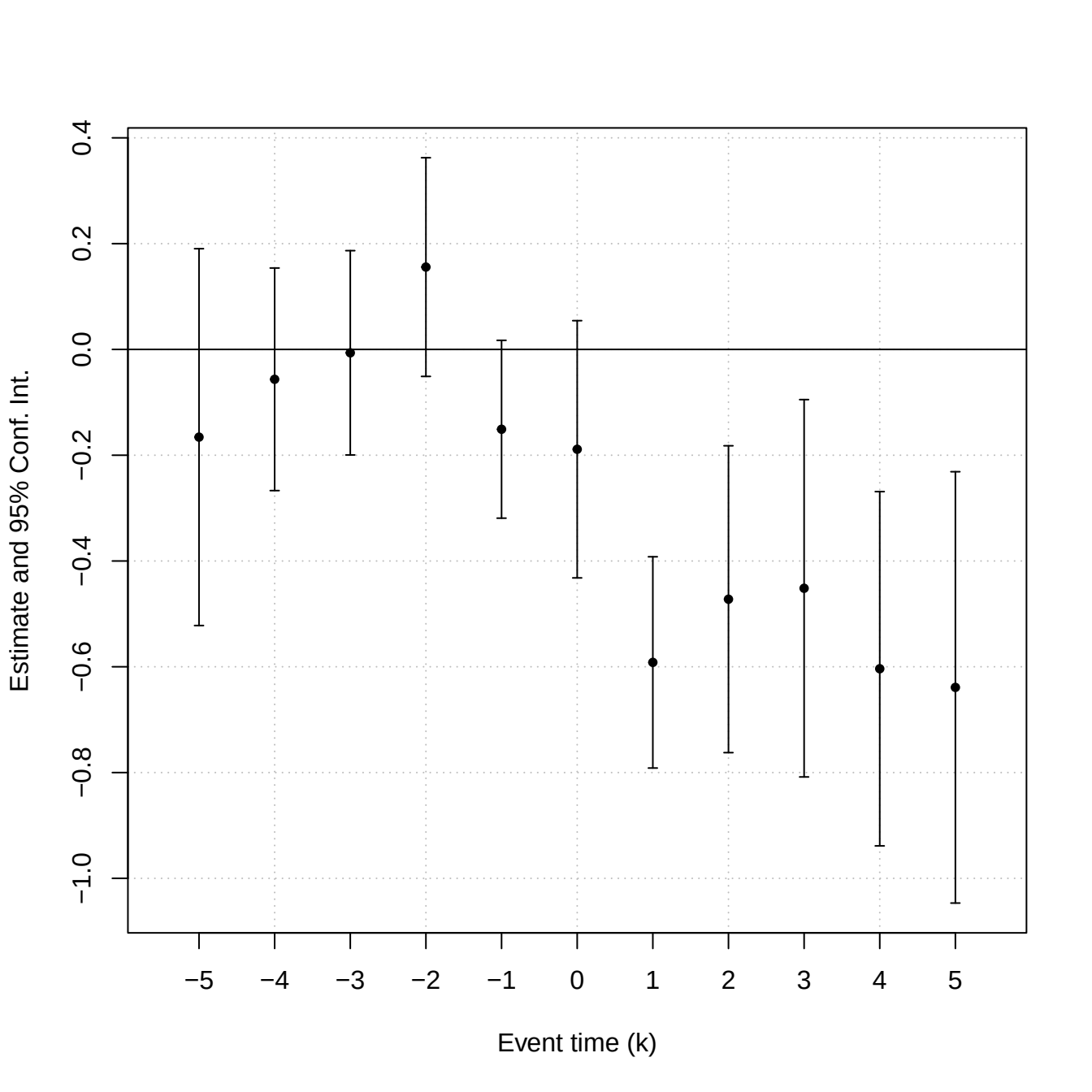

pull_request_opened
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_comment
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.636
Pretrend (Low) p−value: 0.014
Wald test p−value: 0.173
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

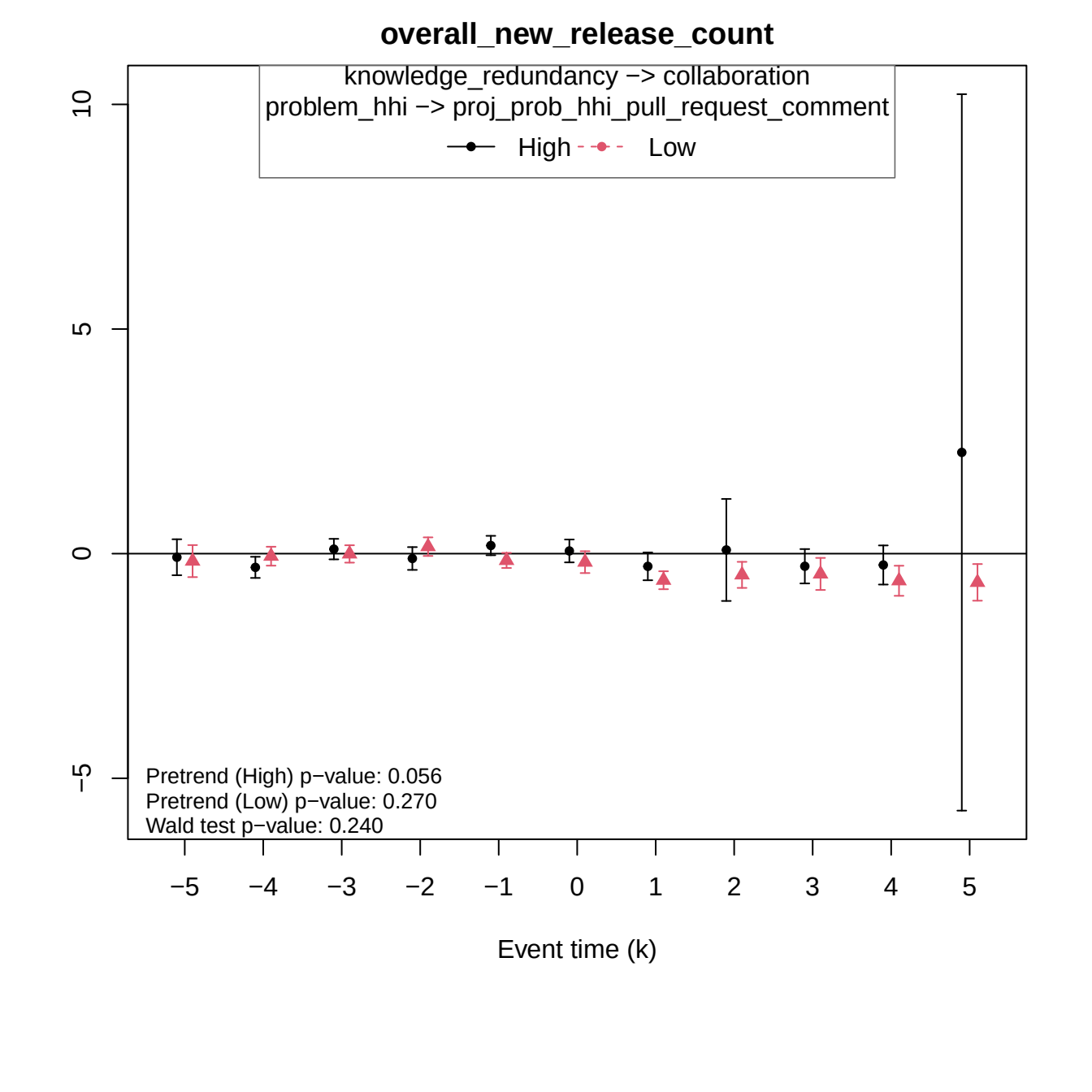

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

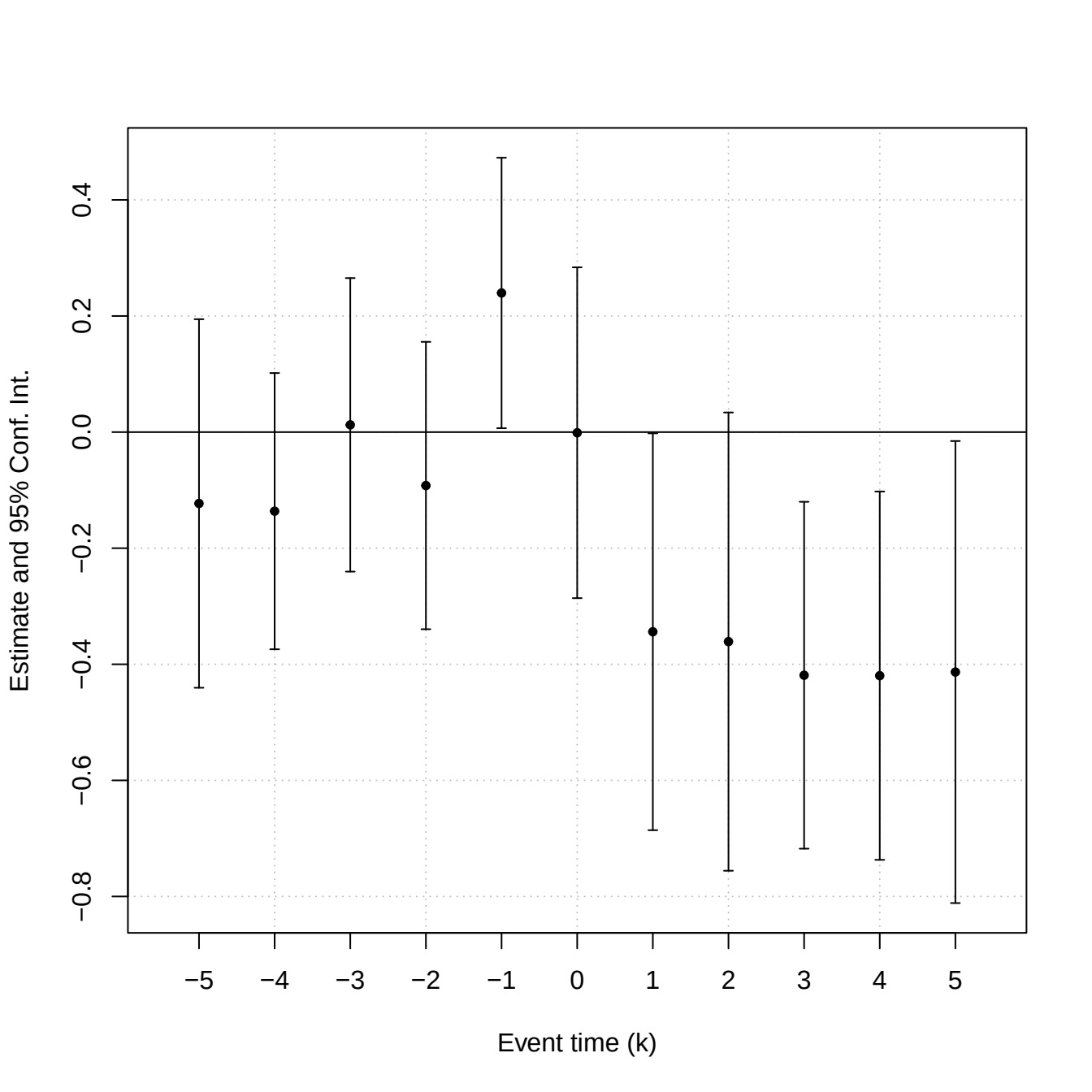

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

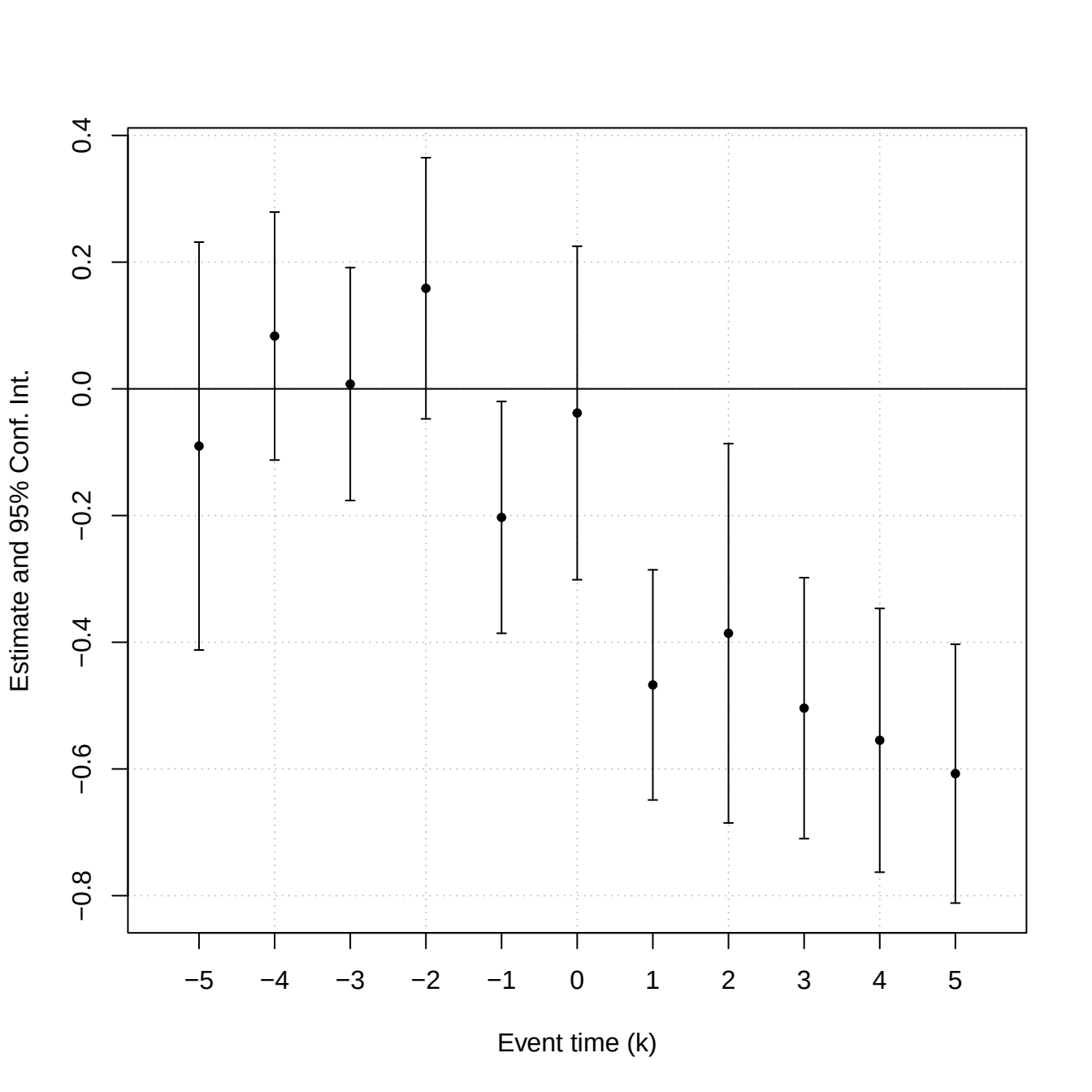

pull_request_merged
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_comment
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.352
Pretrend (Low) p−value: 0.001
Wald test p−value: 0.854
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

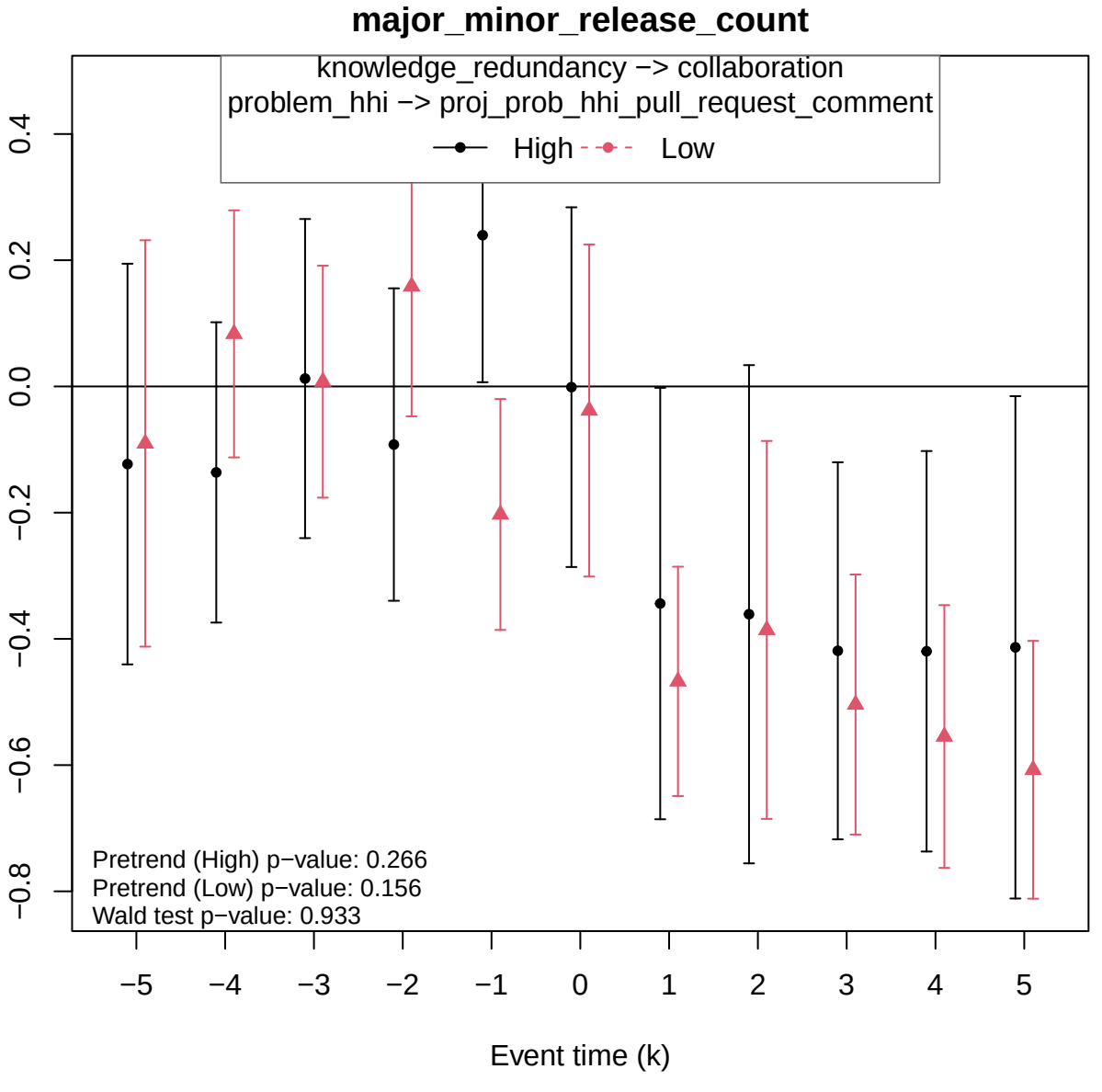

Estimate and 95% Conf. Int.
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

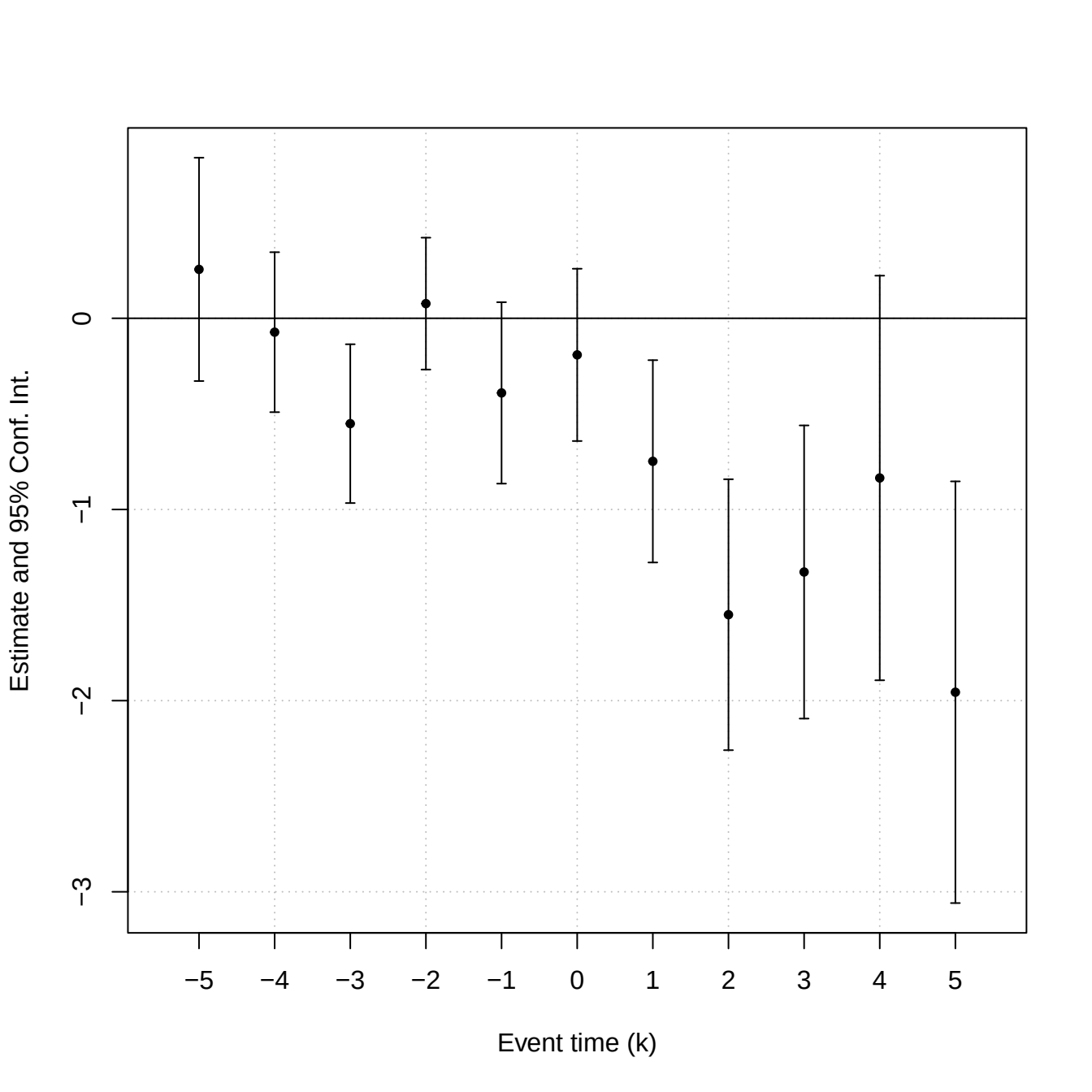

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

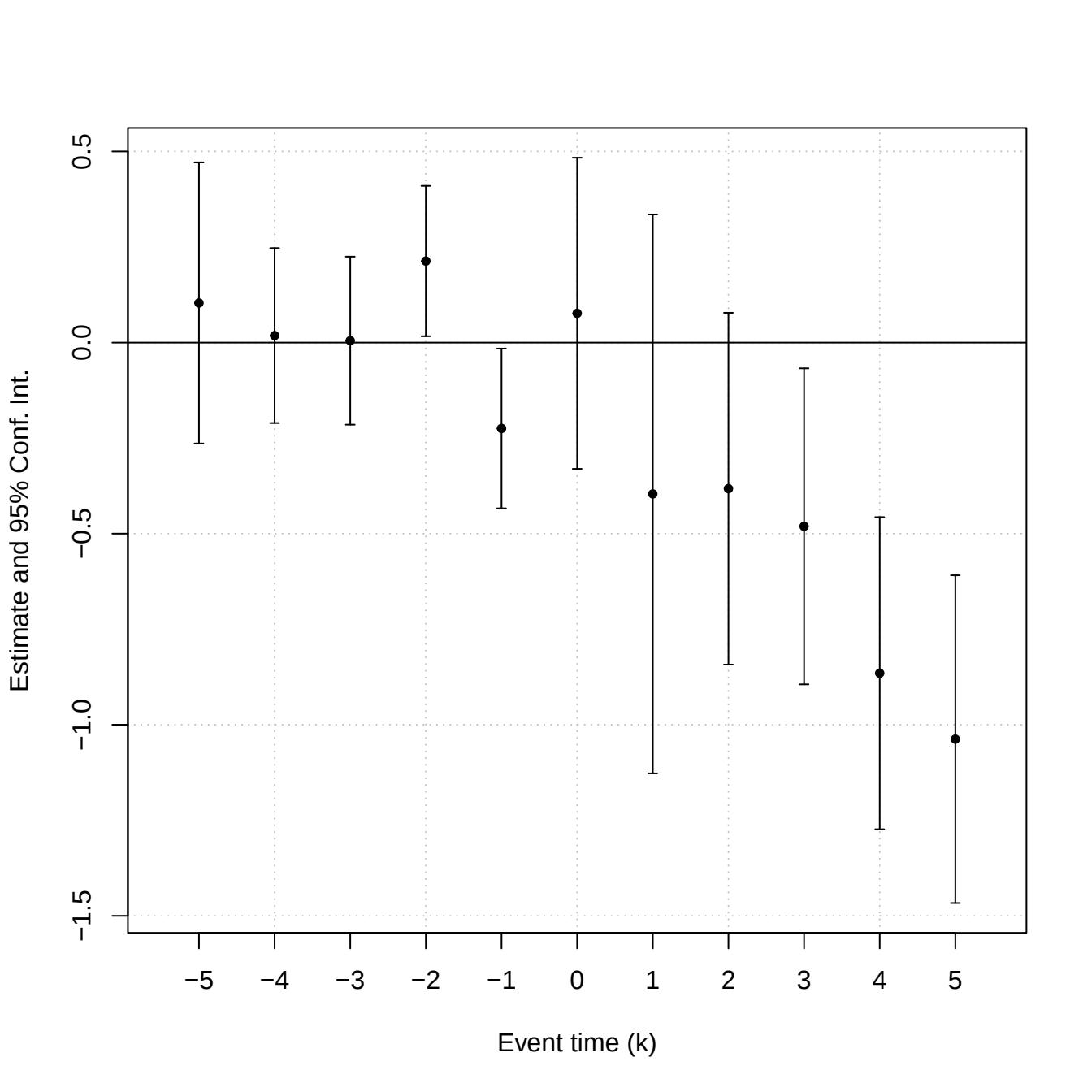

overall_new_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_comment
High
Low
10
5
0
−5
Pretrend (High) p−value: 0.056
Pretrend (Low) p−value: 0.270
Wald test p−value: 0.240
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

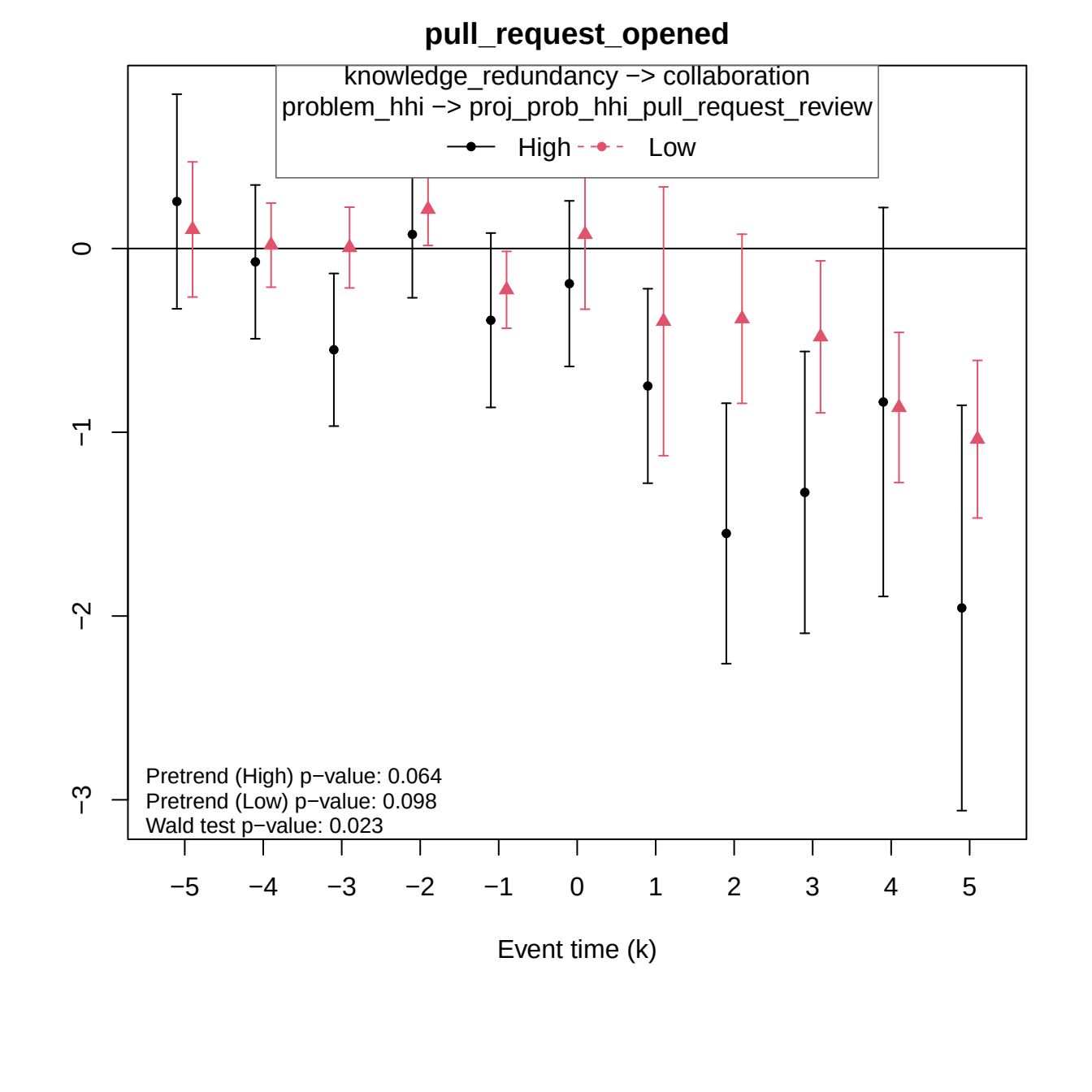

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

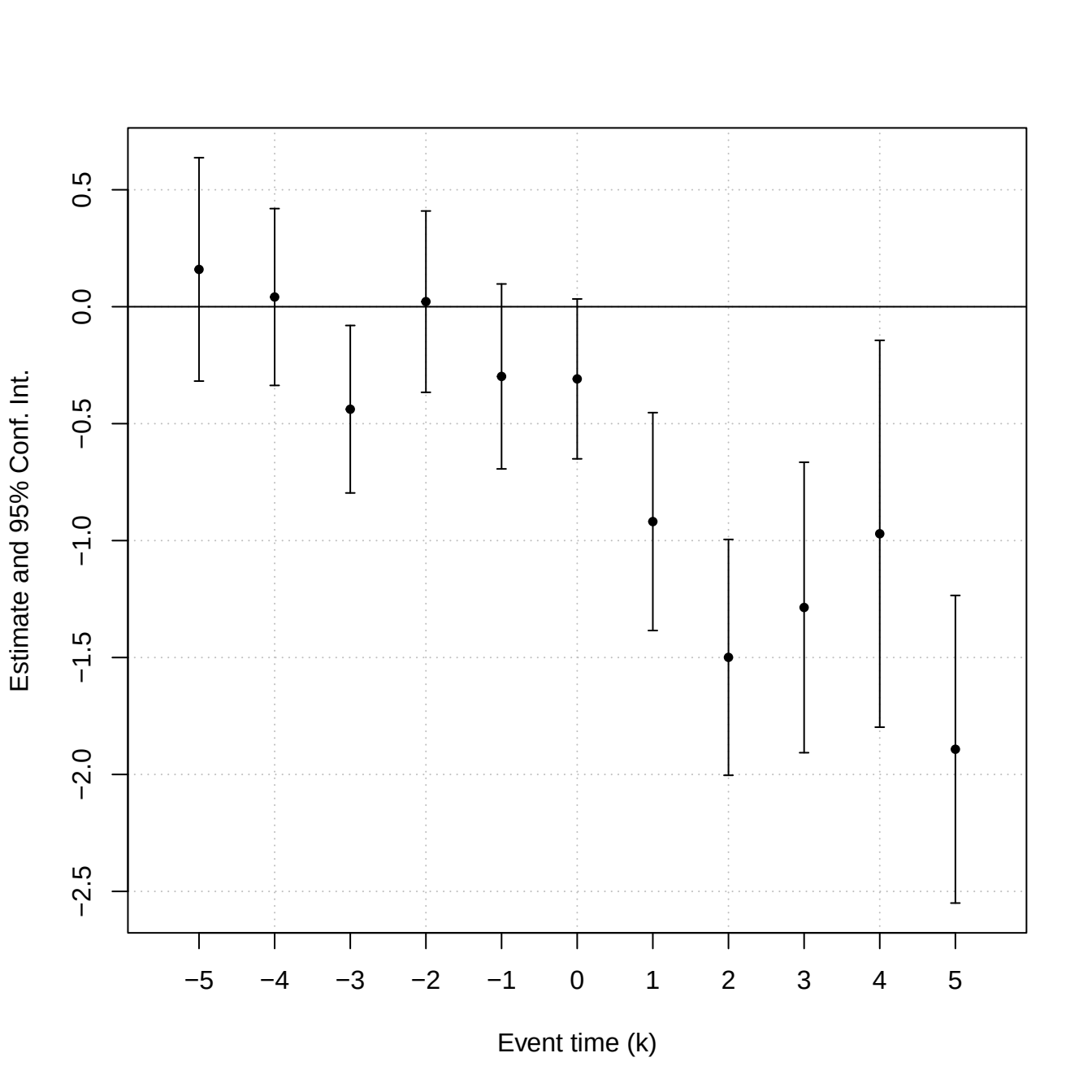

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

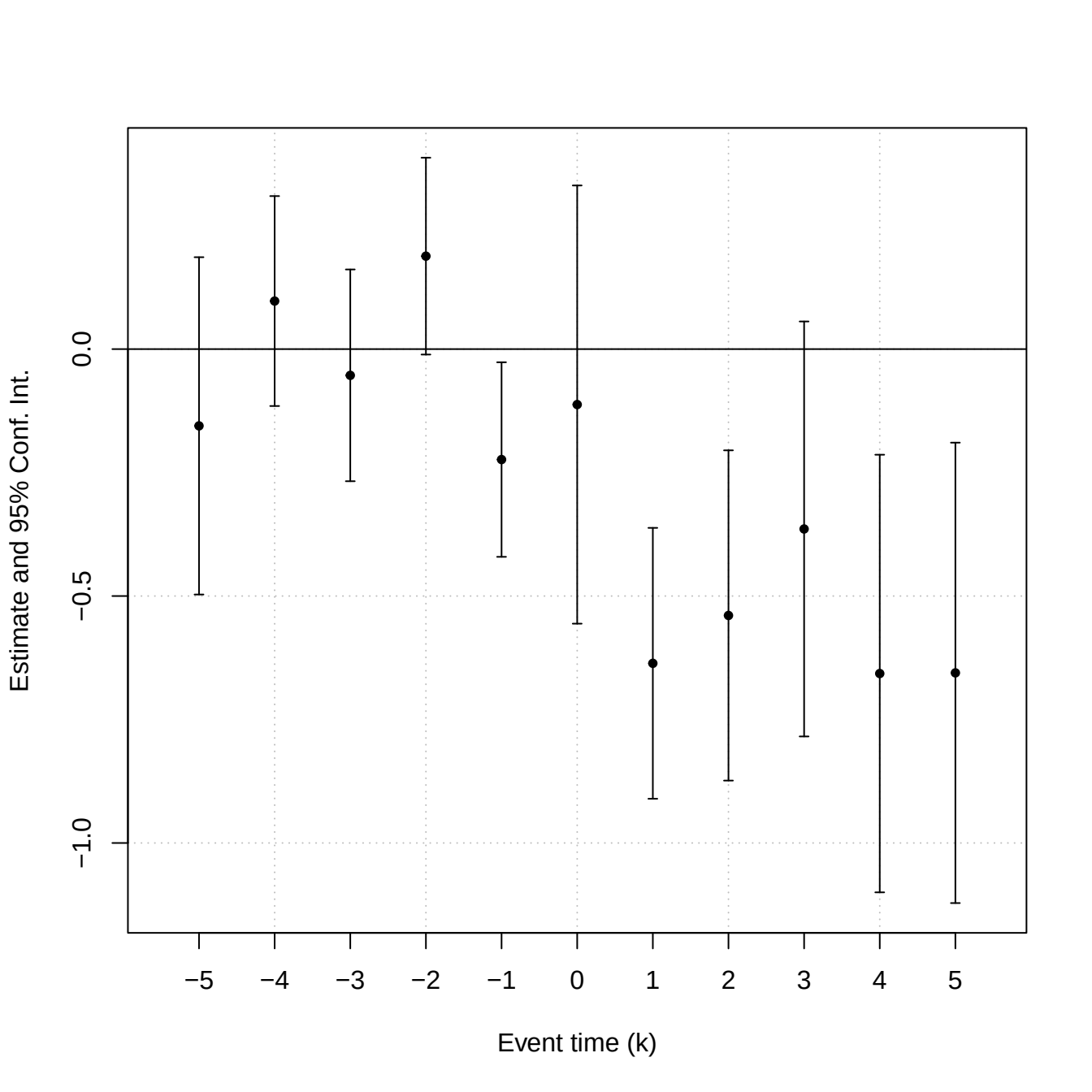

major_minor_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_comment
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.266
Pretrend (Low) p−value: 0.156
Wald test p−value: 0.933
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

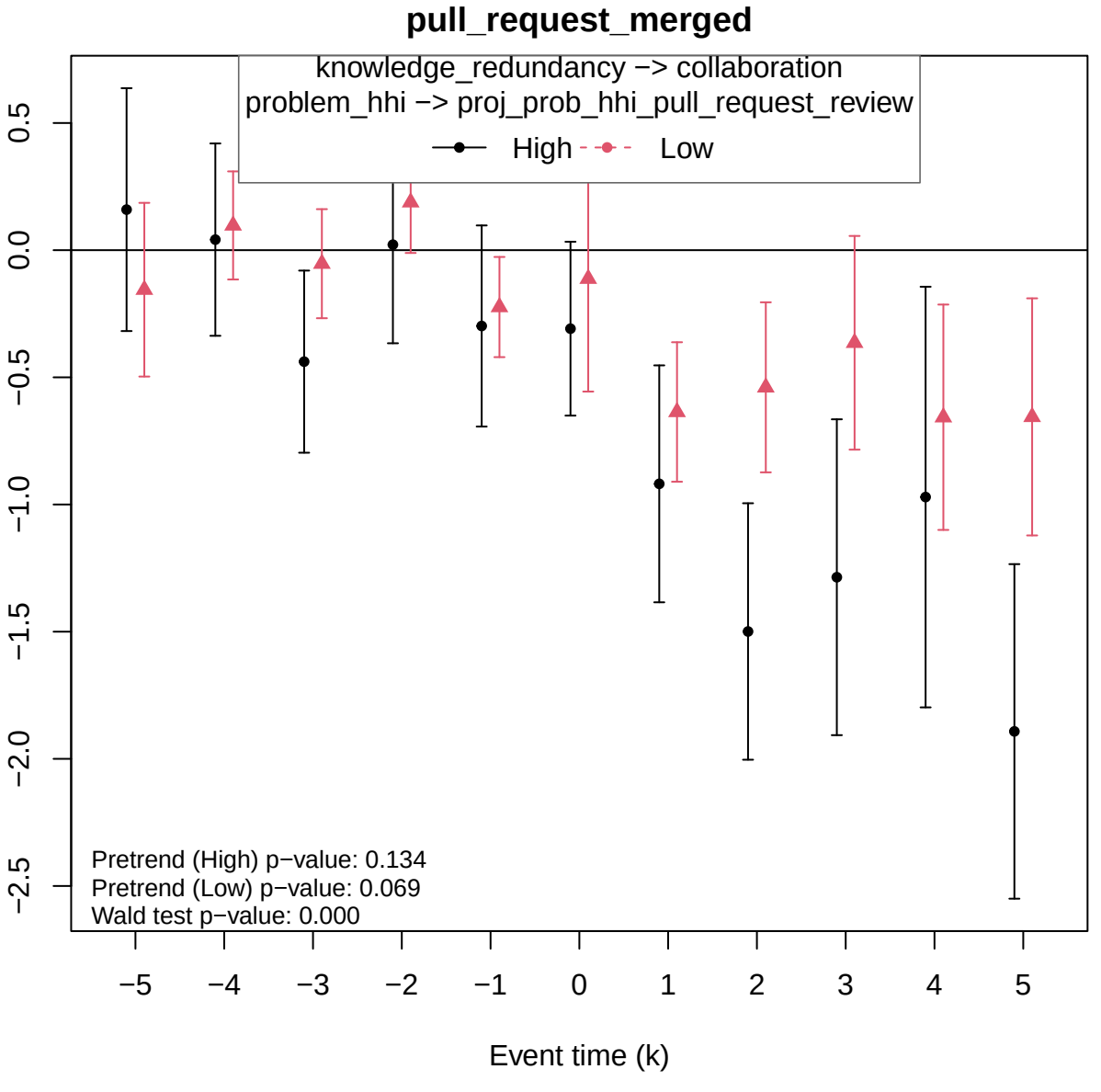

Estimate and 95% Conf. Int.
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

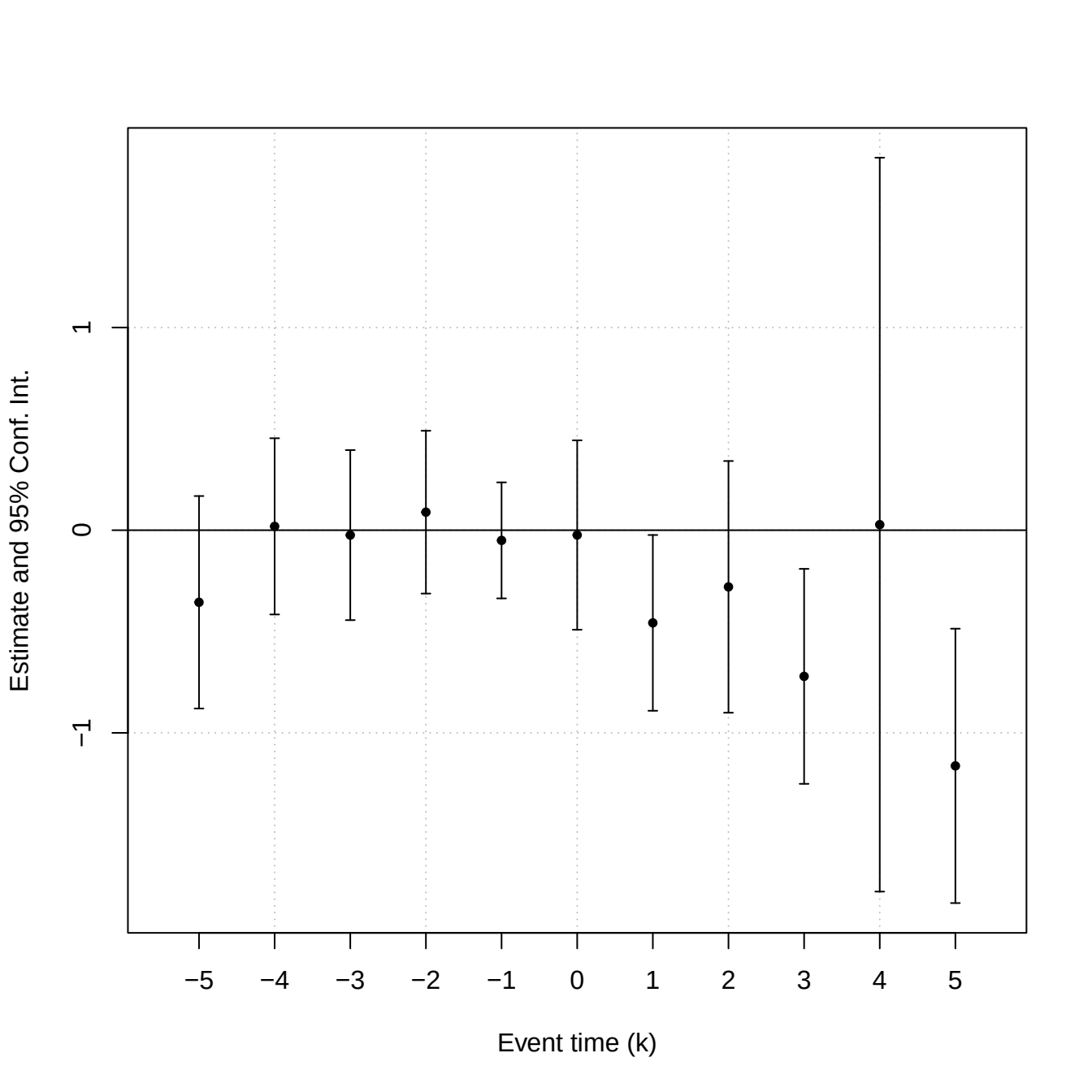

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

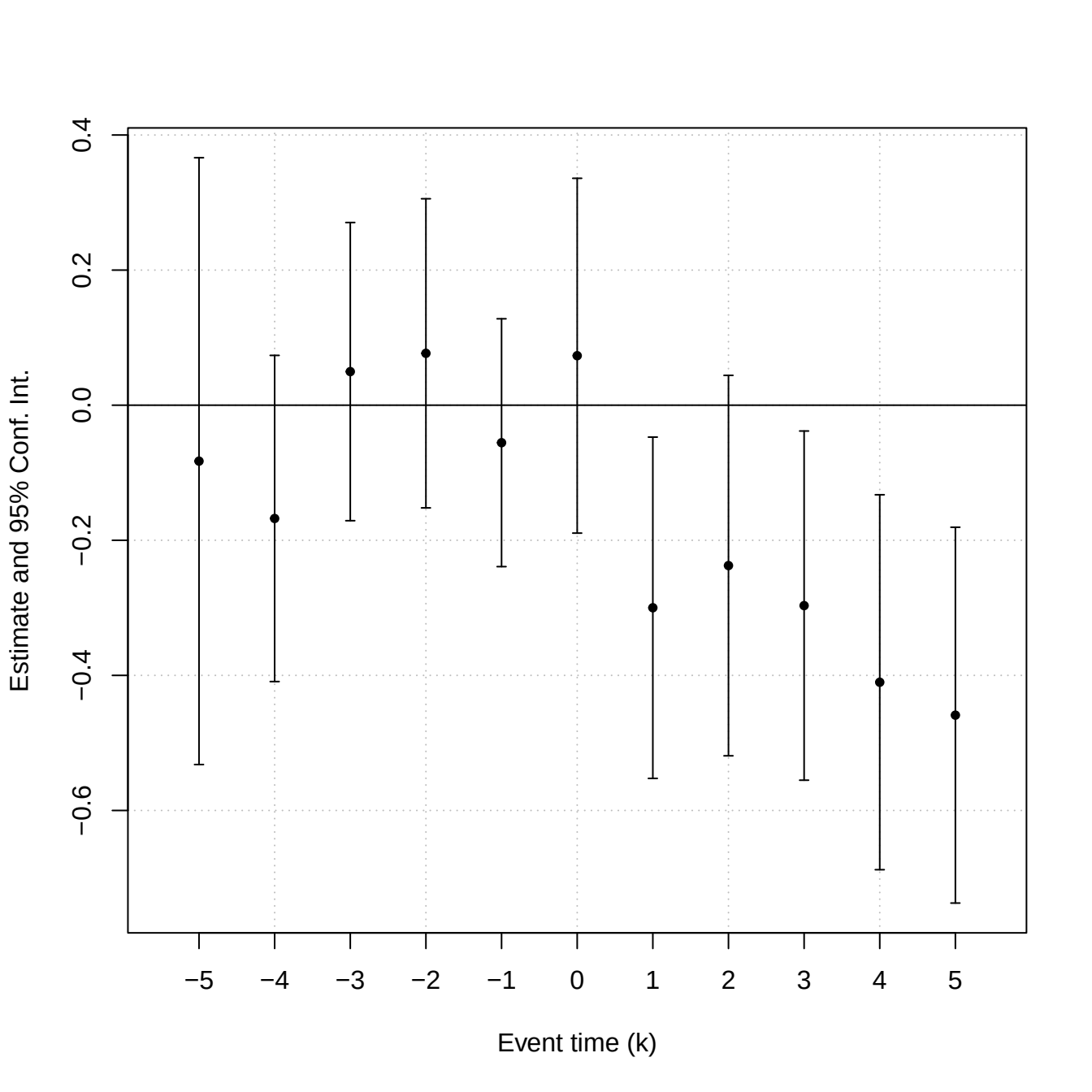

pull_request_opened
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review
High
Low
0
−1
−2
−3
Pretrend (High) p−value: 0.064
Pretrend (Low) p−value: 0.098
Wald test p−value: 0.023
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

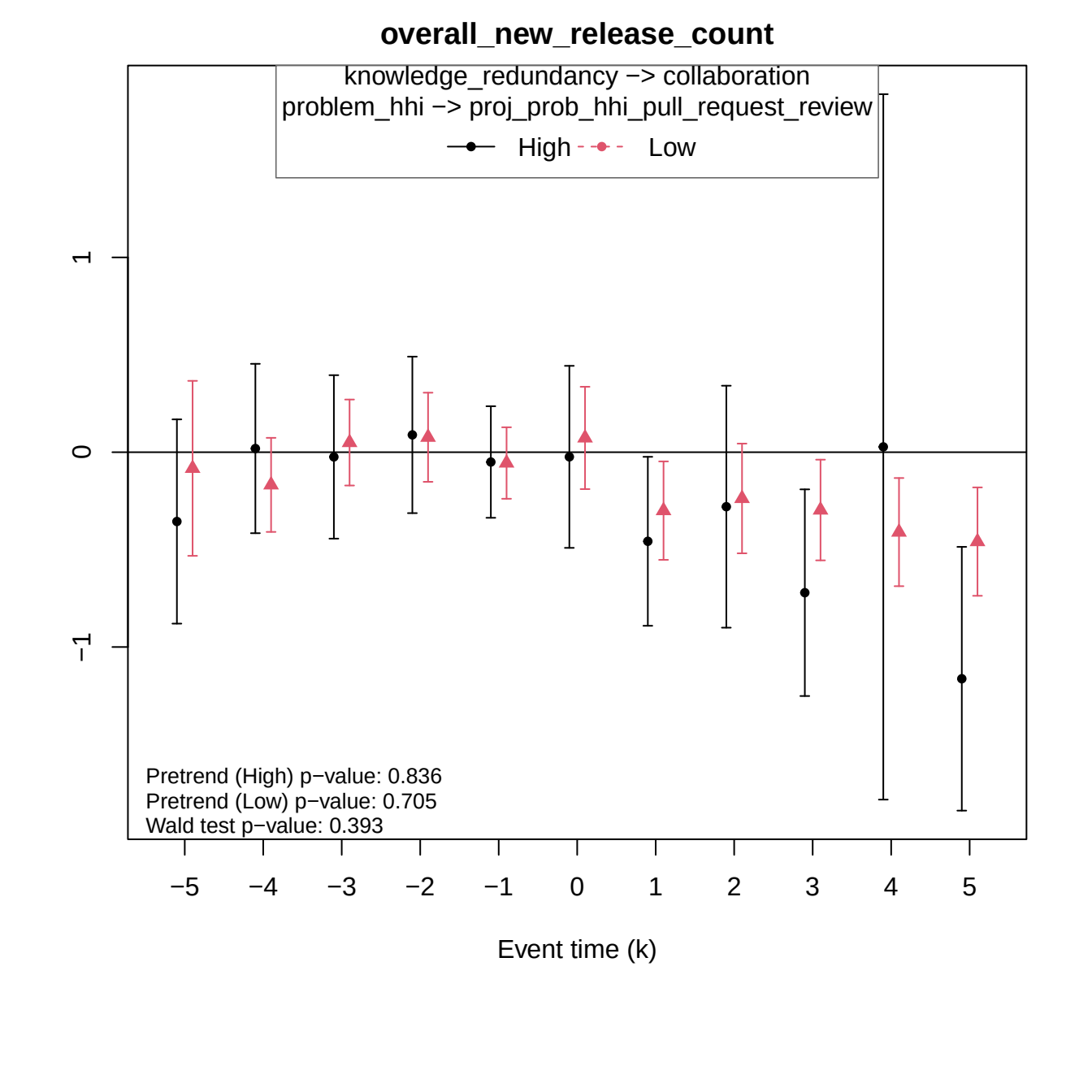

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

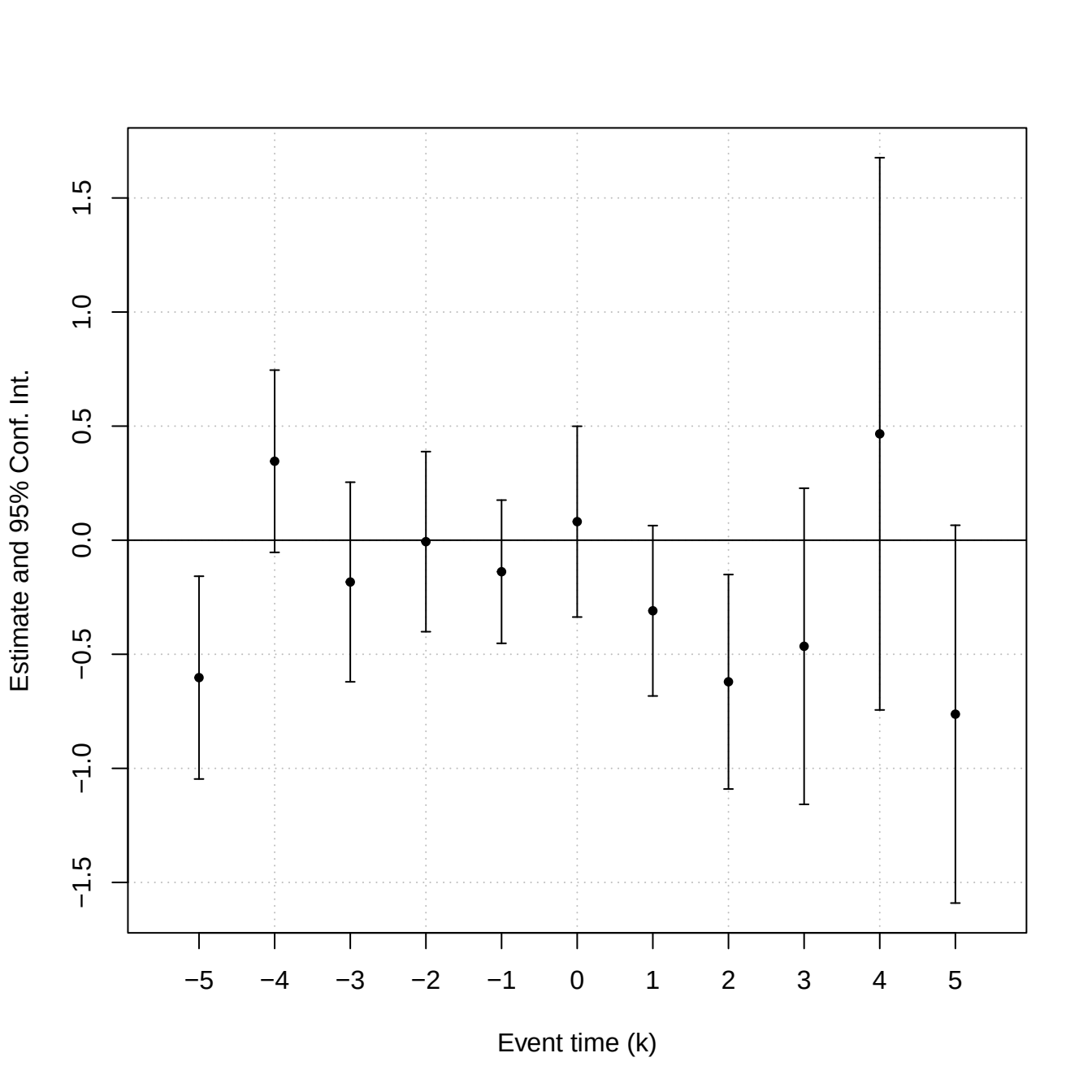

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

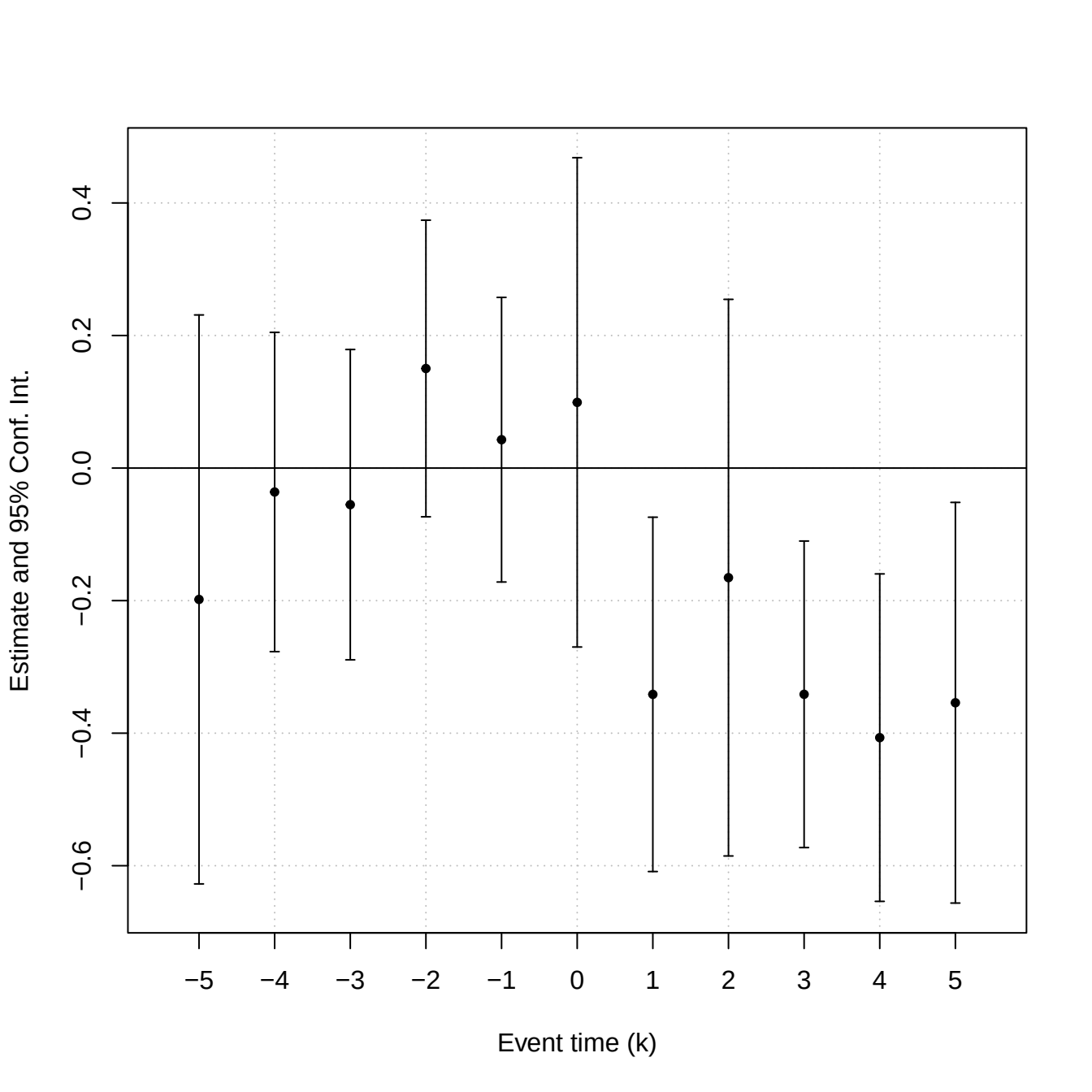

pull_request_merged
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
Pretrend (High) p−value: 0.134
Pretrend (Low) p−value: 0.069
Wald test p−value: 0.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

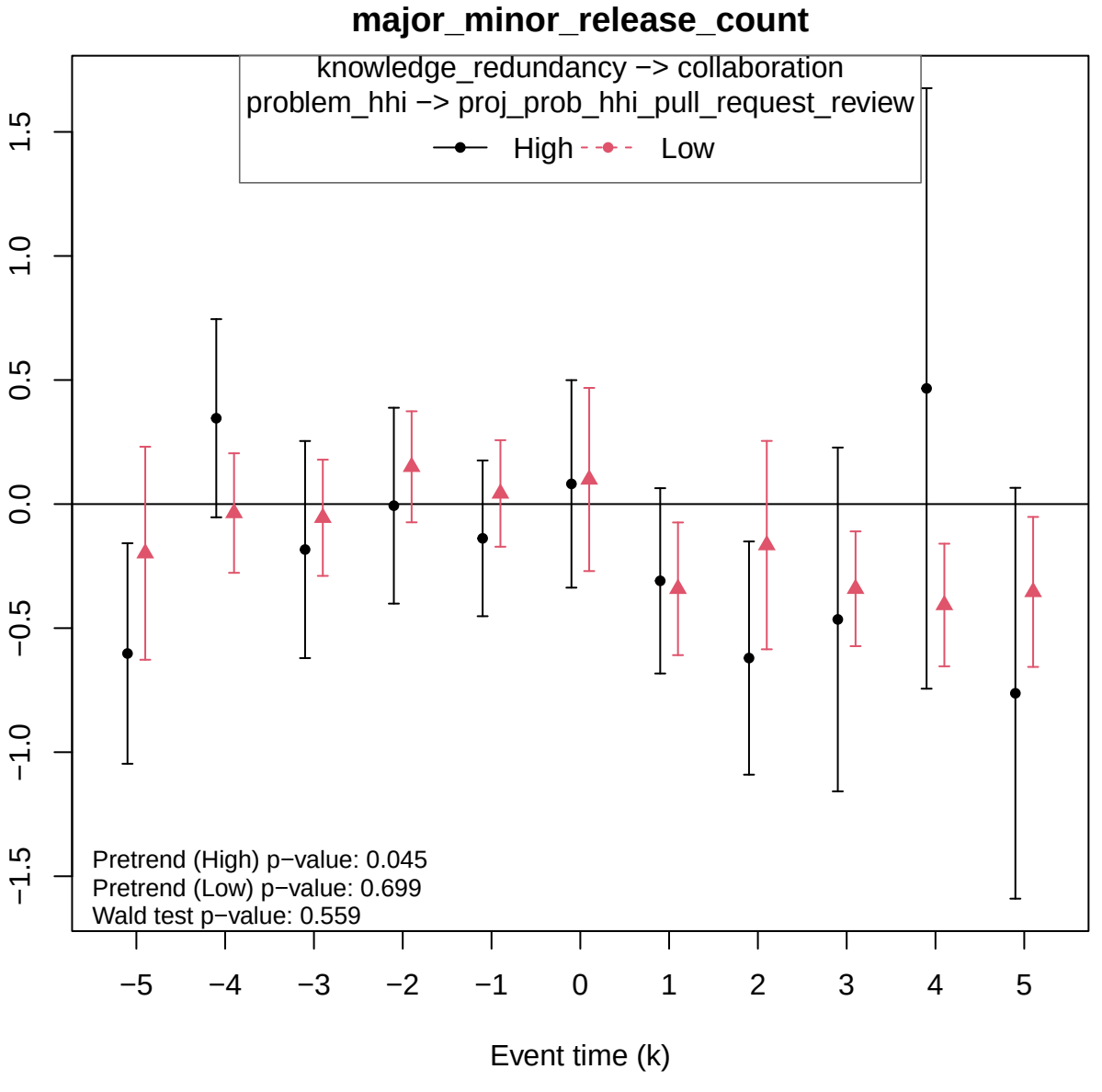

Estimate and 95% Conf. Int.
1
0
−1
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

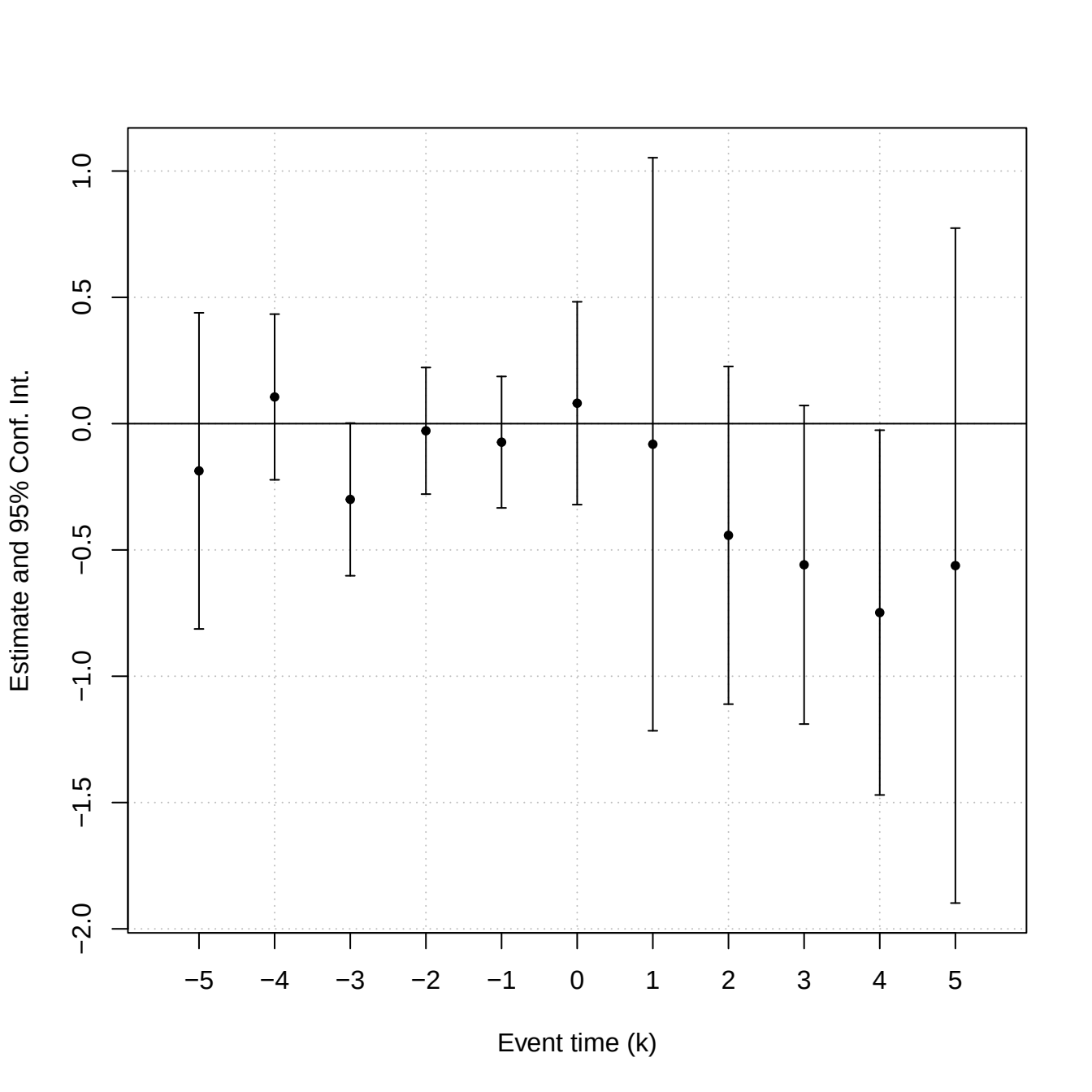

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

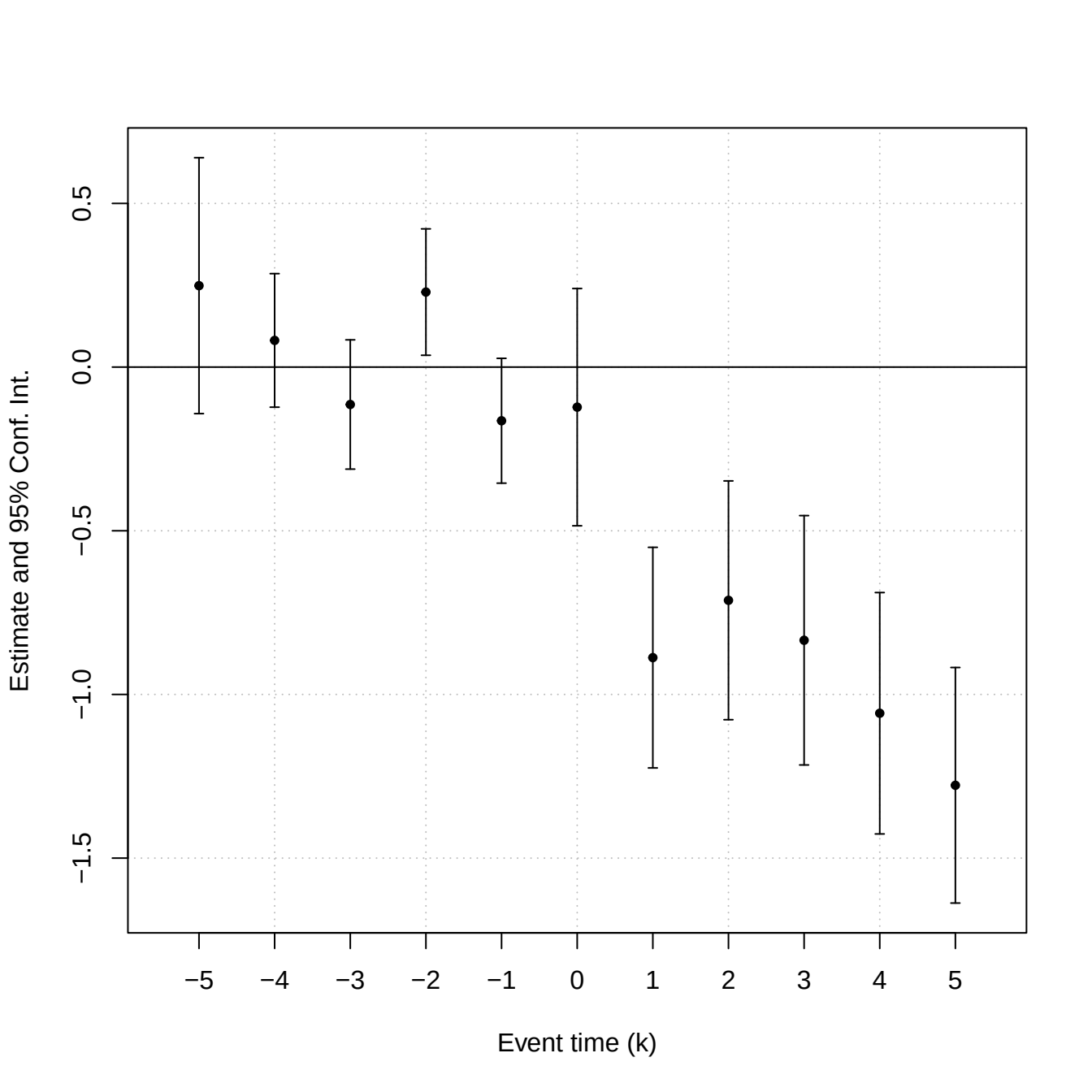

overall_new_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review
High
Low
1
0
−1
Pretrend (High) p−value: 0.836
Pretrend (Low) p−value: 0.705
Wald test p−value: 0.393
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

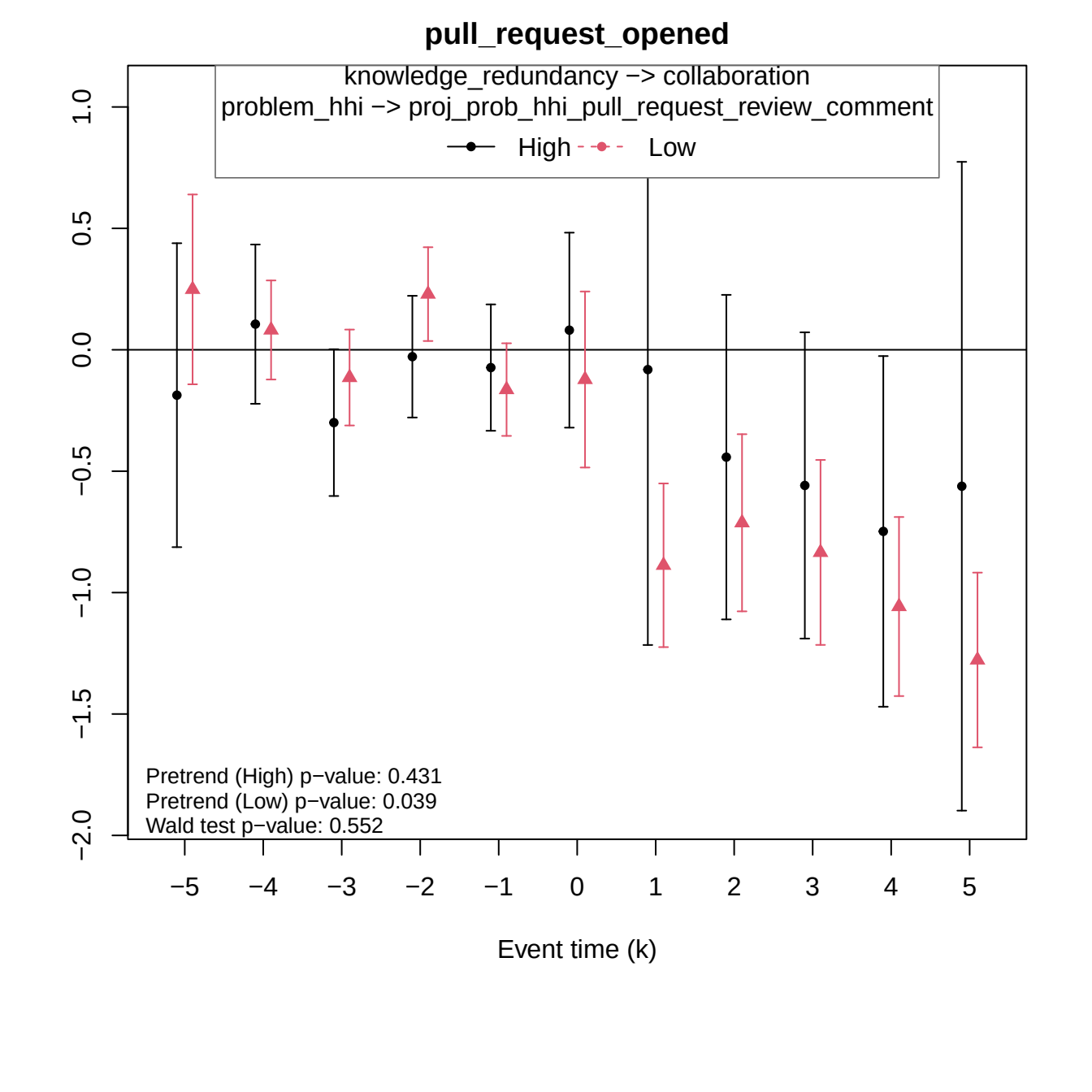

Estimate and 95% Conf. Int.
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

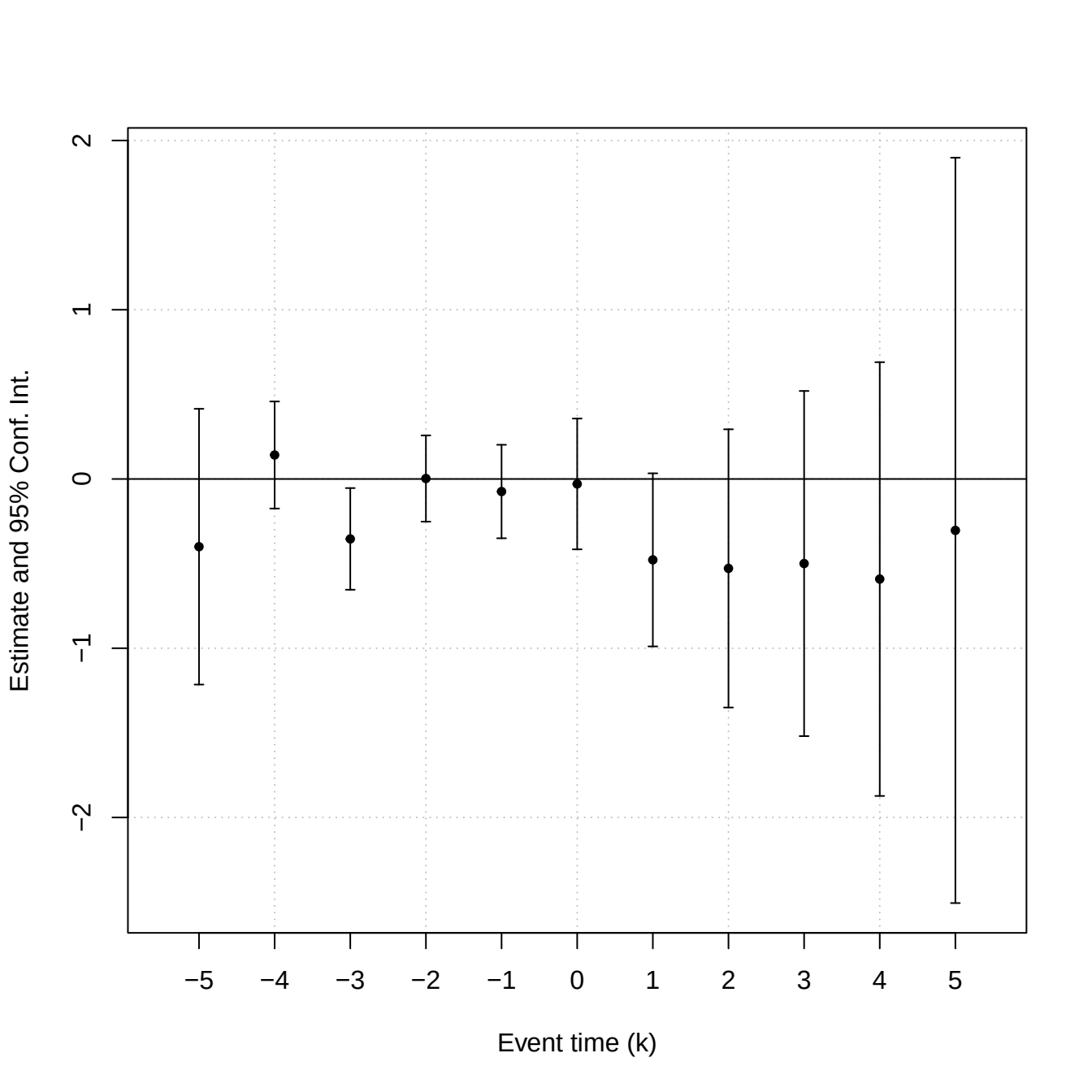

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

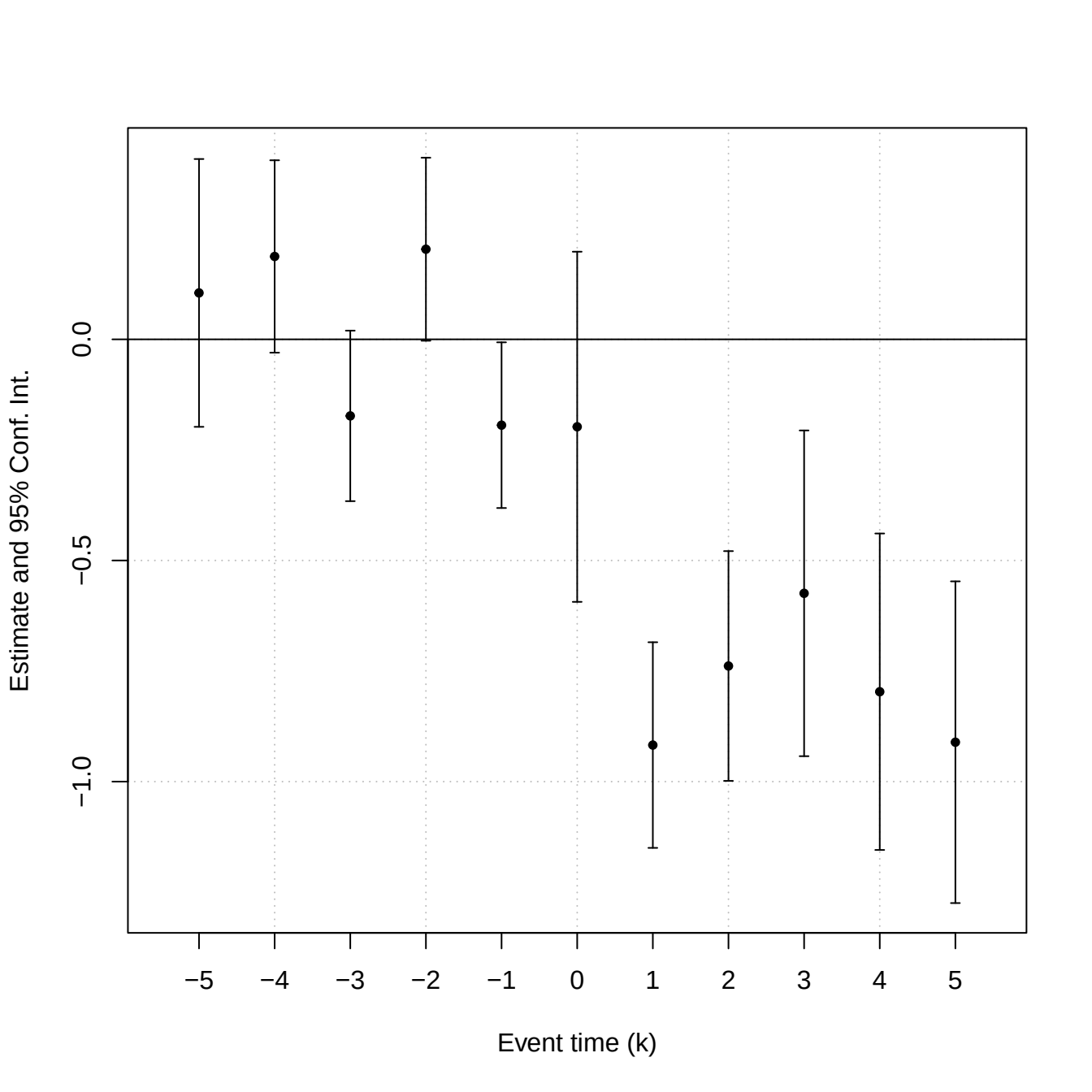

major_minor_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review
High
Low
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.045
Pretrend (Low) p−value: 0.699
Wald test p−value: 0.559
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

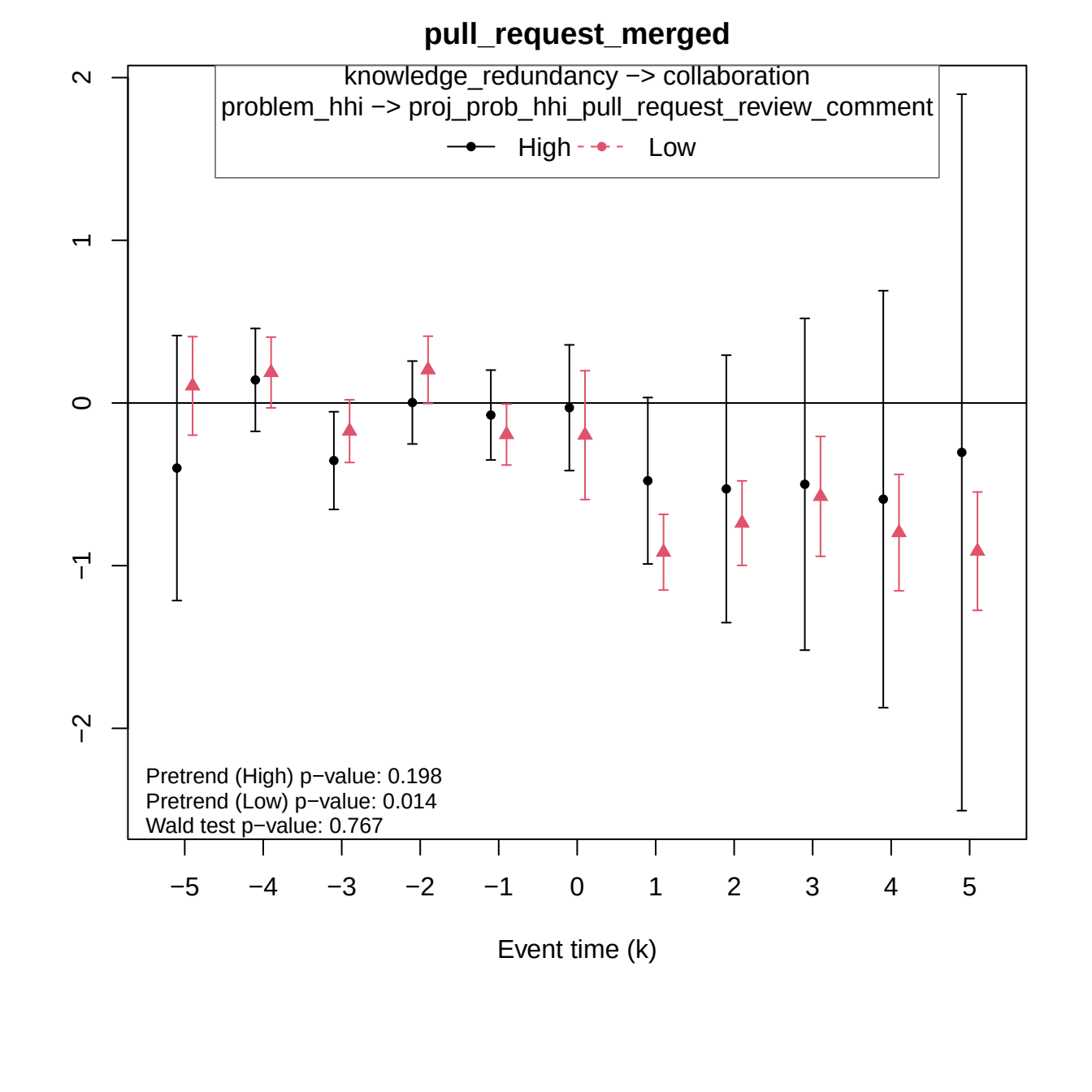

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

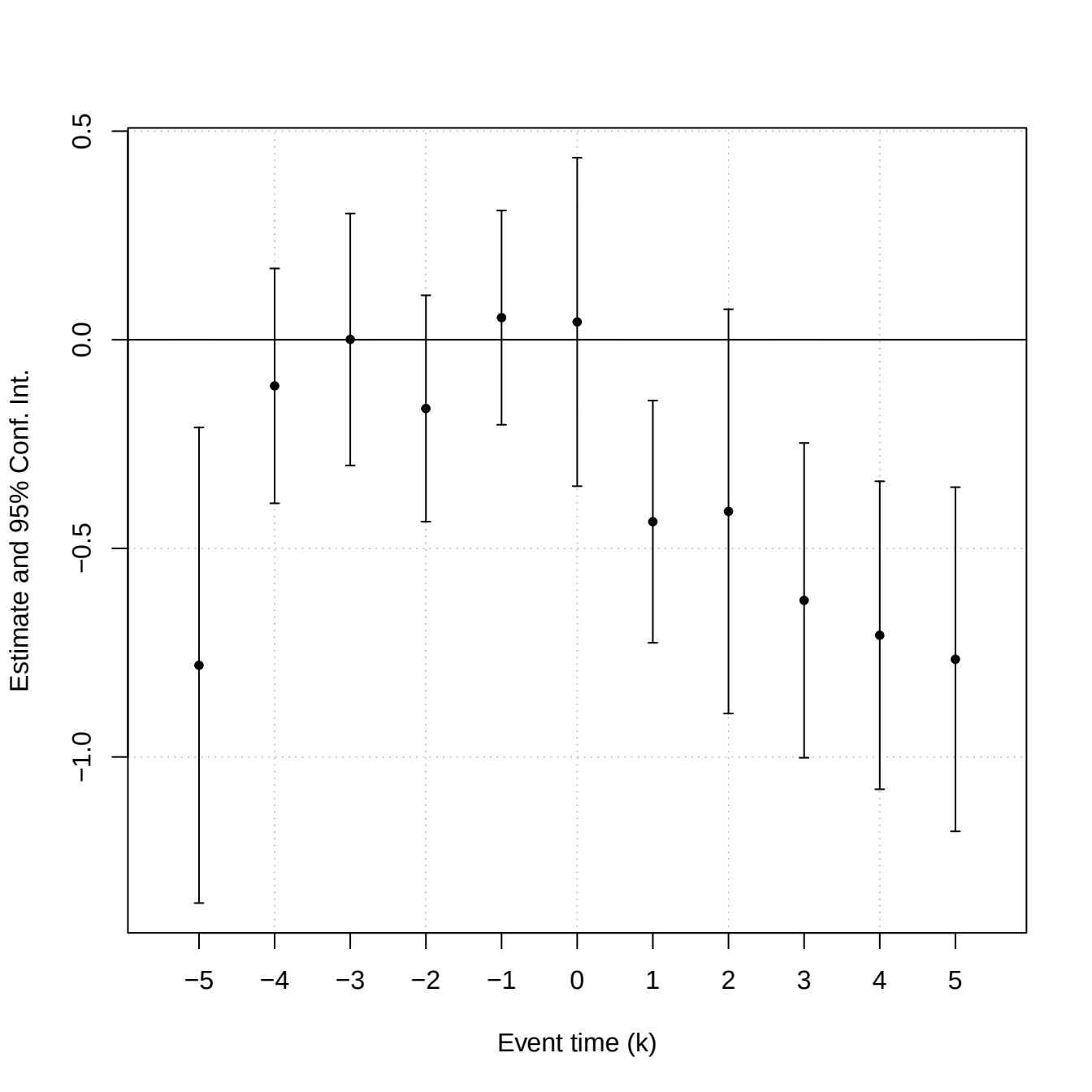

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

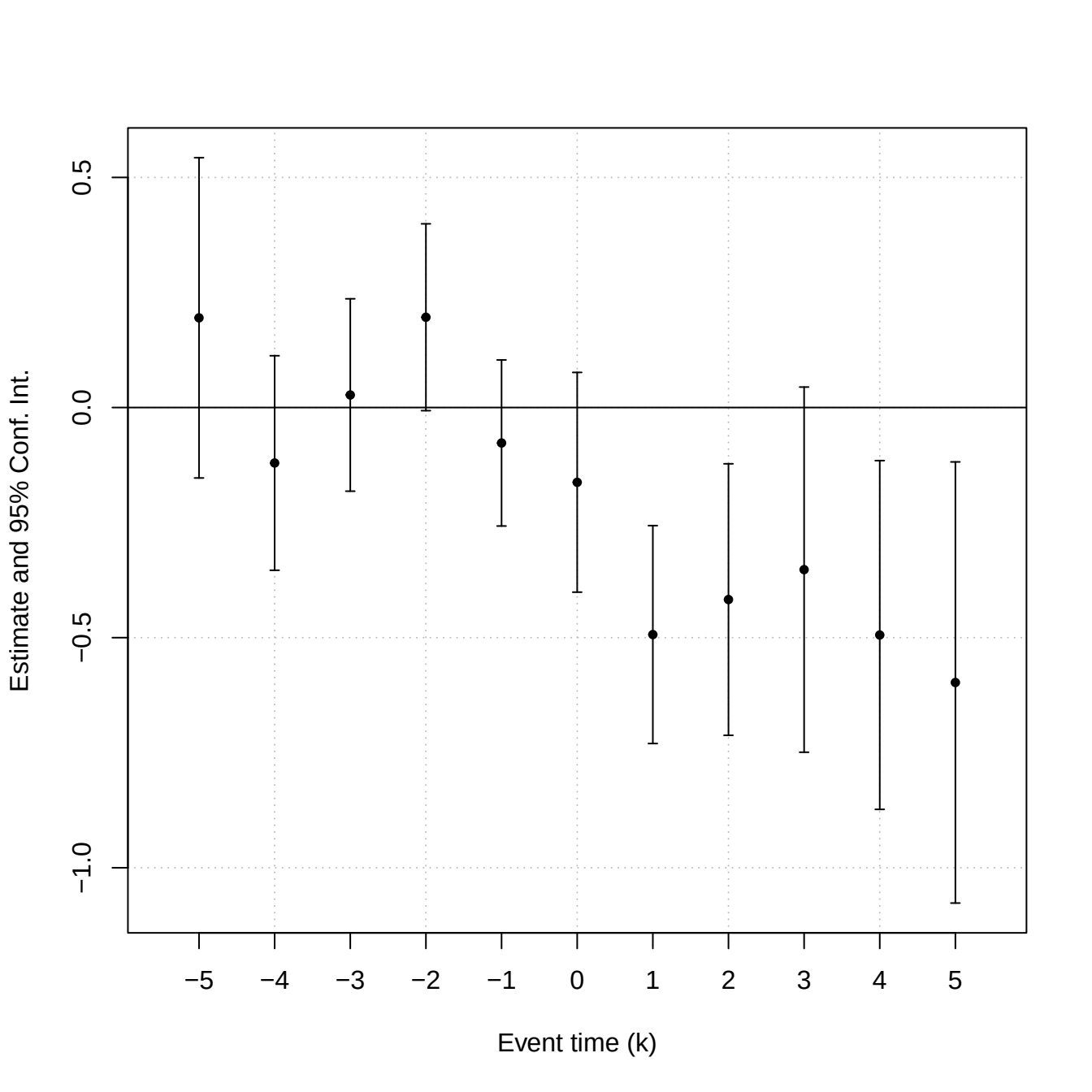

pull_request_opened
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review_comment
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.431
Pretrend (Low) p−value: 0.039
Wald test p−value: 0.552
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

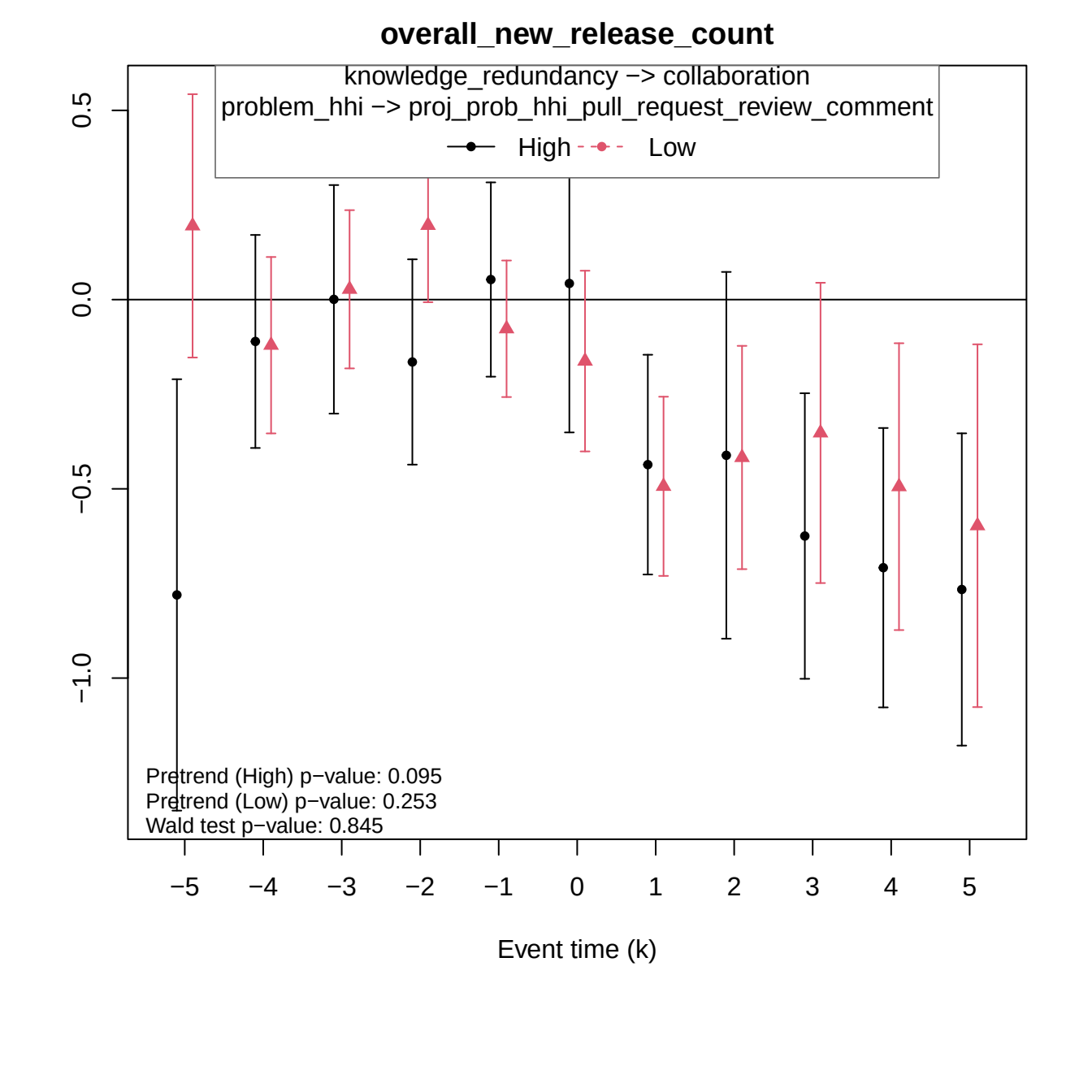

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

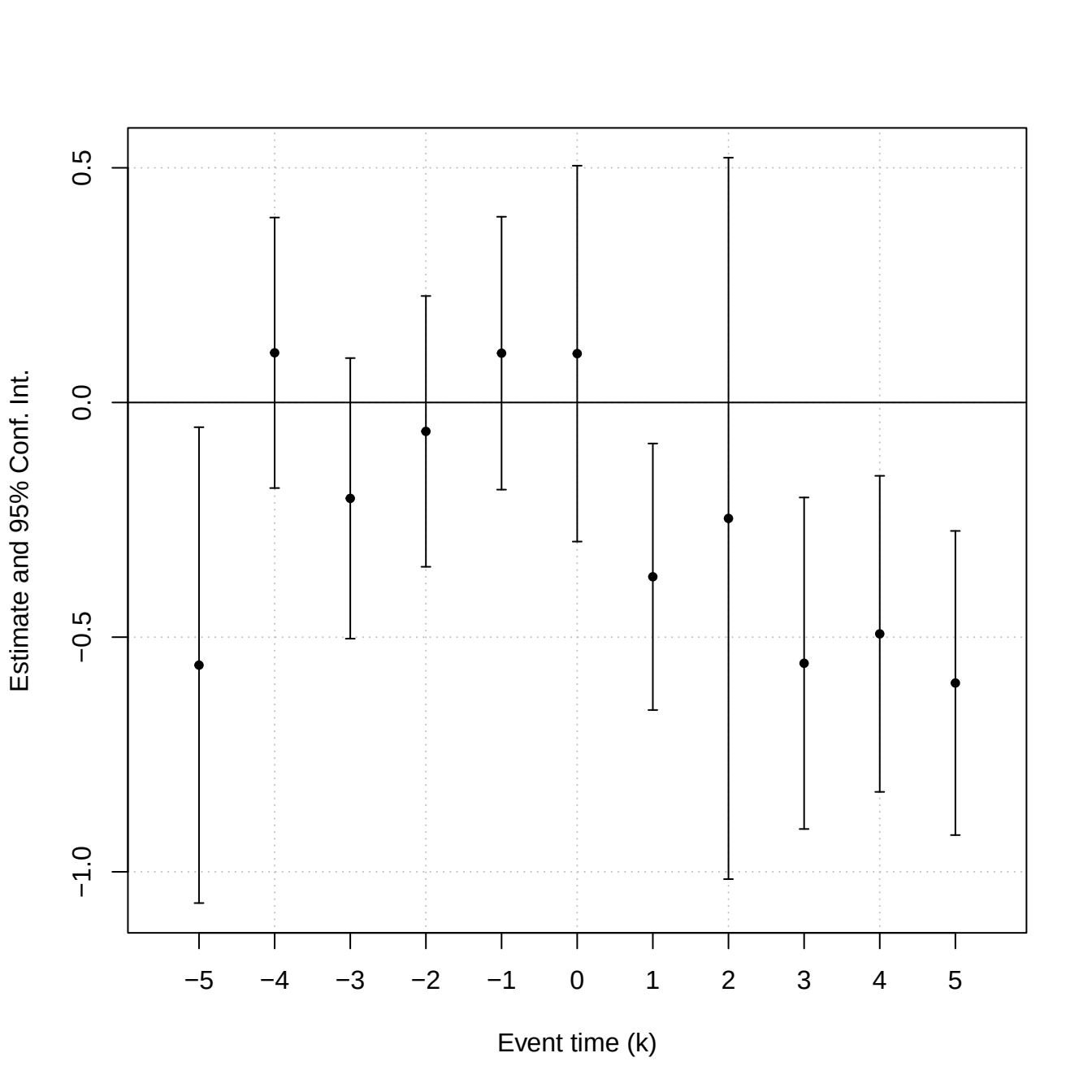

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

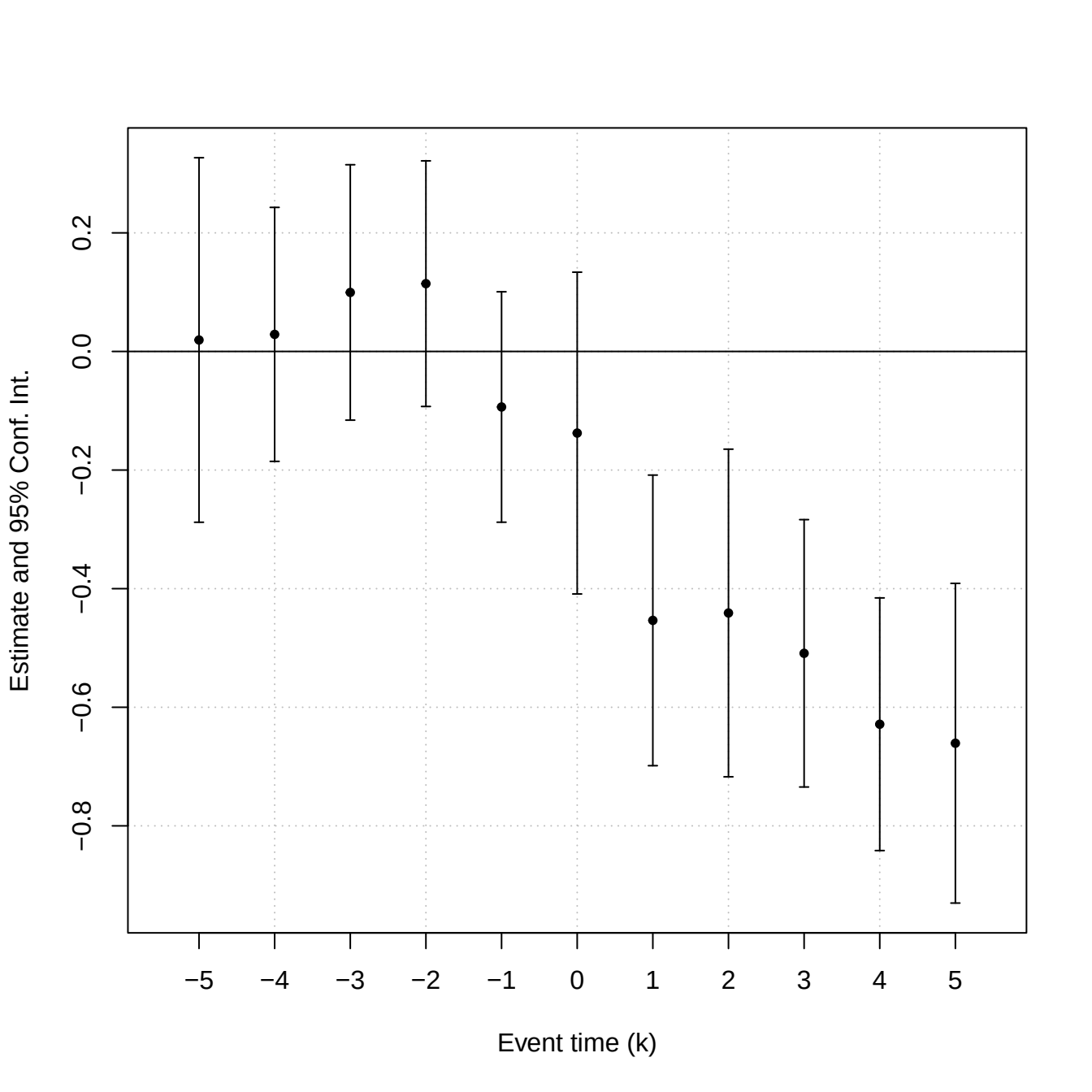

pull_request_merged
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review_comment
High
Low
Pretrend (High) p−value: 0.198
Pretrend (Low) p−value: 0.014
Wald test p−value: 0.767
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

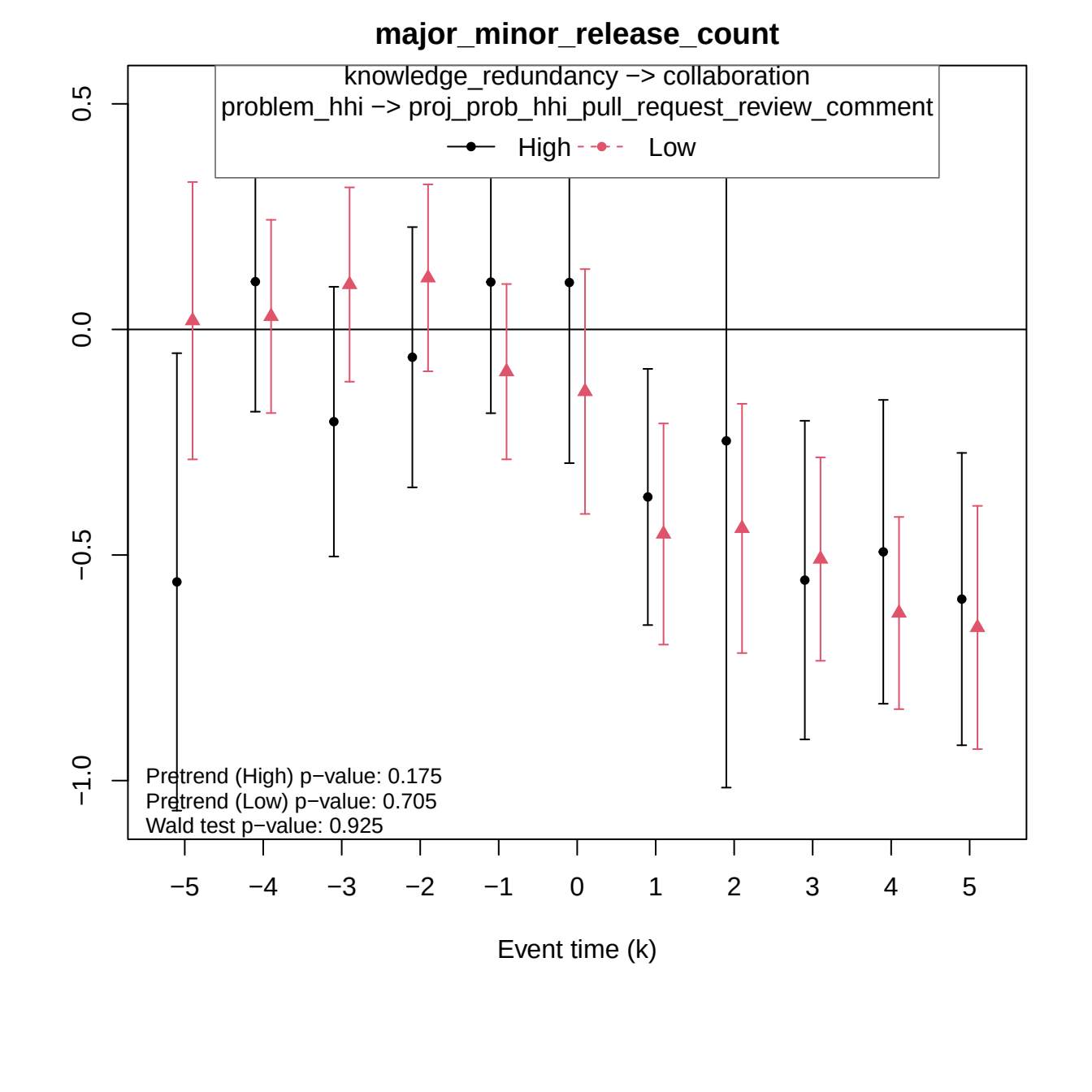

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

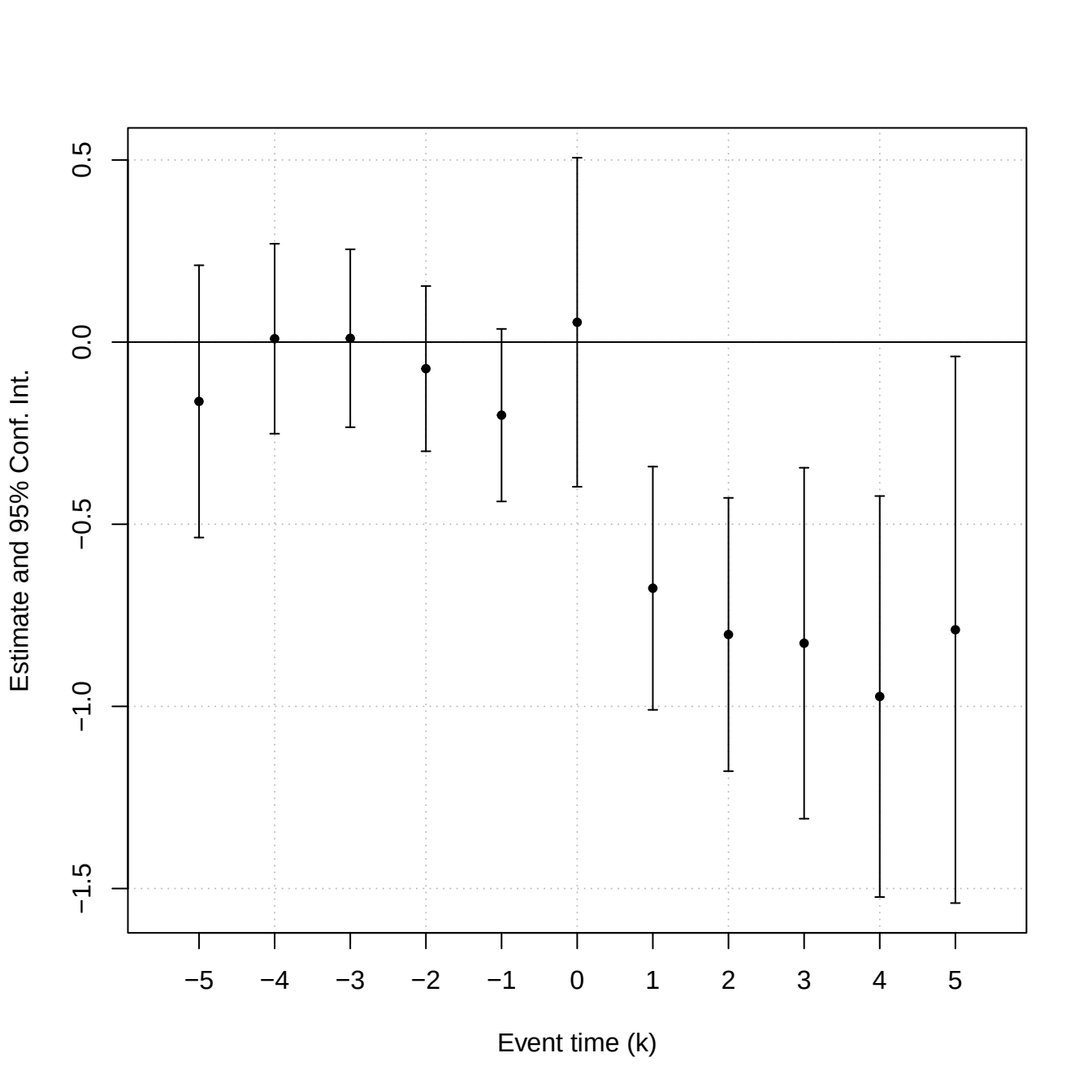

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

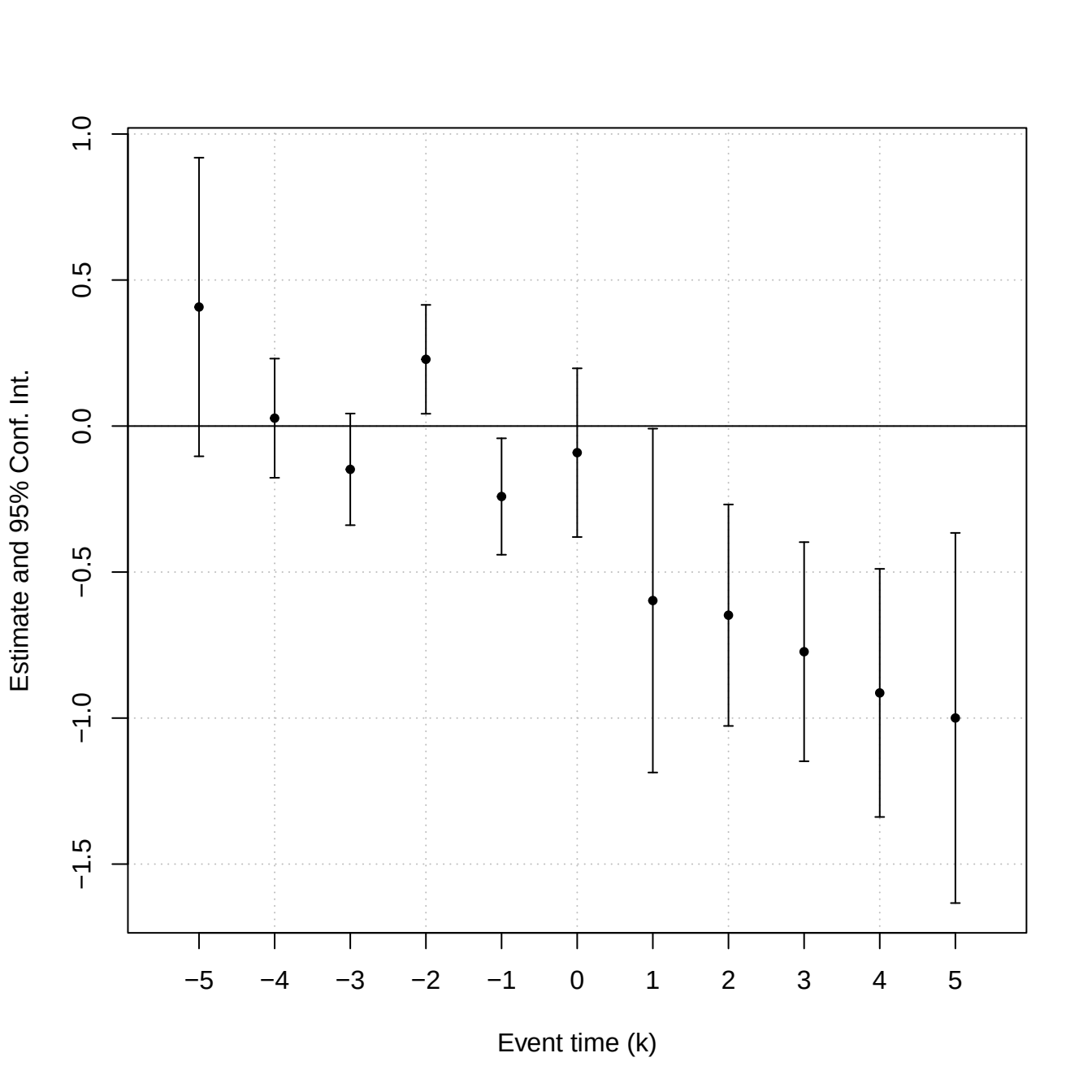

overall_new_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review_comment
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.095
Pretrend (Low) p−value: 0.253
Wald test p−value: 0.845
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

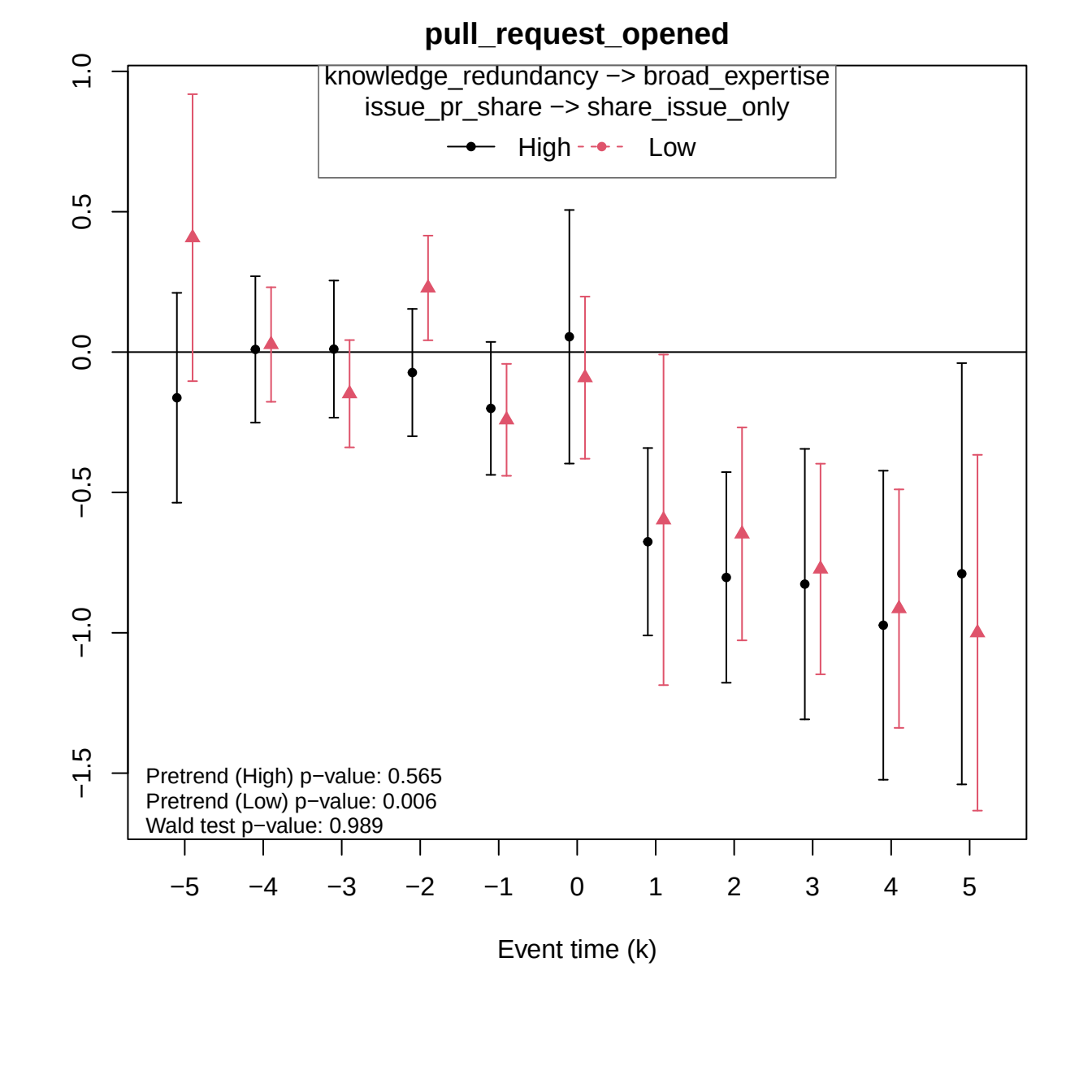

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

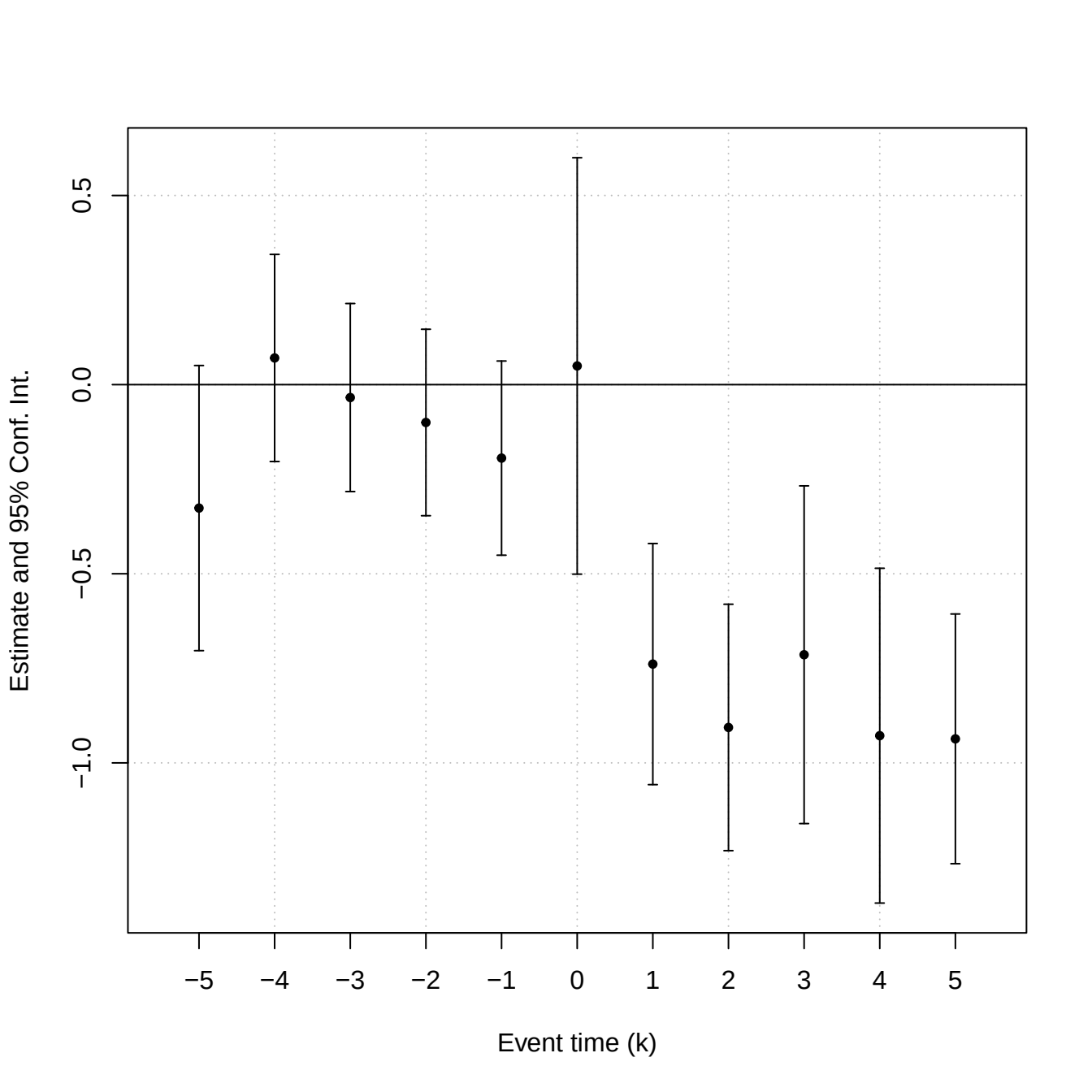

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

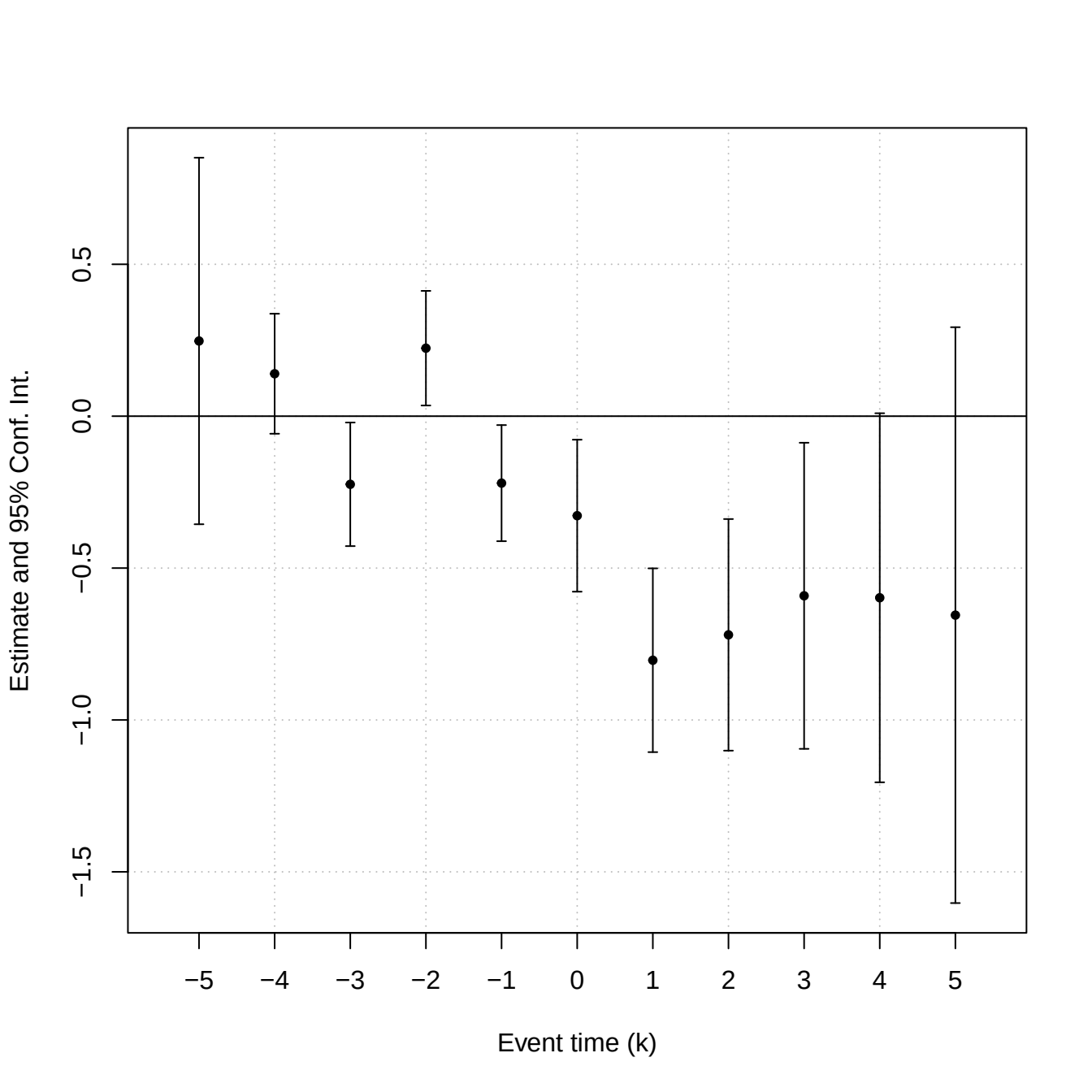

major_minor_release_count
knowledge_redundancy −> collaboration
problem_hhi −> proj_prob_hhi_pull_request_review_comment
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.175
Pretrend (Low) p−value: 0.705
Wald test p−value: 0.925
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

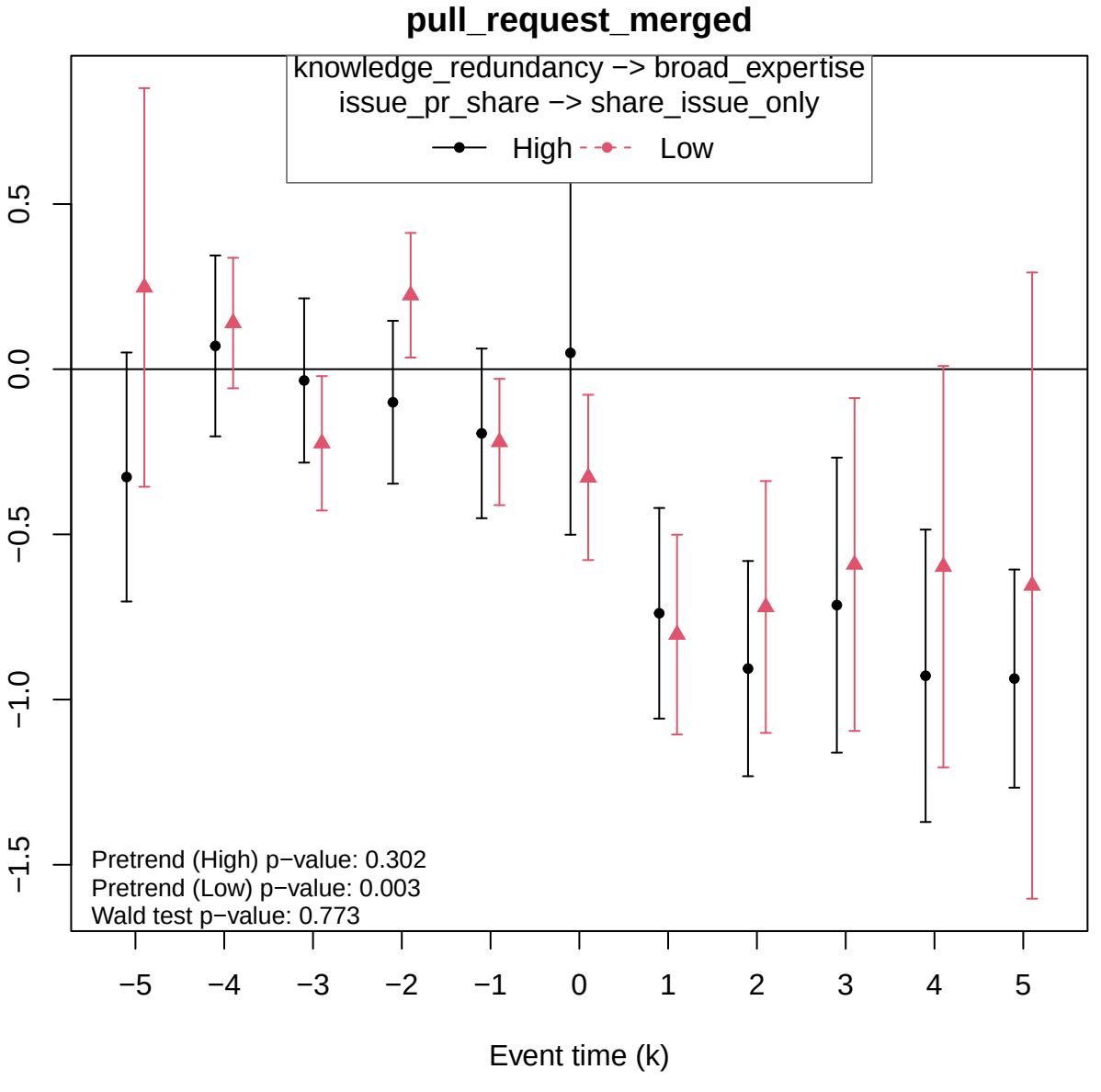

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

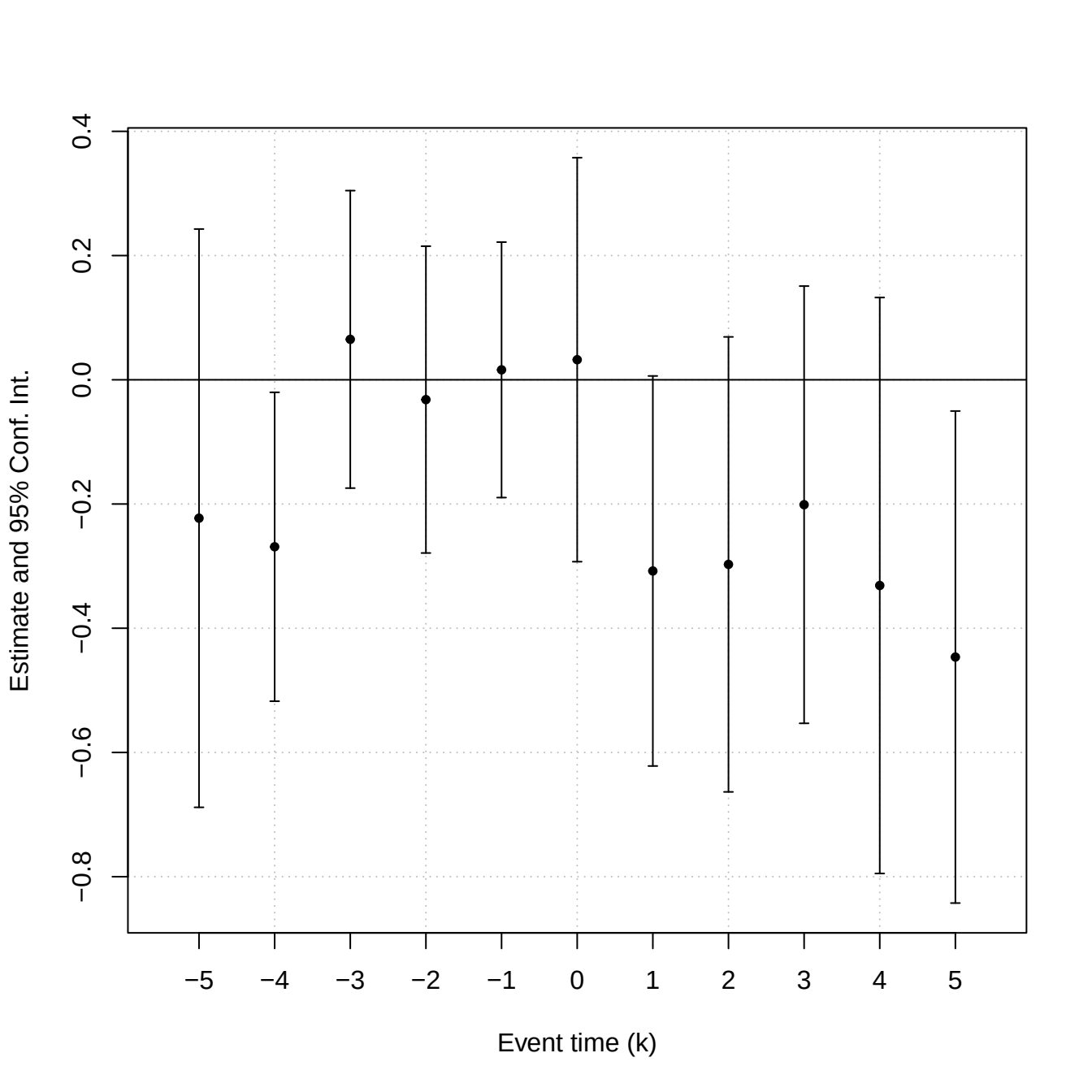

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

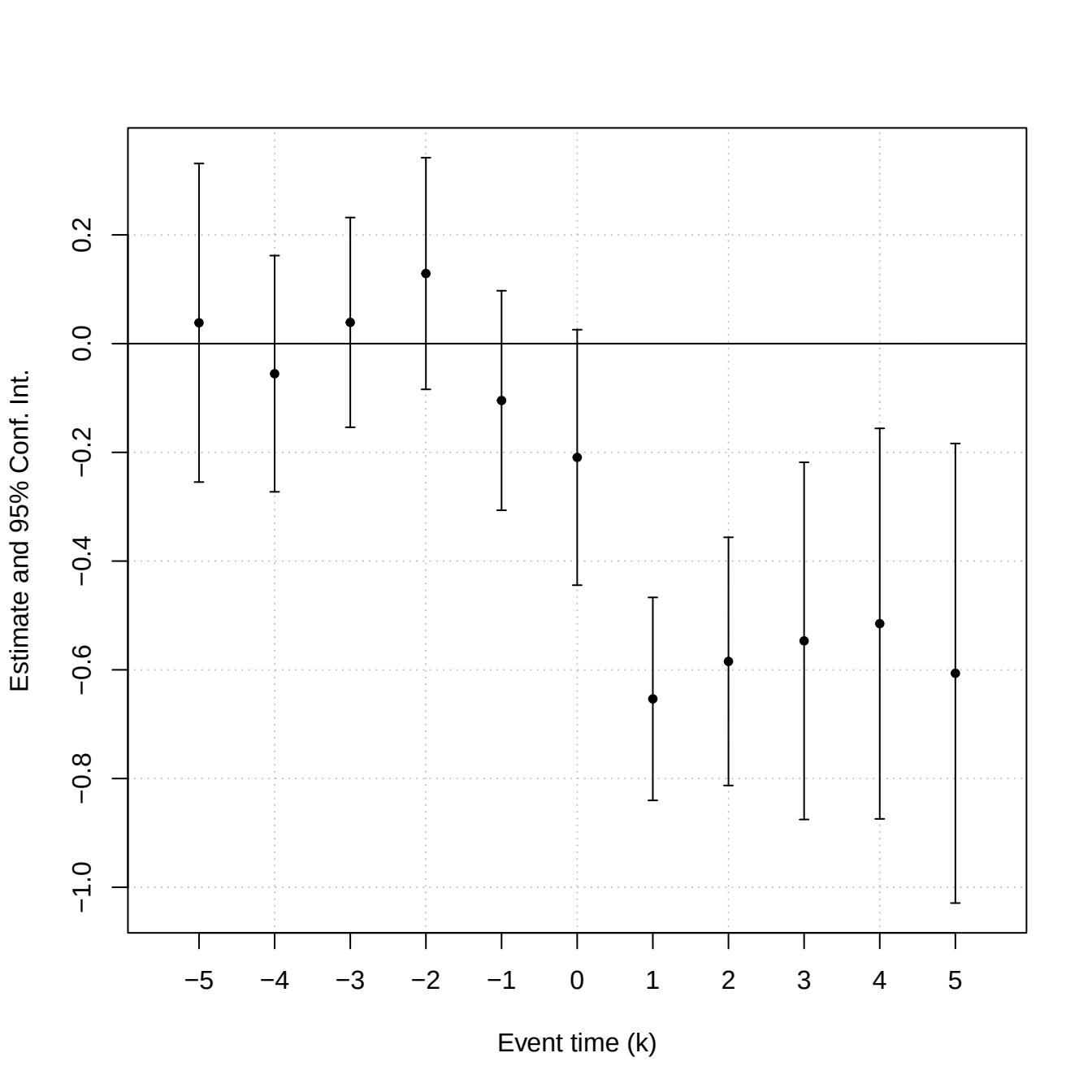

pull_request_opened
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_only
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.565
Pretrend (Low) p−value: 0.006
Wald test p−value: 0.989
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

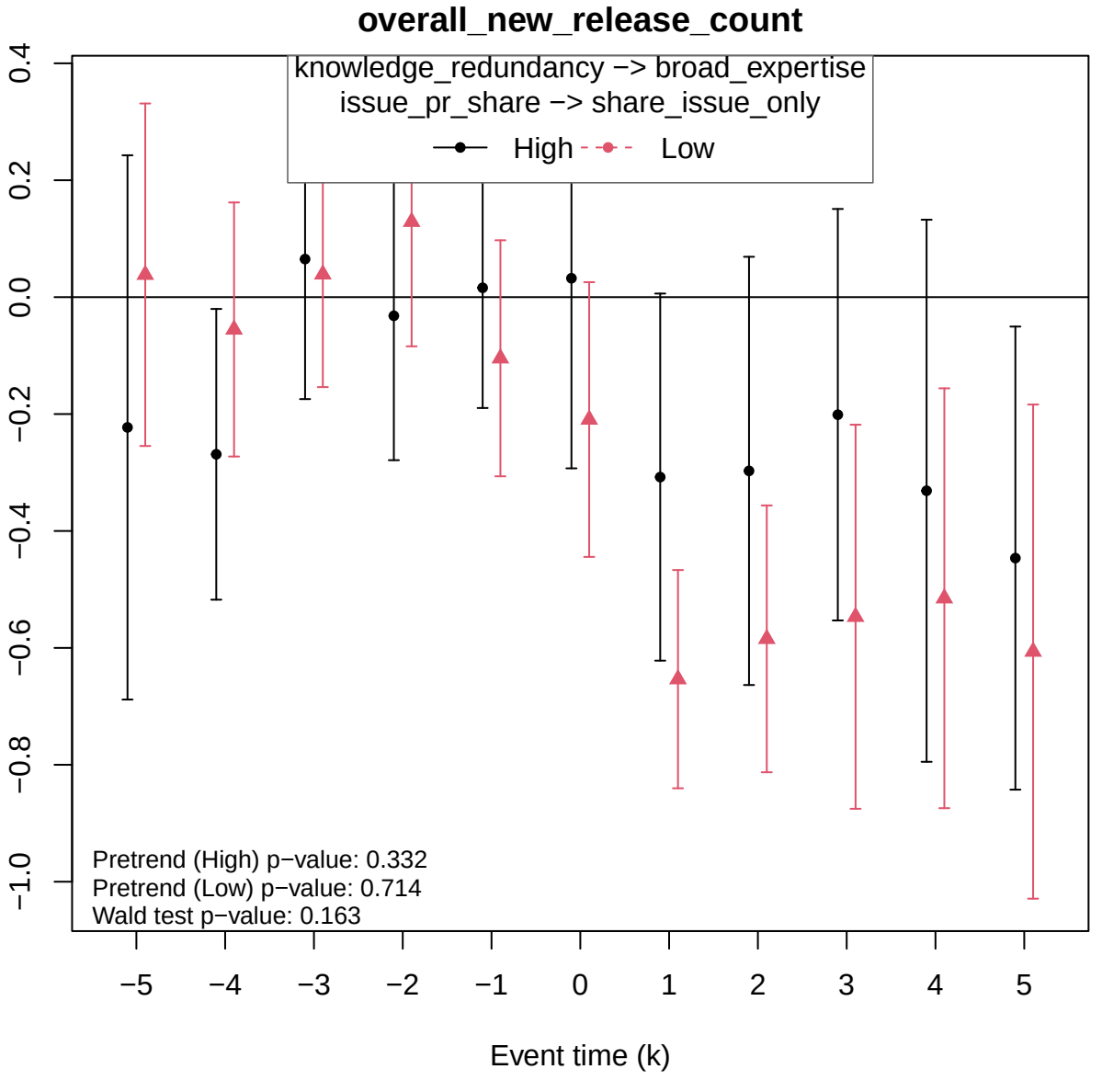

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

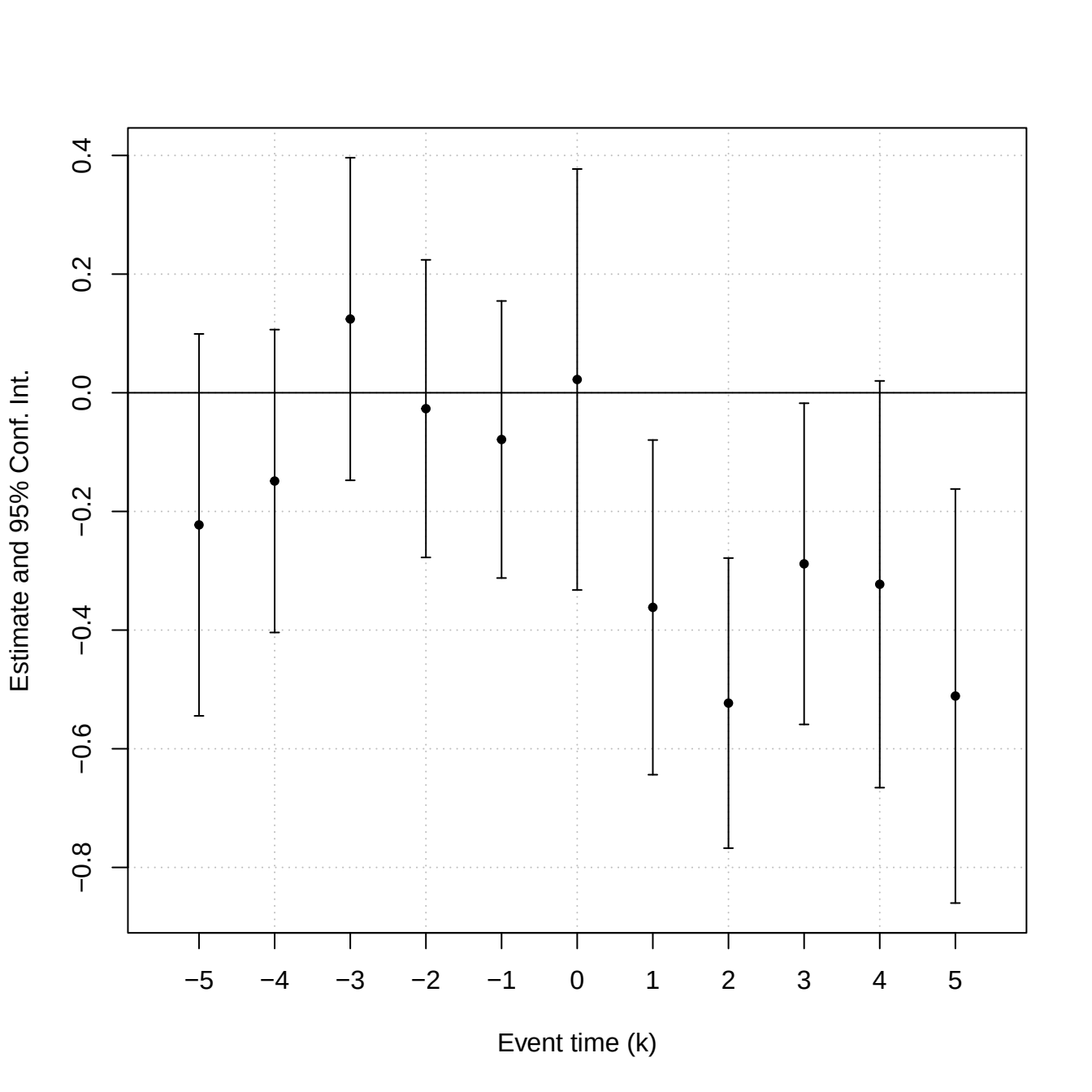

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

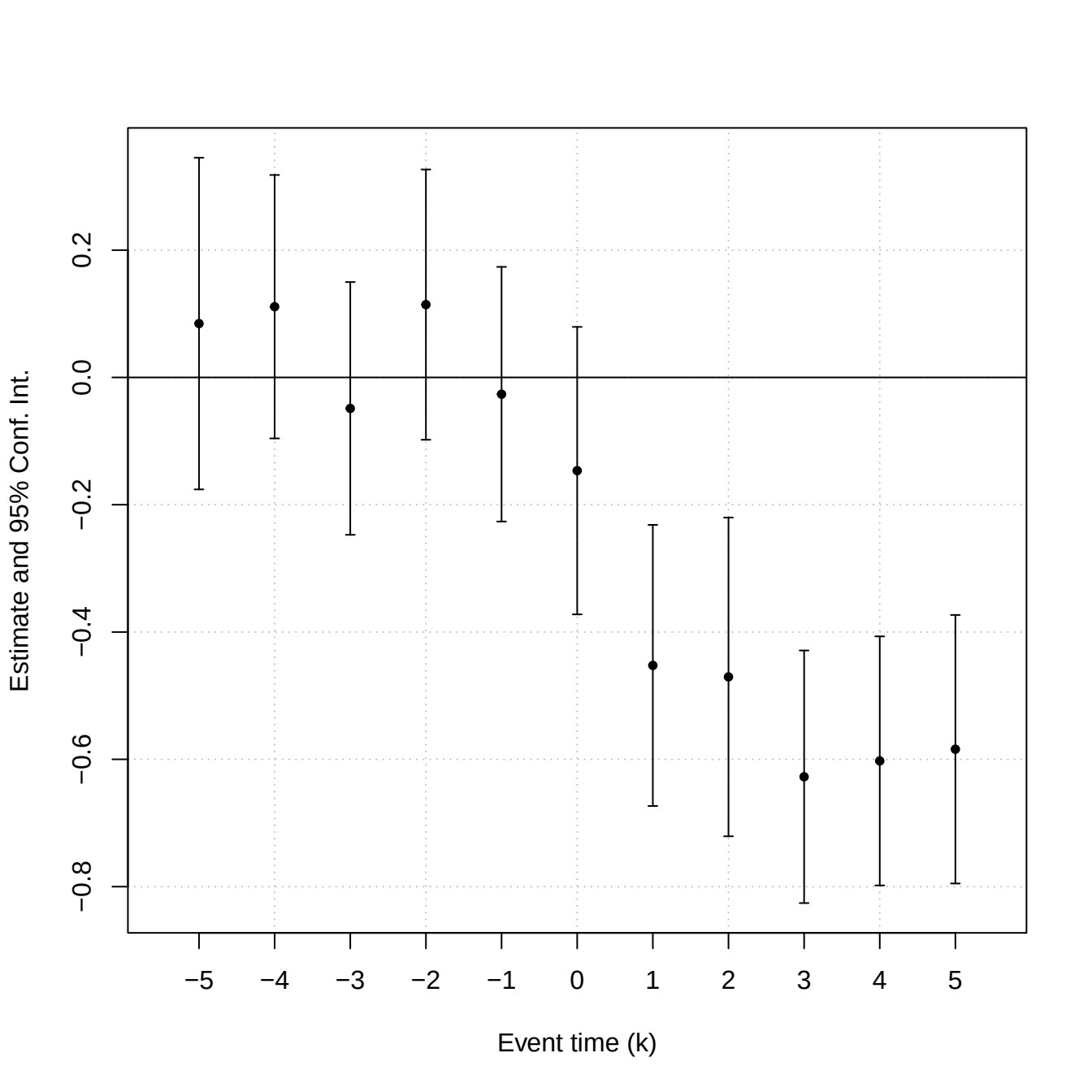

pull_request_merged
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_only
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.302
Pretrend (Low) p−value: 0.003
Wald test p−value: 0.773
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

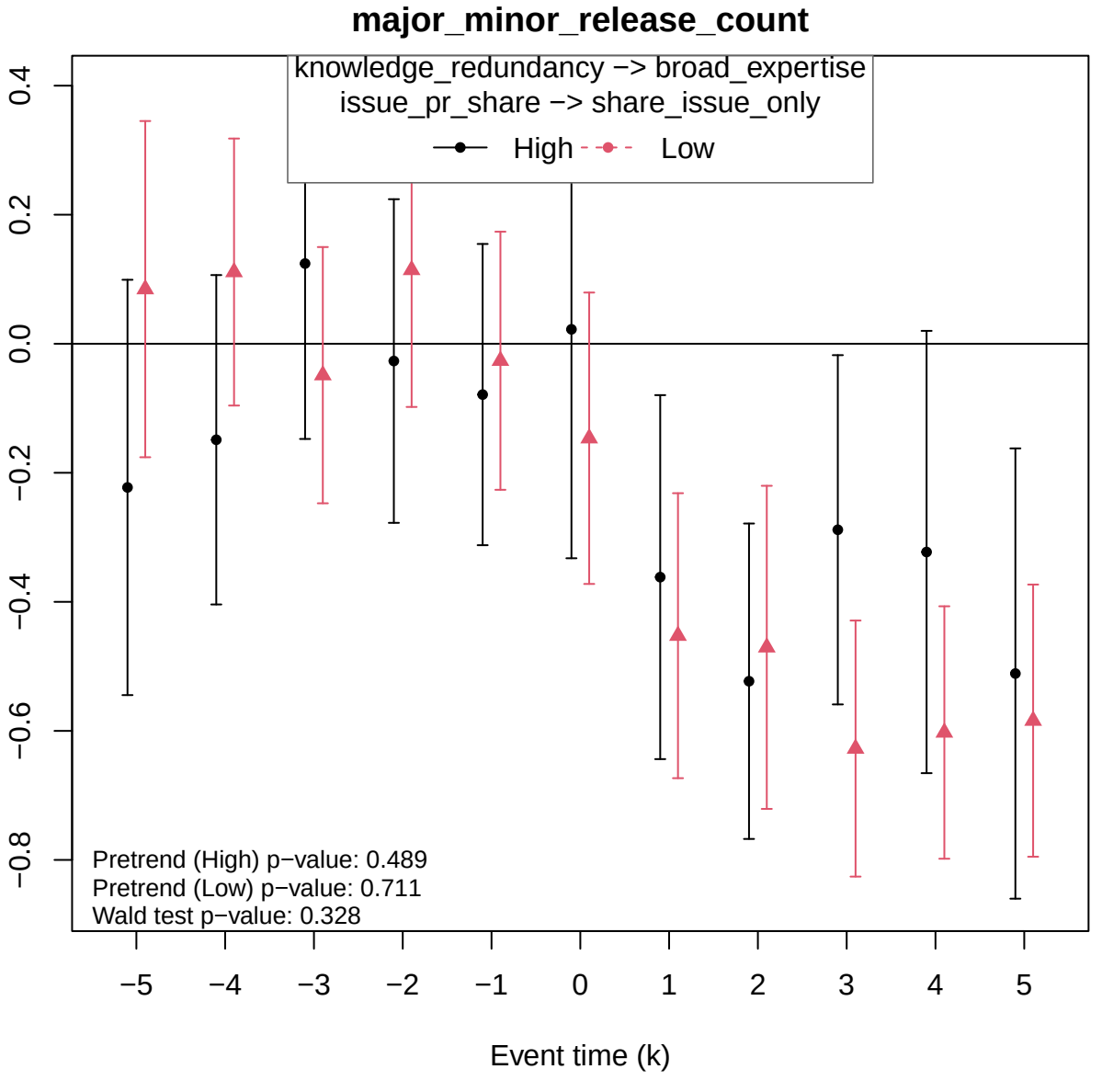

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

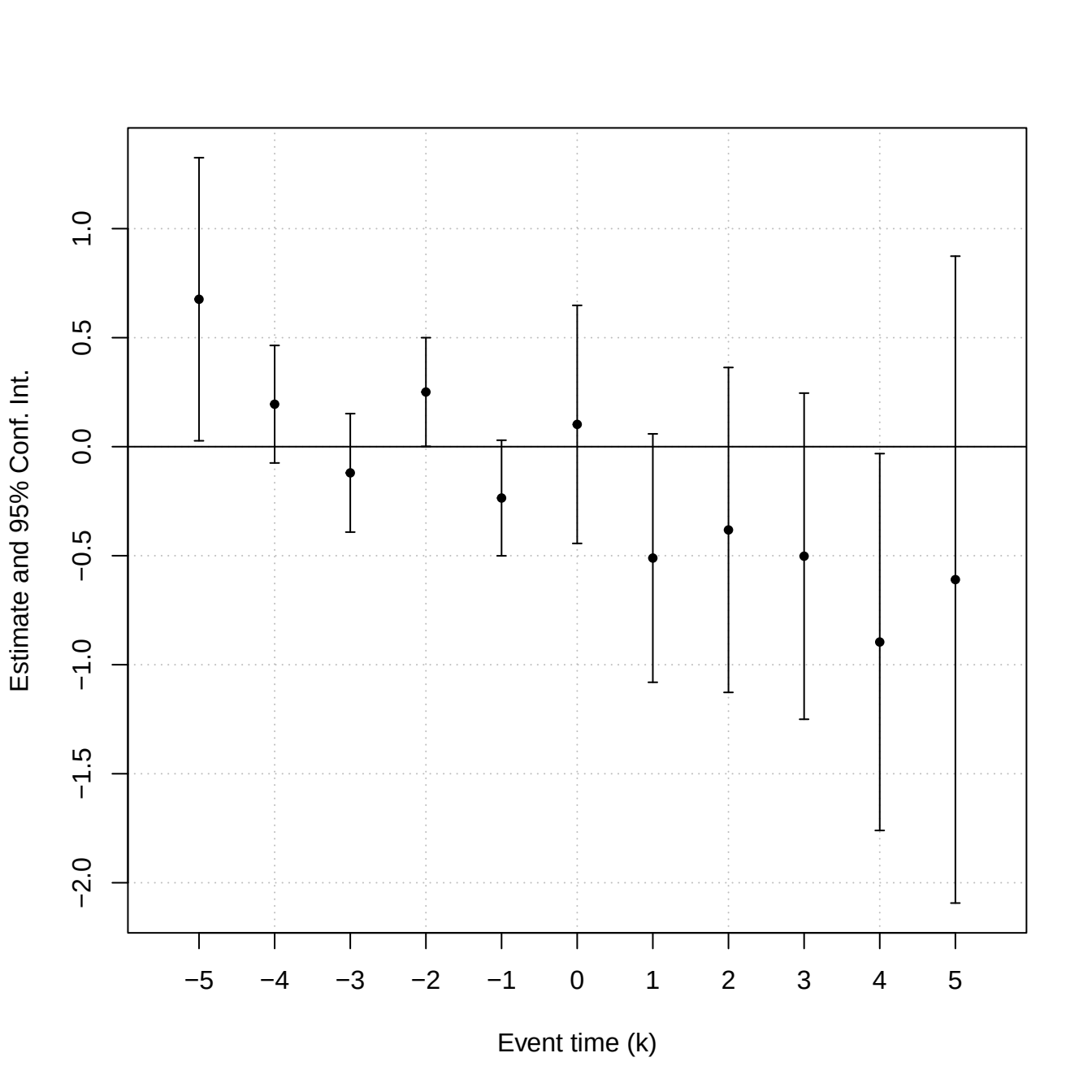

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

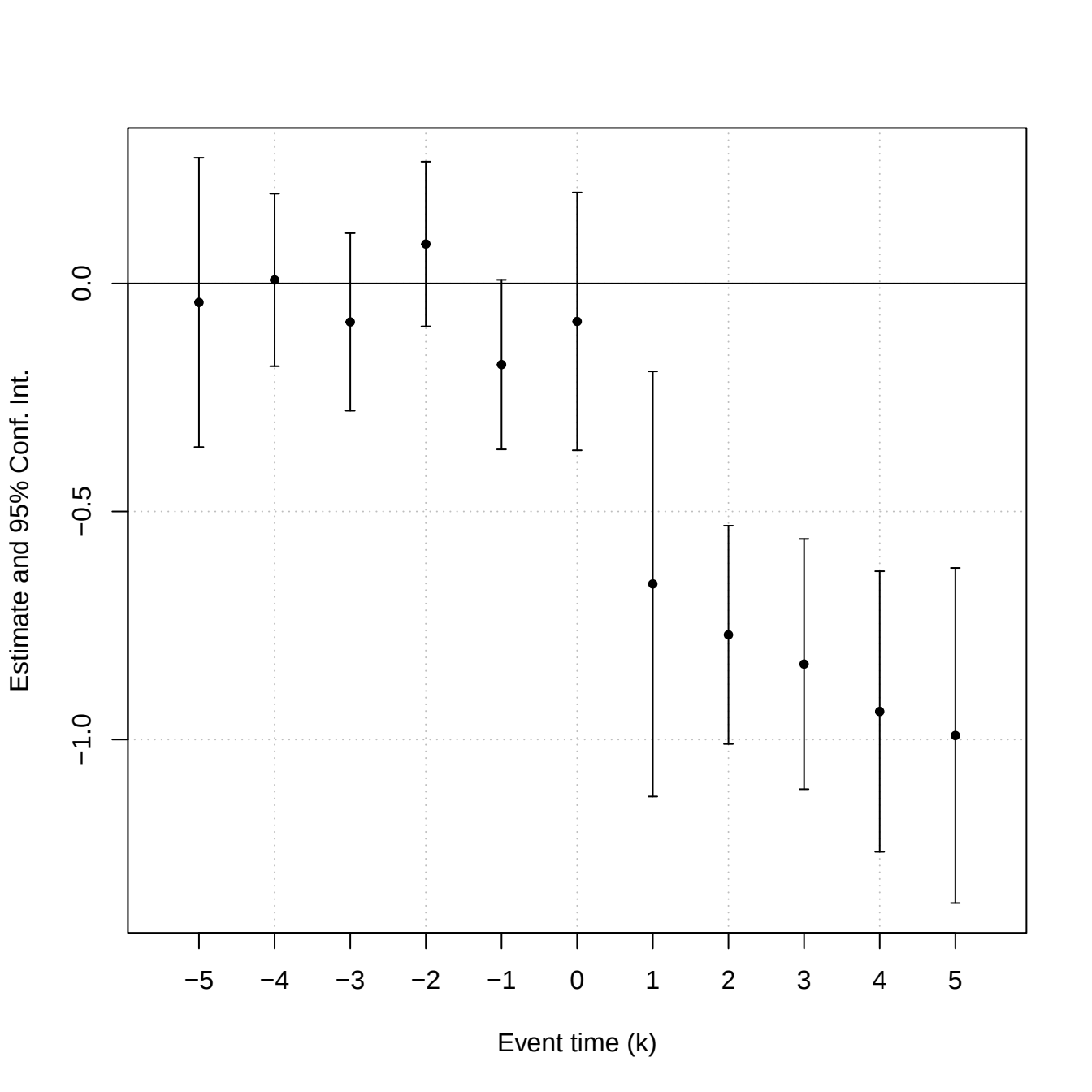

overall_new_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_only
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
Pretrend (High) p−value: 0.332
Pretrend (Low) p−value: 0.714
Wald test p−value: 0.163
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

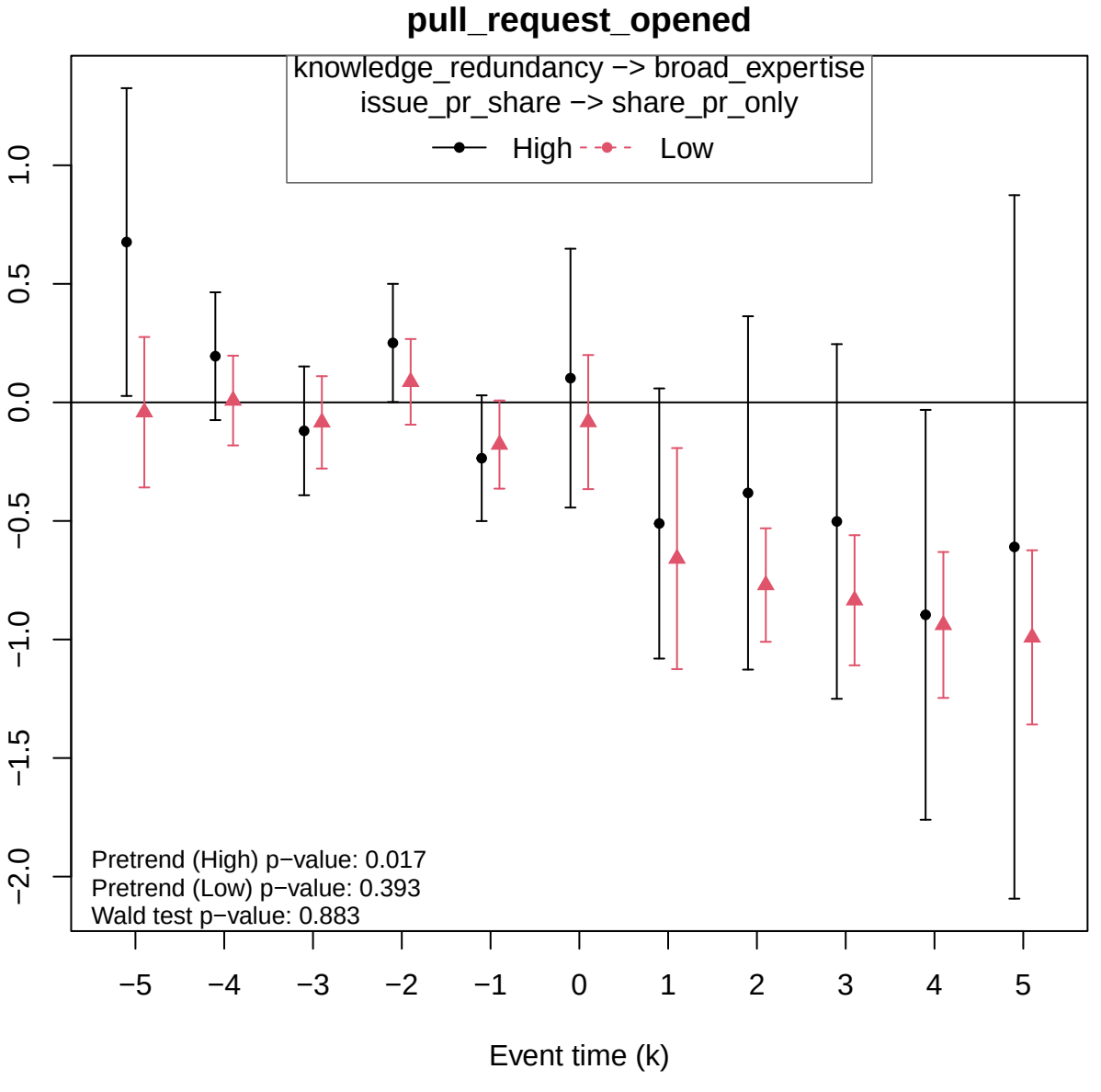

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

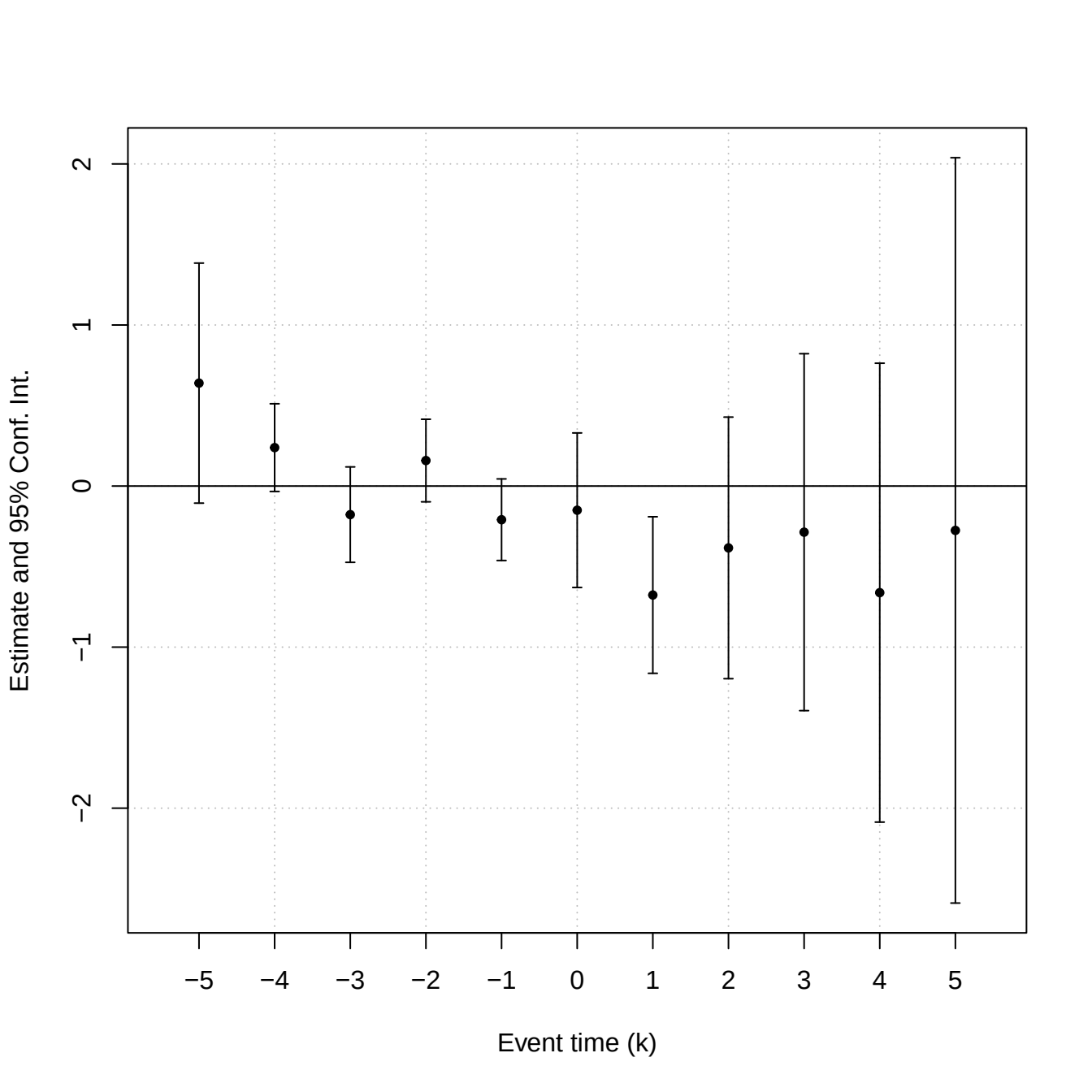

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

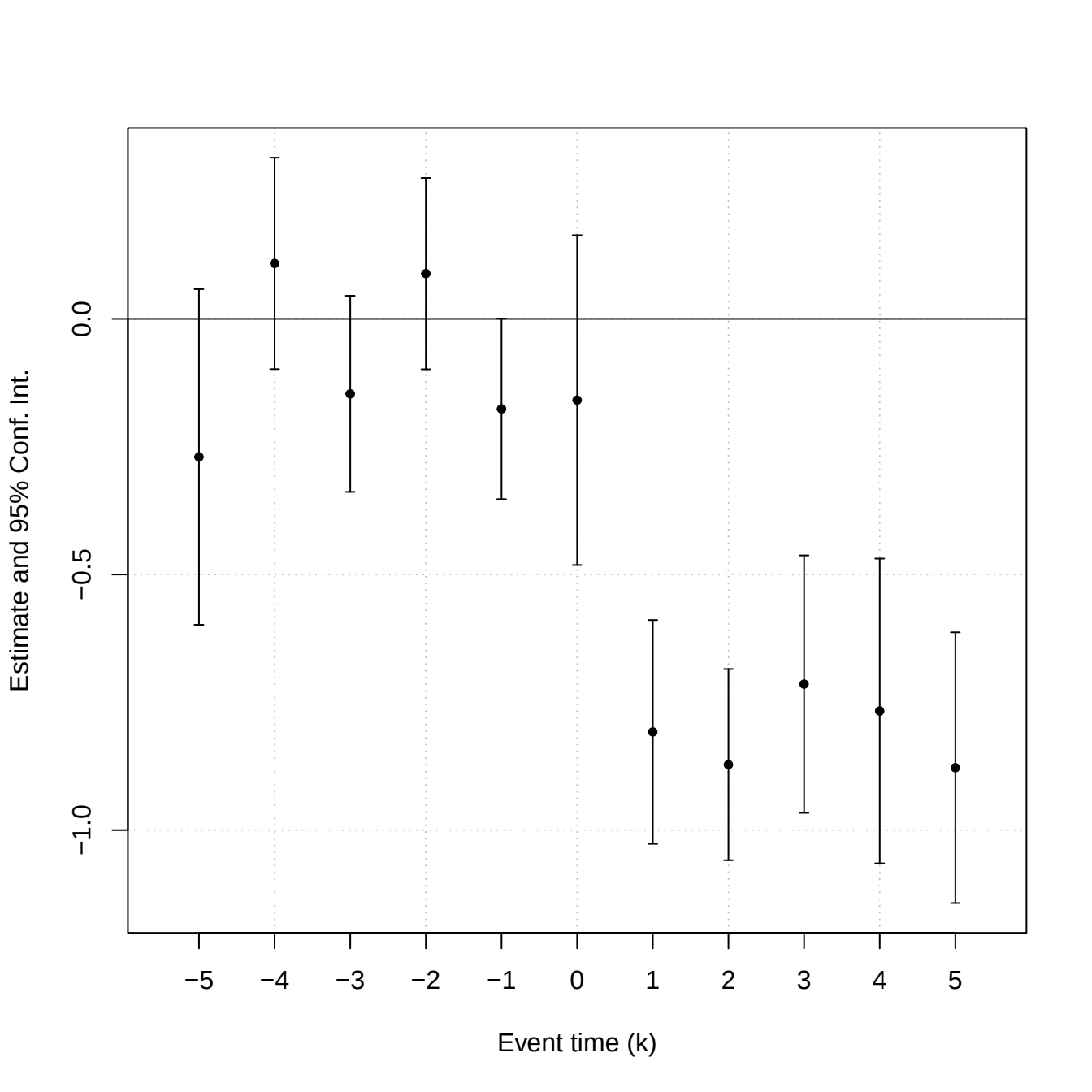

major_minor_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_only
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.489
Pretrend (Low) p−value: 0.711
Wald test p−value: 0.328
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

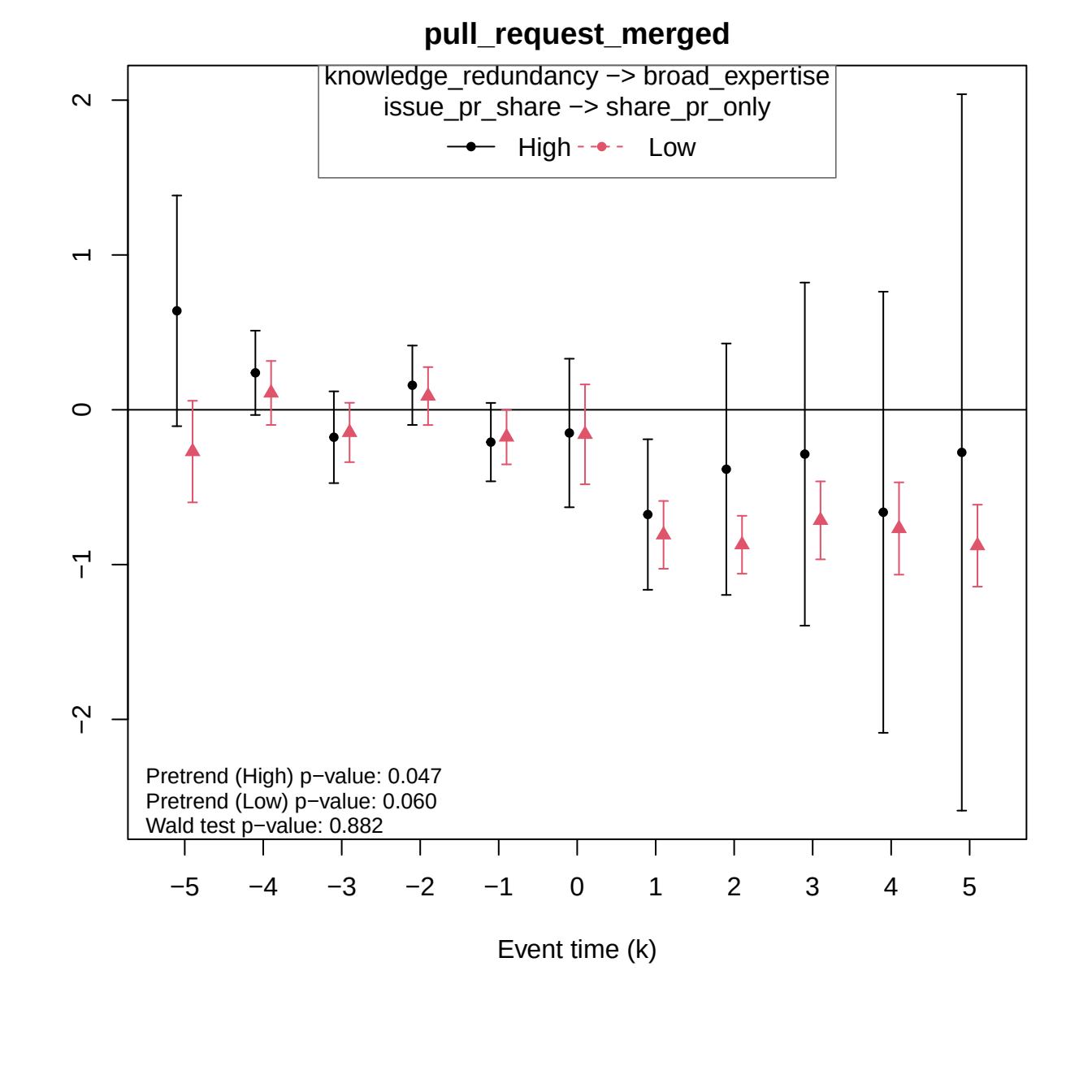

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

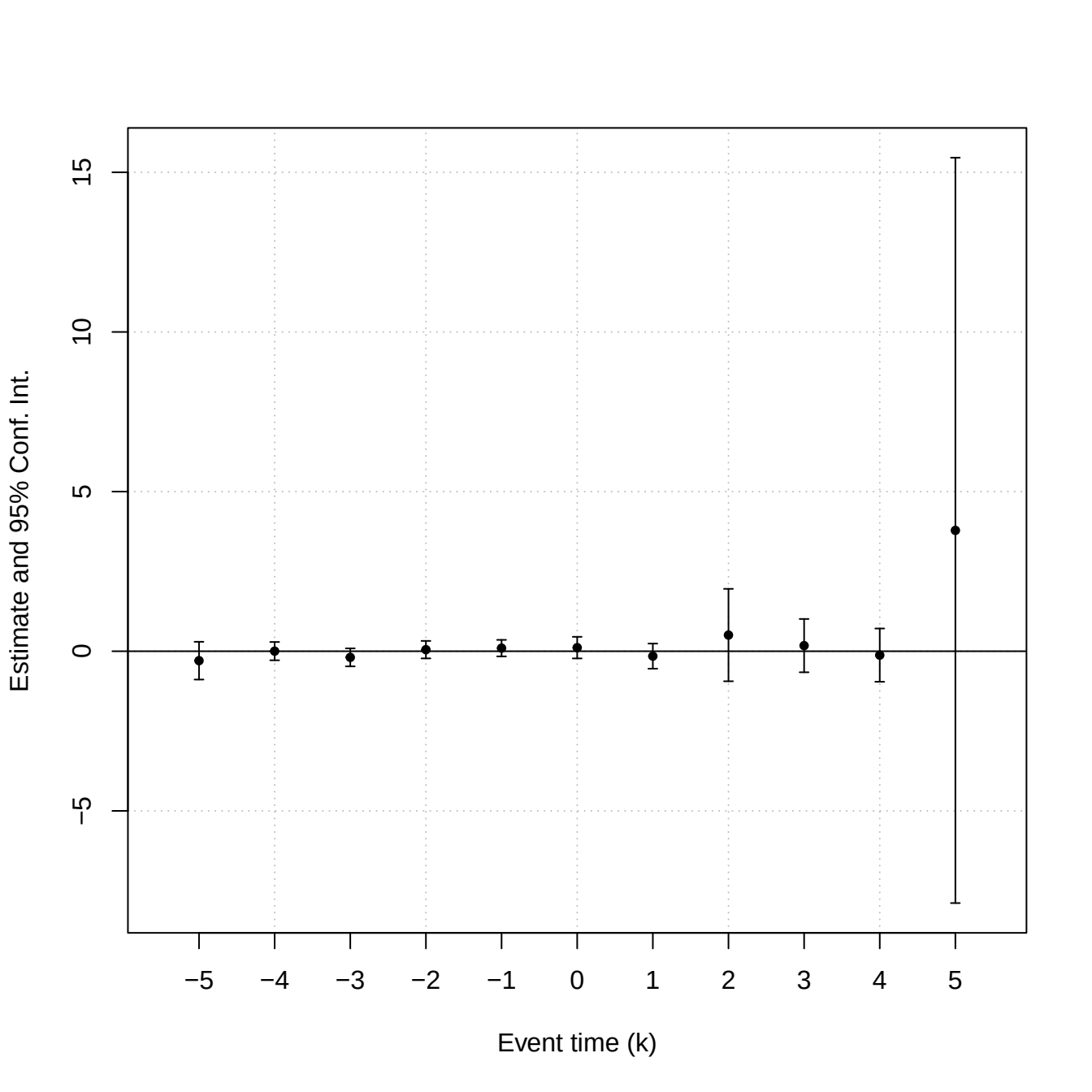

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

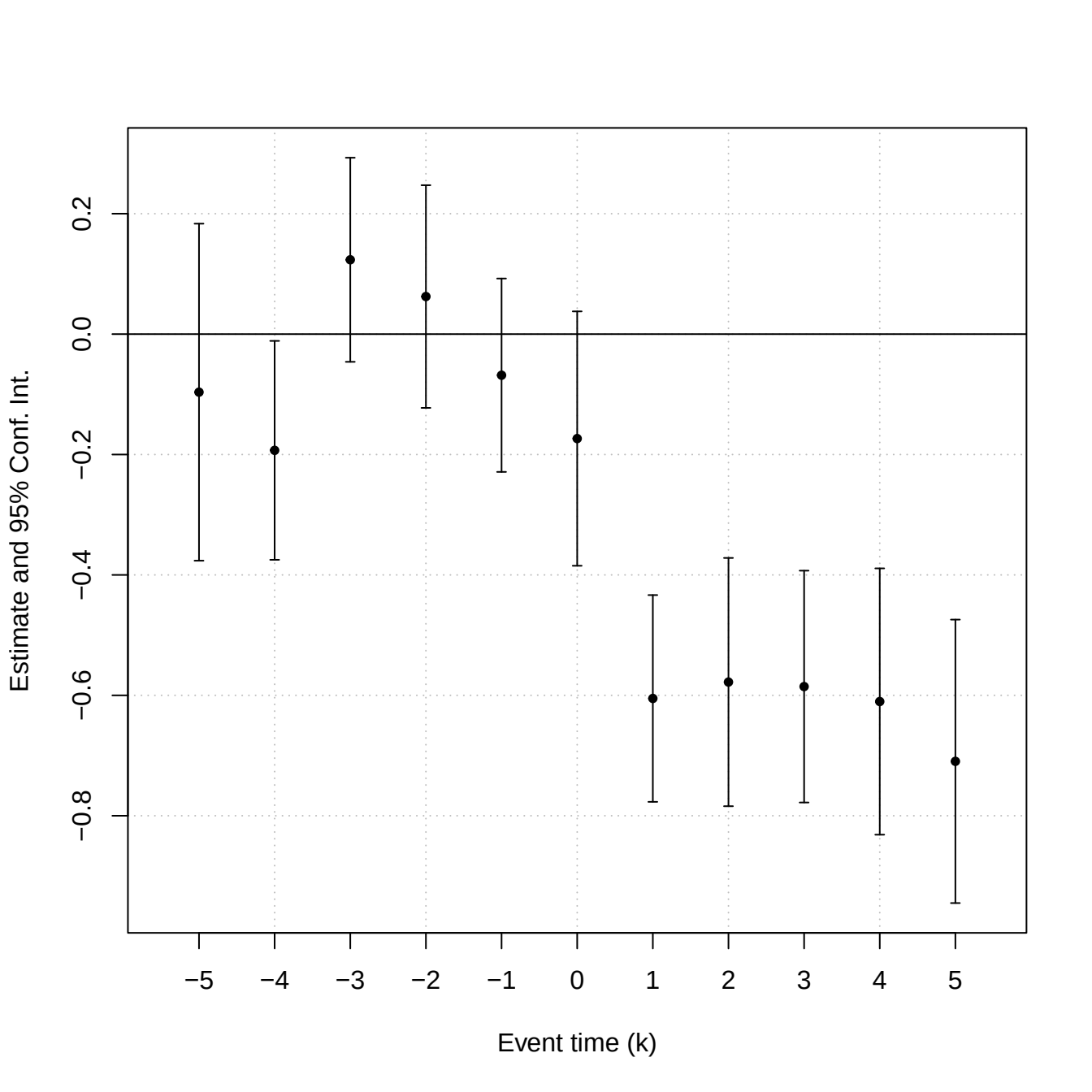

pull_request_opened
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_pr_only
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.017
Pretrend (Low) p−value: 0.393
Wald test p−value: 0.883
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

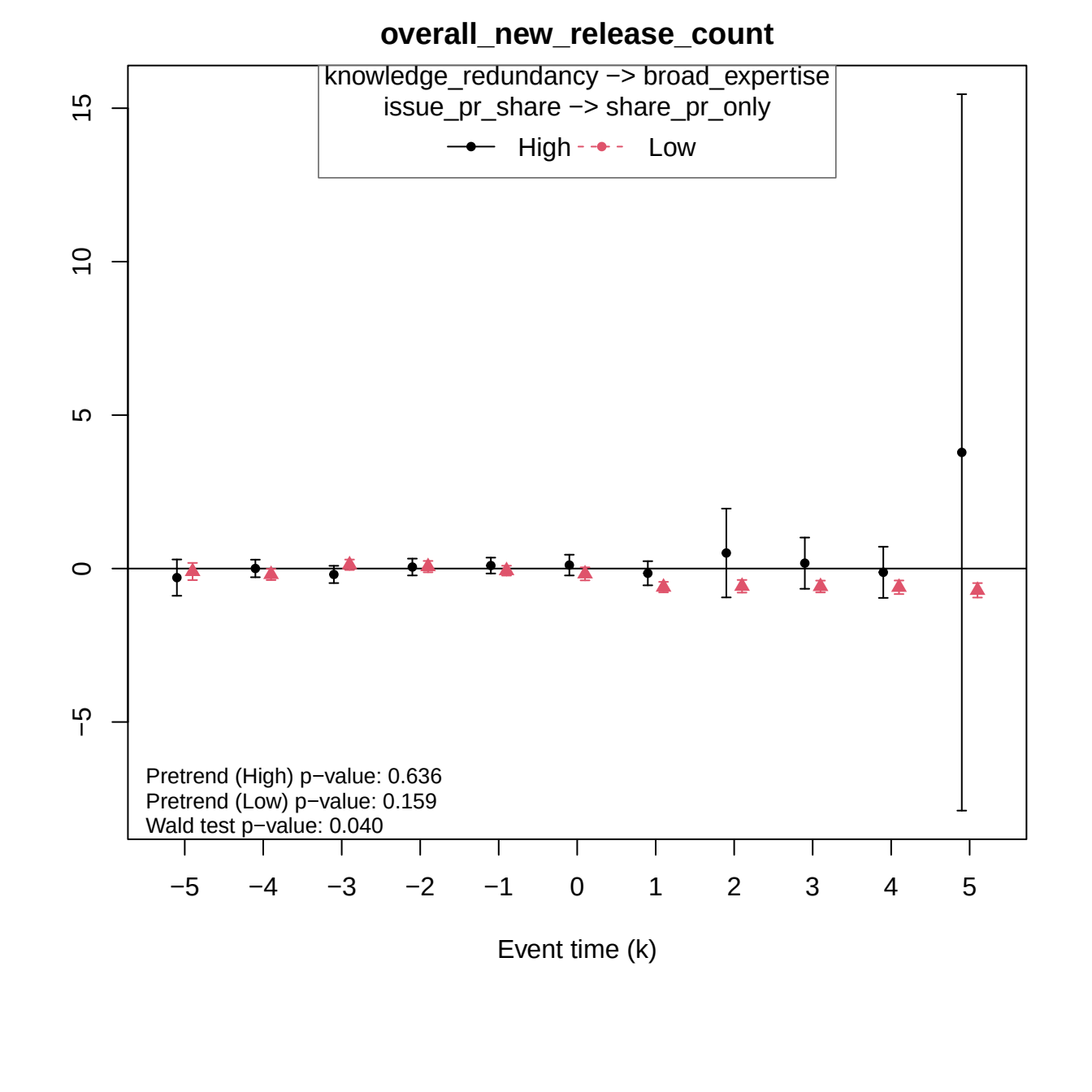

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

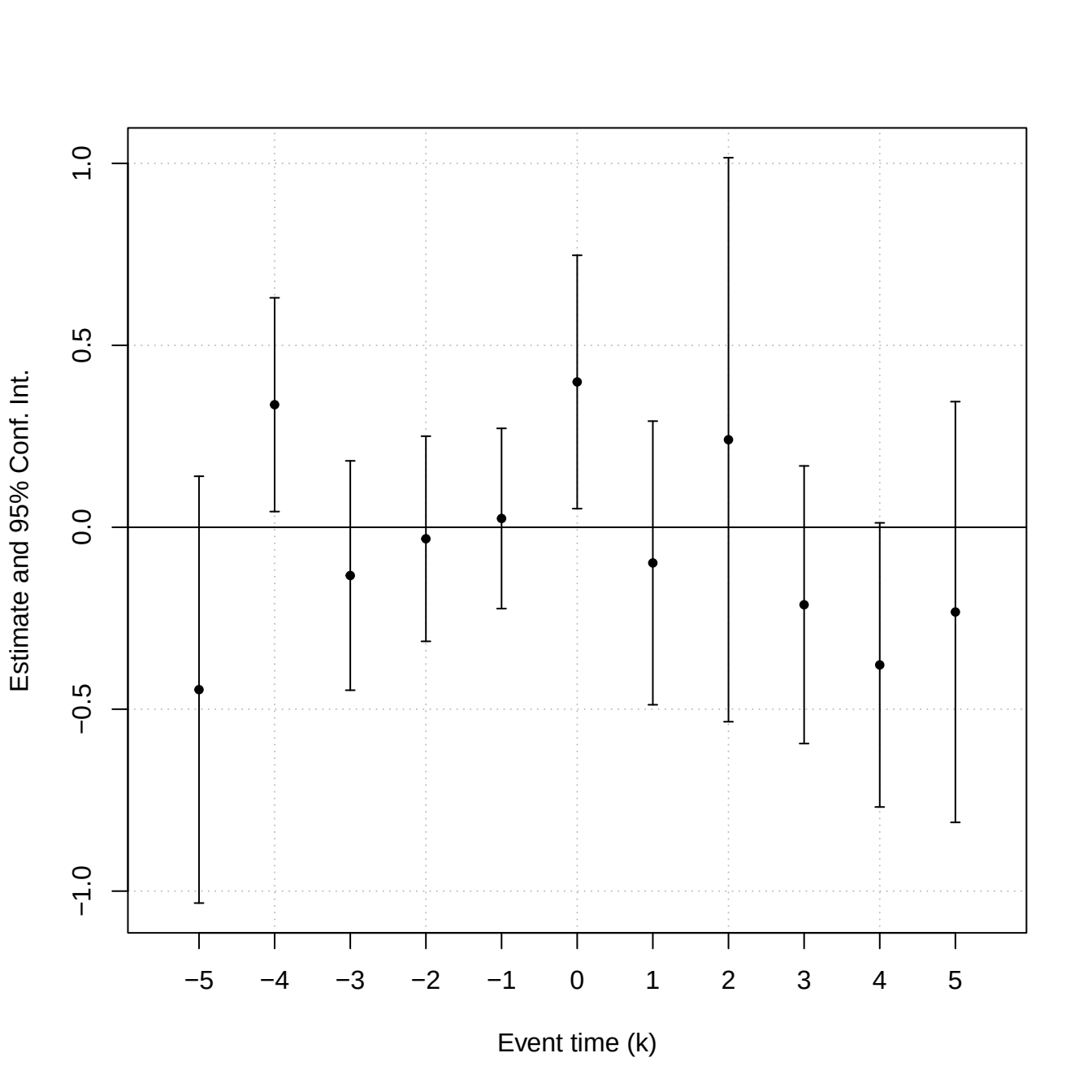

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

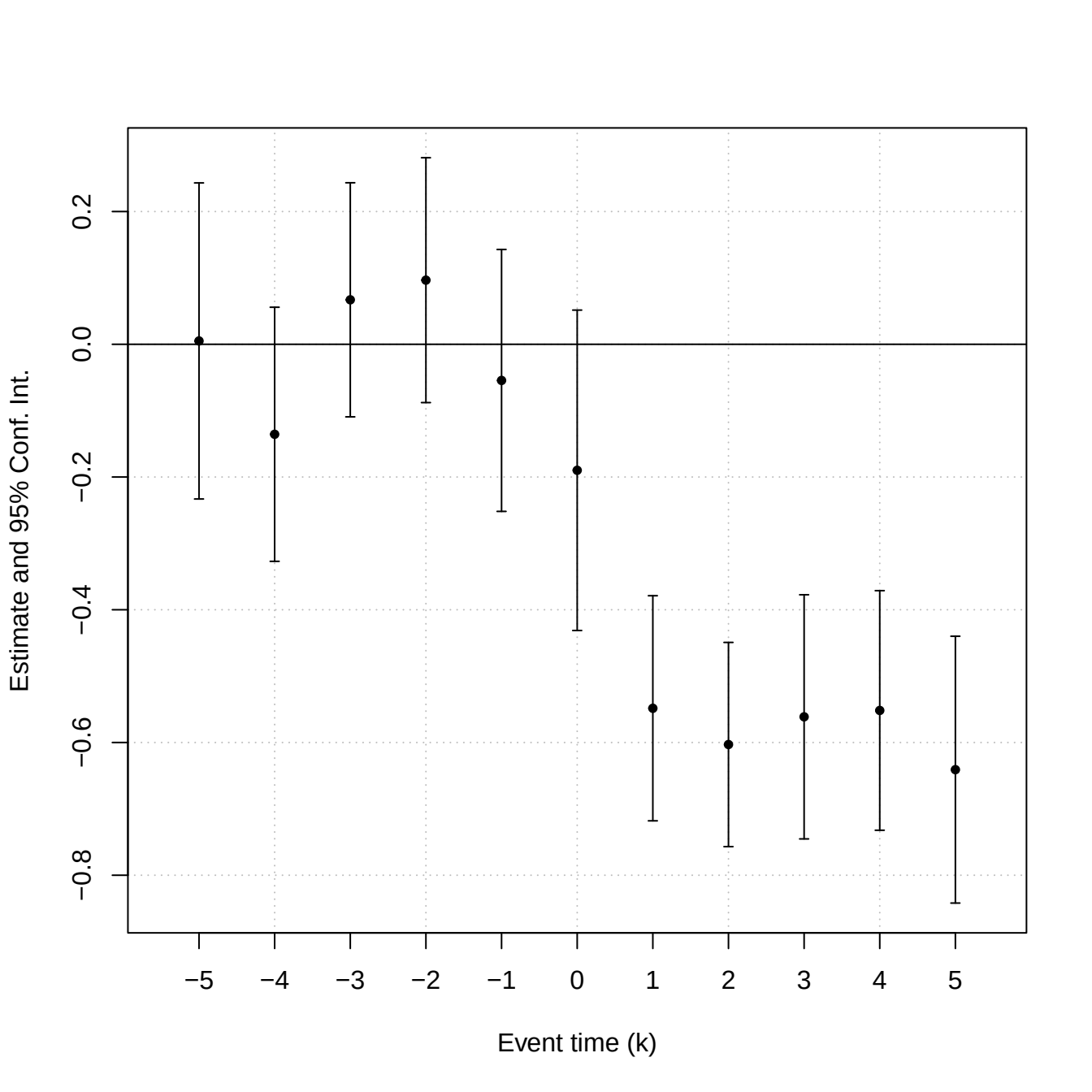

pull_request_merged
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_pr_only
High
Low
2
1
0
−1
−2
Pretrend (High) p−value: 0.047
Pretrend (Low) p−value: 0.060
Wald test p−value: 0.882
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

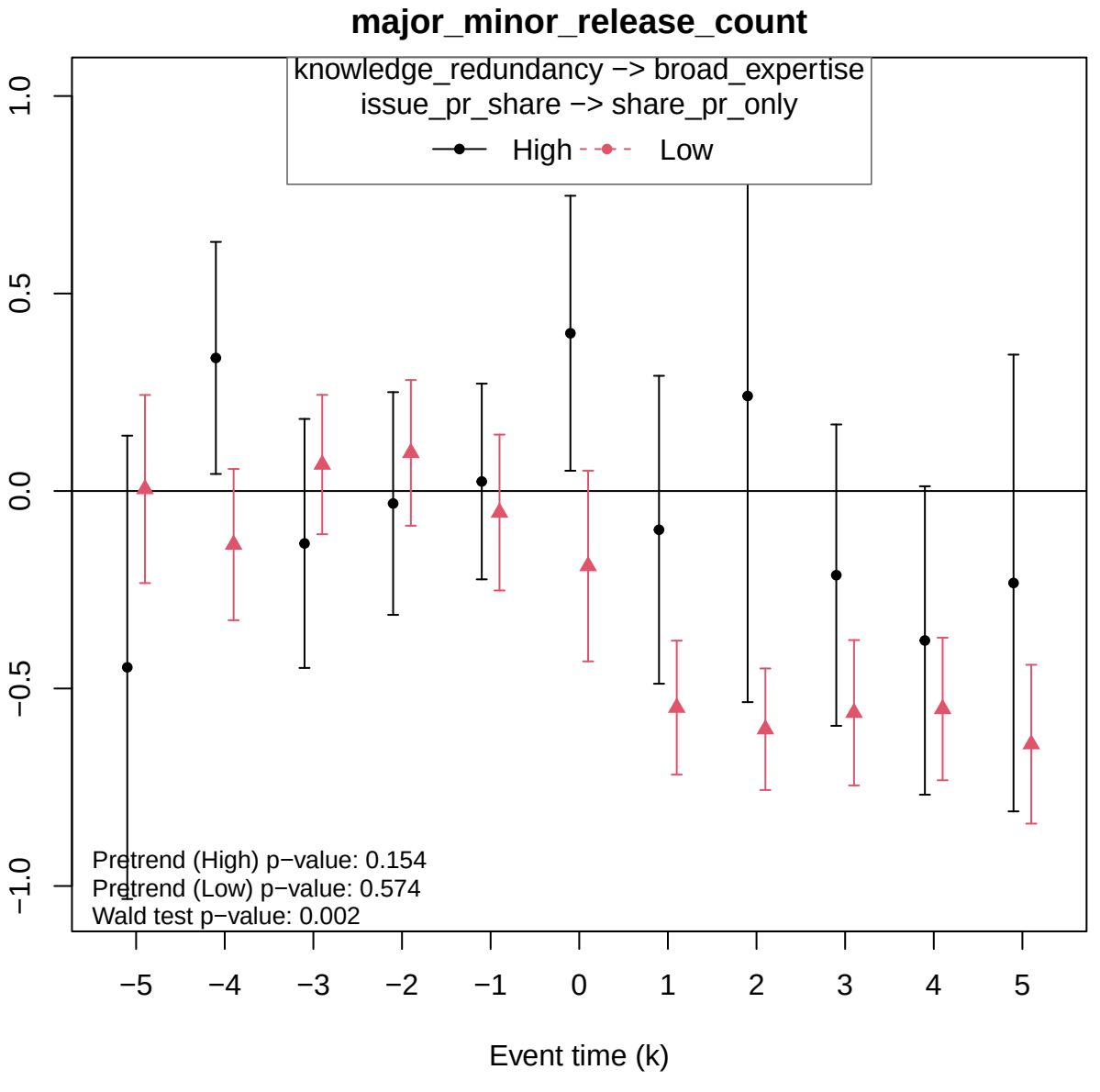

Estimate and 95% Conf. Int.
15
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

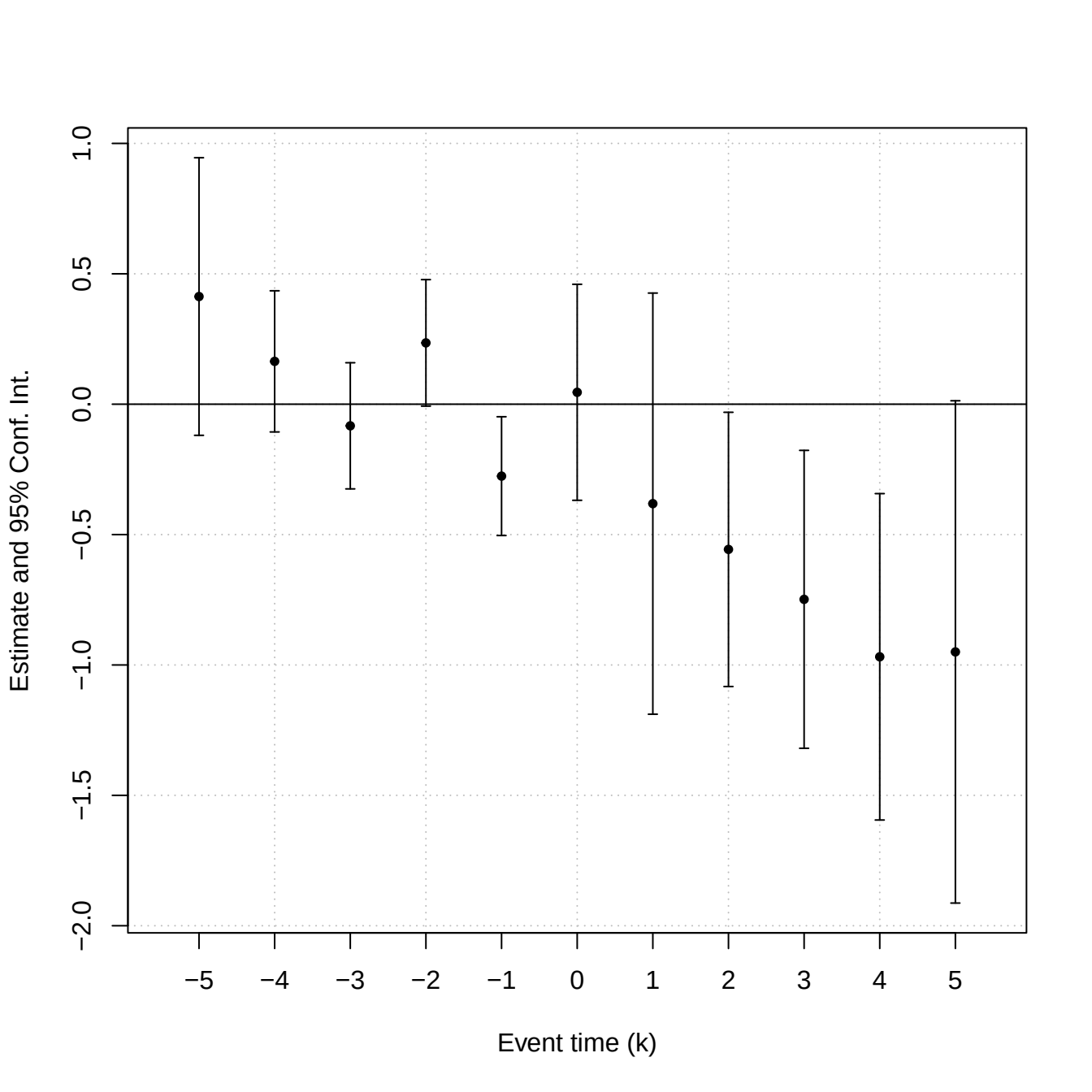

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

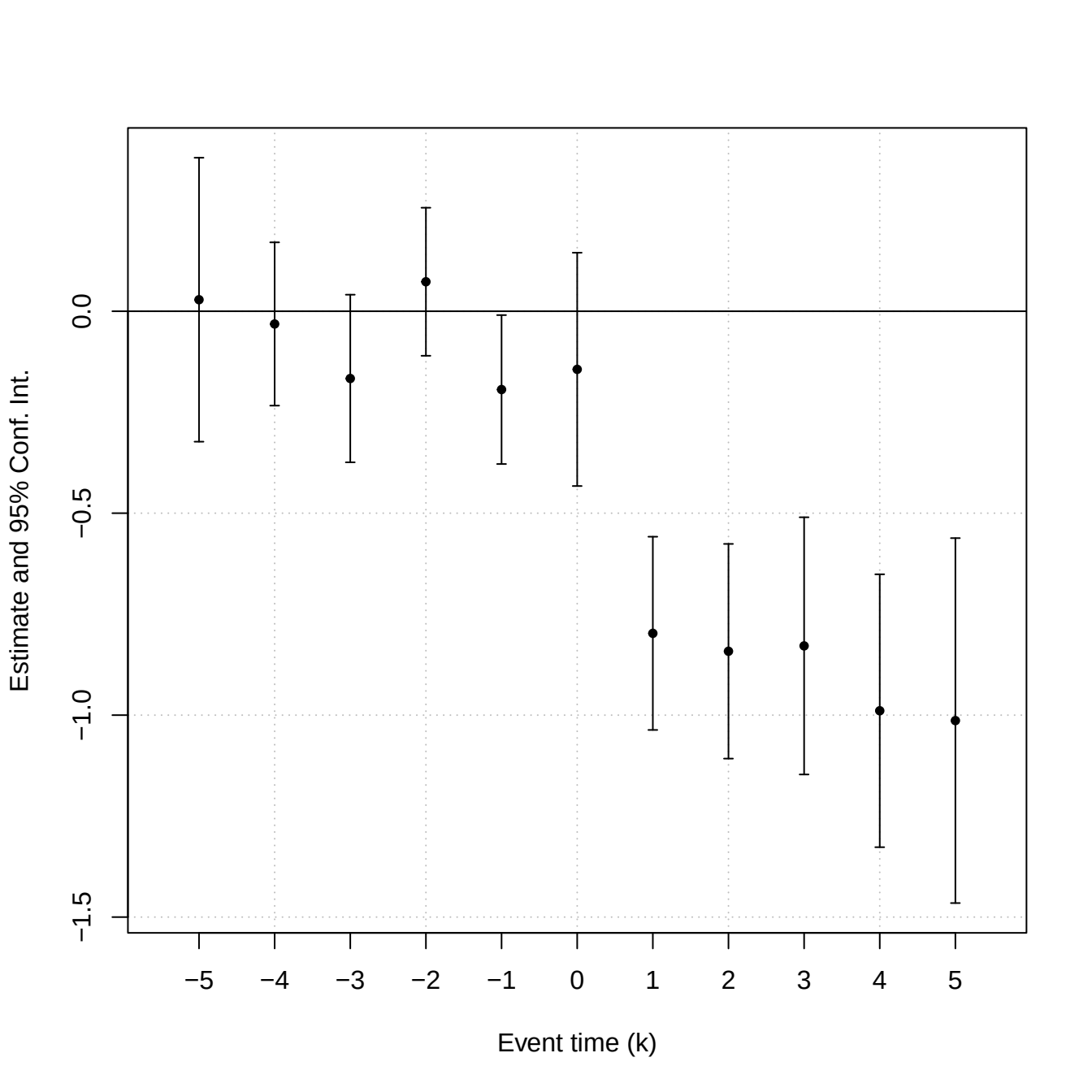

overall_new_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_pr_only
High
Low
15
10
5
0
−5
Pretrend (High) p−value: 0.636
Pretrend (Low) p−value: 0.159
Wald test p−value: 0.040
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

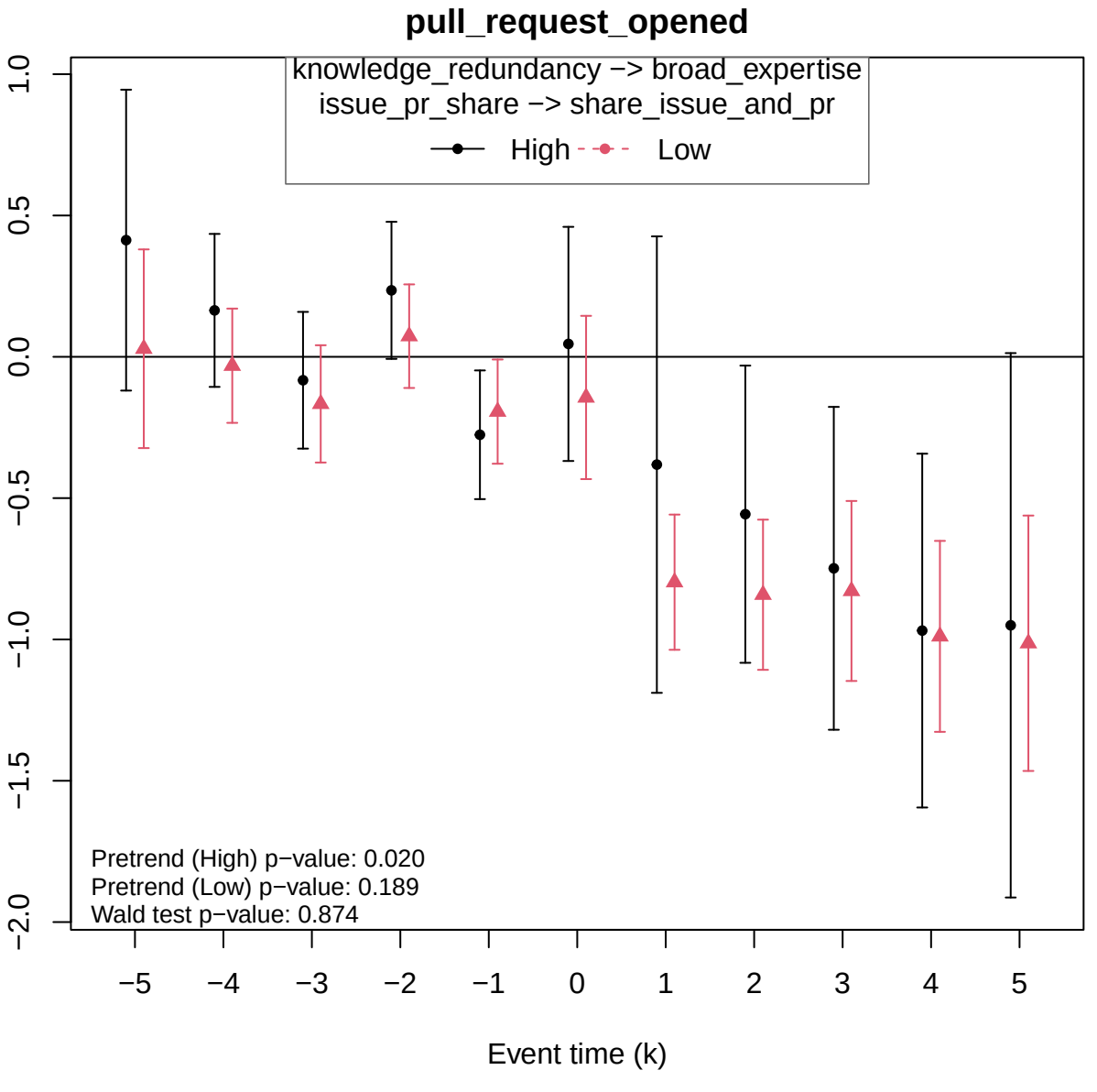

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

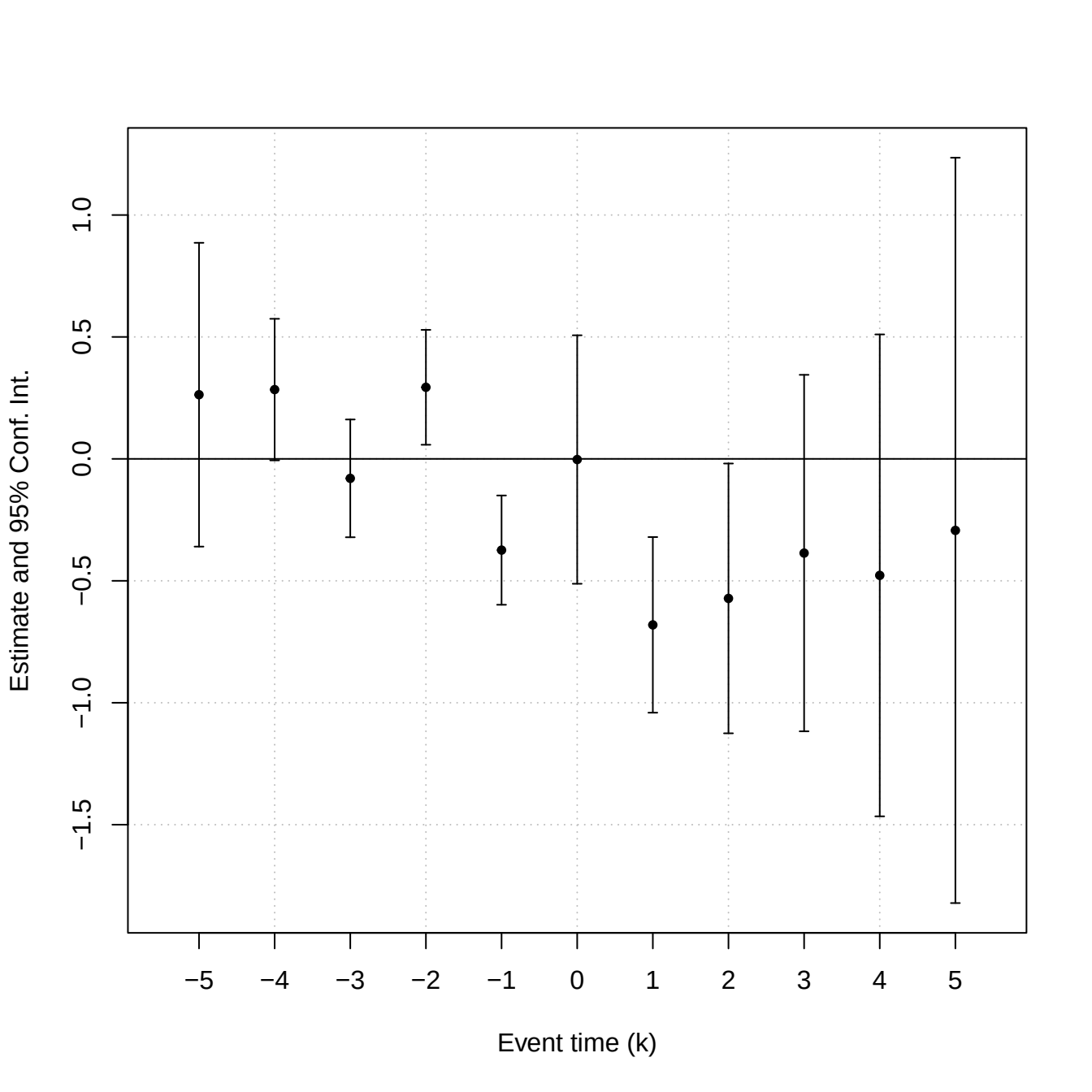

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

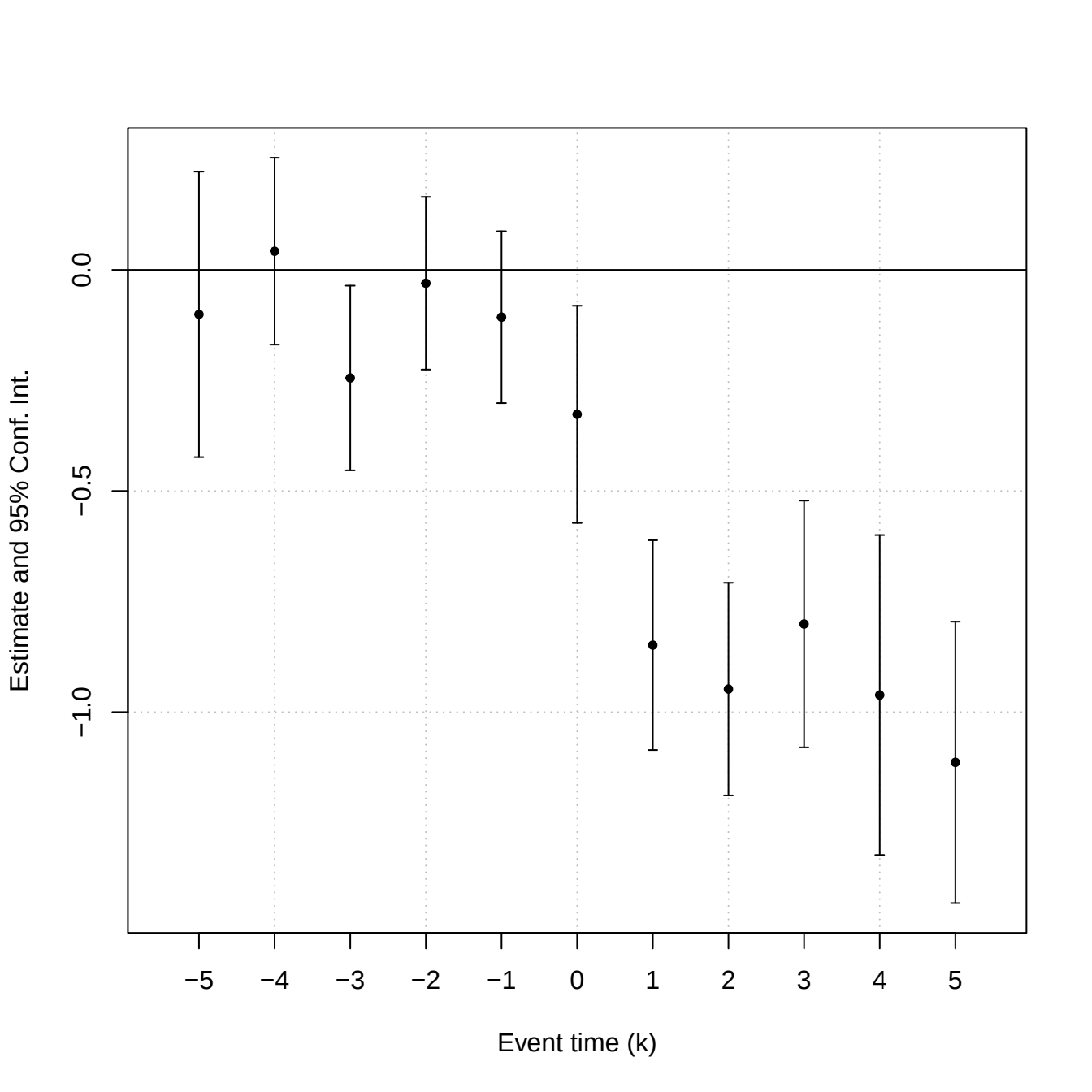

major_minor_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_pr_only
High
Low
1.0
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.154
Pretrend (Low) p−value: 0.574
Wald test p−value: 0.002
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

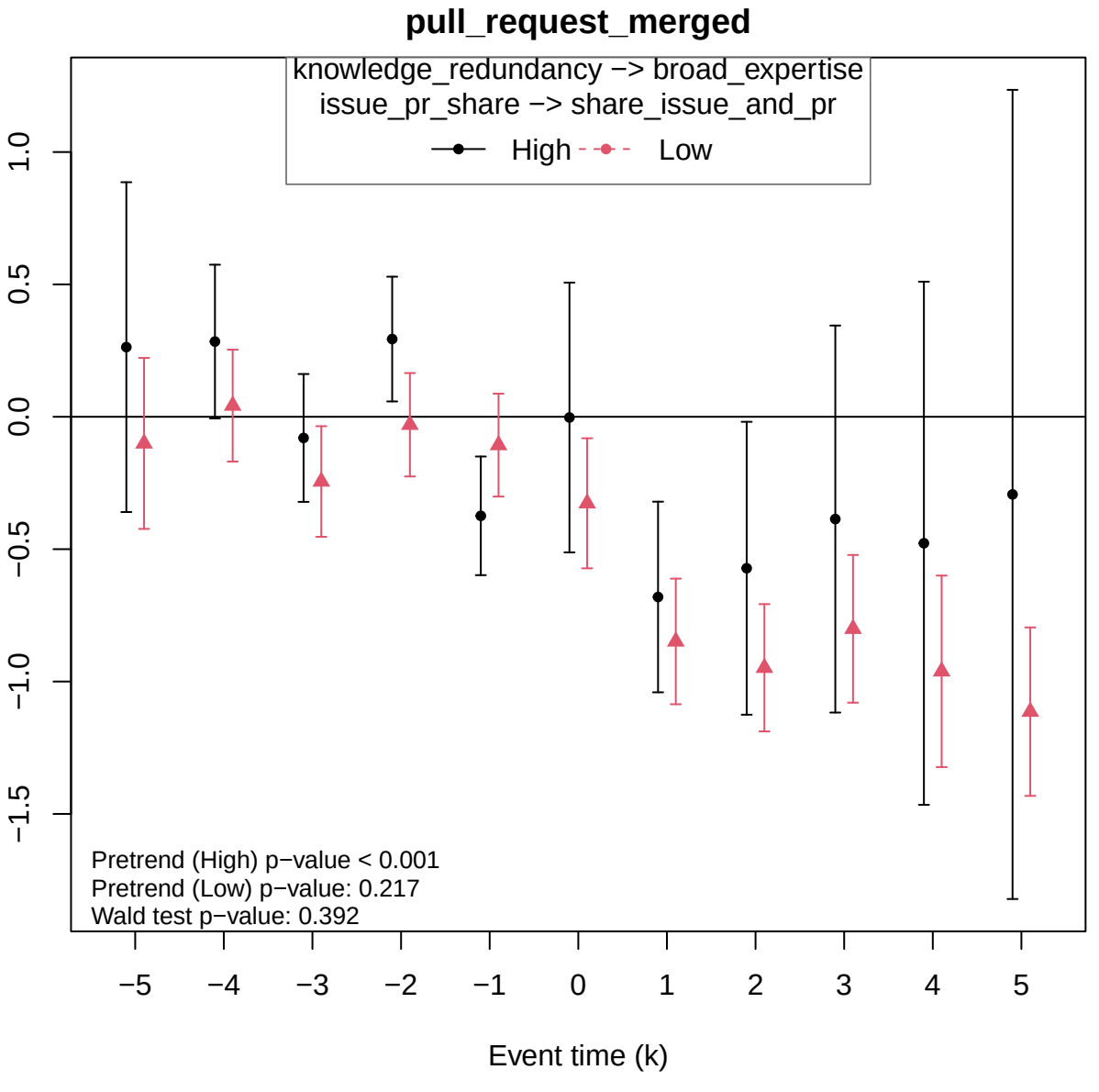

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

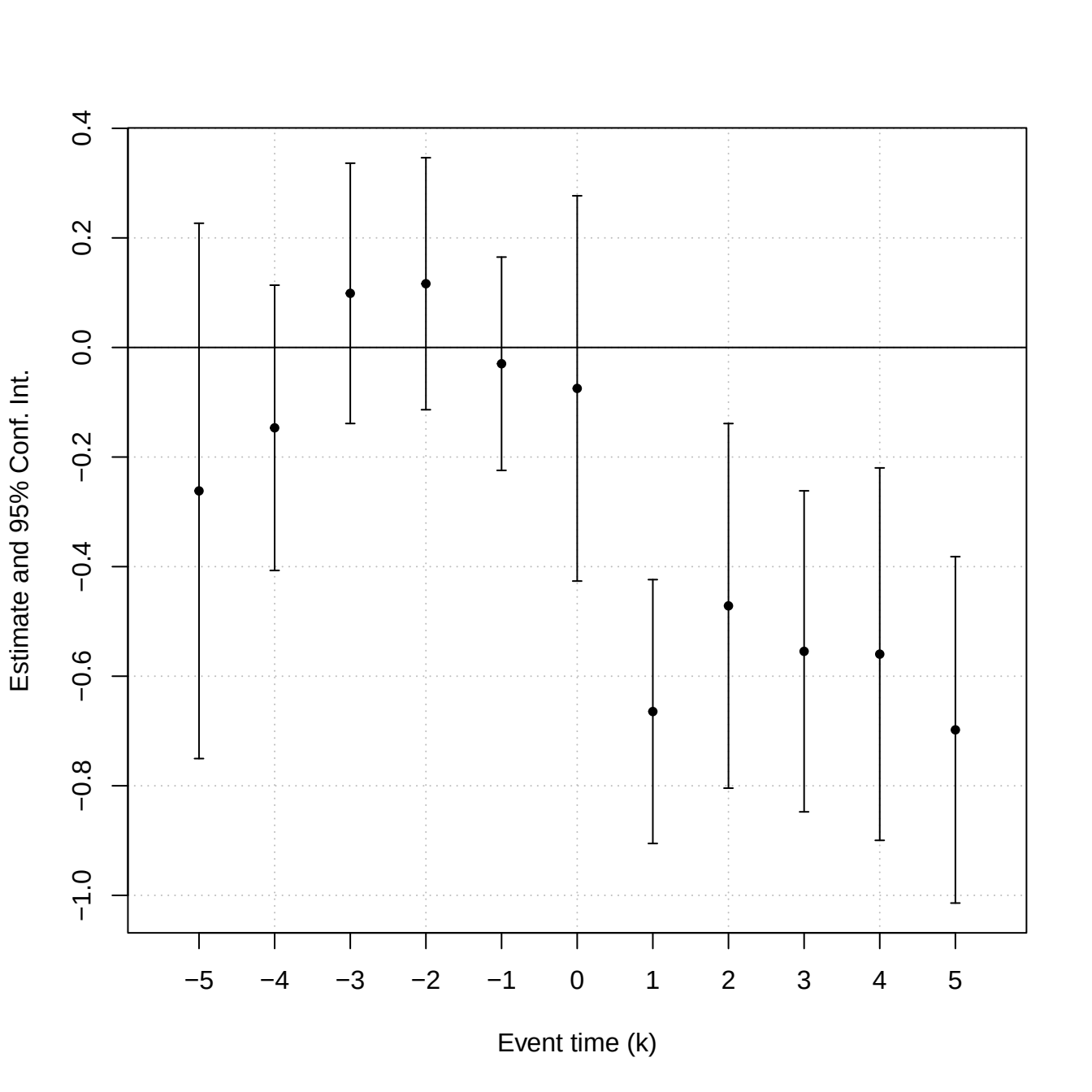

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

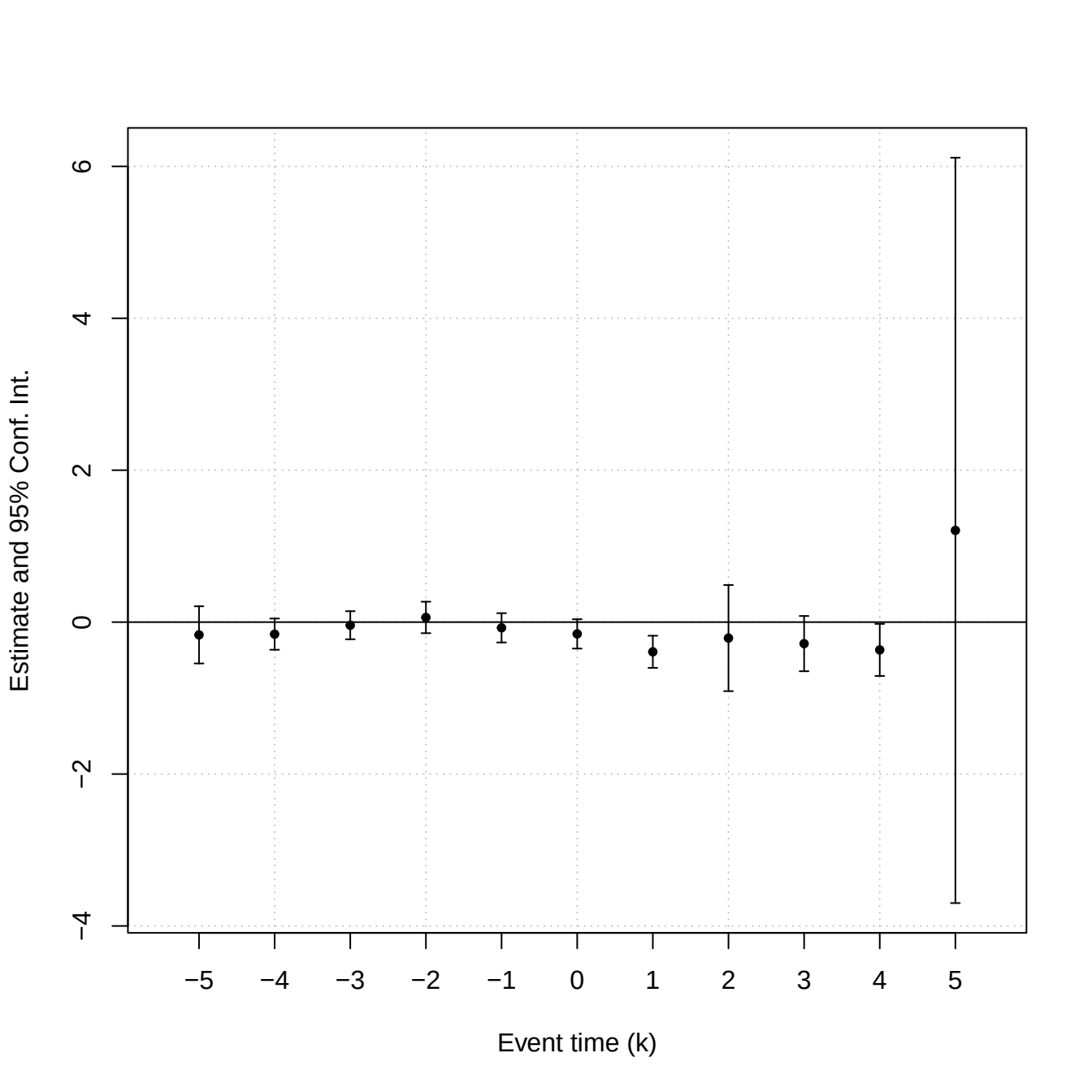

pull_request_opened
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_and_pr
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.020
Pretrend (Low) p−value: 0.189
Wald test p−value: 0.874
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

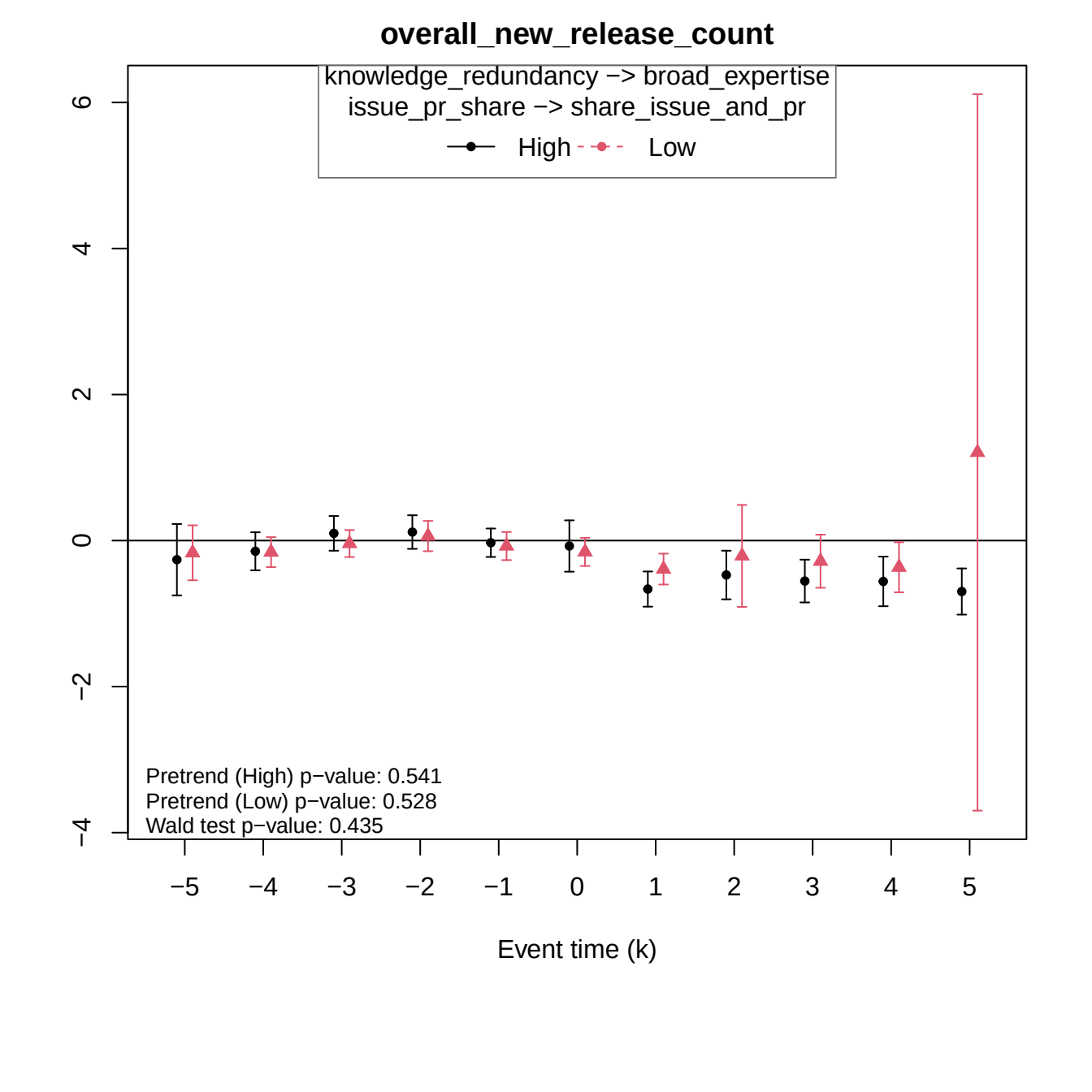

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

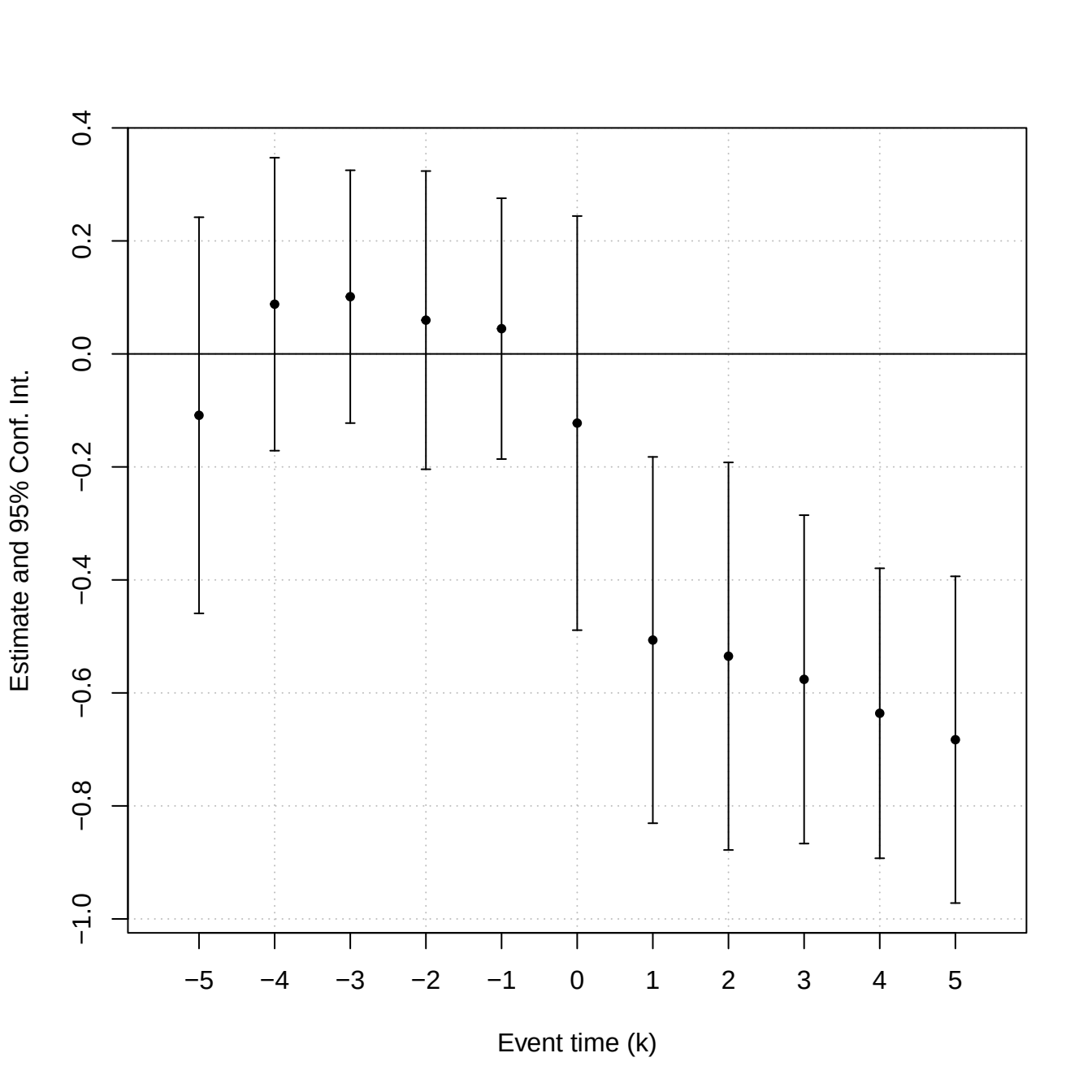

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

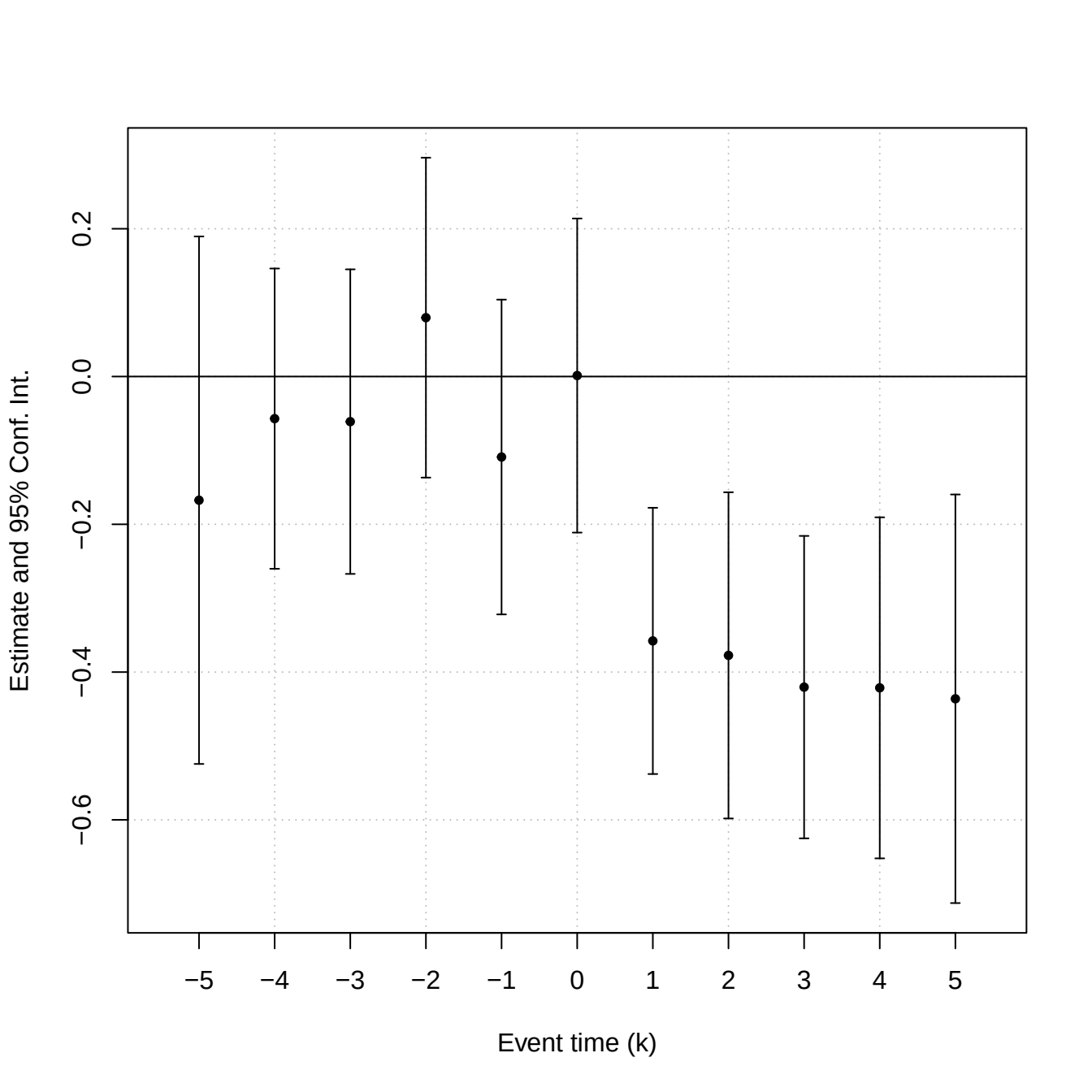

pull_request_merged
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_and_pr
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value < 0.001
Pretrend (Low) p−value: 0.217
Wald test p−value: 0.392
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

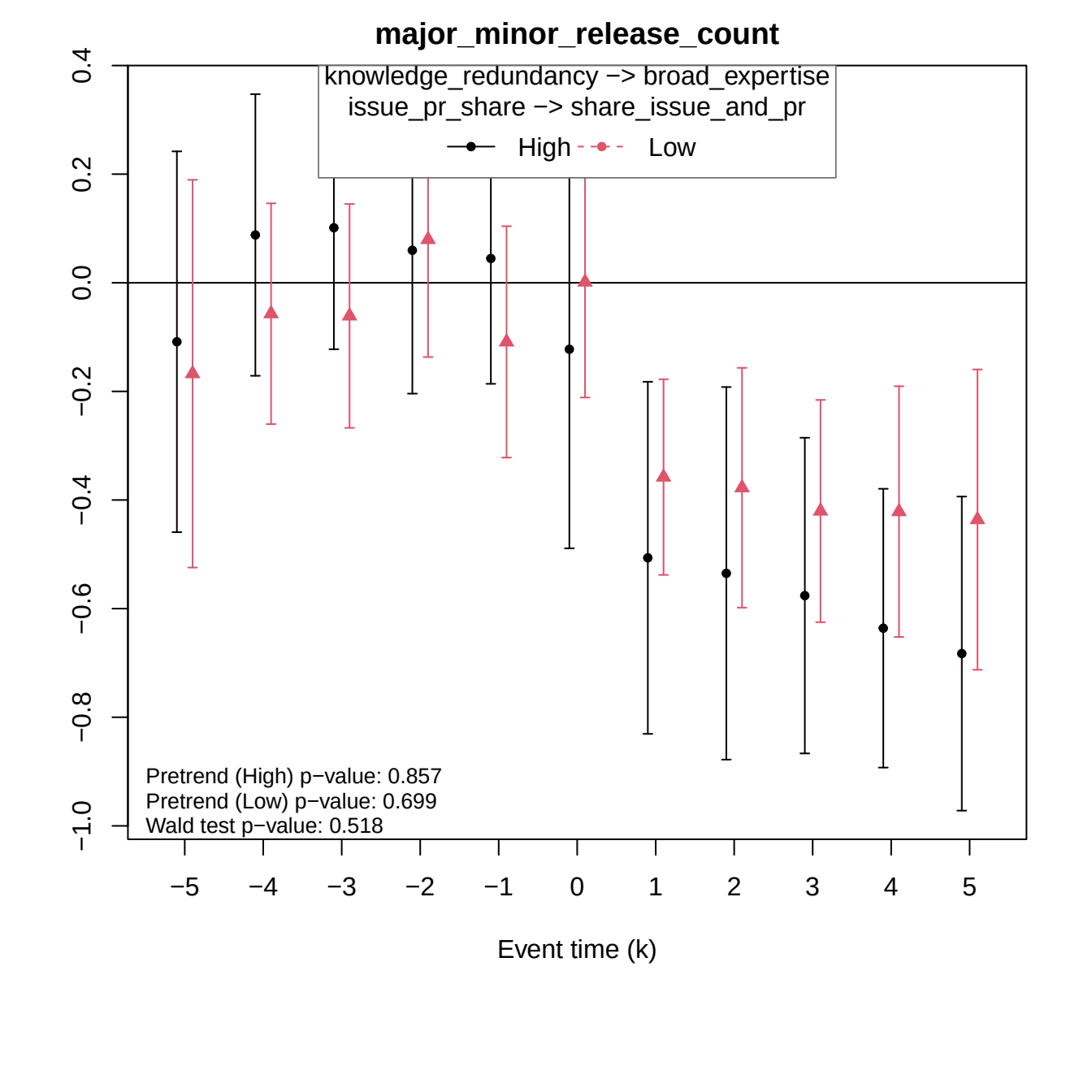

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

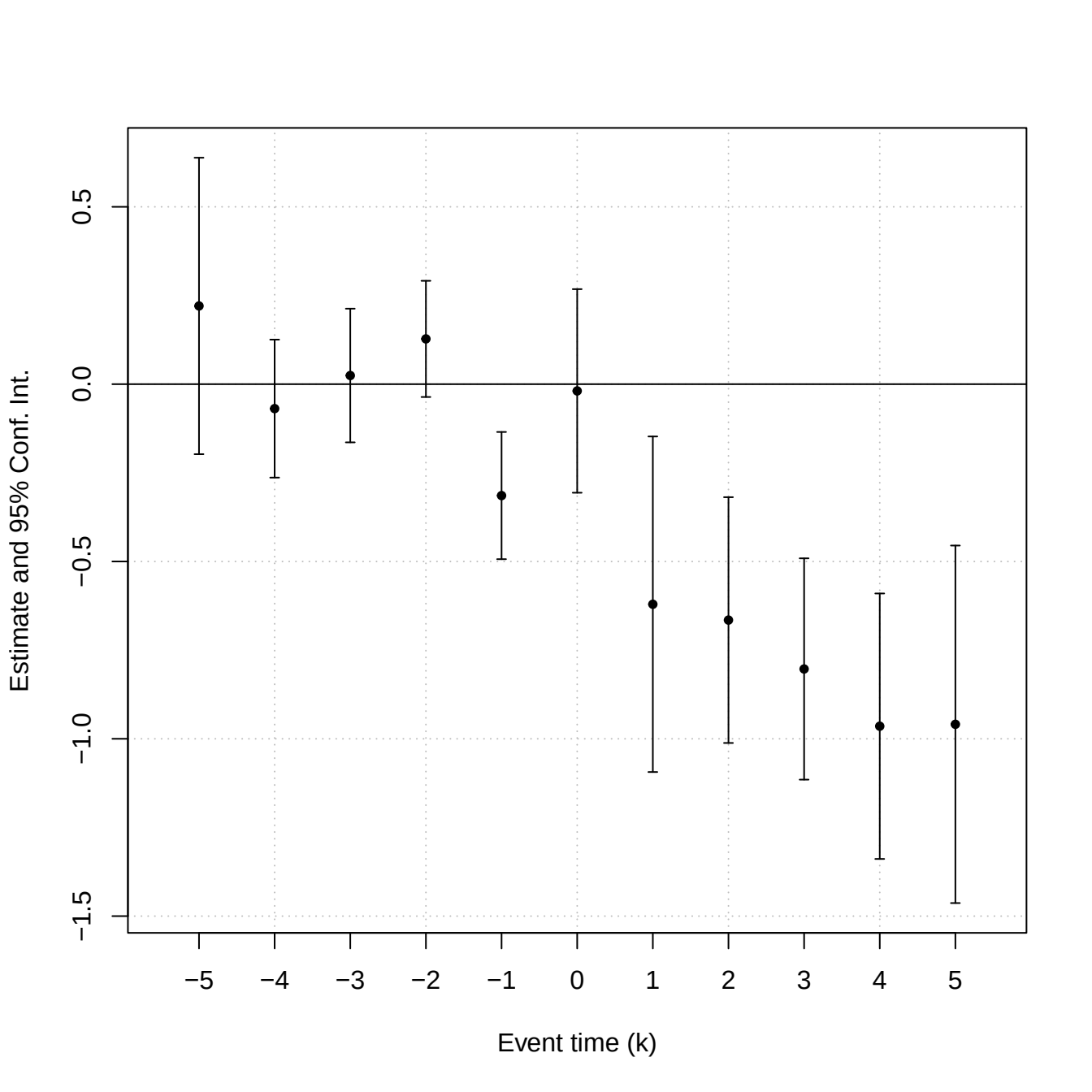

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

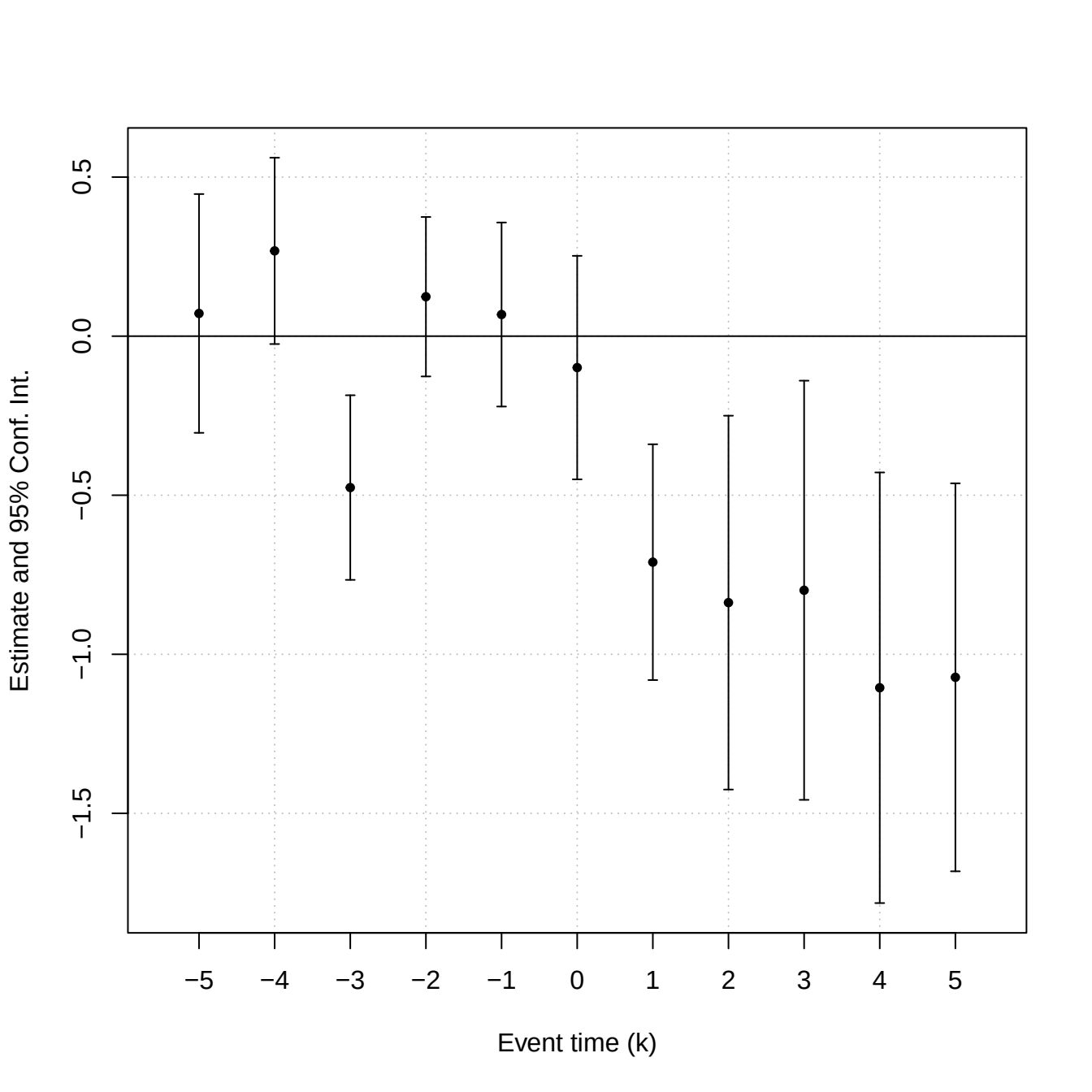

overall_new_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_and_pr
High
Low
Pretrend (High) p−value: 0.541
Pretrend (Low) p−value: 0.528
Wald test p−value: 0.435
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

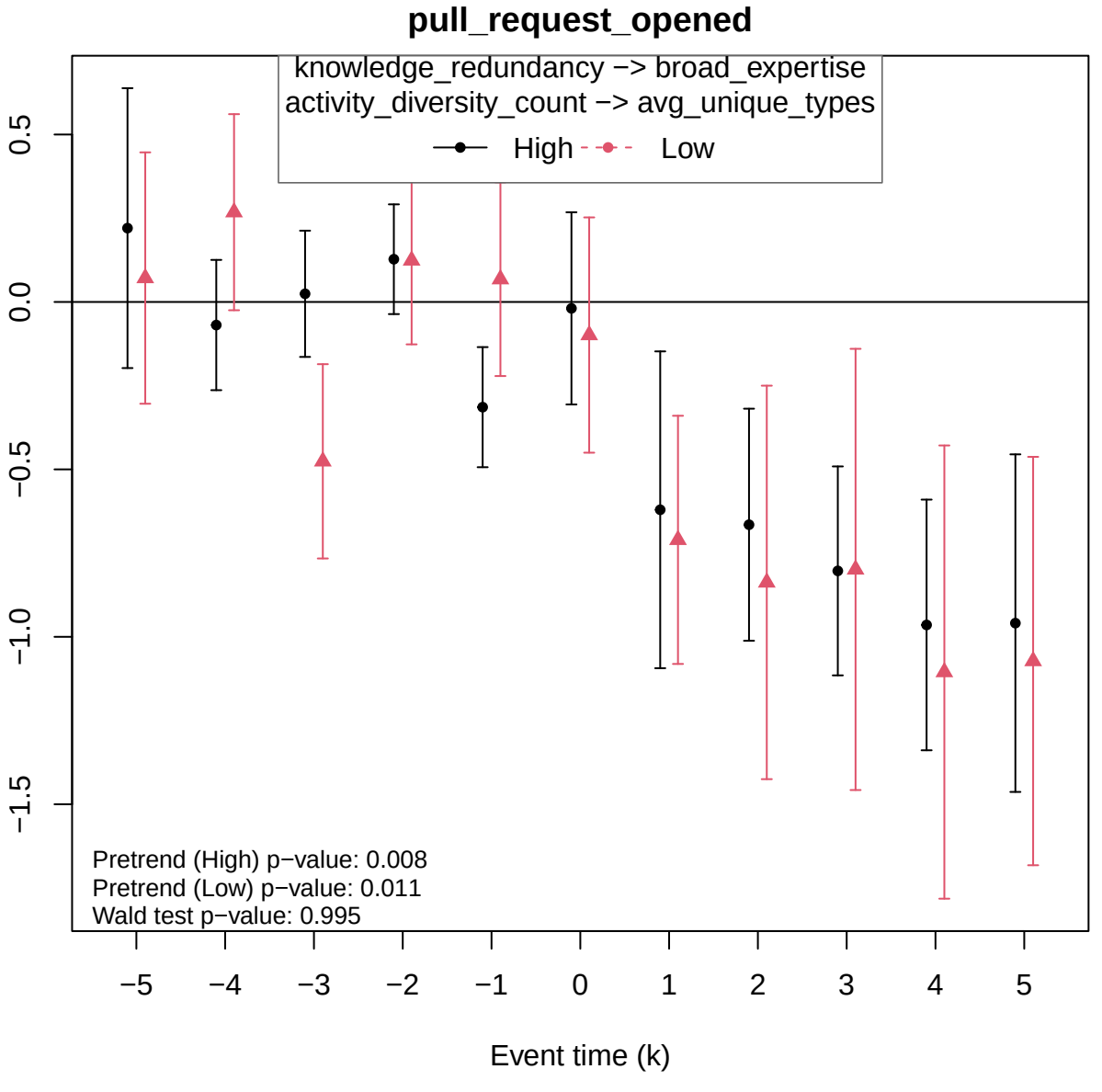

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

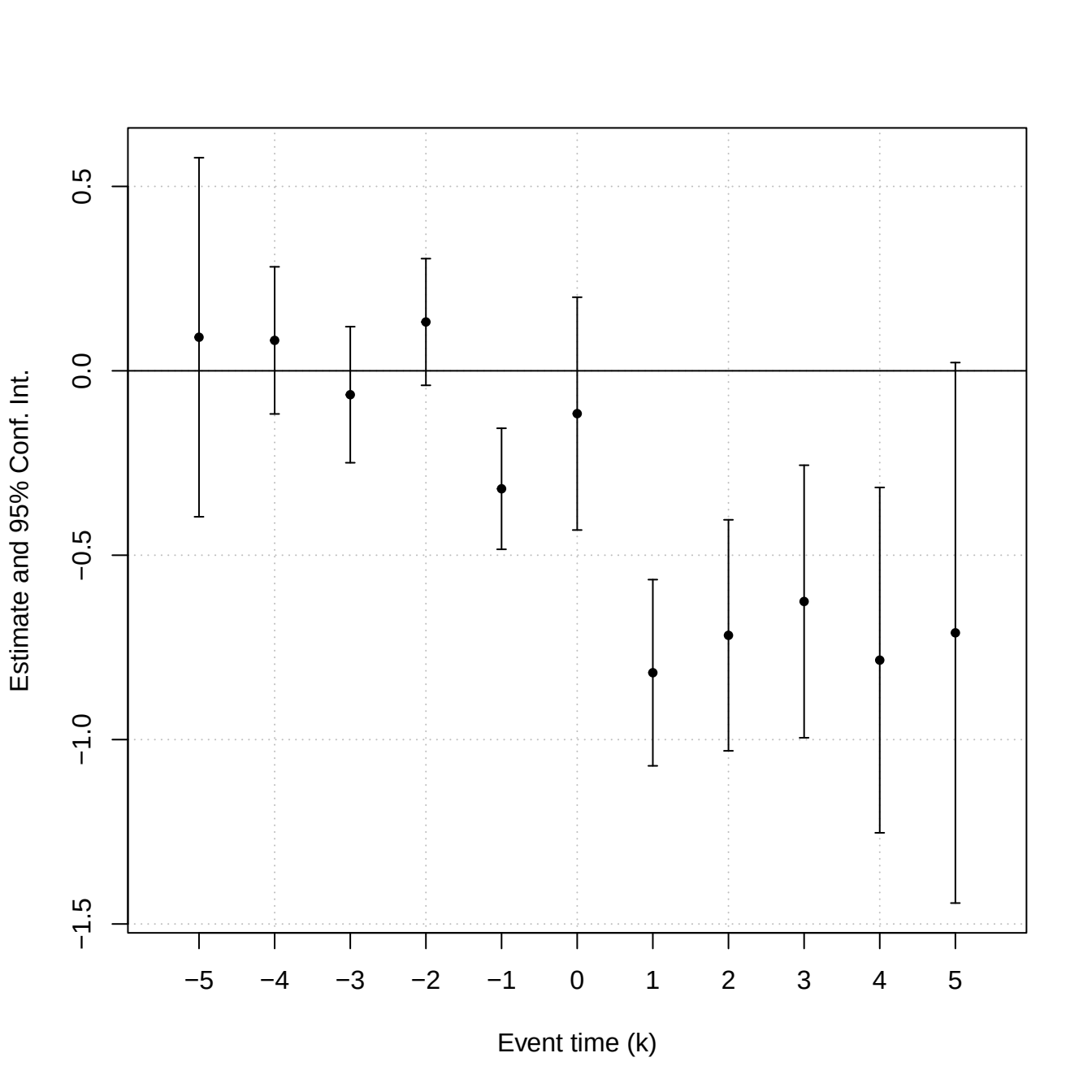

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

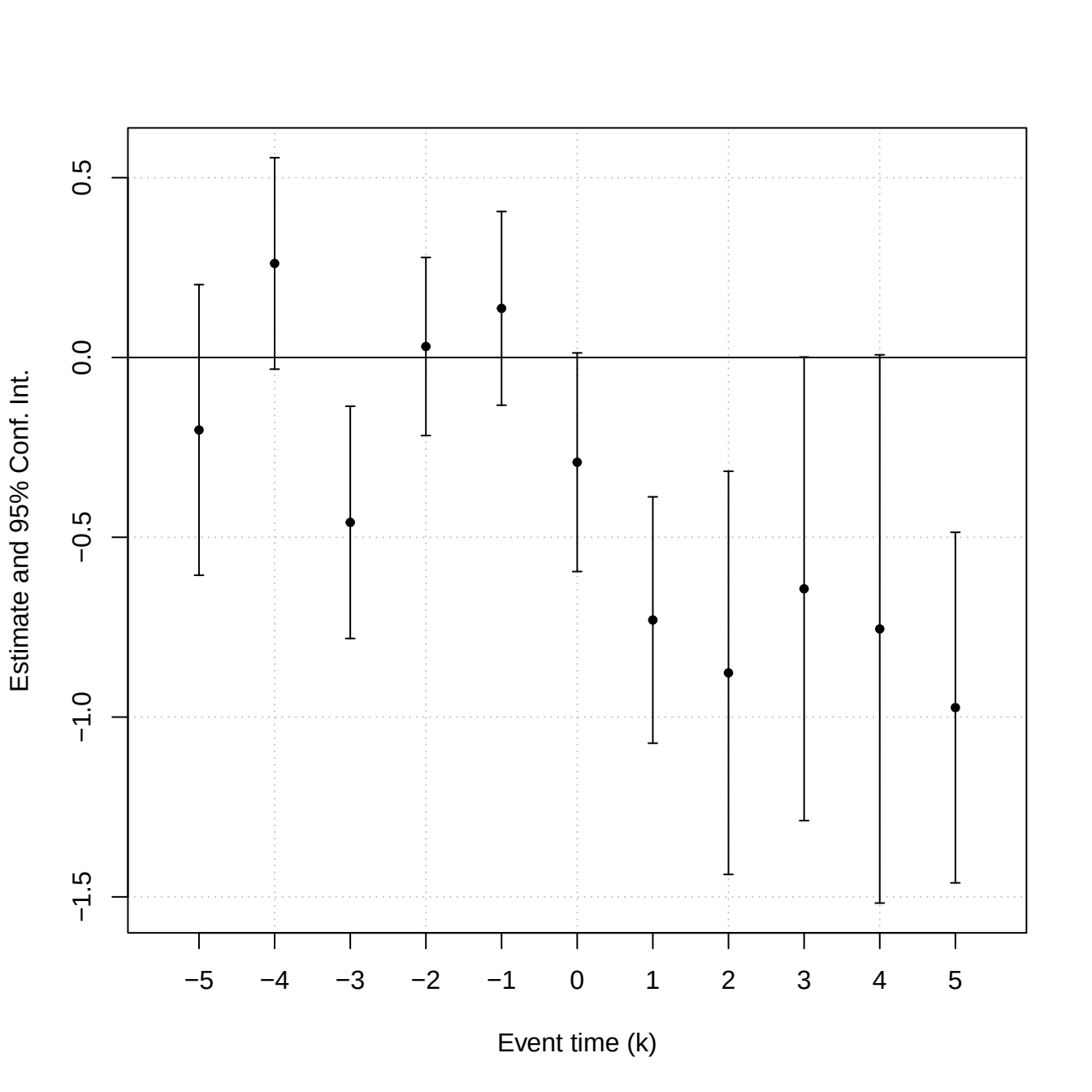

major_minor_release_count
knowledge_redundancy −> broad_expertise
issue_pr_share −> share_issue_and_pr
High
Low
Pretrend (High) p−value: 0.857
Pretrend (Low) p−value: 0.699
Wald test p−value: 0.518
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

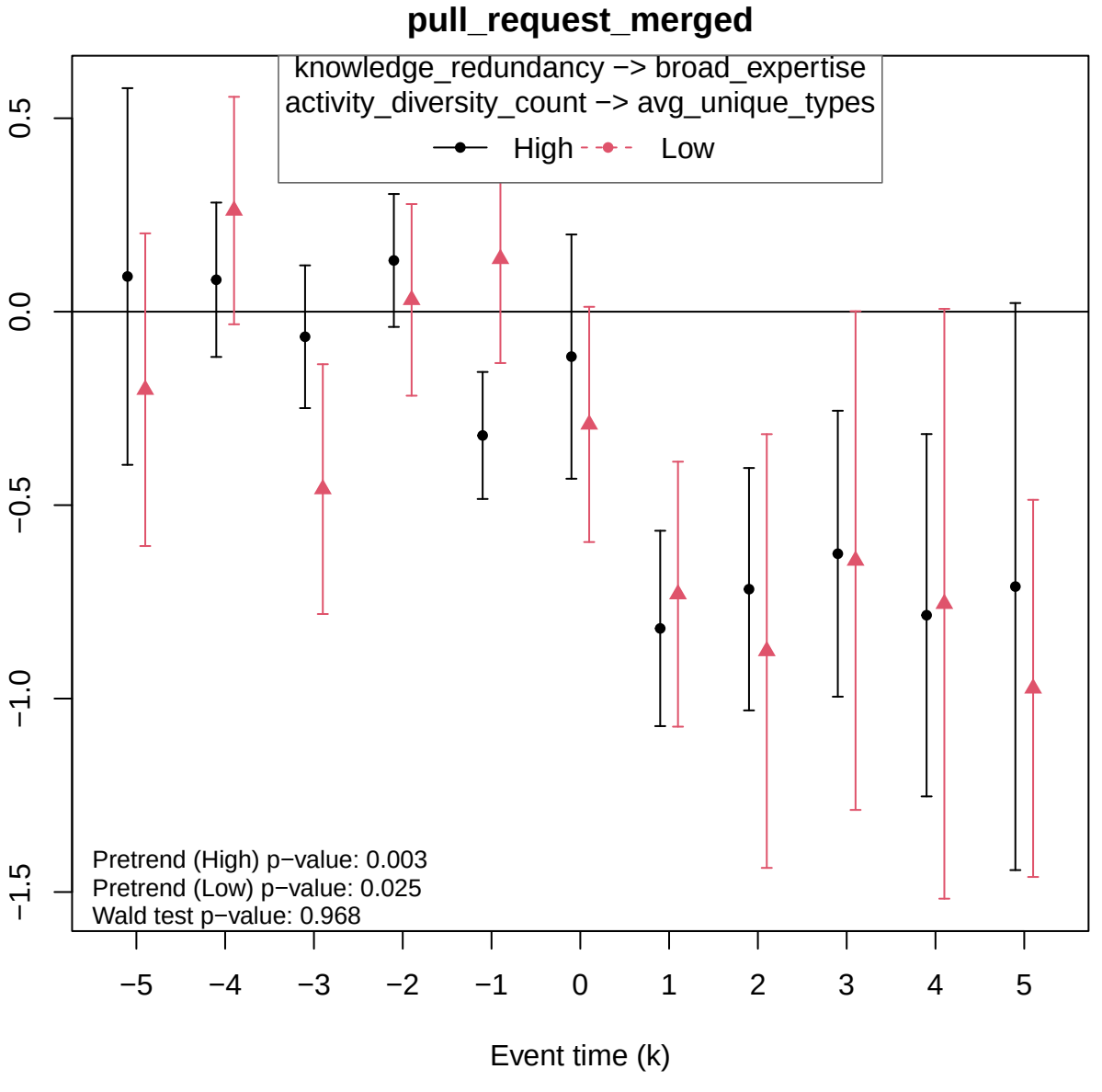

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

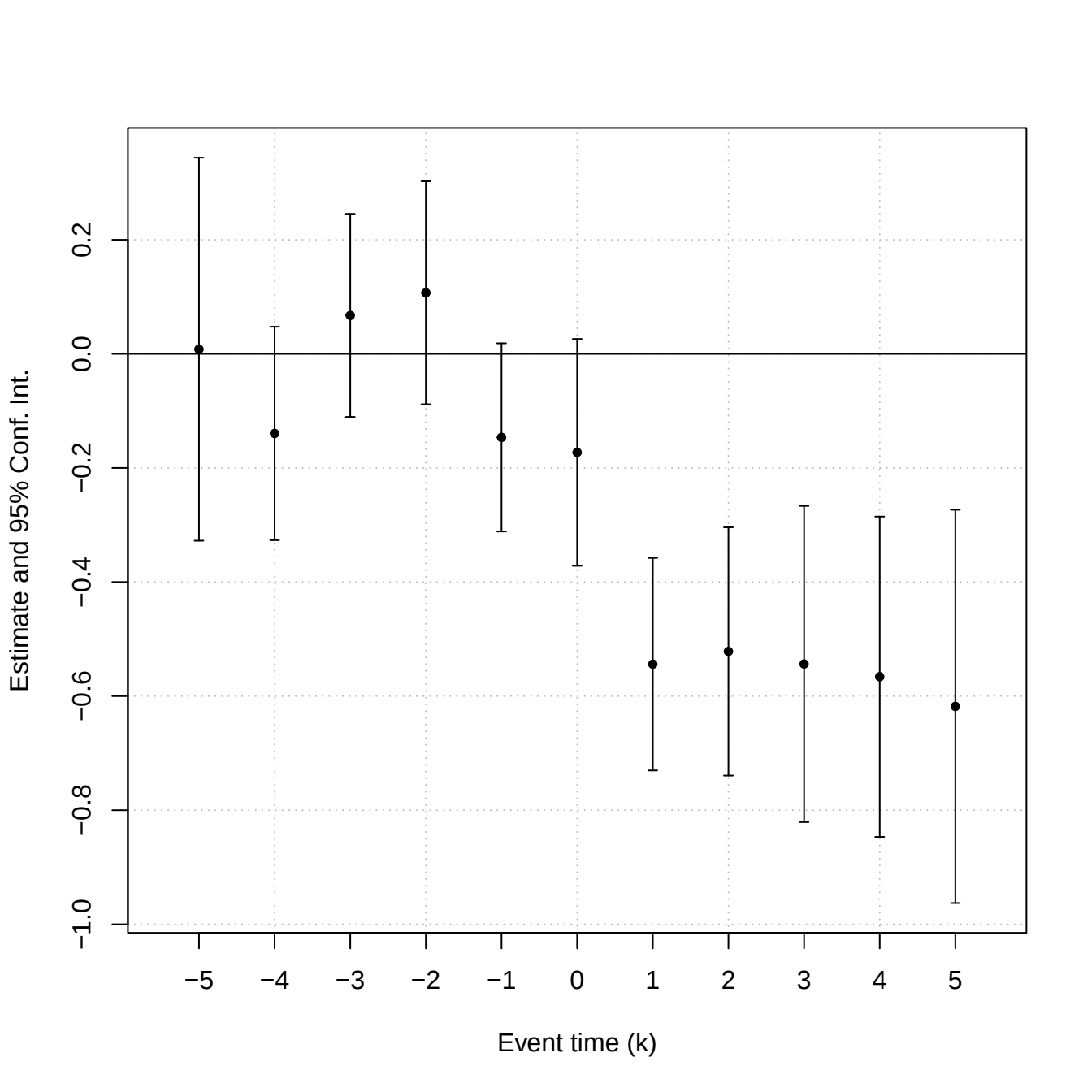

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

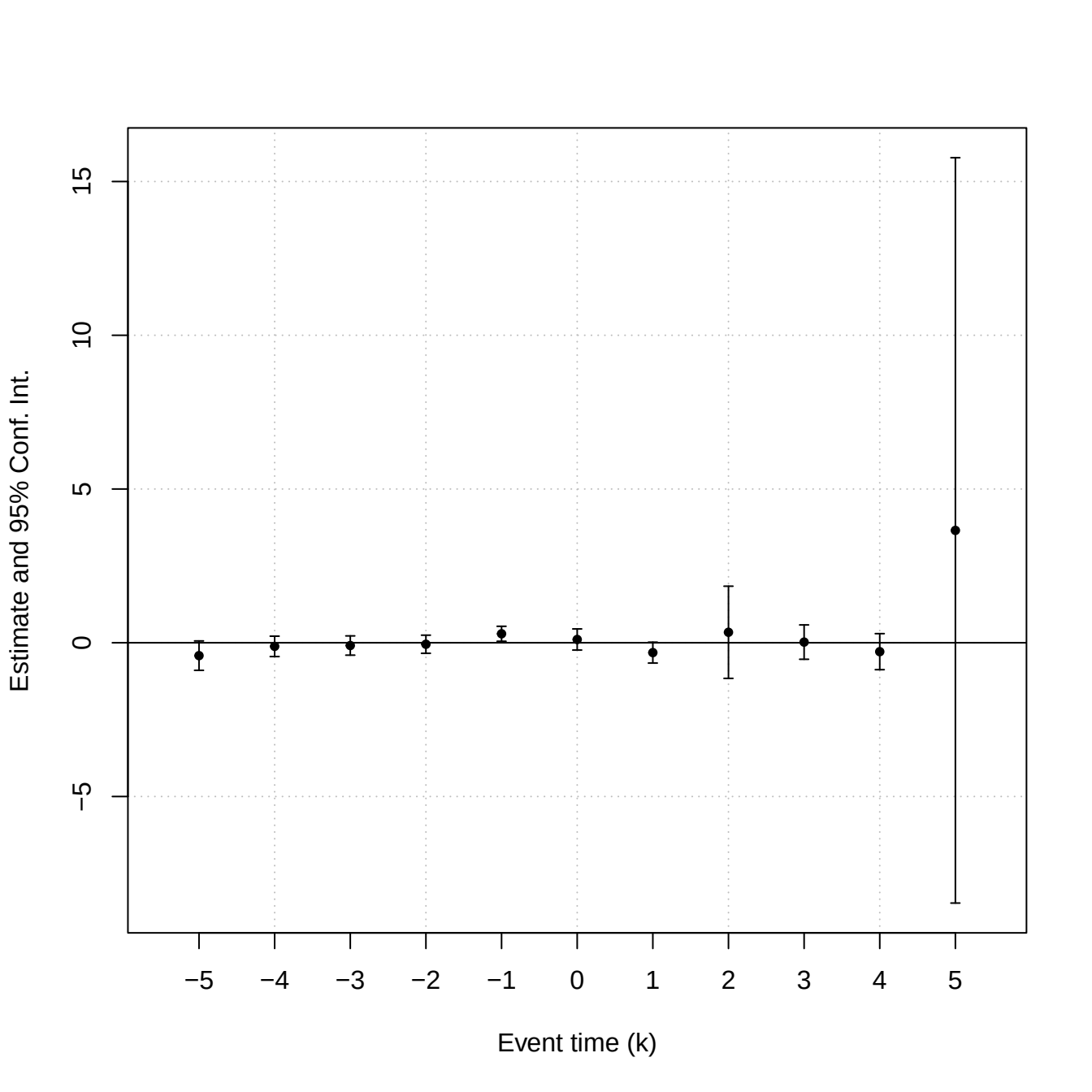

pull_request_opened
knowledge_redundancy −> broad_expertise
activity_diversity_count −> avg_unique_types
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.008
Pretrend (Low) p−value: 0.011
Wald test p−value: 0.995
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

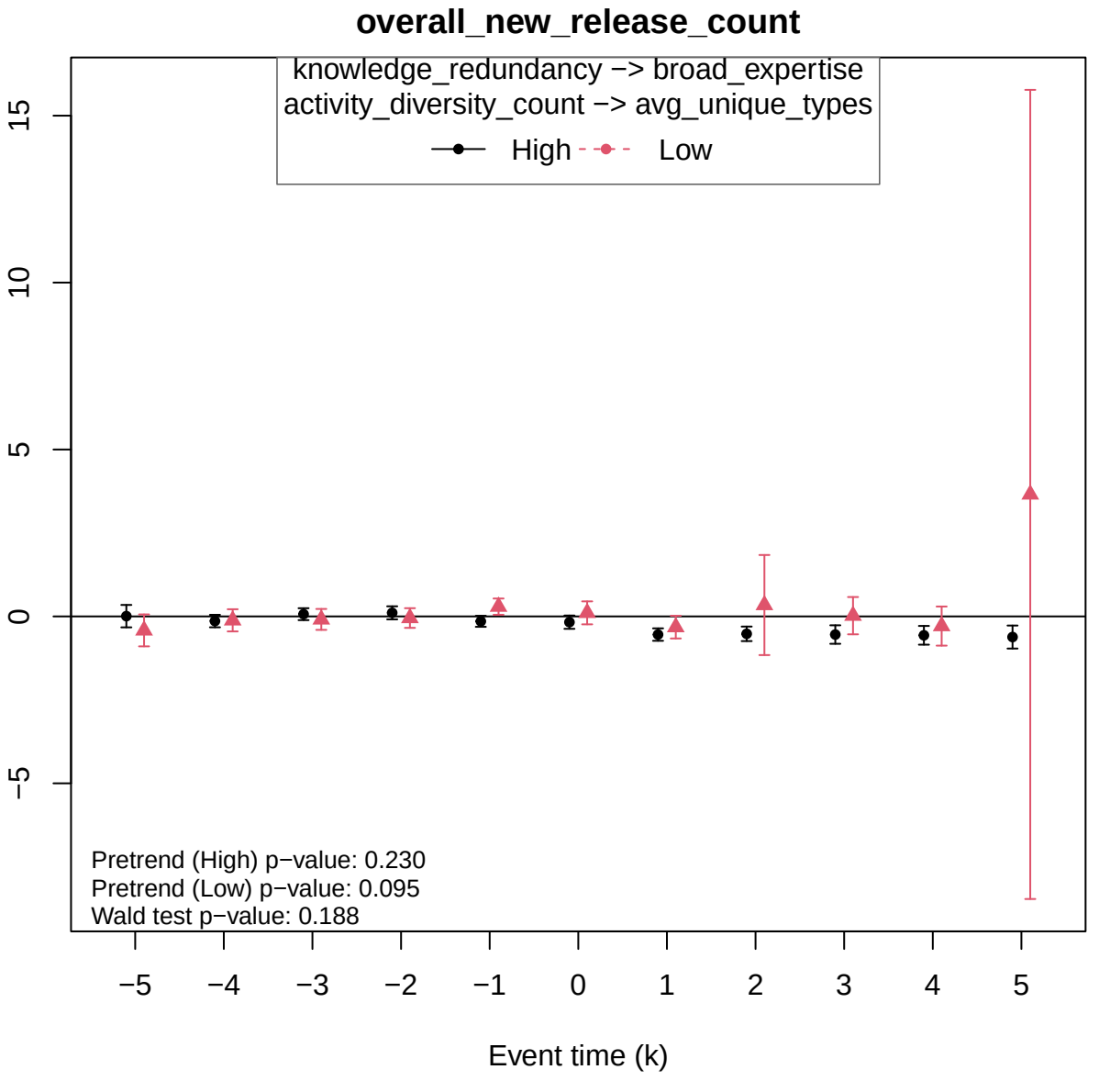

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

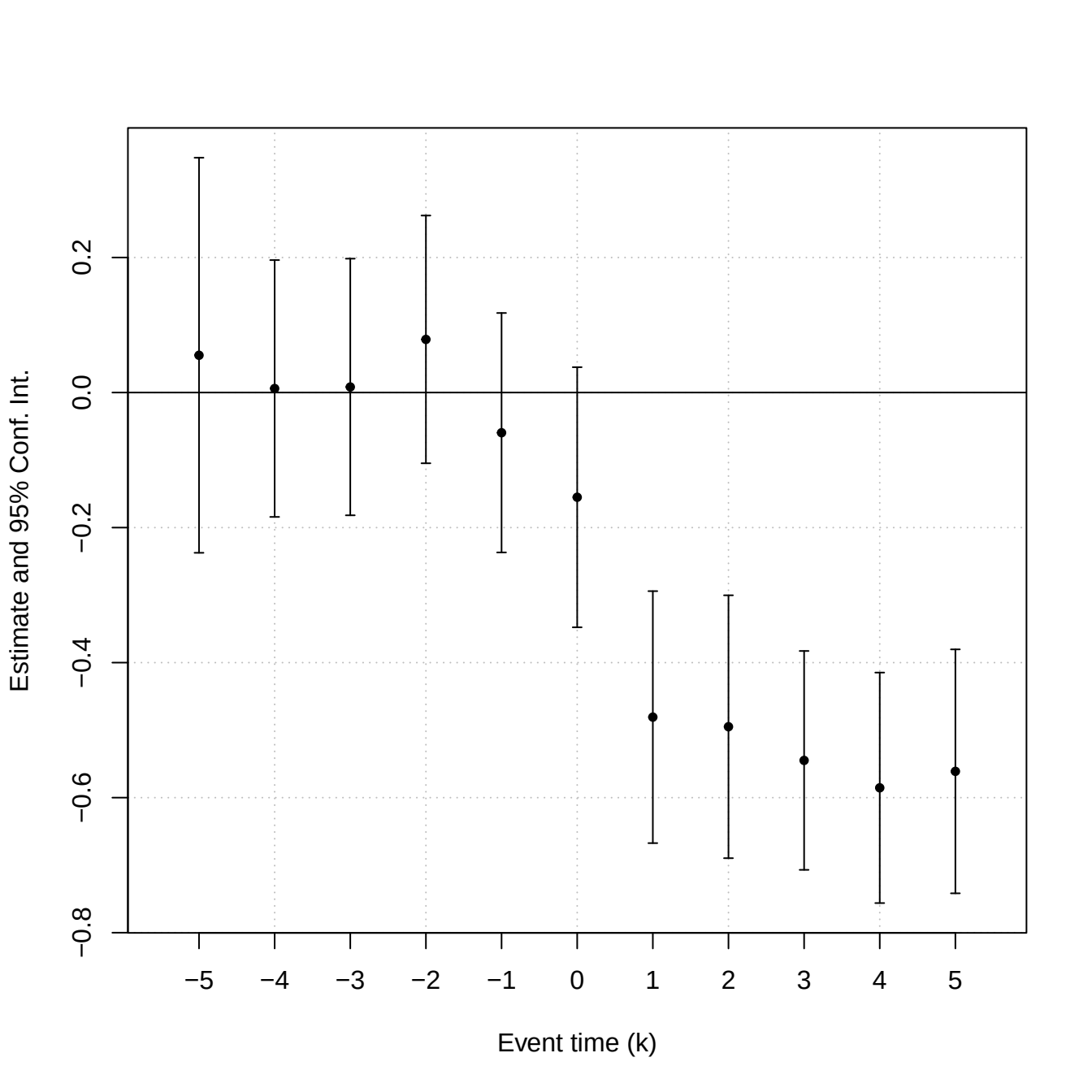

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

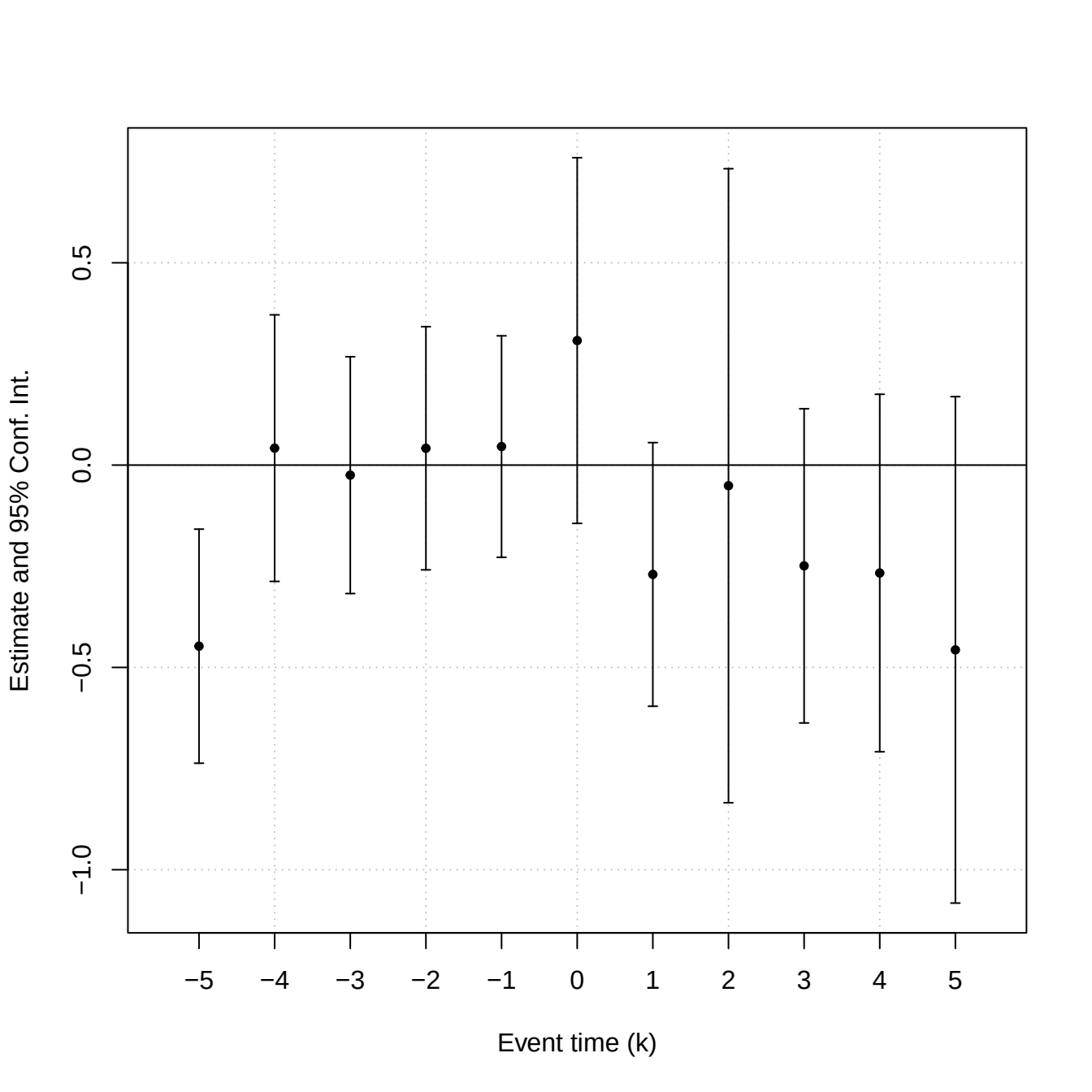

pull_request_merged
knowledge_redundancy −> broad_expertise
activity_diversity_count −> avg_unique_types
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.003
Pretrend (Low) p−value: 0.025
Wald test p−value: 0.968
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

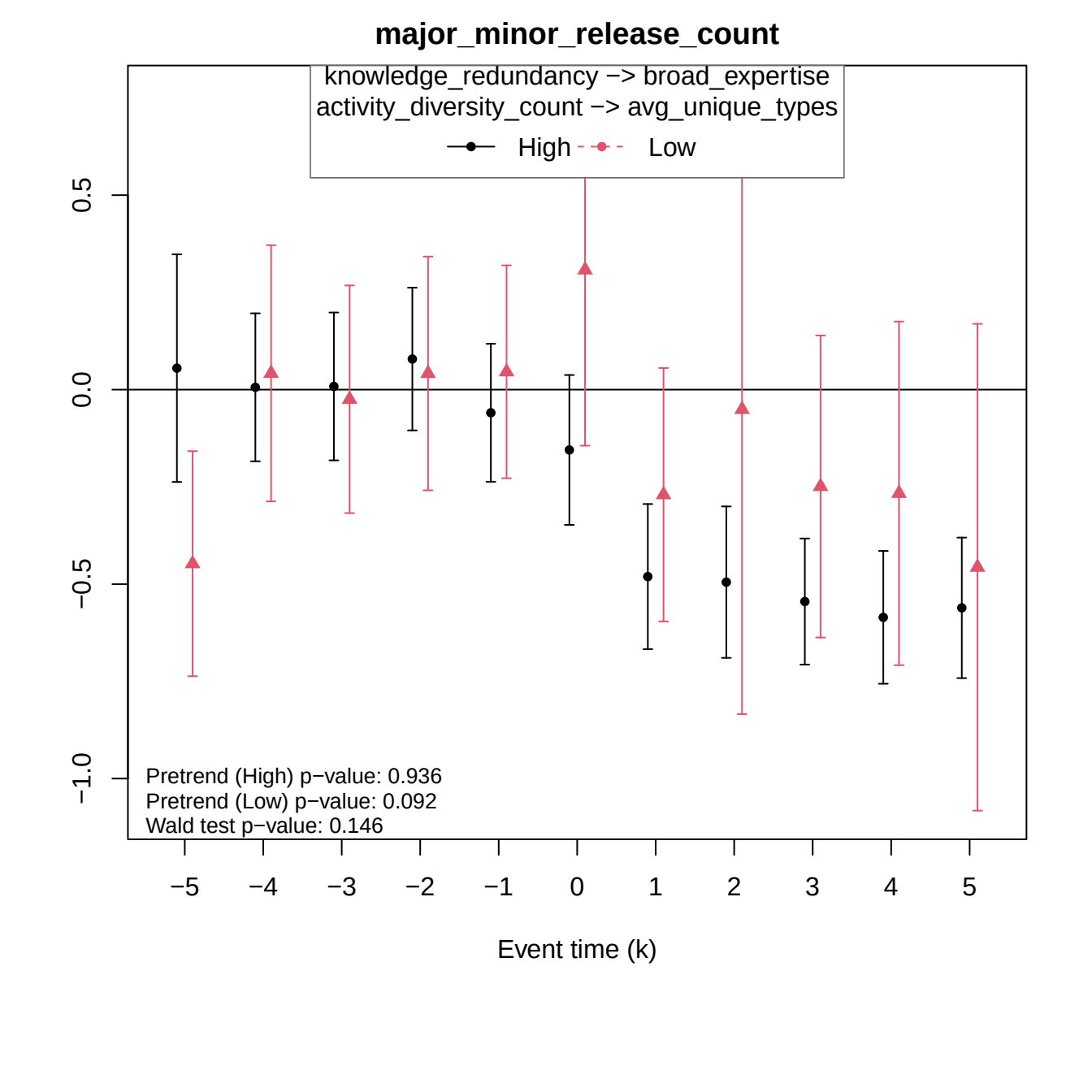

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

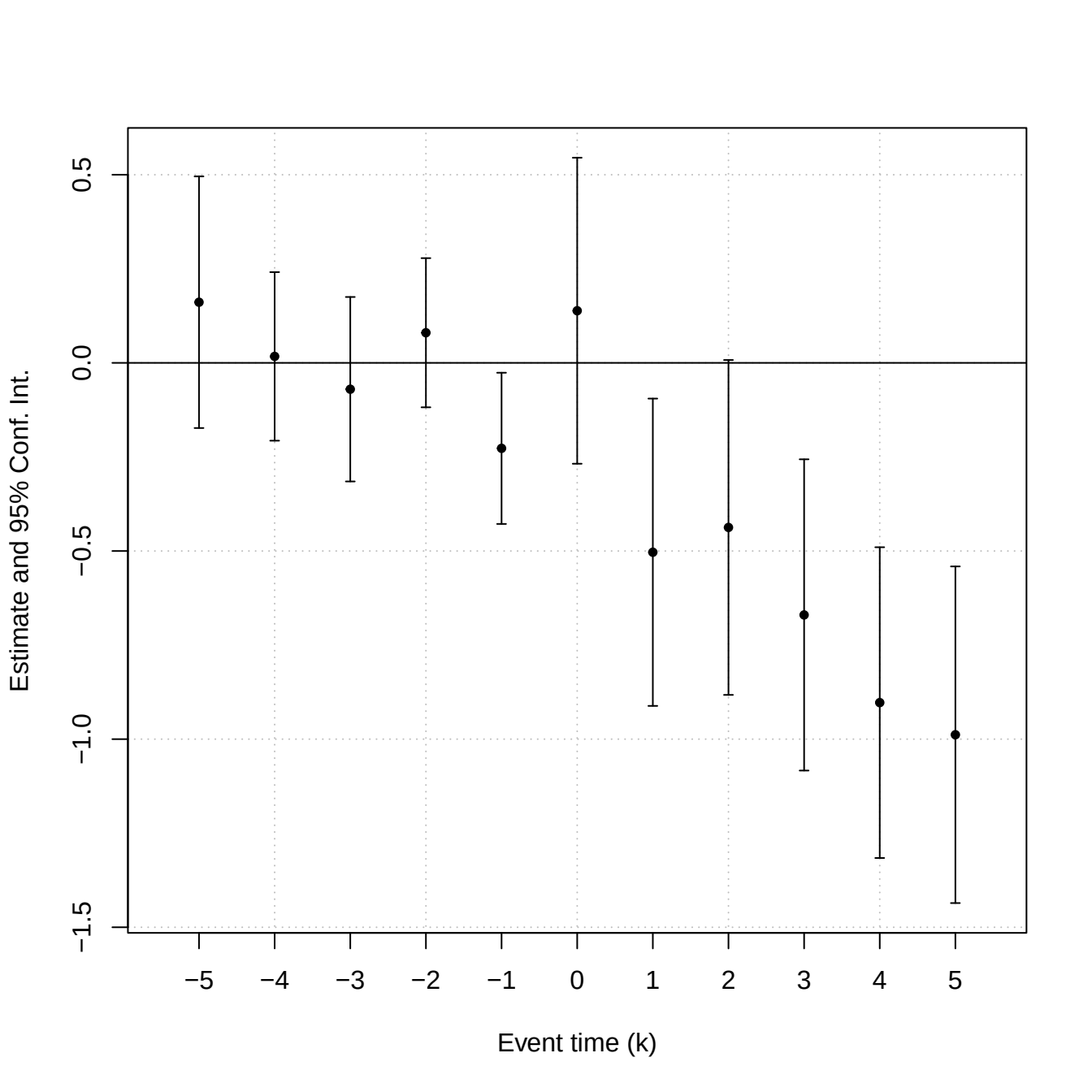

Estimate and 95% Conf. Int.
15
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

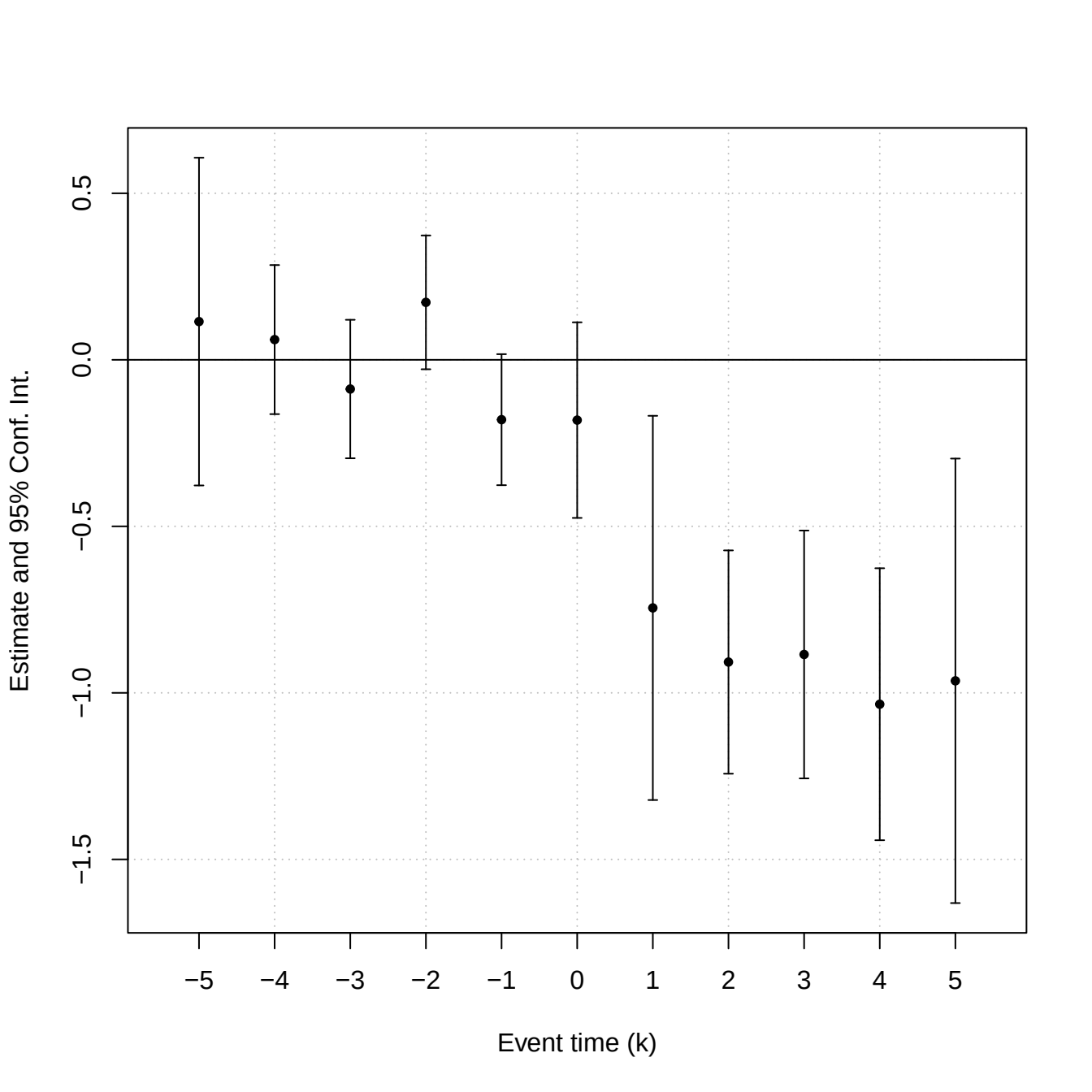

overall_new_release_count
knowledge_redundancy −> broad_expertise
activity_diversity_count −> avg_unique_types
High
Low
15
10
5
0
−5
Pretrend (High) p−value: 0.230
Pretrend (Low) p−value: 0.095
Wald test p−value: 0.188
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

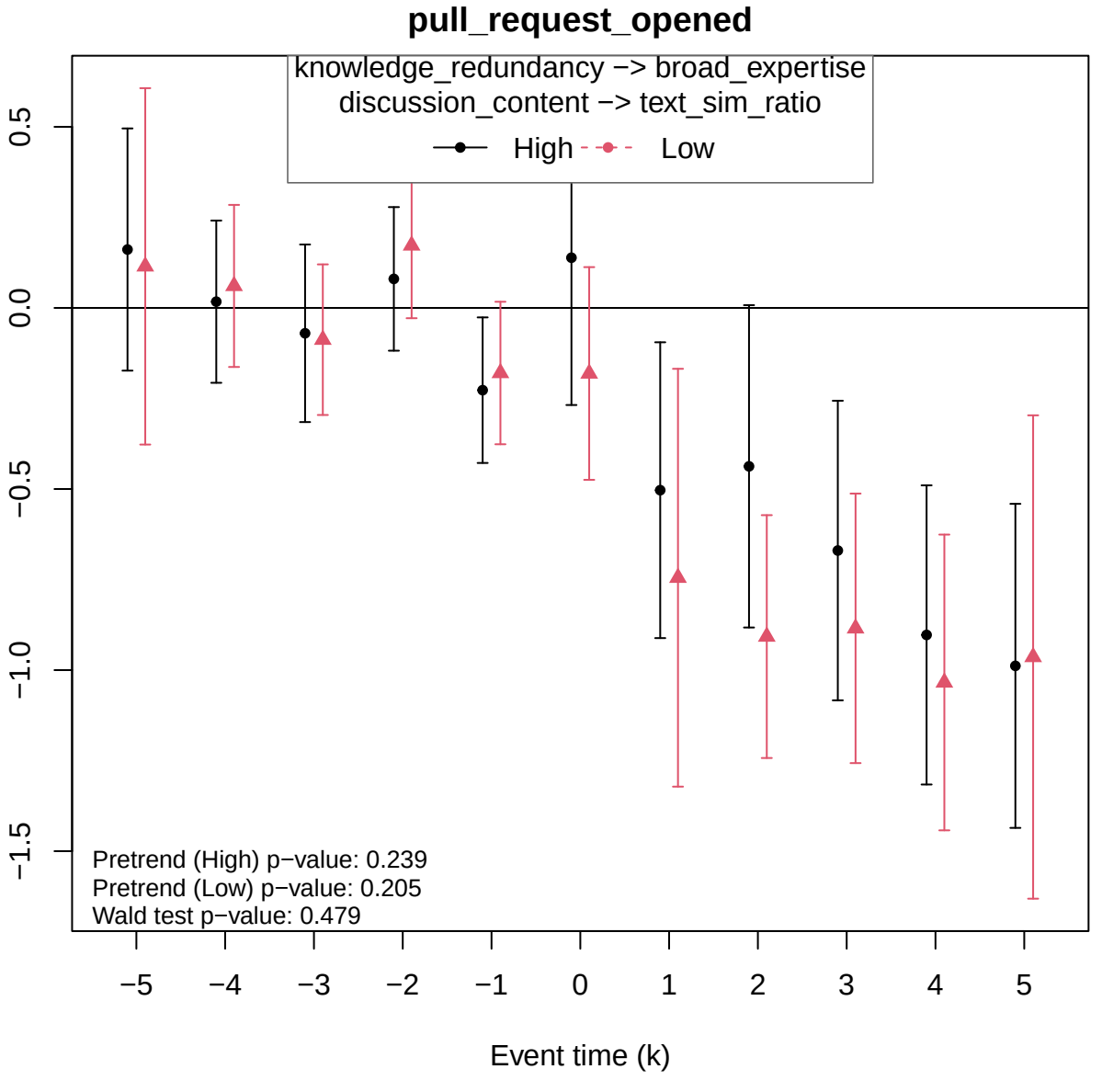

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

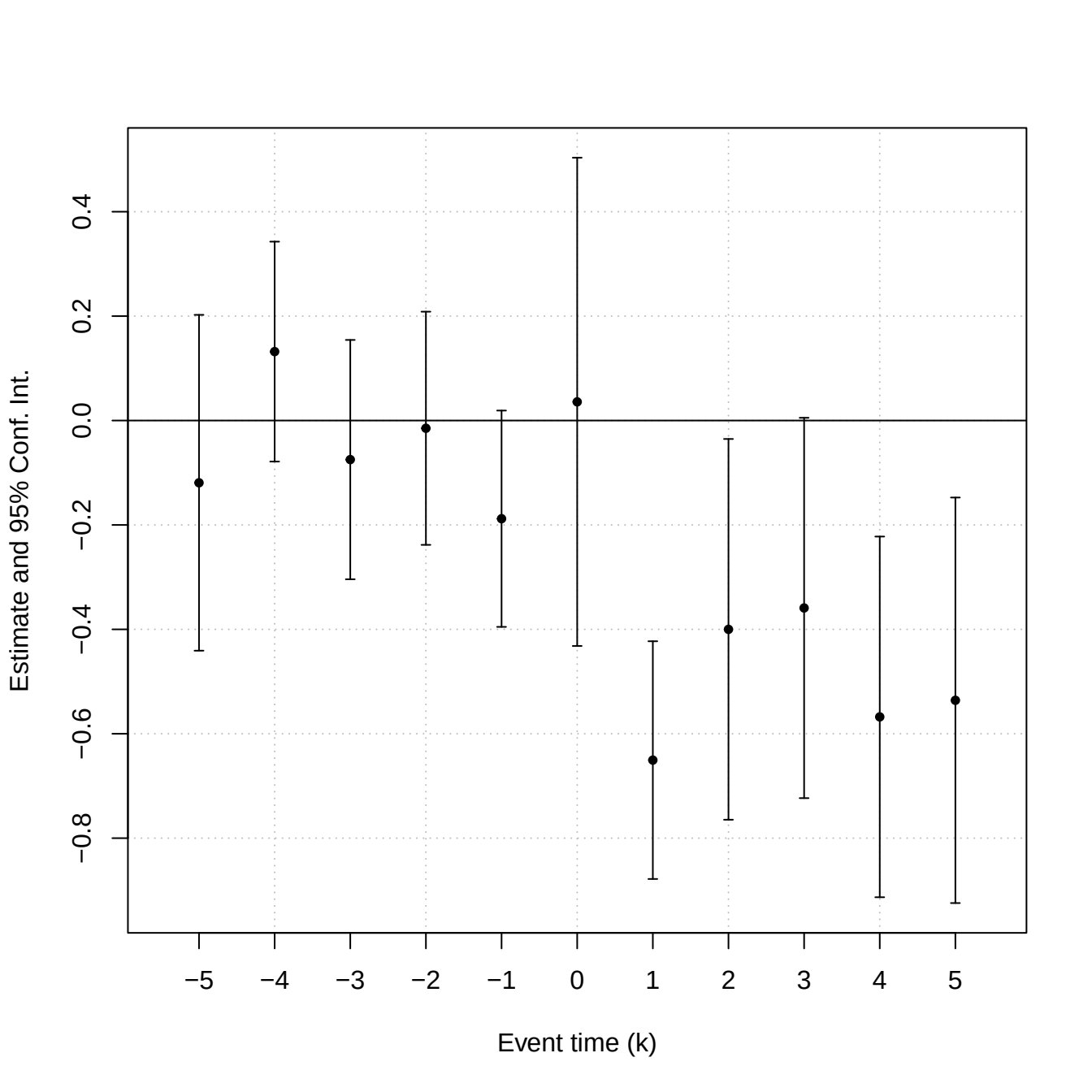

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

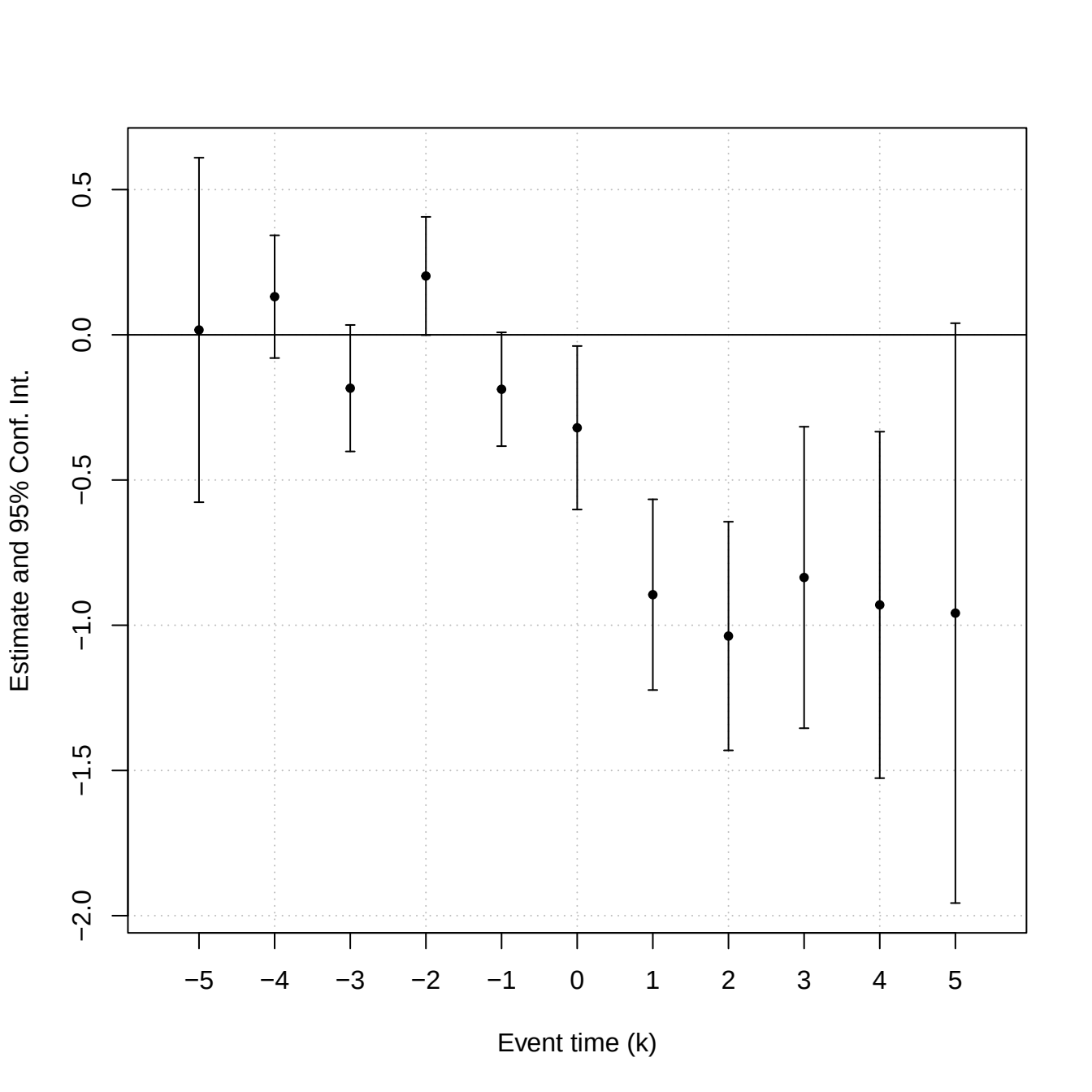

major_minor_release_count
knowledge_redundancy −> broad_expertise
activity_diversity_count −> avg_unique_types
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.936
Pretrend (Low) p−value: 0.092
Wald test p−value: 0.146
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

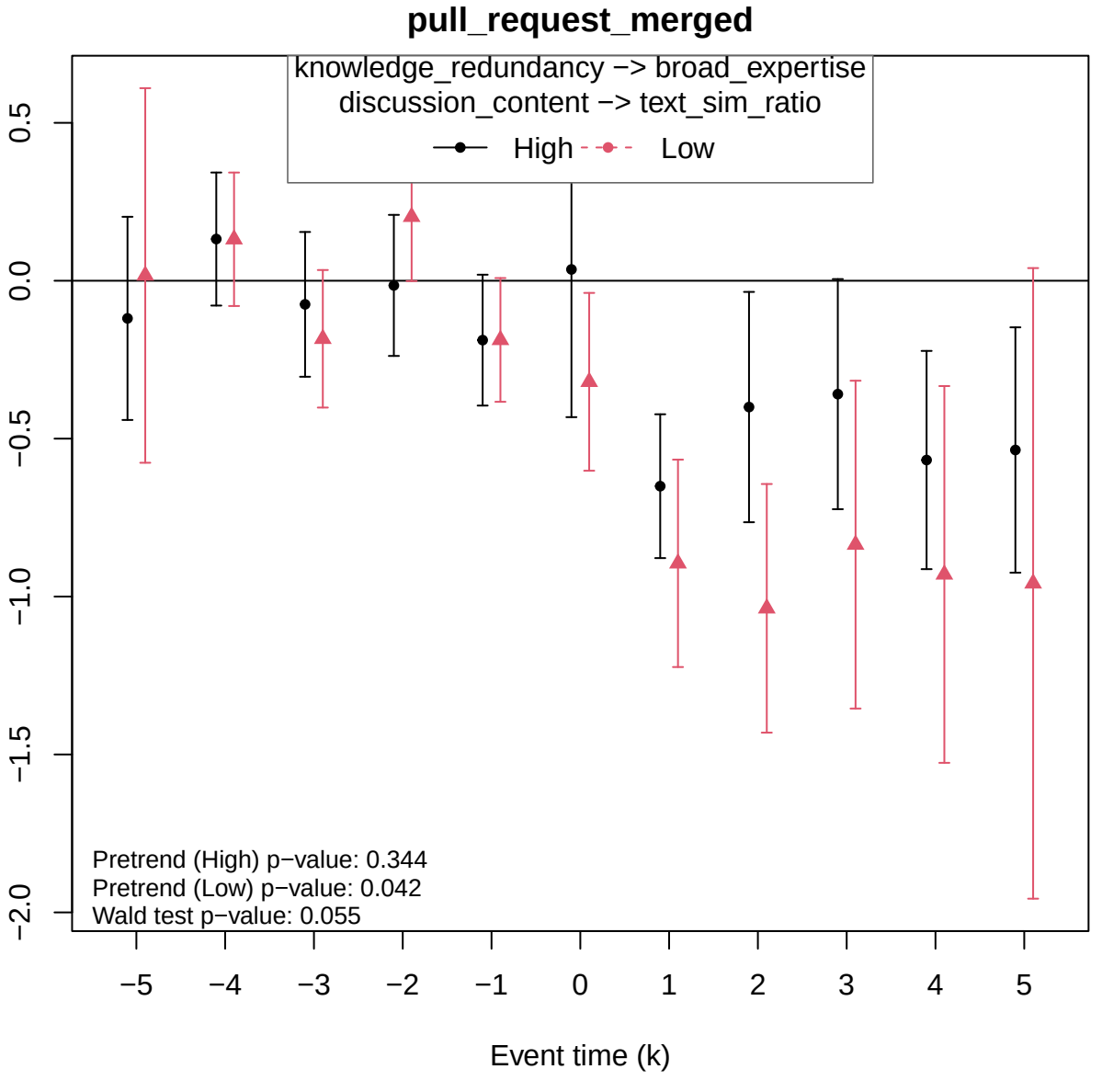

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

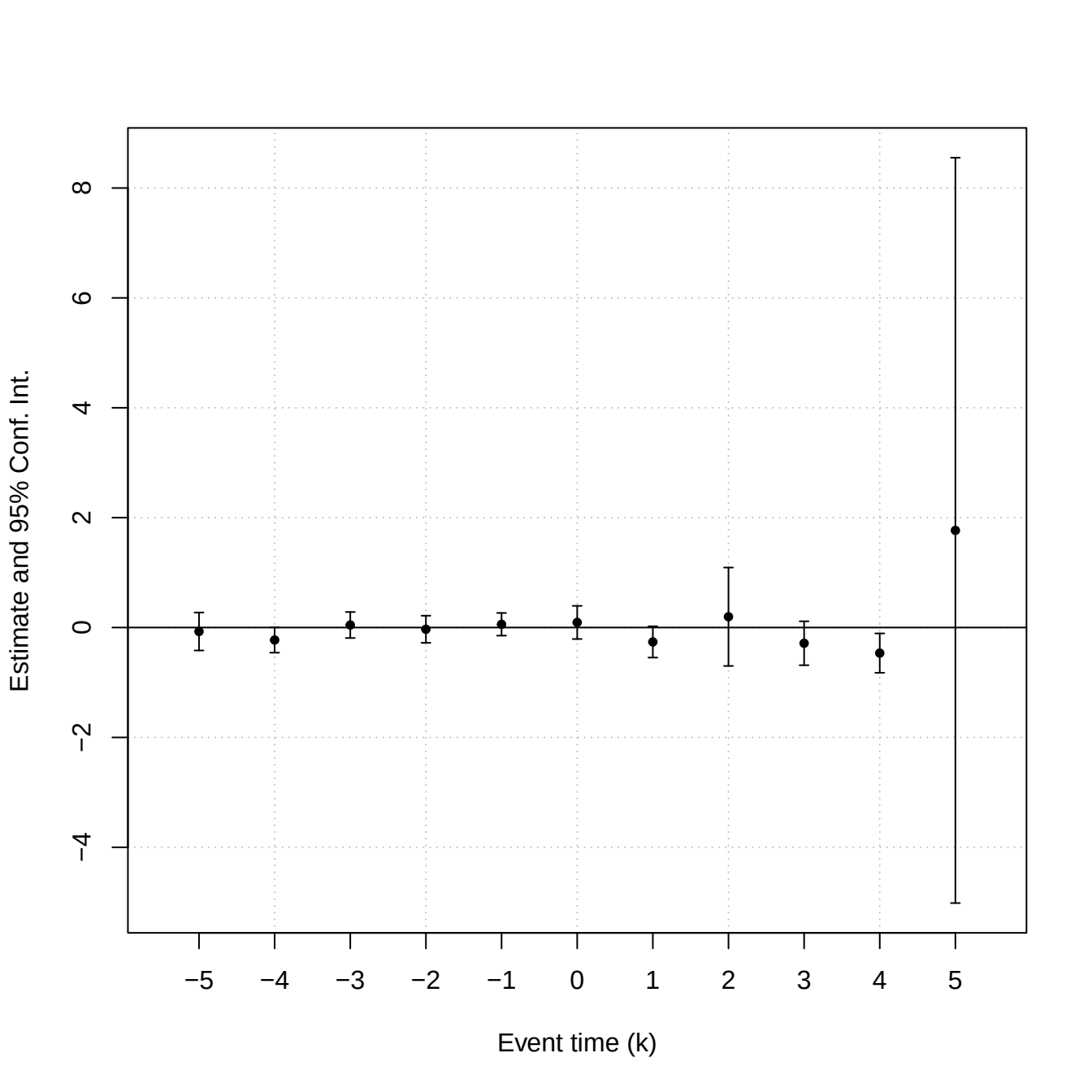

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

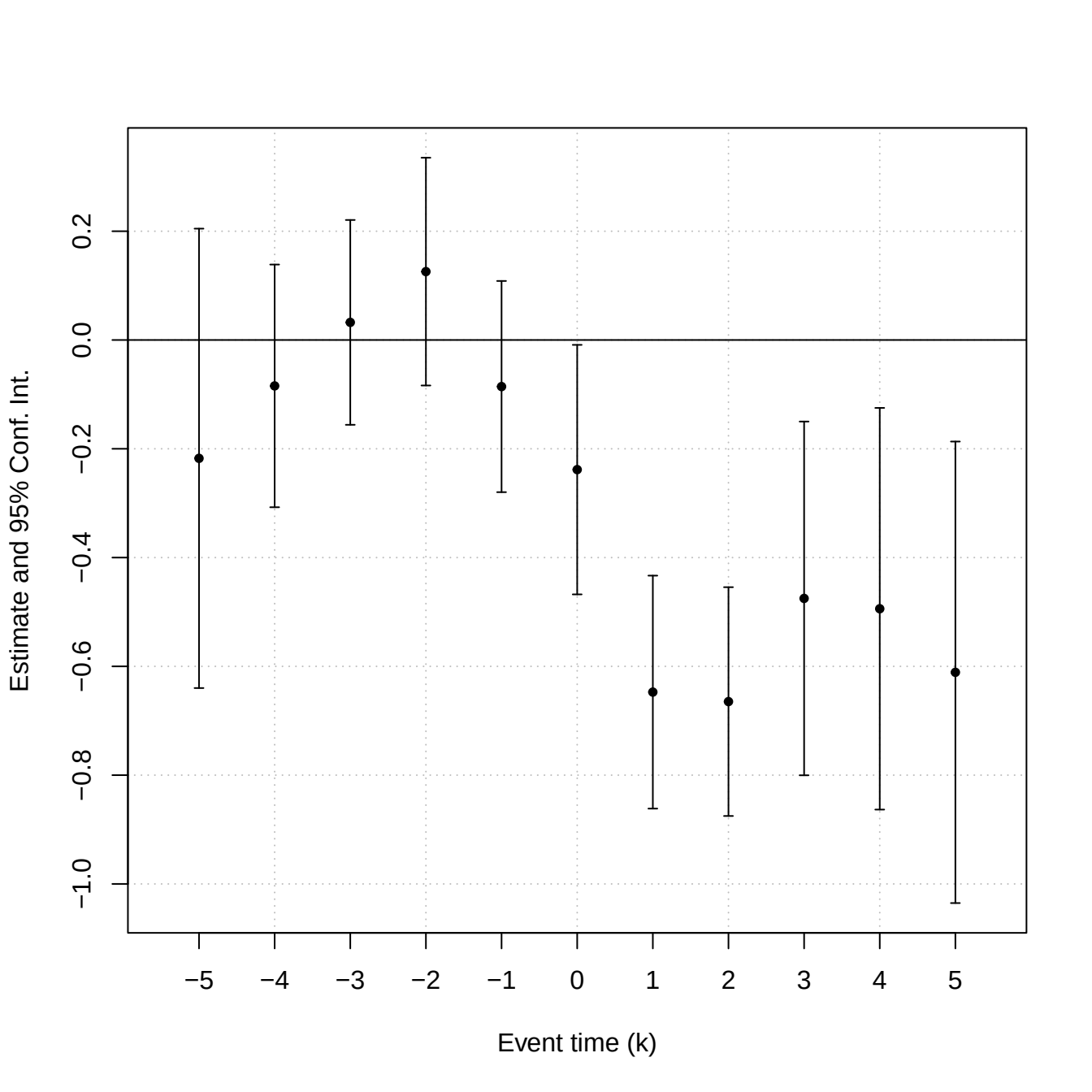

pull_request_opened
knowledge_redundancy −> broad_expertise
discussion_content −> text_sim_ratio
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.239
Pretrend (Low) p−value: 0.205
Wald test p−value: 0.479
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

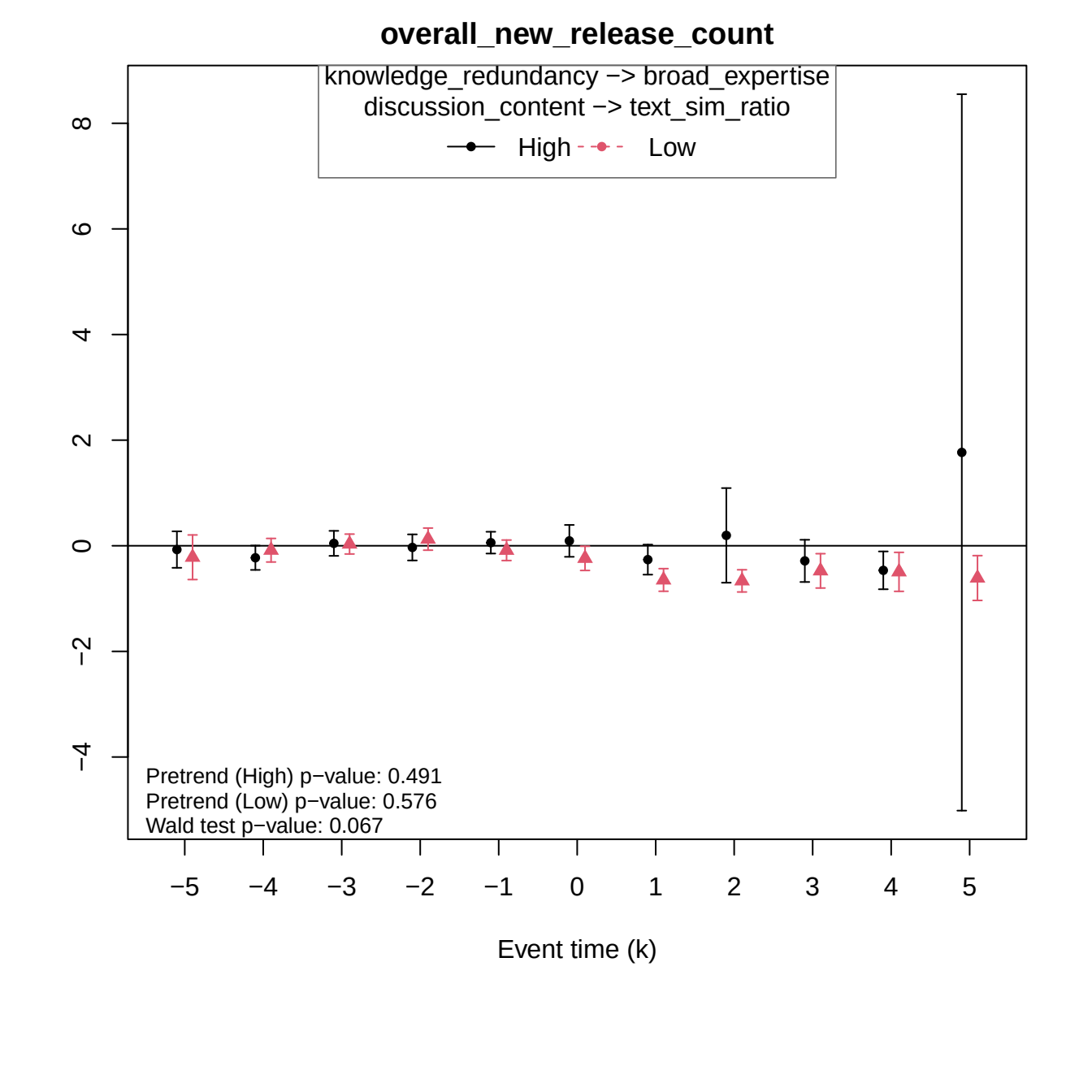

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

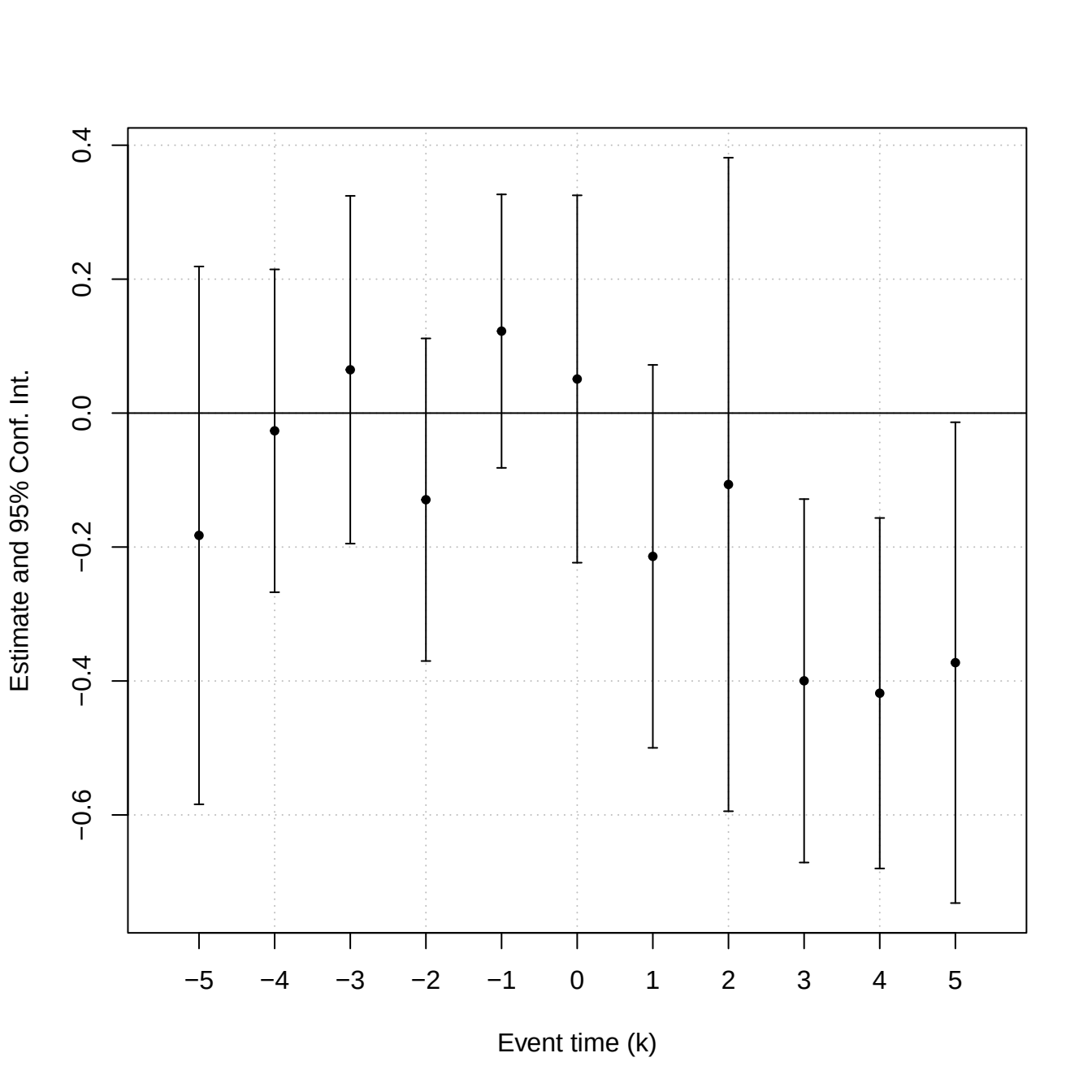

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

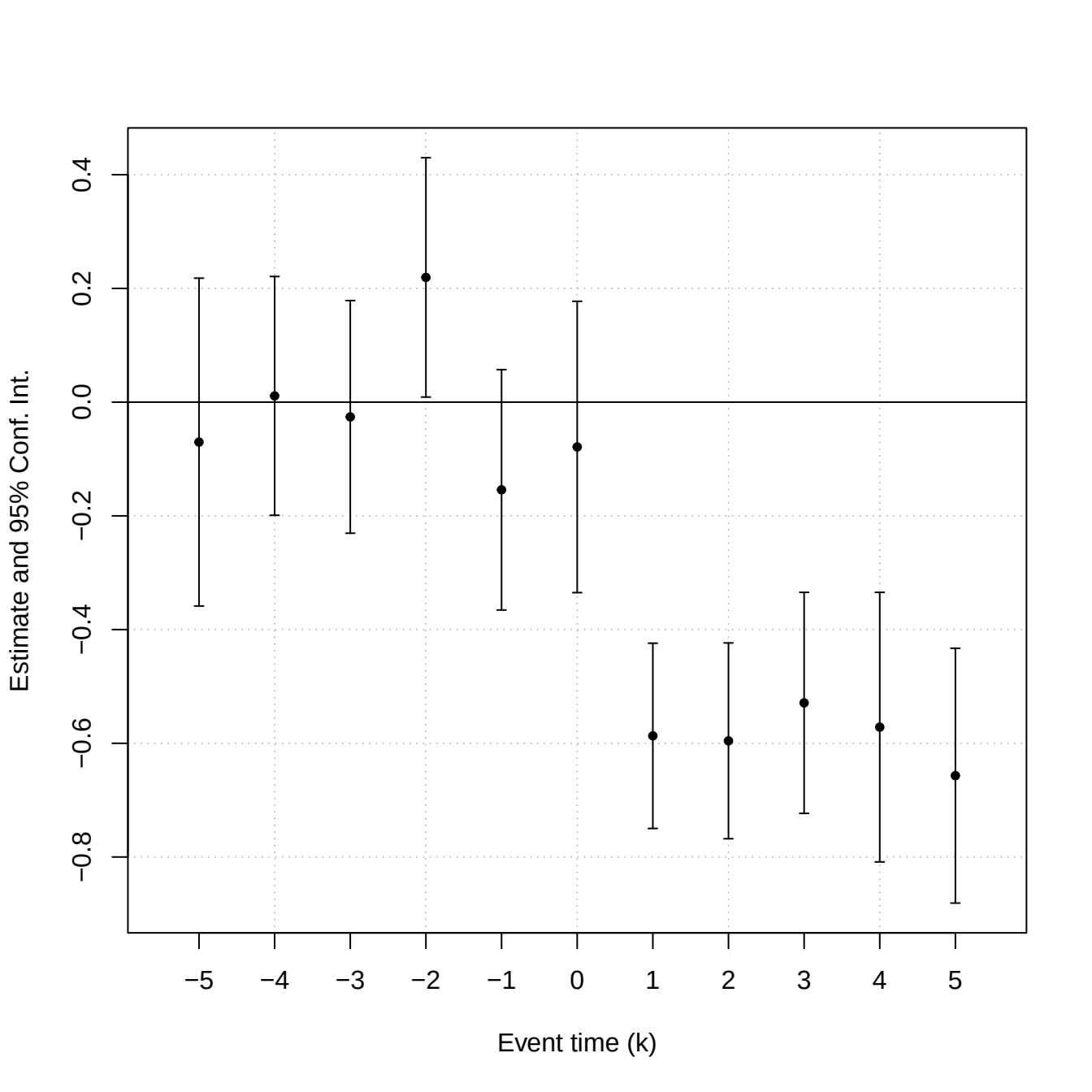

pull_request_merged
knowledge_redundancy −> broad_expertise
discussion_content −> text_sim_ratio
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.344
Pretrend (Low) p−value: 0.042
Wald test p−value: 0.055
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

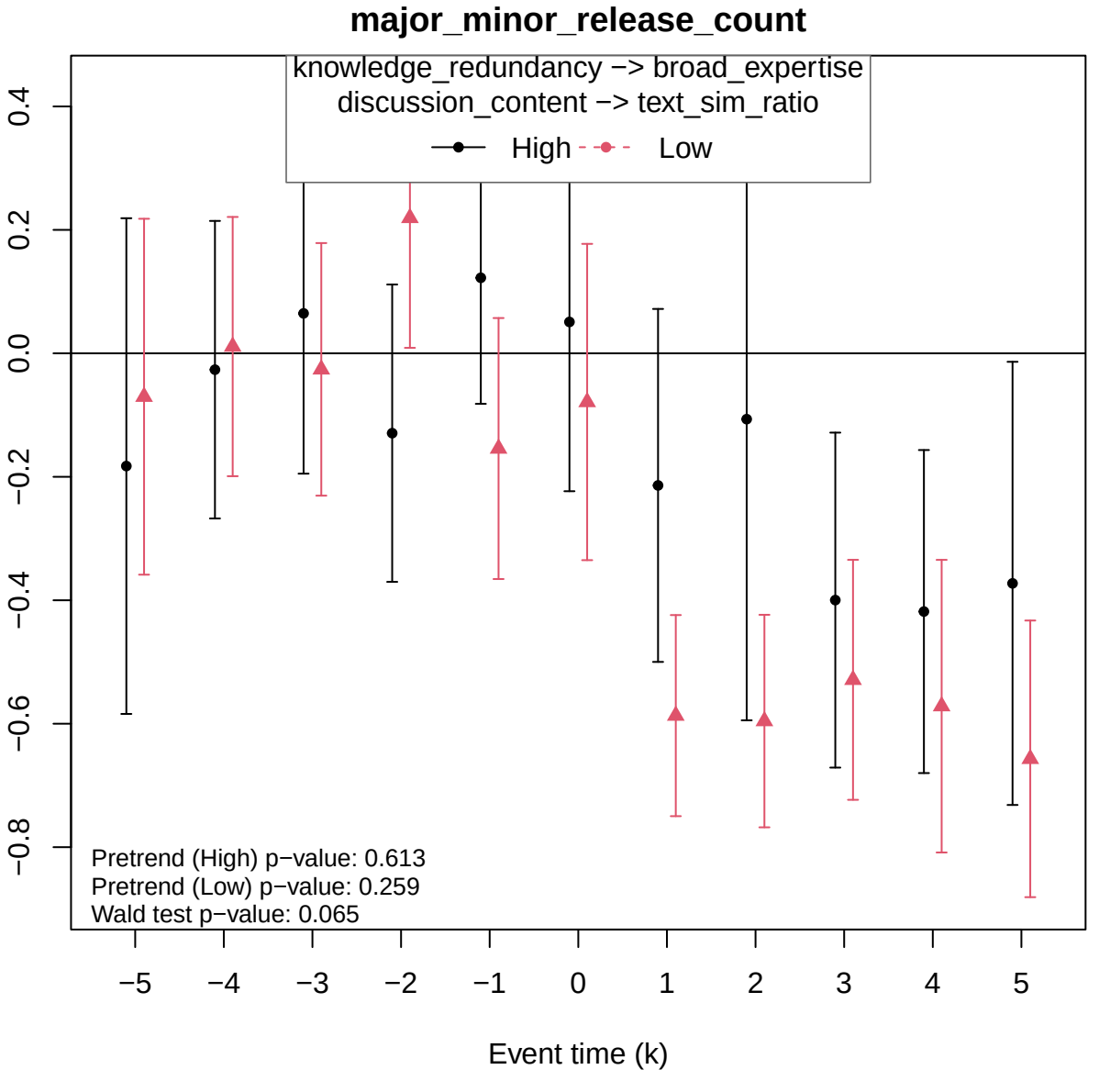

Estimate and 95% Conf. Int.
8
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

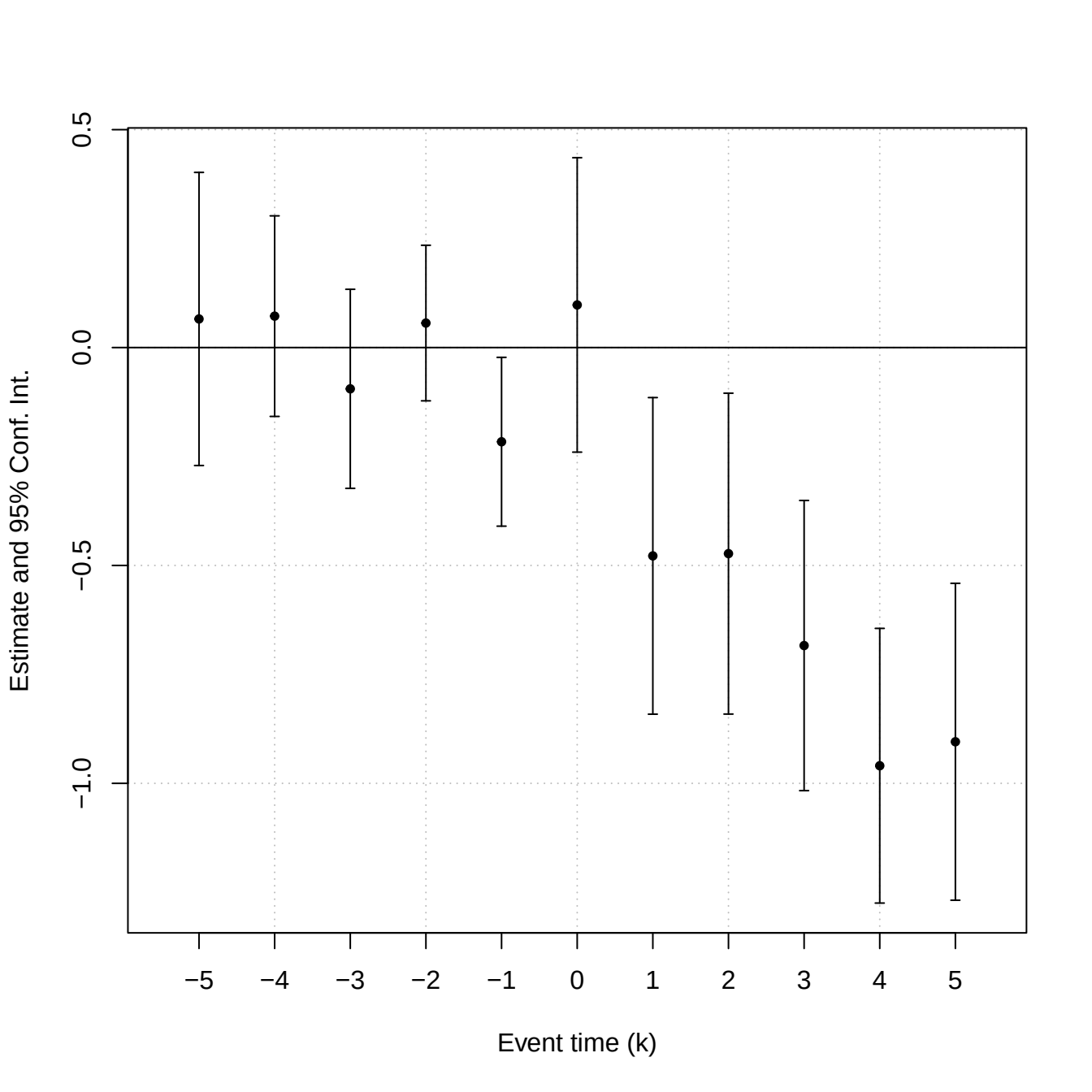

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

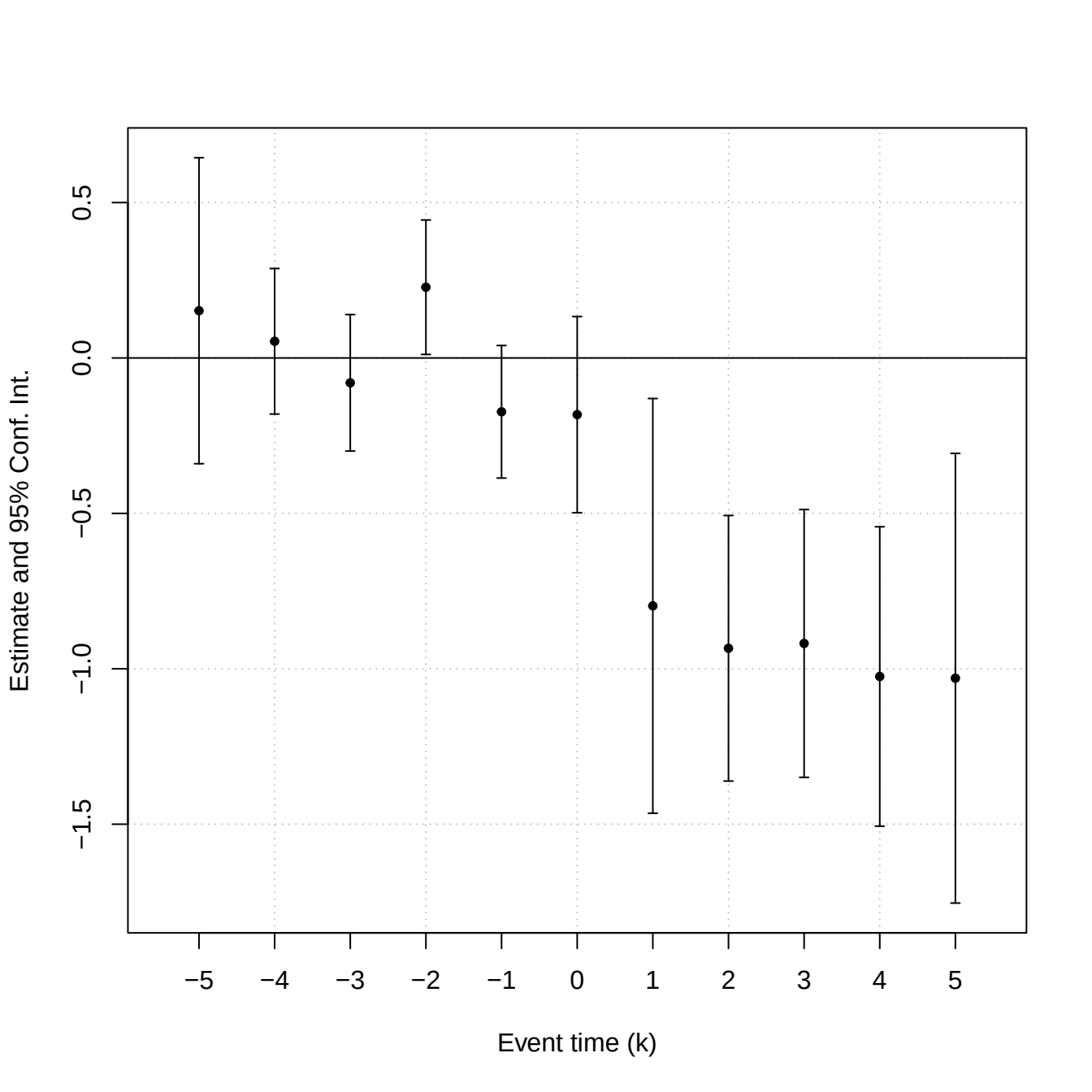

overall_new_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> text_sim_ratio
High
Low
8
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.491
Pretrend (Low) p−value: 0.576
Wald test p−value: 0.067
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

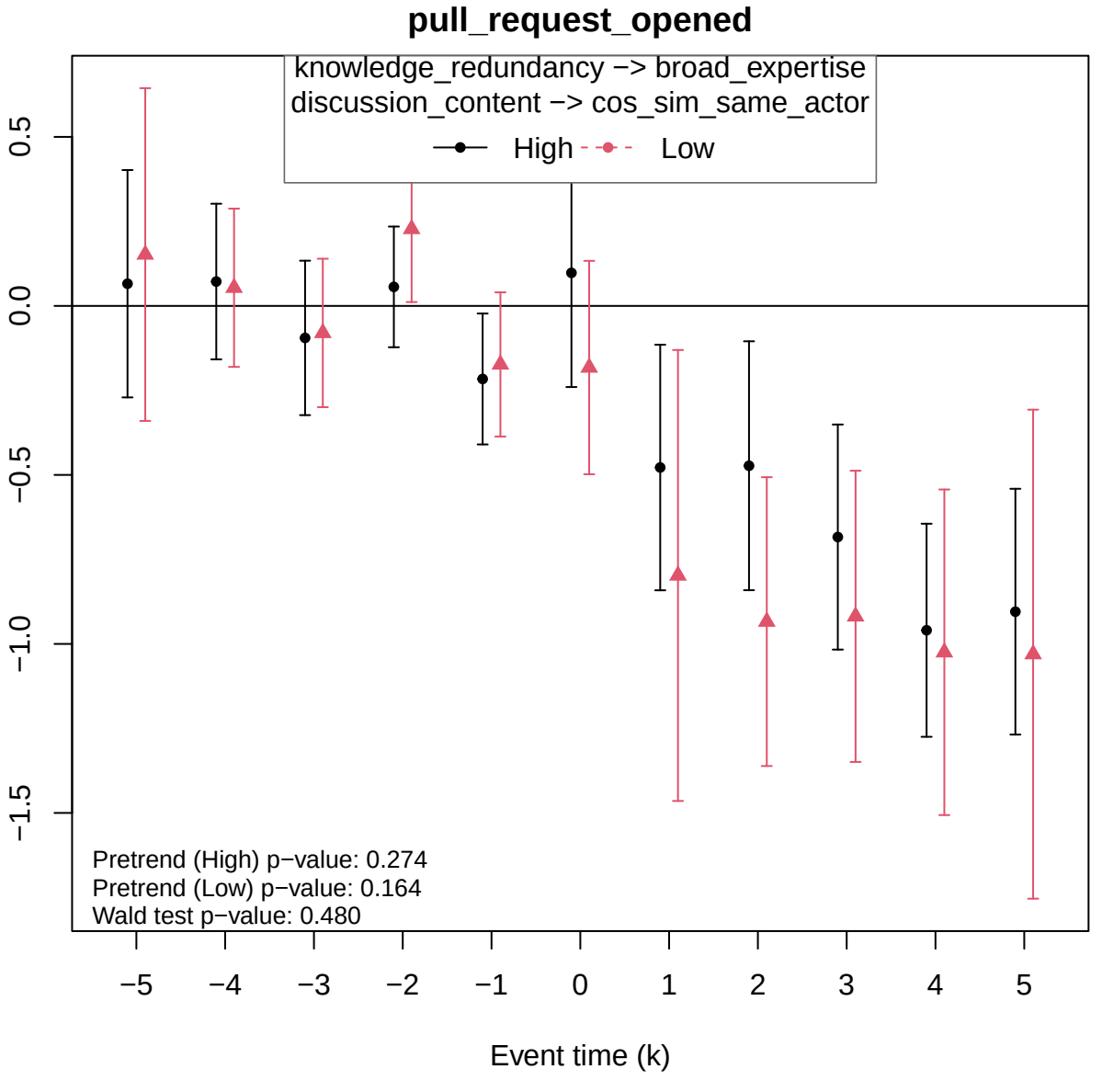

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

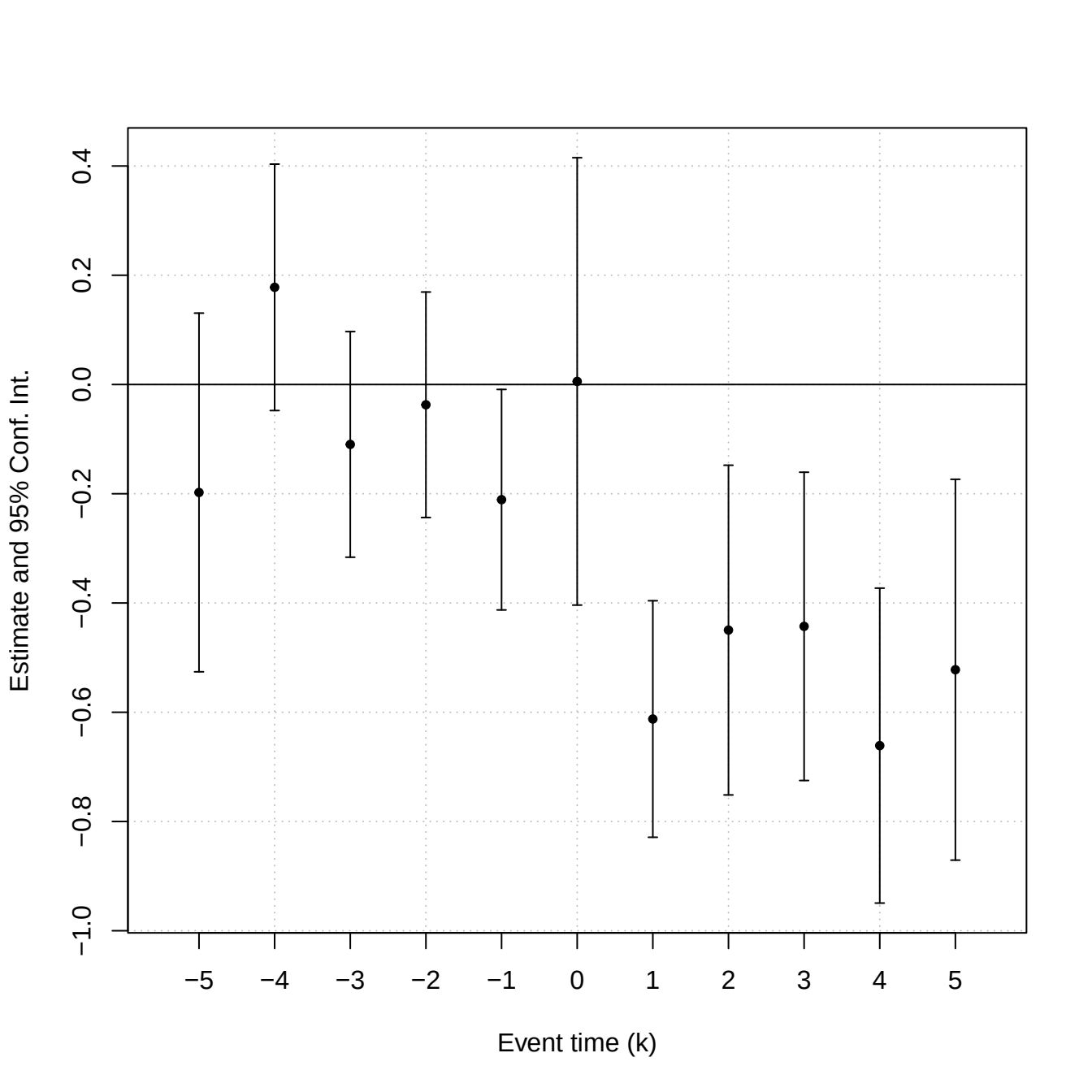

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

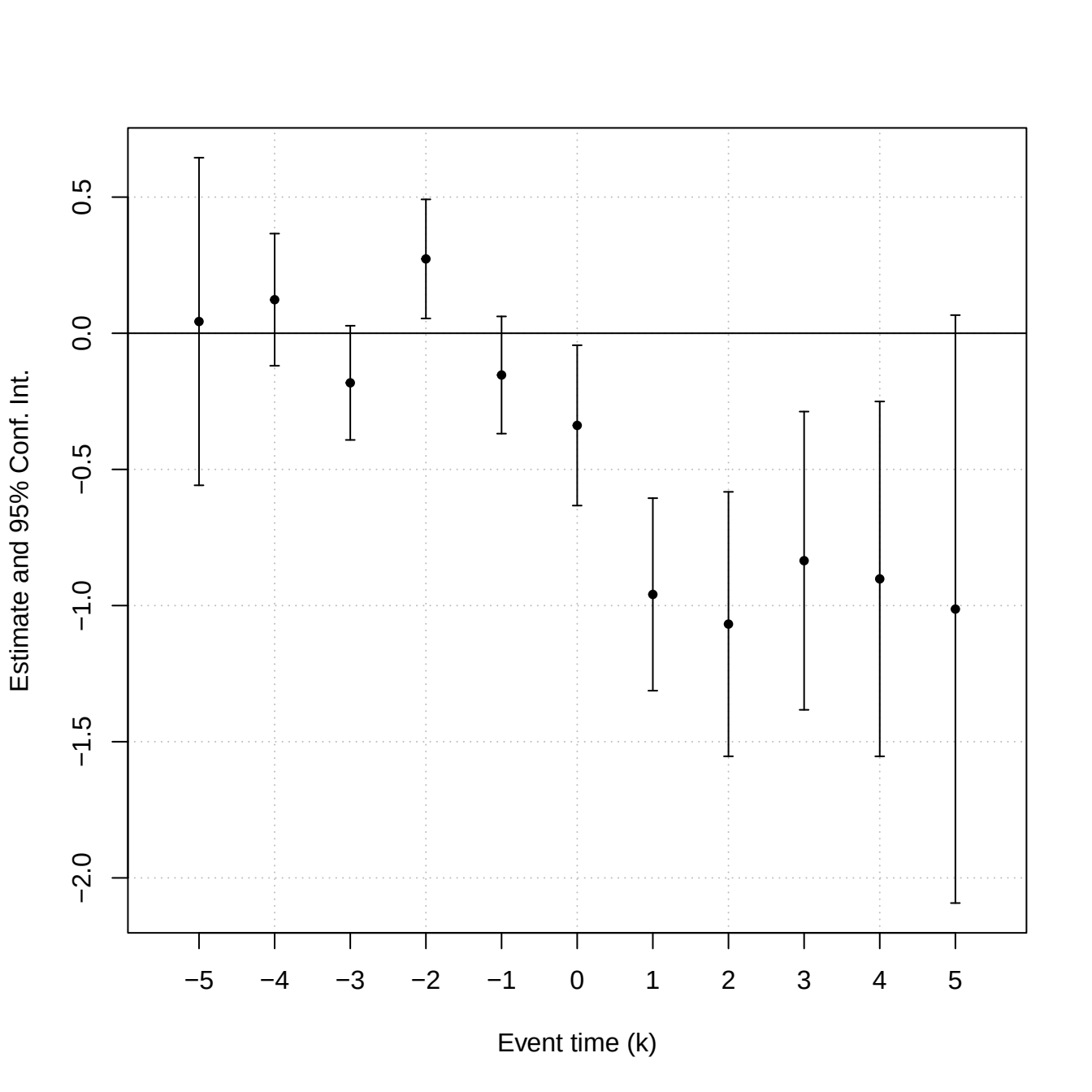

major_minor_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> text_sim_ratio
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.613
Pretrend (Low) p−value: 0.259
Wald test p−value: 0.065
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

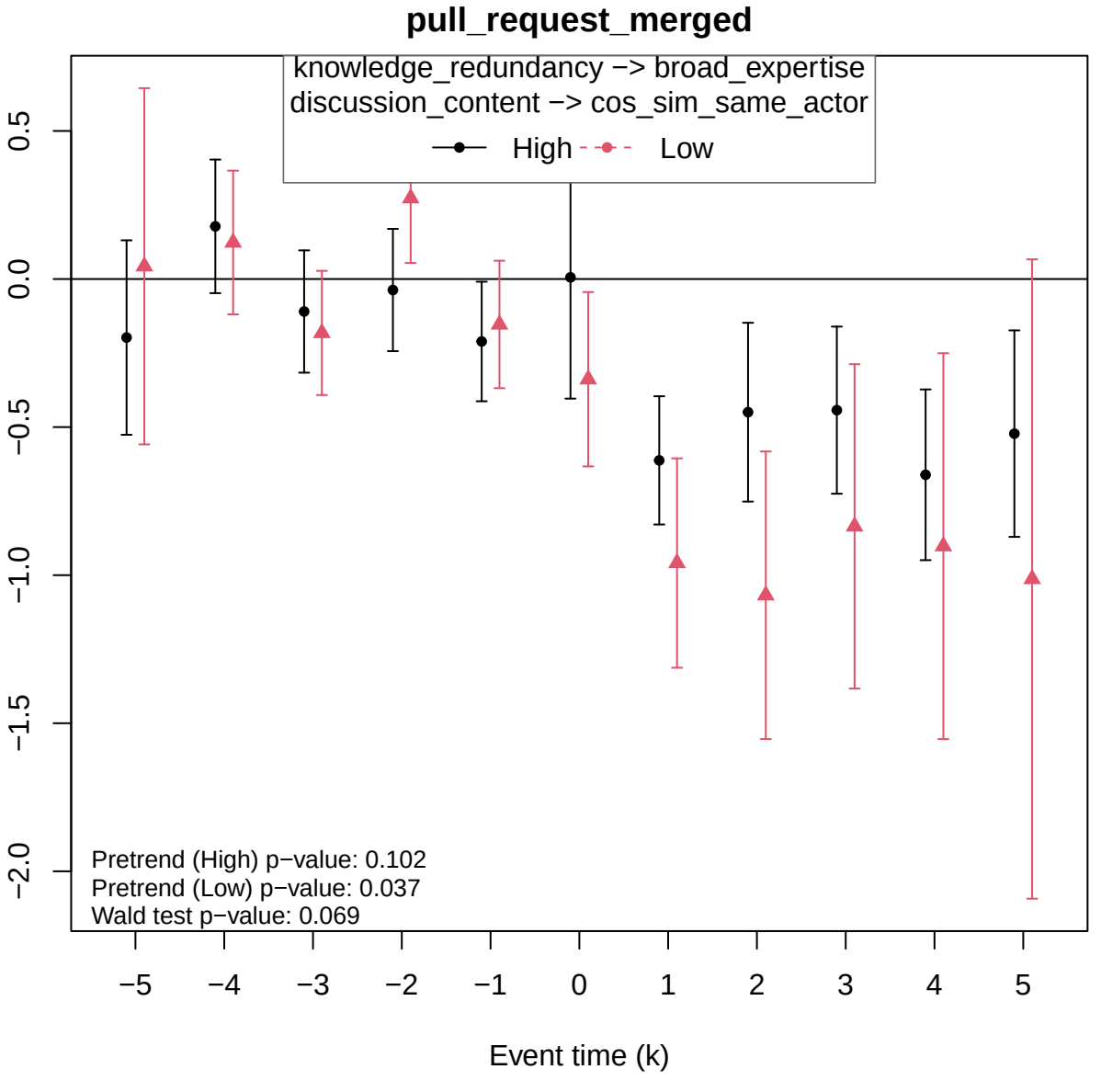

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

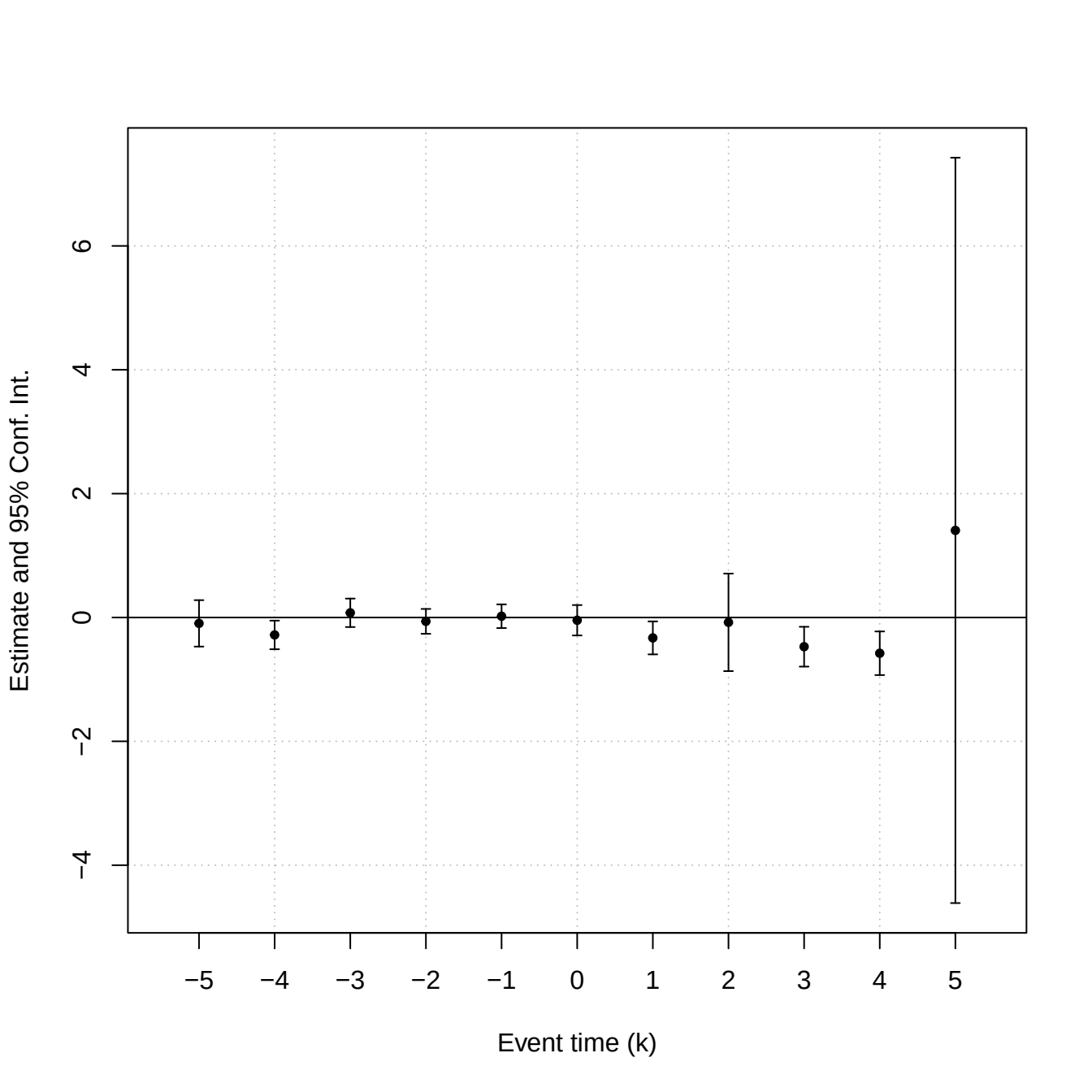

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

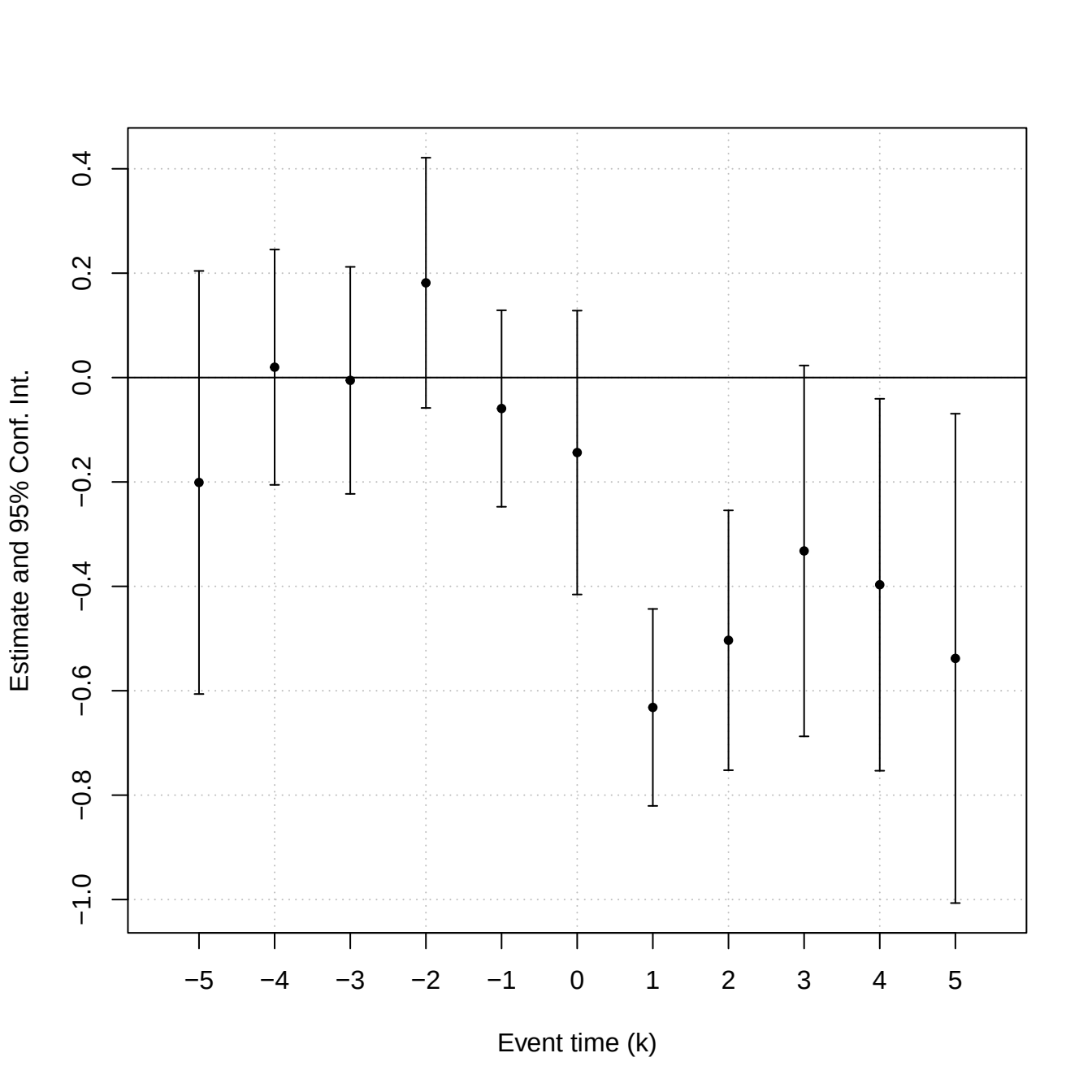

pull_request_opened
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_same_actor
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.274
Pretrend (Low) p−value: 0.164
Wald test p−value: 0.480
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

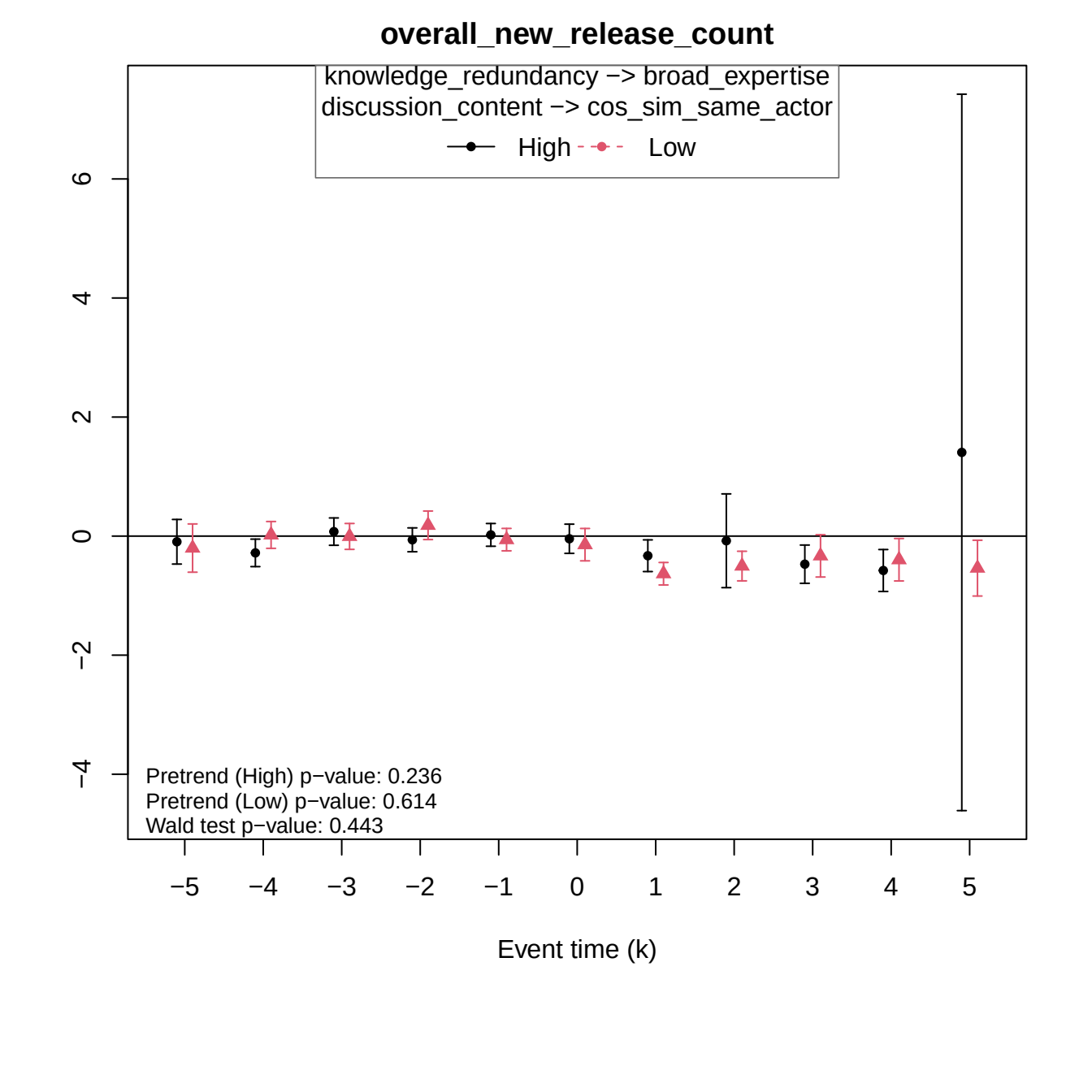

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

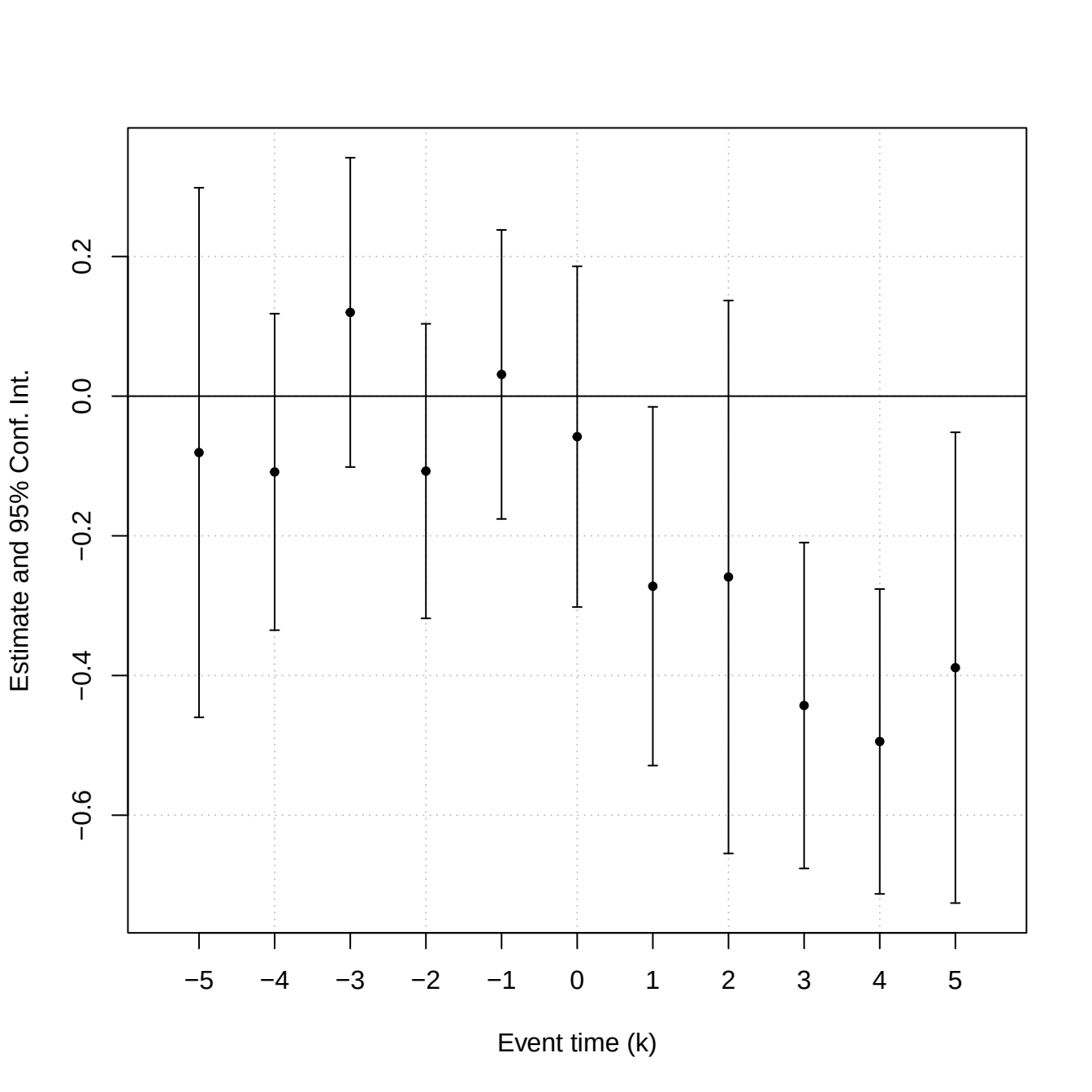

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

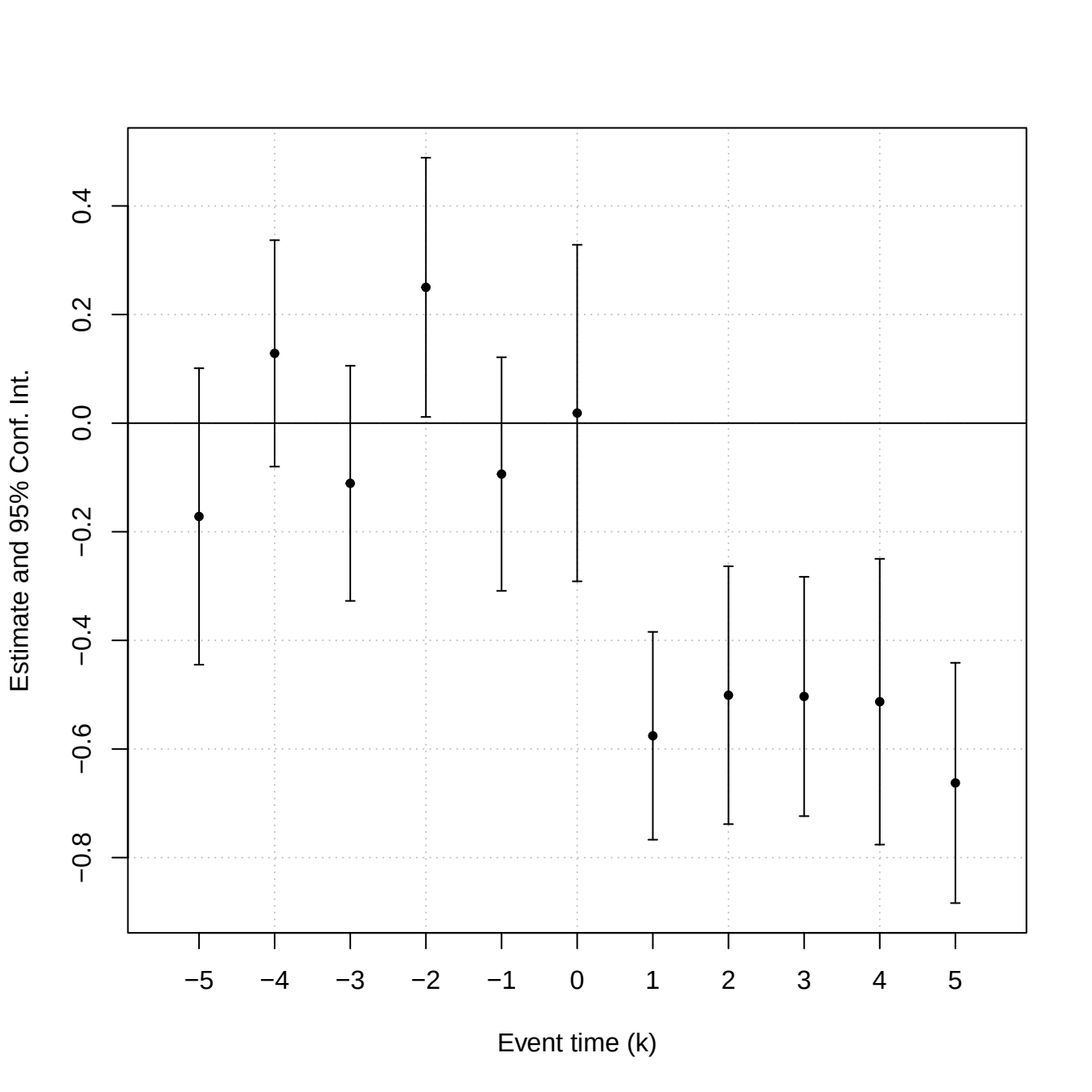

pull_request_merged
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_same_actor
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.102
Pretrend (Low) p−value: 0.037
Wald test p−value: 0.069
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

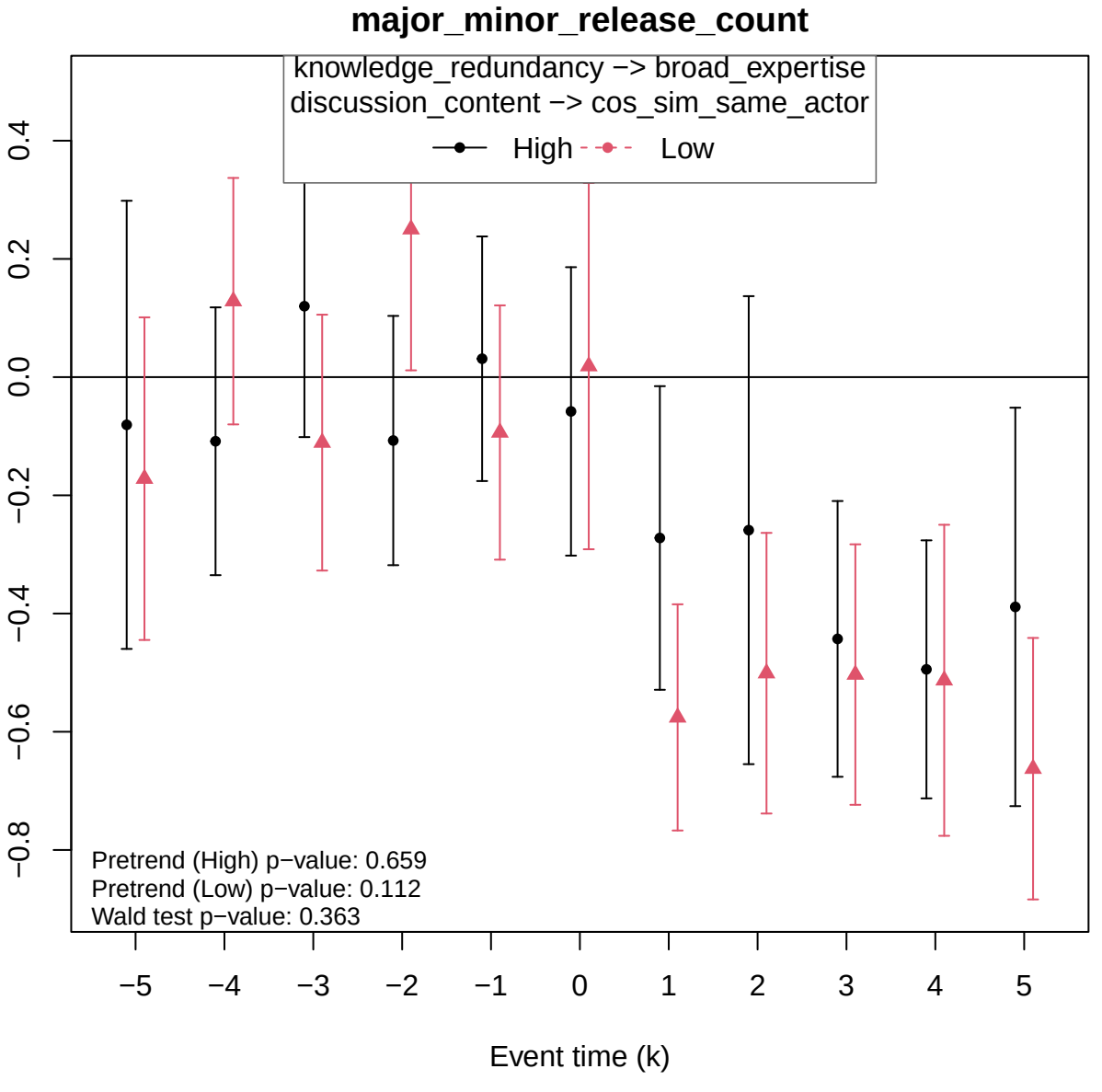

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

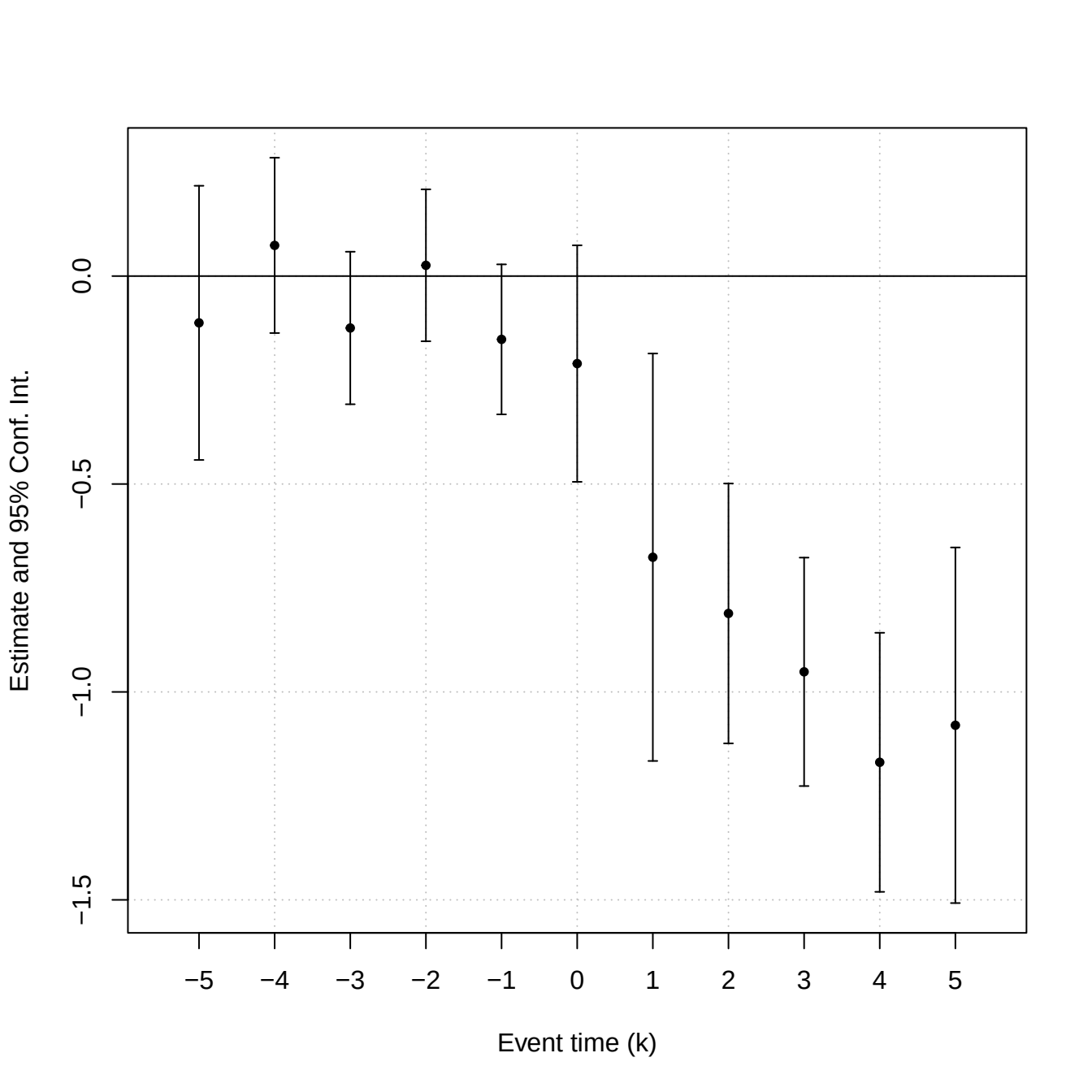

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

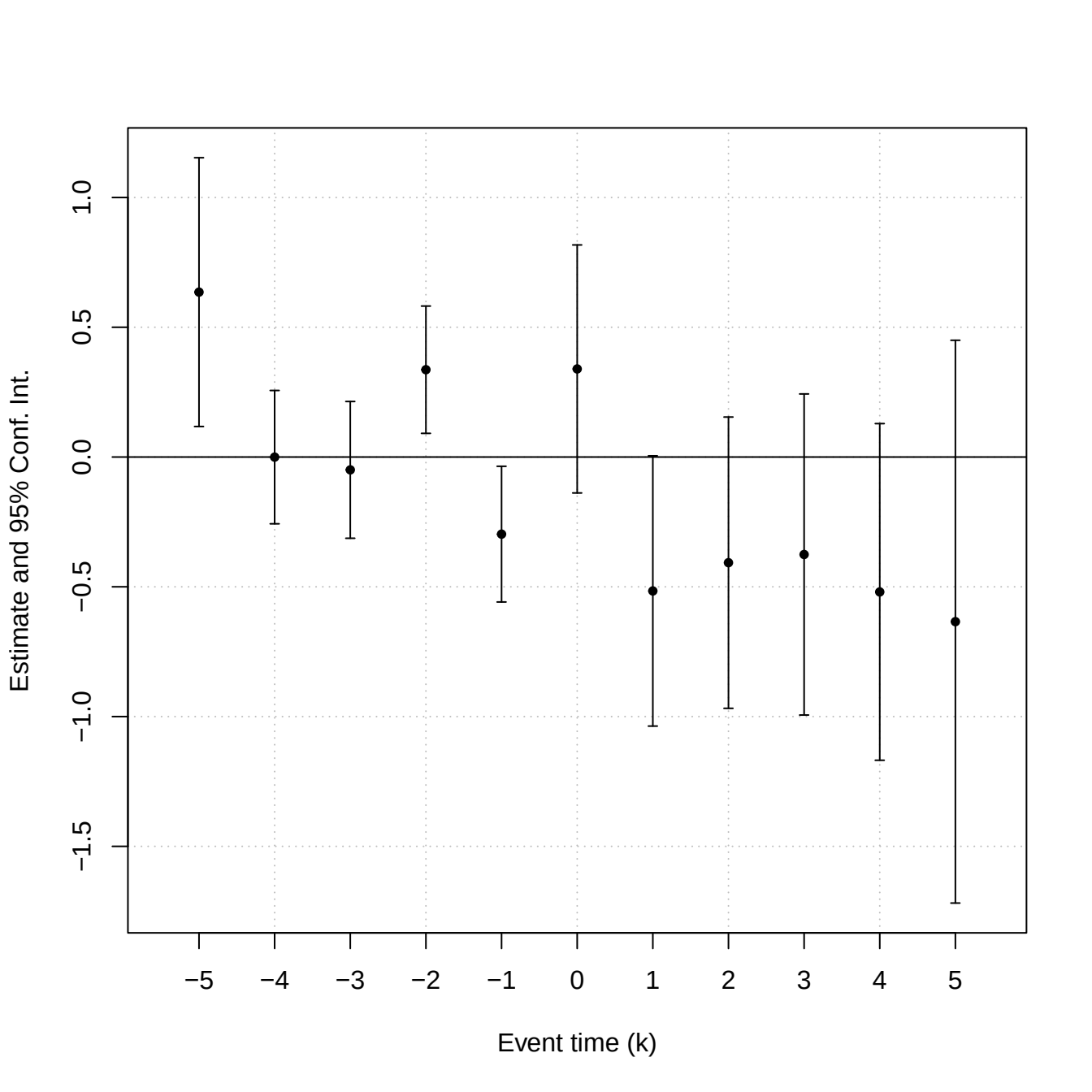

overall_new_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_same_actor
High
Low
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.236
Pretrend (Low) p−value: 0.614
Wald test p−value: 0.443
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

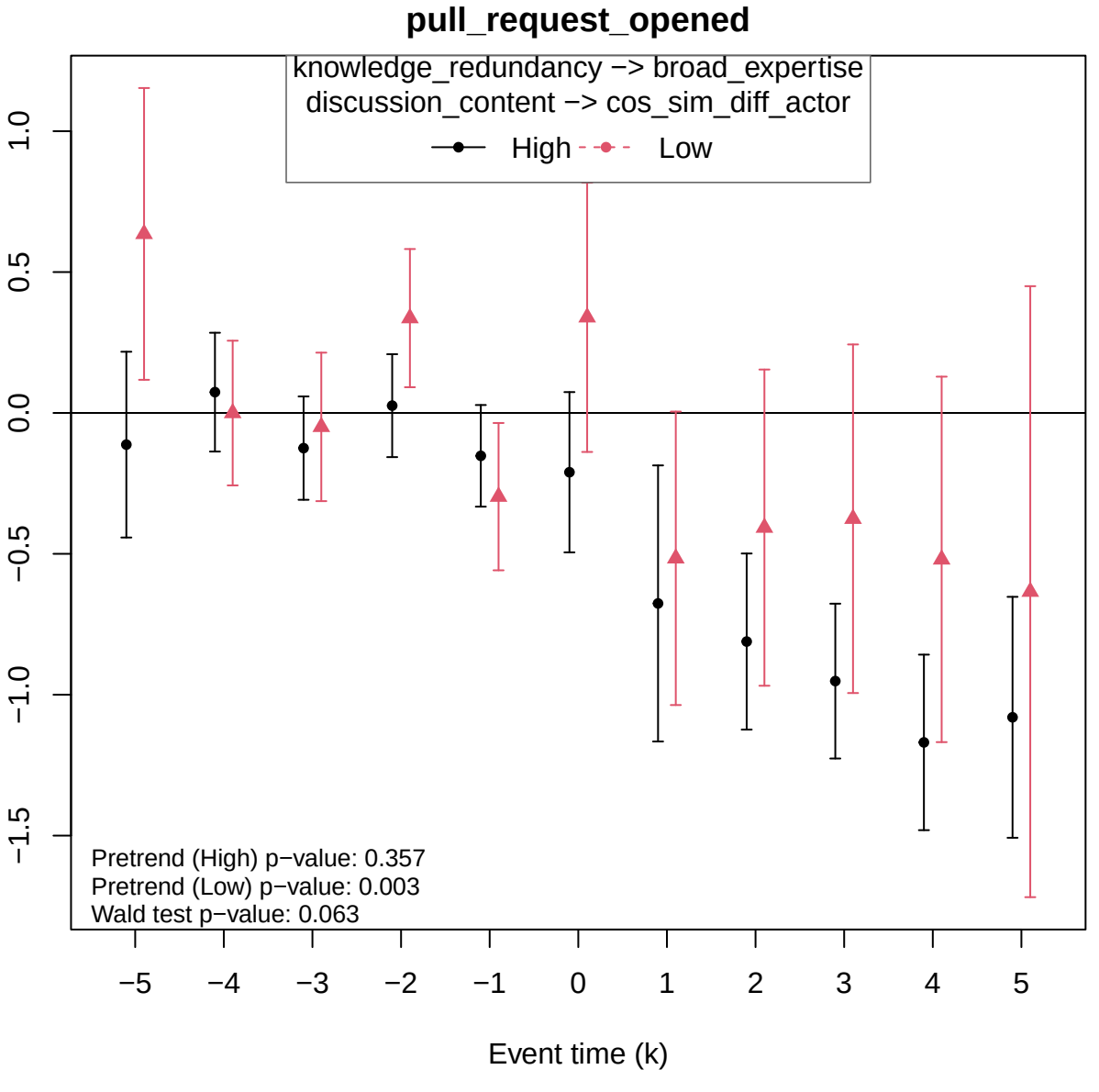

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

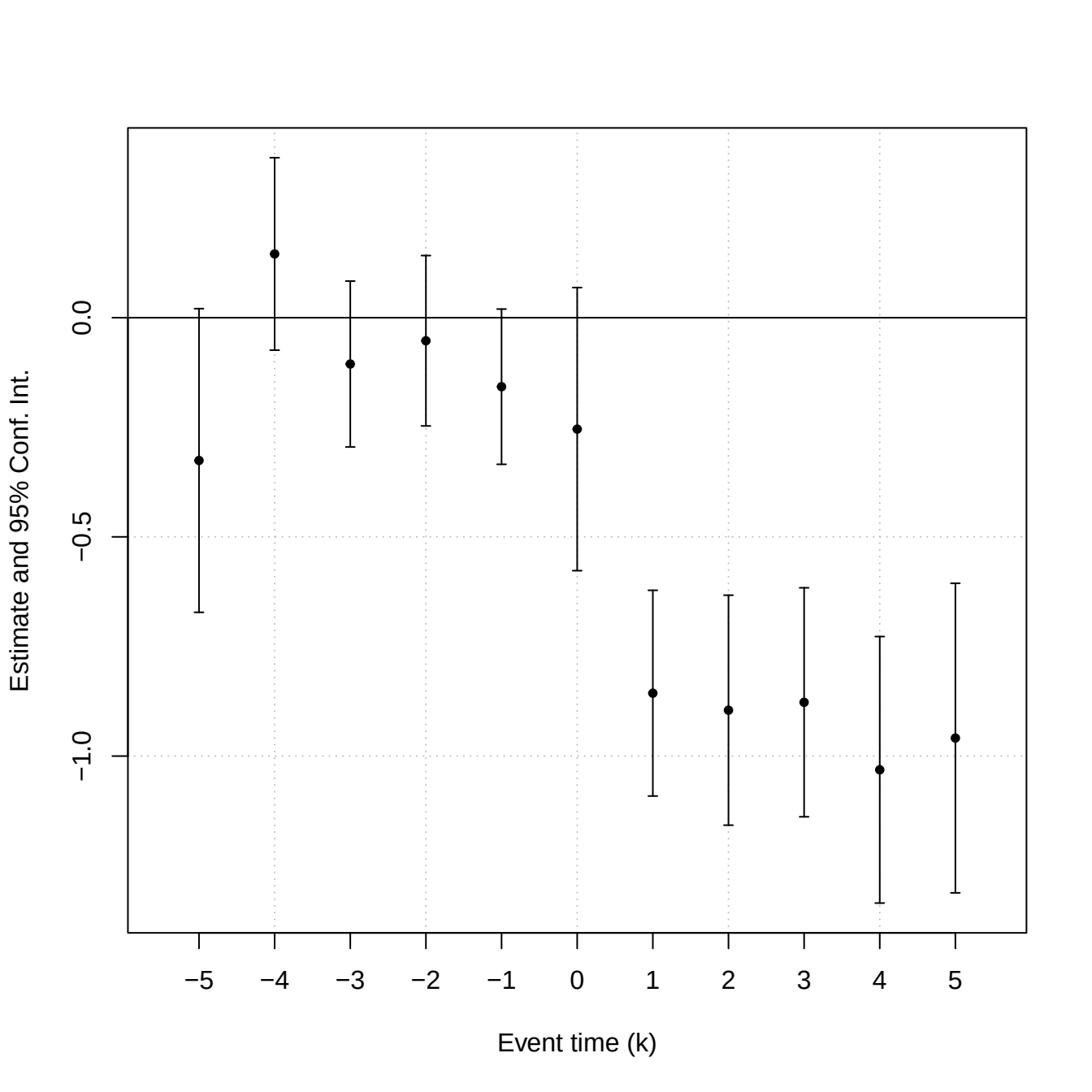

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

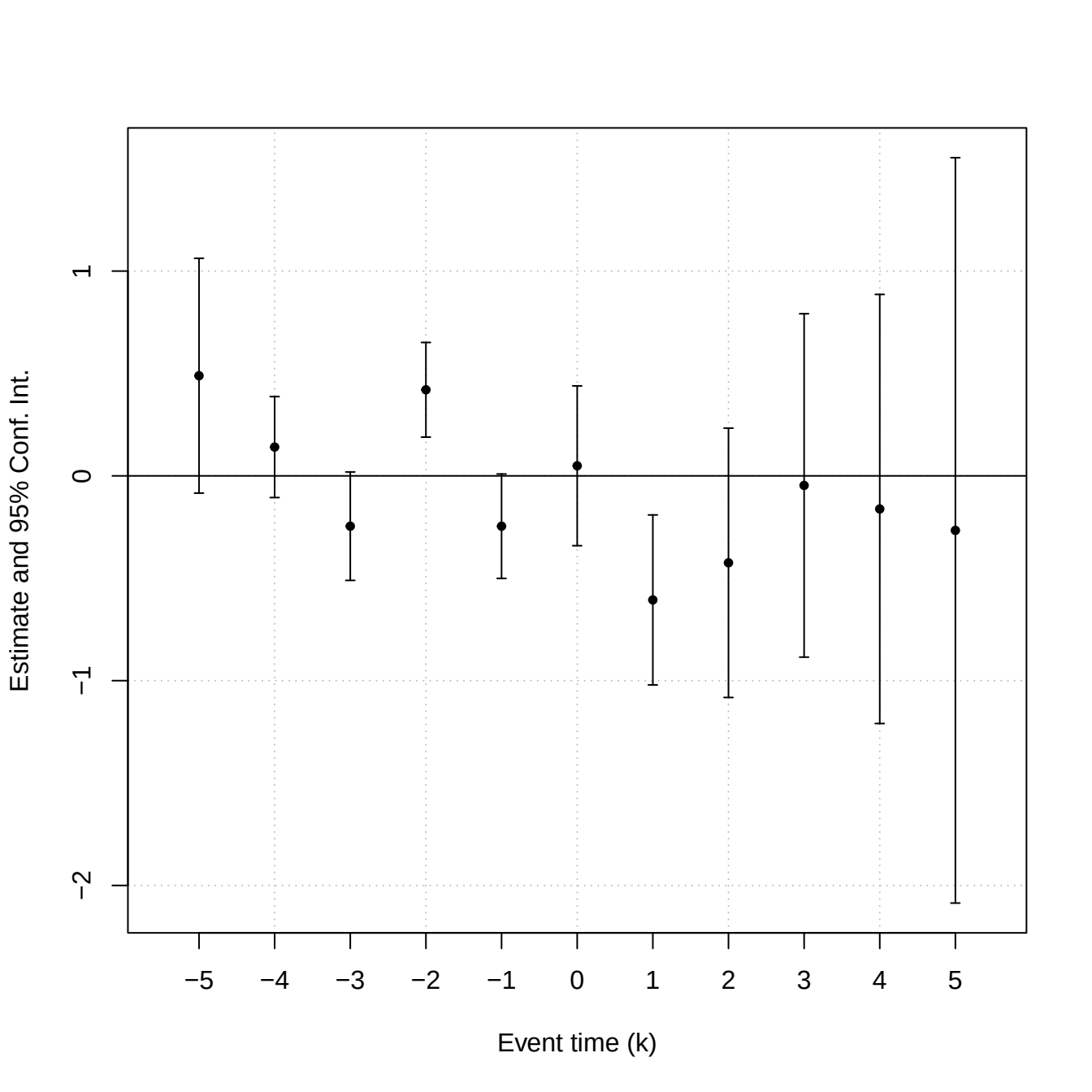

major_minor_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_same_actor
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.659
Pretrend (Low) p−value: 0.112
Wald test p−value: 0.363
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

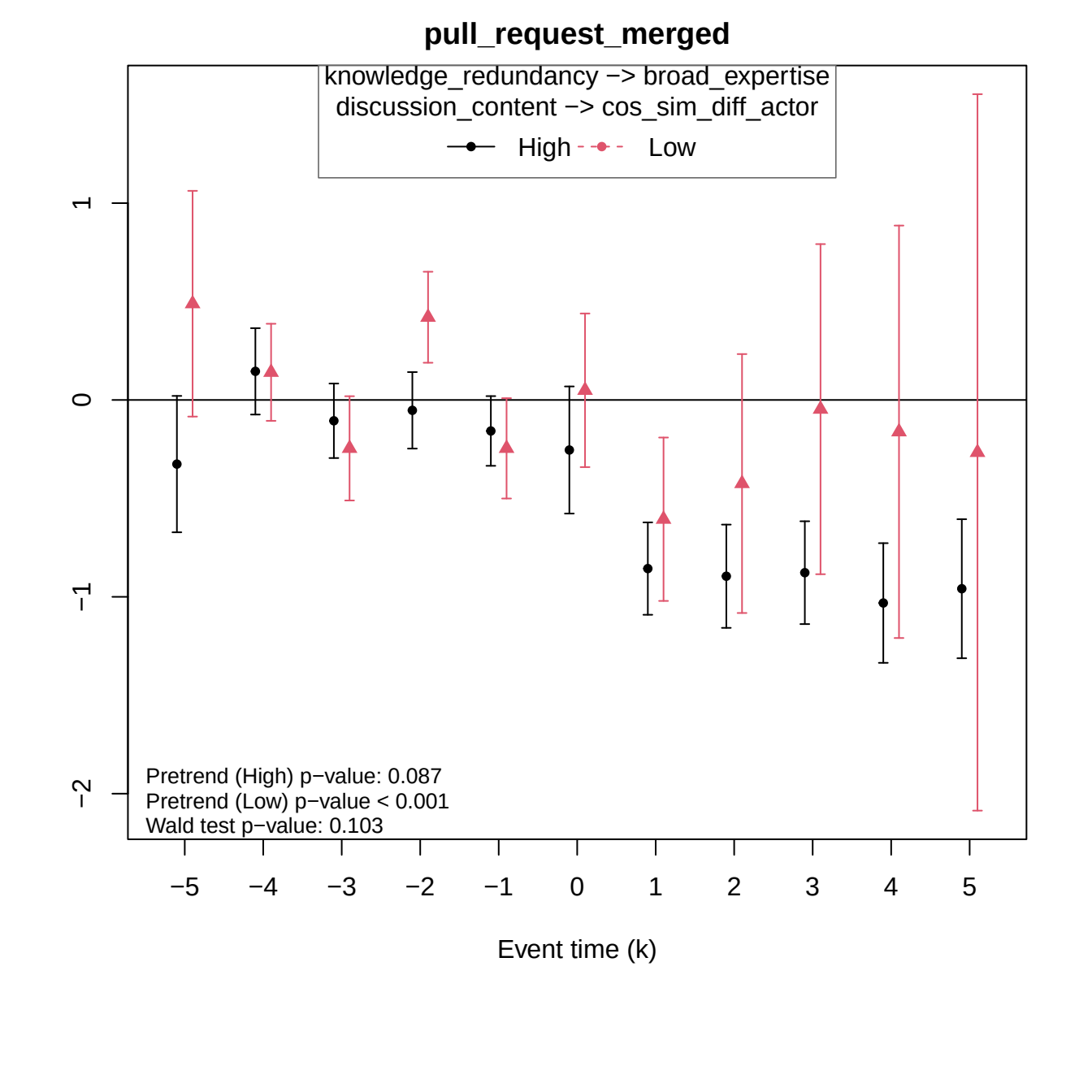

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

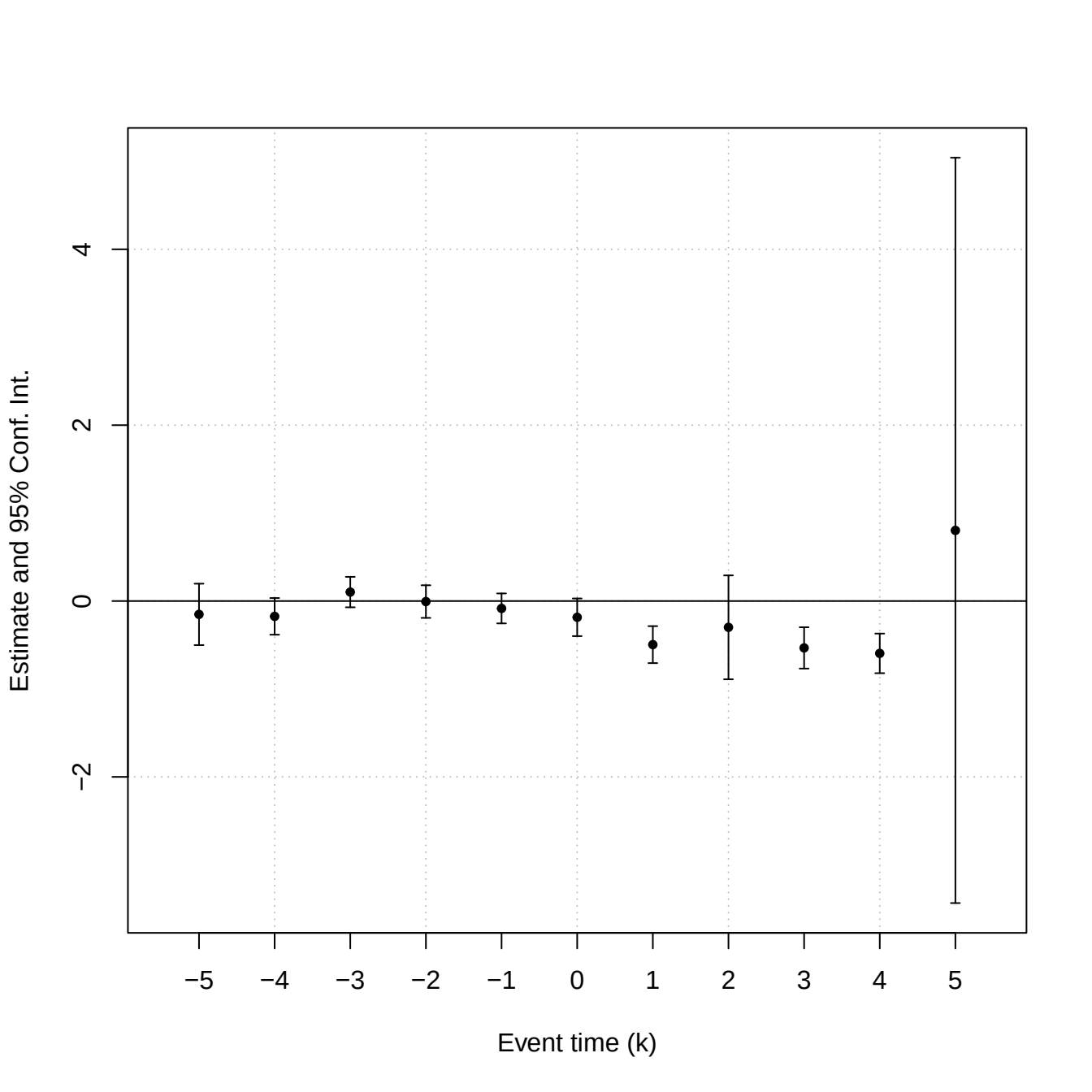

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

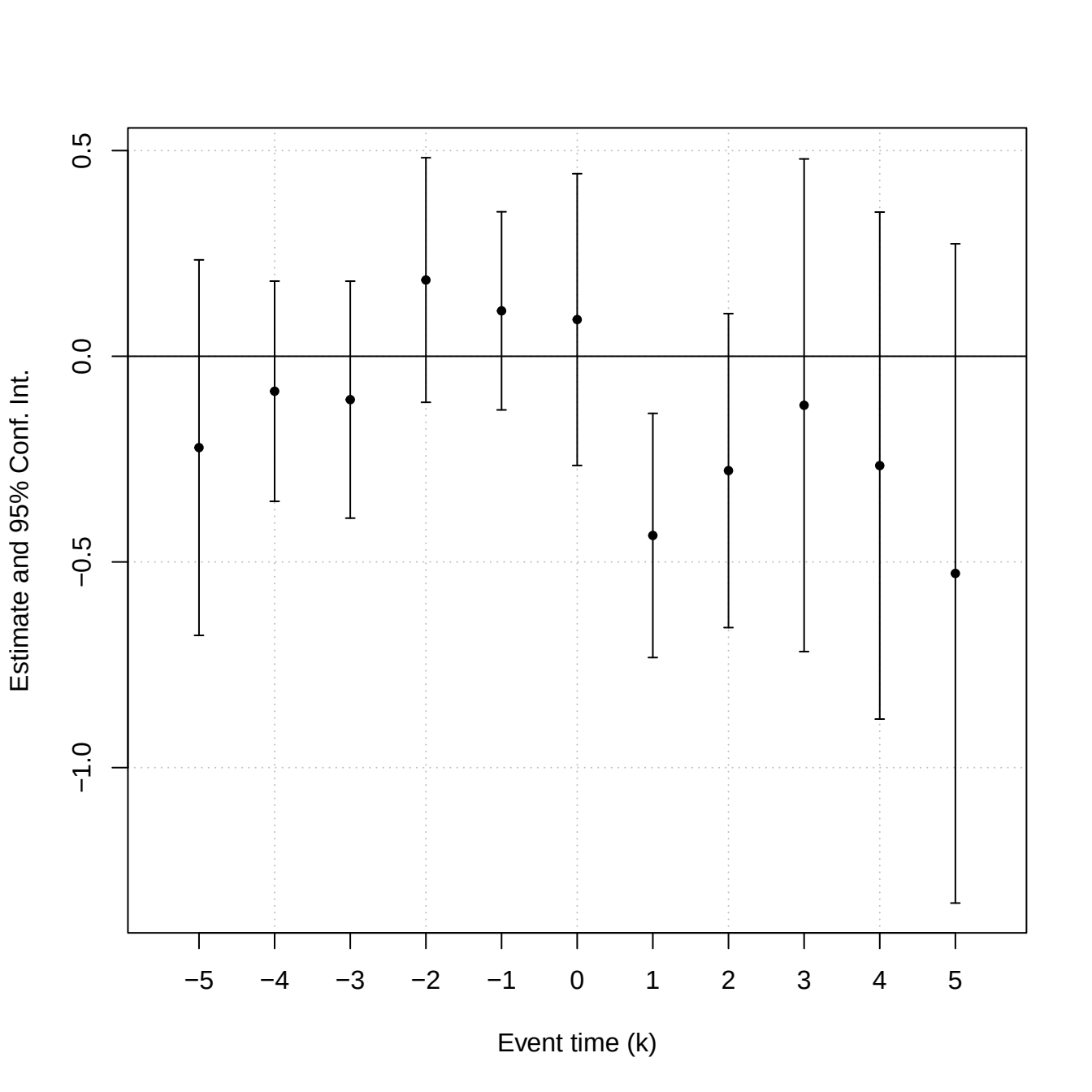

pull_request_opened
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_diff_actor
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.357
Pretrend (Low) p−value: 0.003
Wald test p−value: 0.063
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

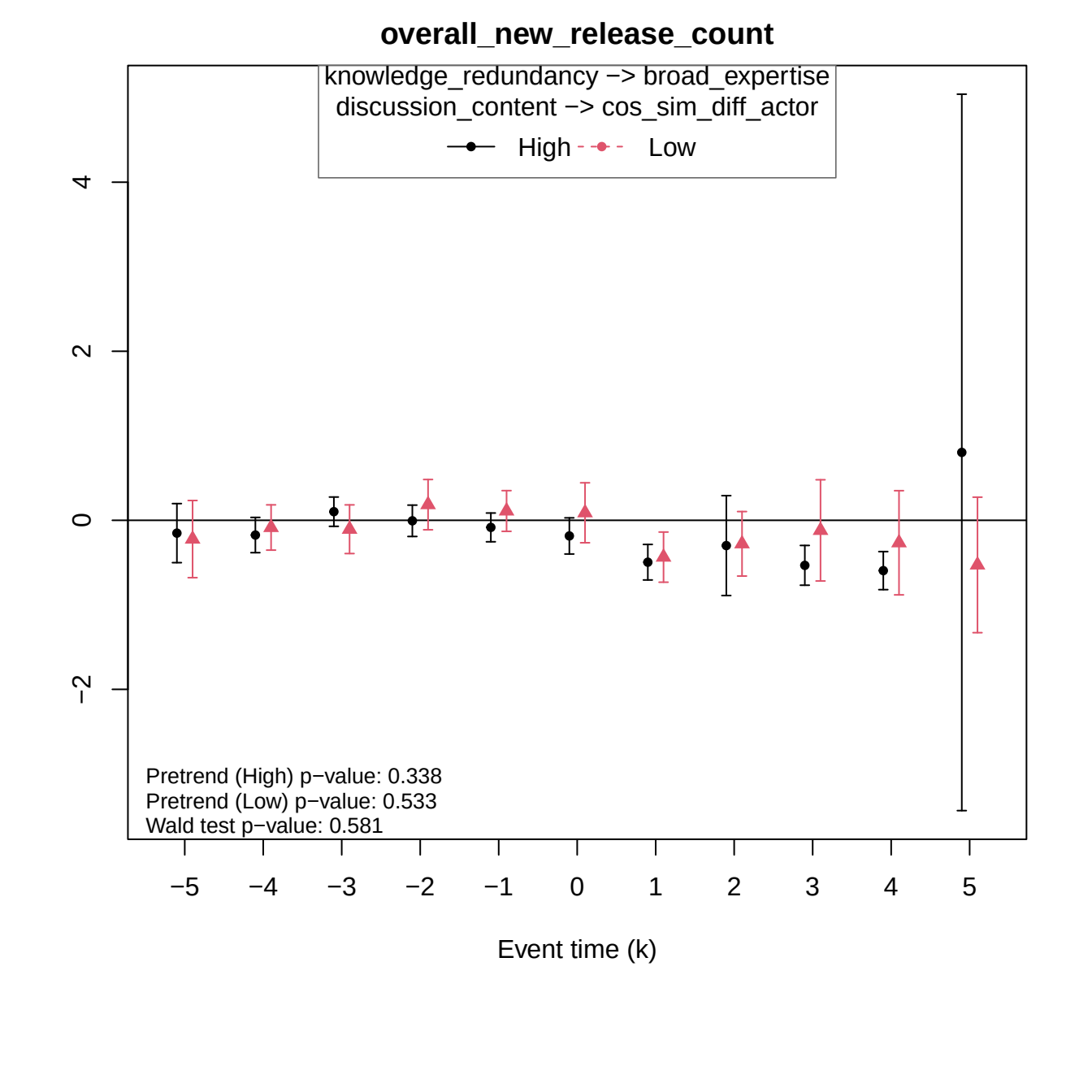

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

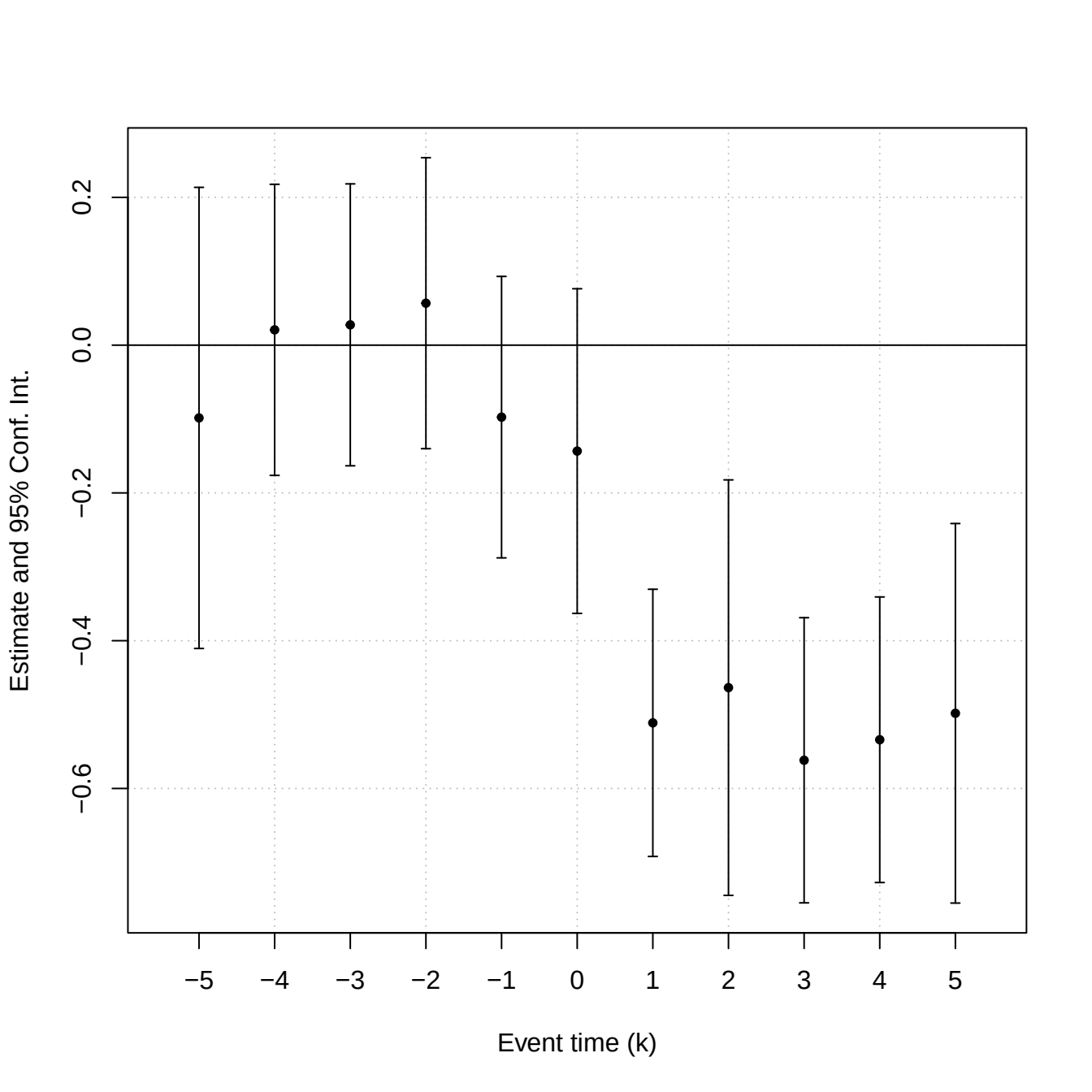

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

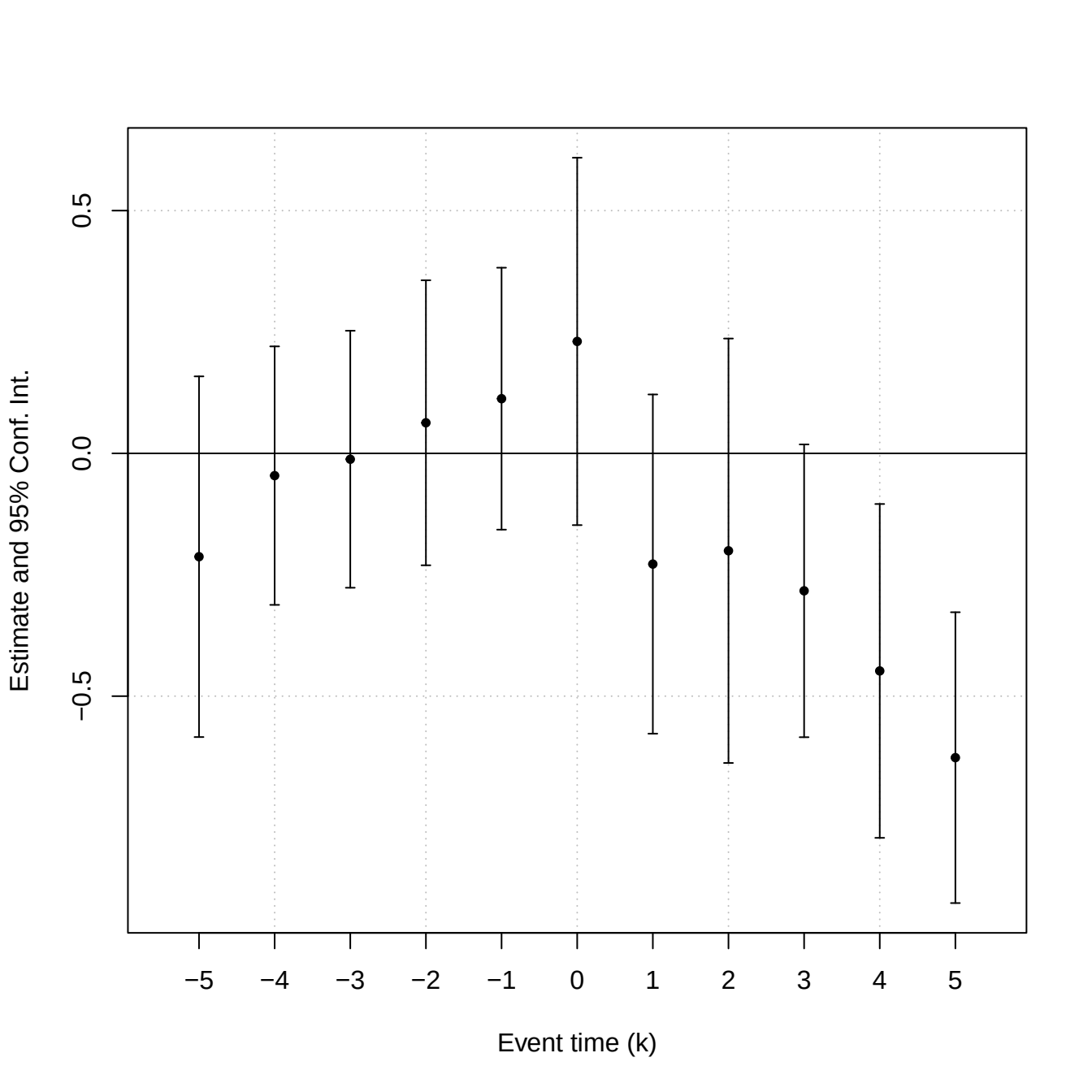

pull_request_merged
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_diff_actor
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.087
Pretrend (Low) p−value < 0.001
Wald test p−value: 0.103
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

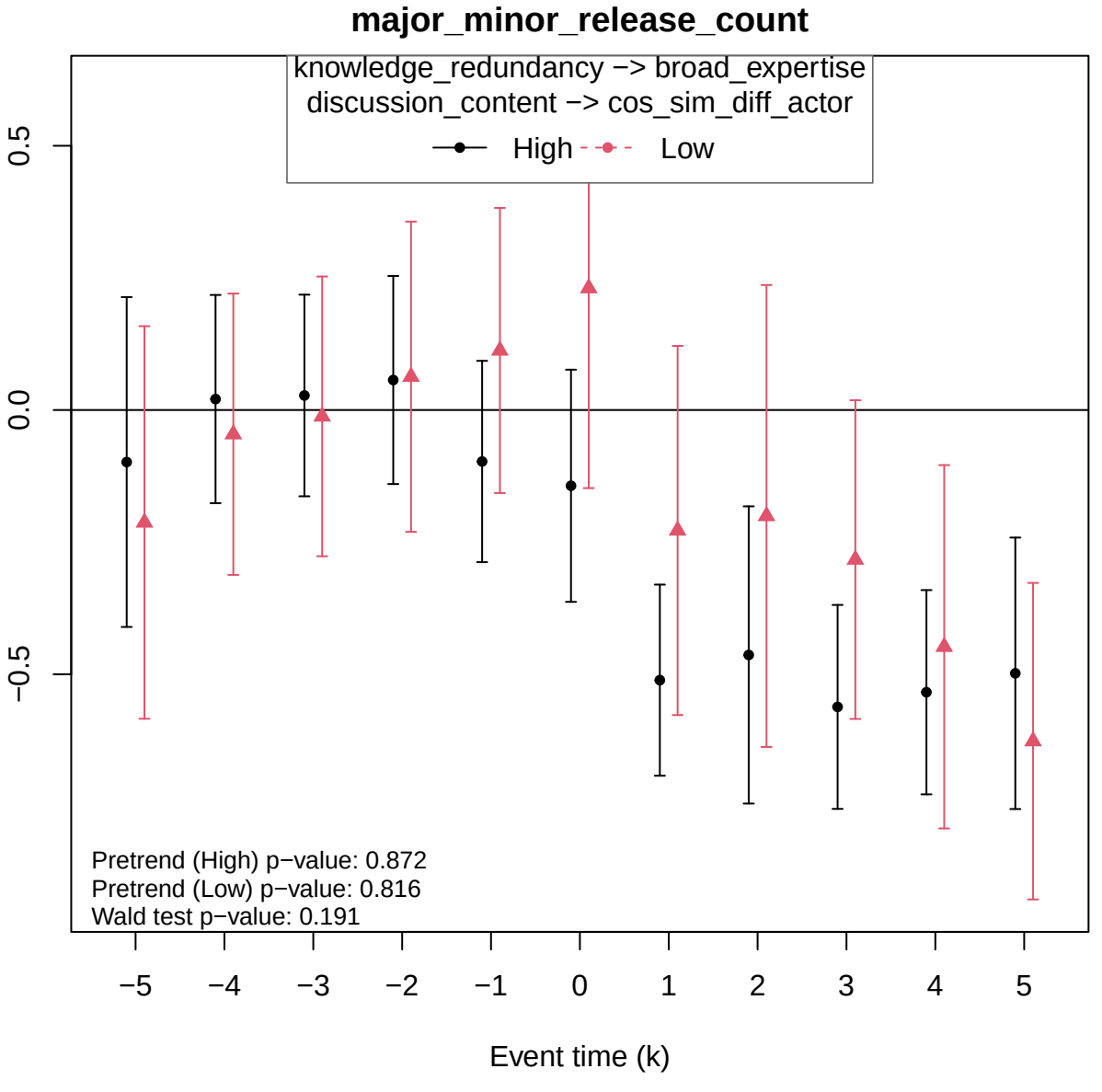

Estimate and 95% Conf. Int.
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

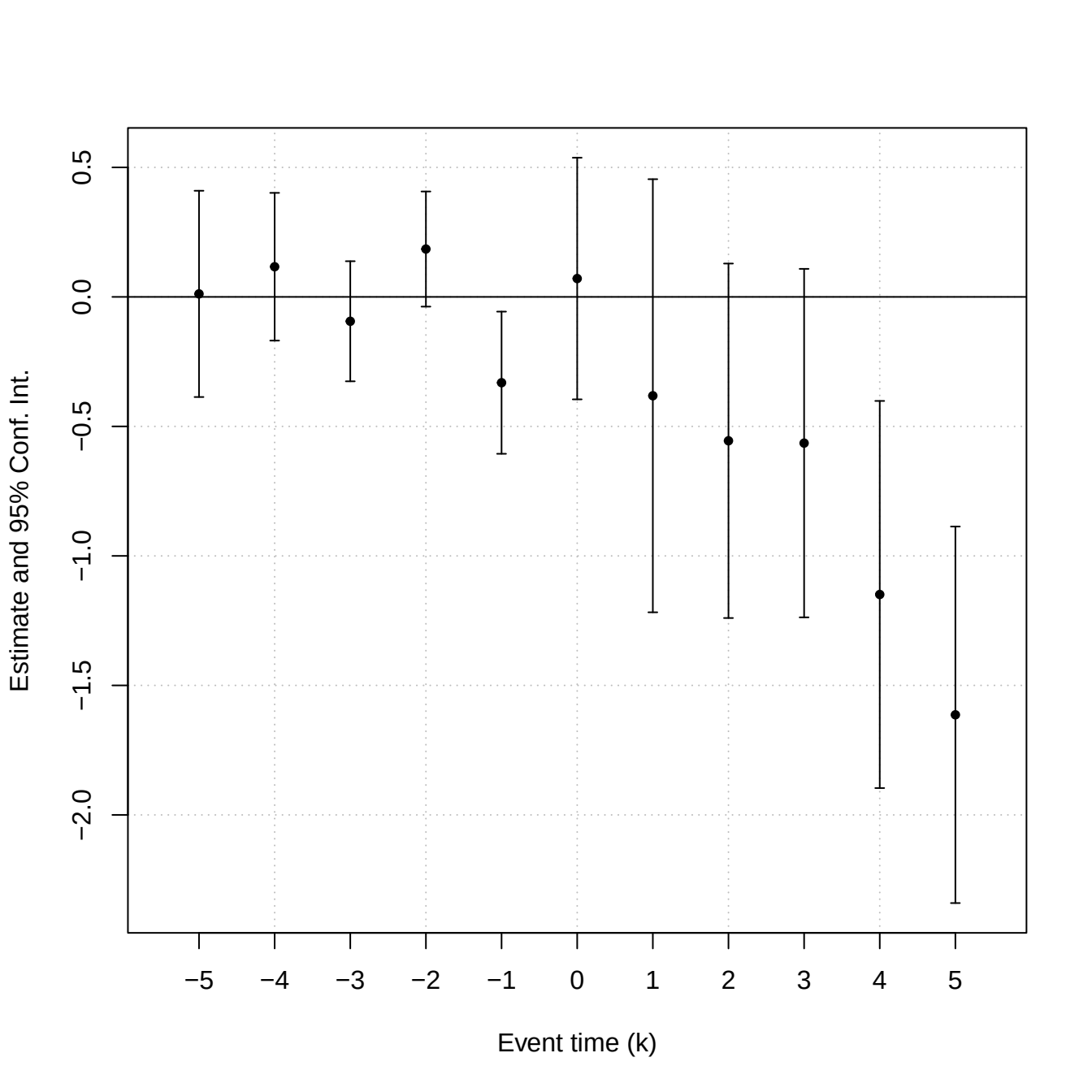

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

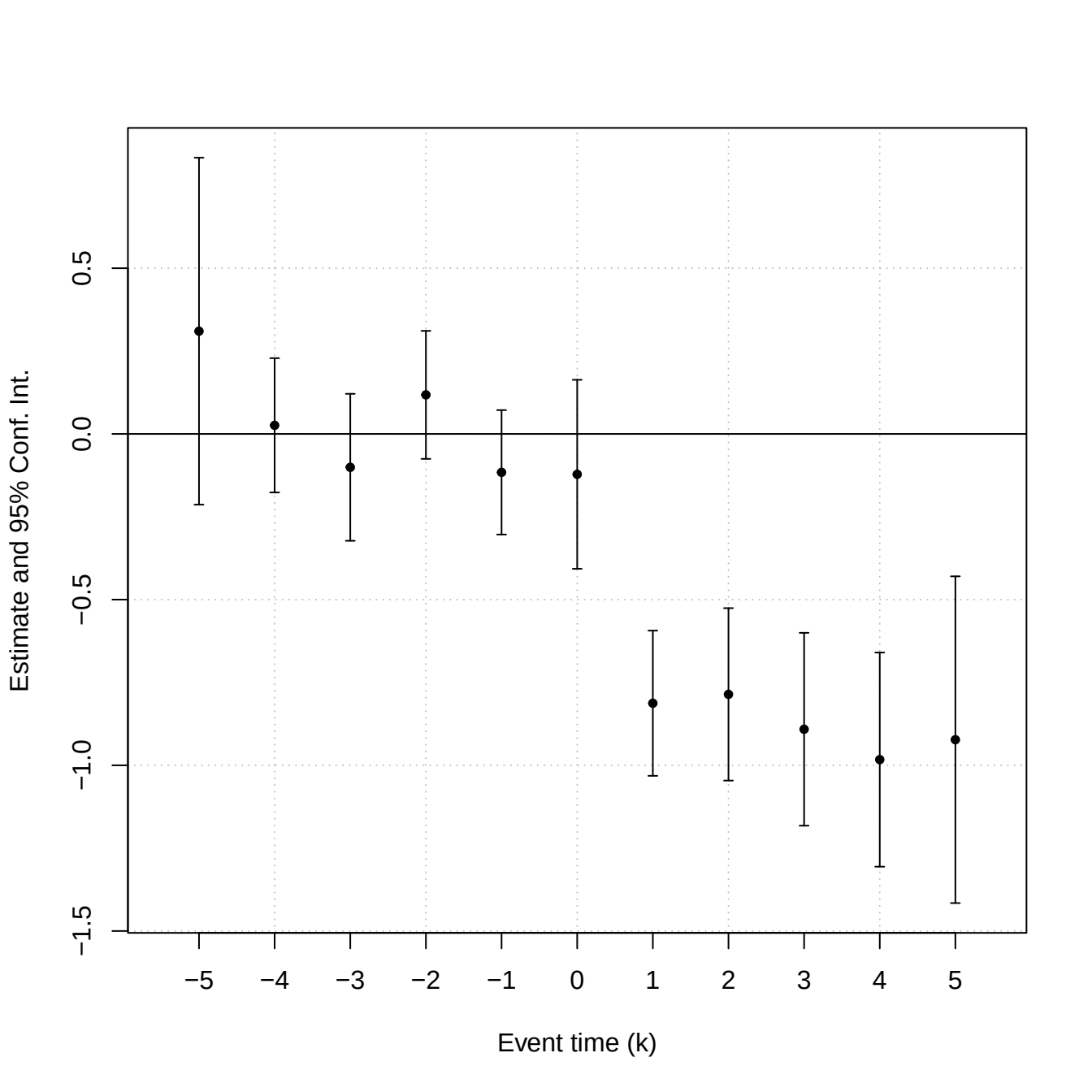

overall_new_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_diff_actor
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.338
Pretrend (Low) p−value: 0.533
Wald test p−value: 0.581
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

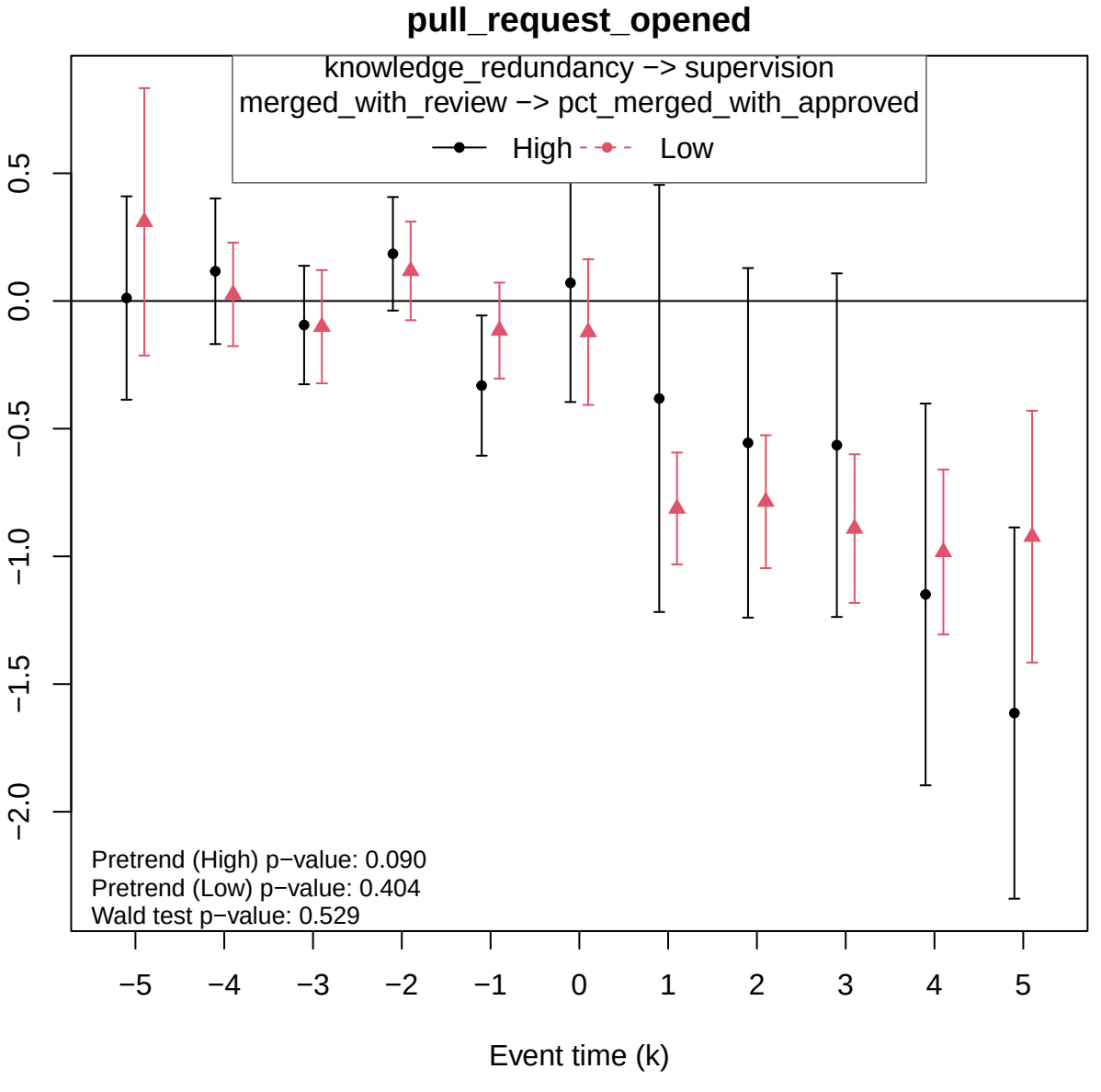

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

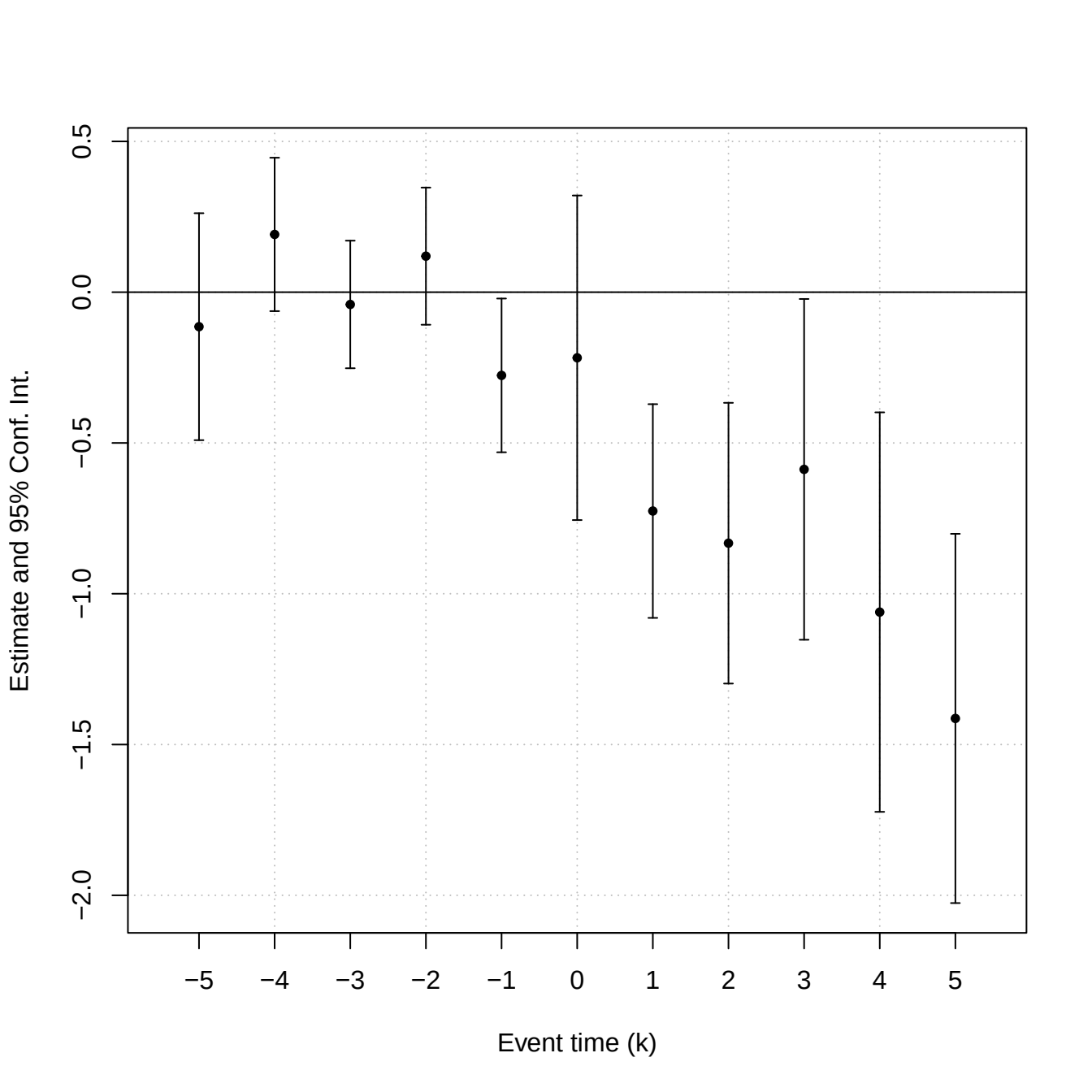

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

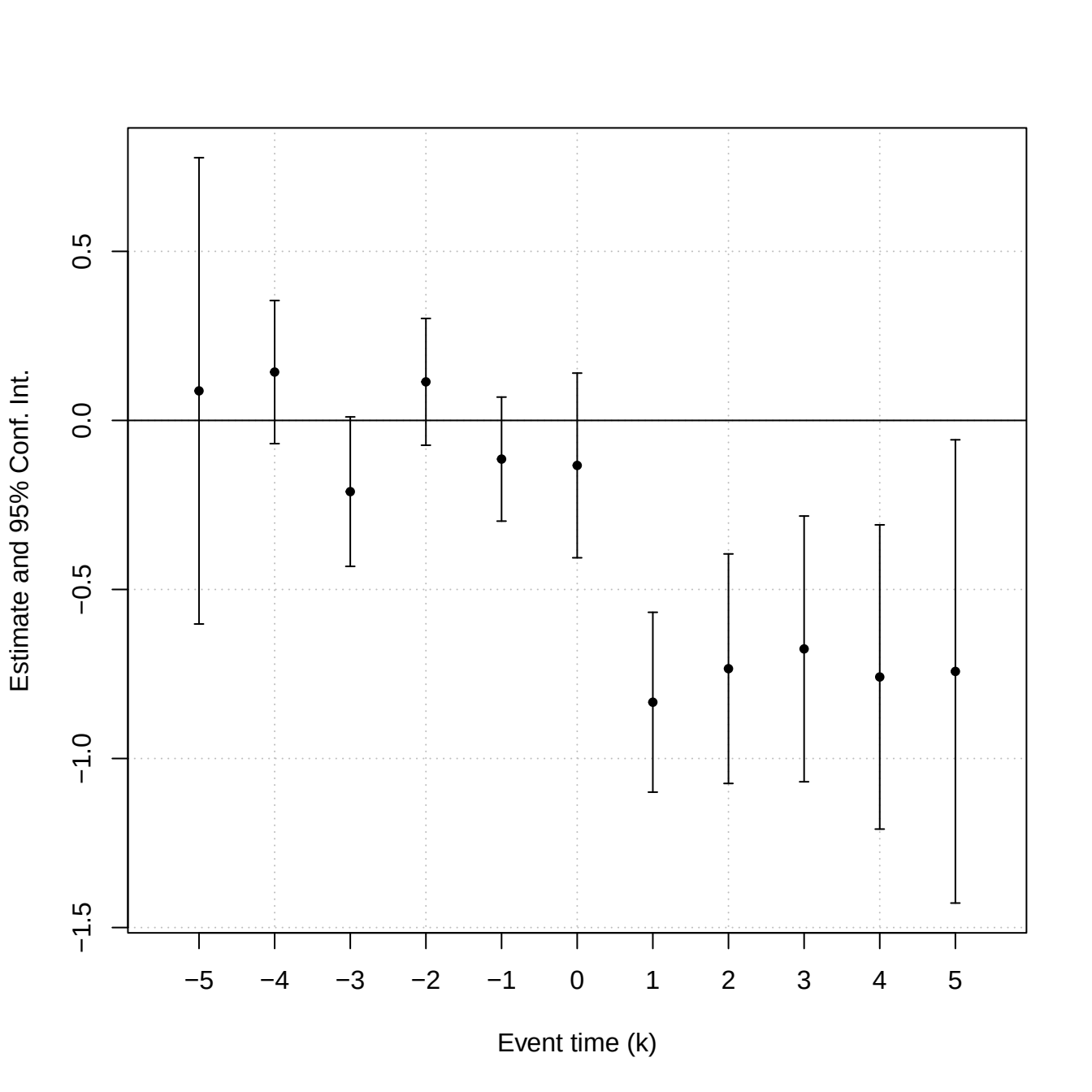

major_minor_release_count
knowledge_redundancy −> broad_expertise
discussion_content −> cos_sim_diff_actor
High
Low
0.5
0.0
−0.5
Pretrend (High) p−value: 0.872
Pretrend (Low) p−value: 0.816
Wald test p−value: 0.191
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

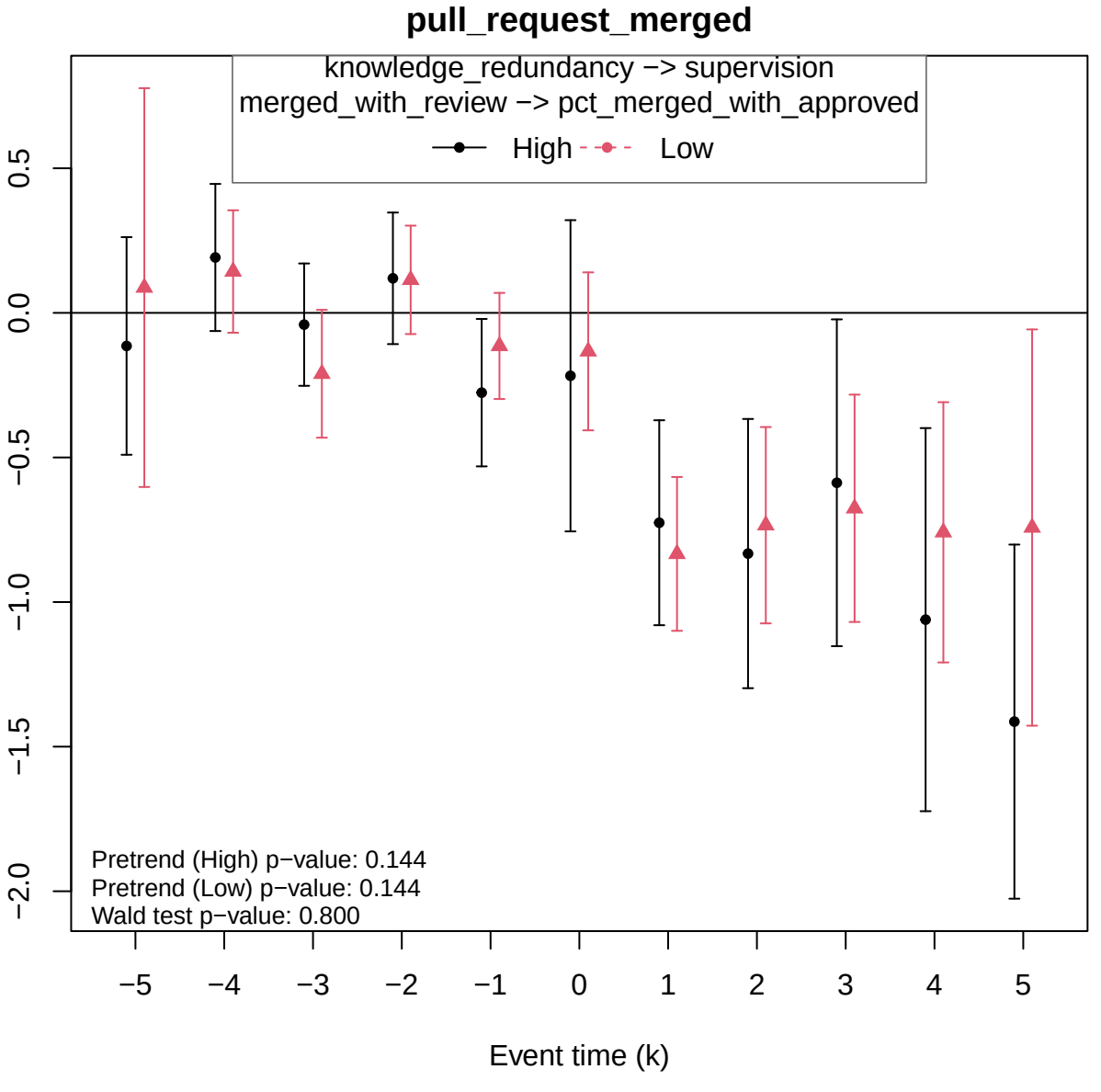

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

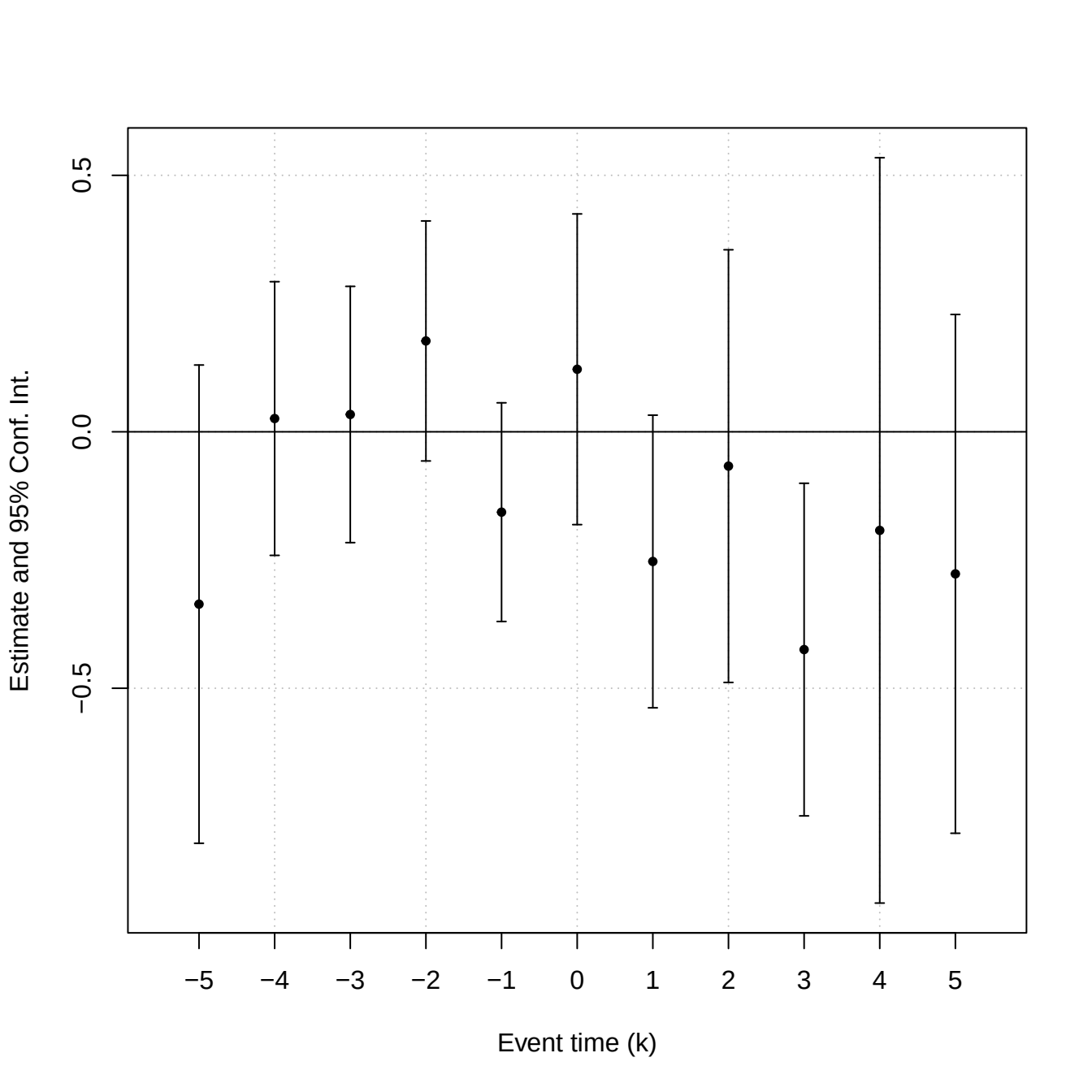

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

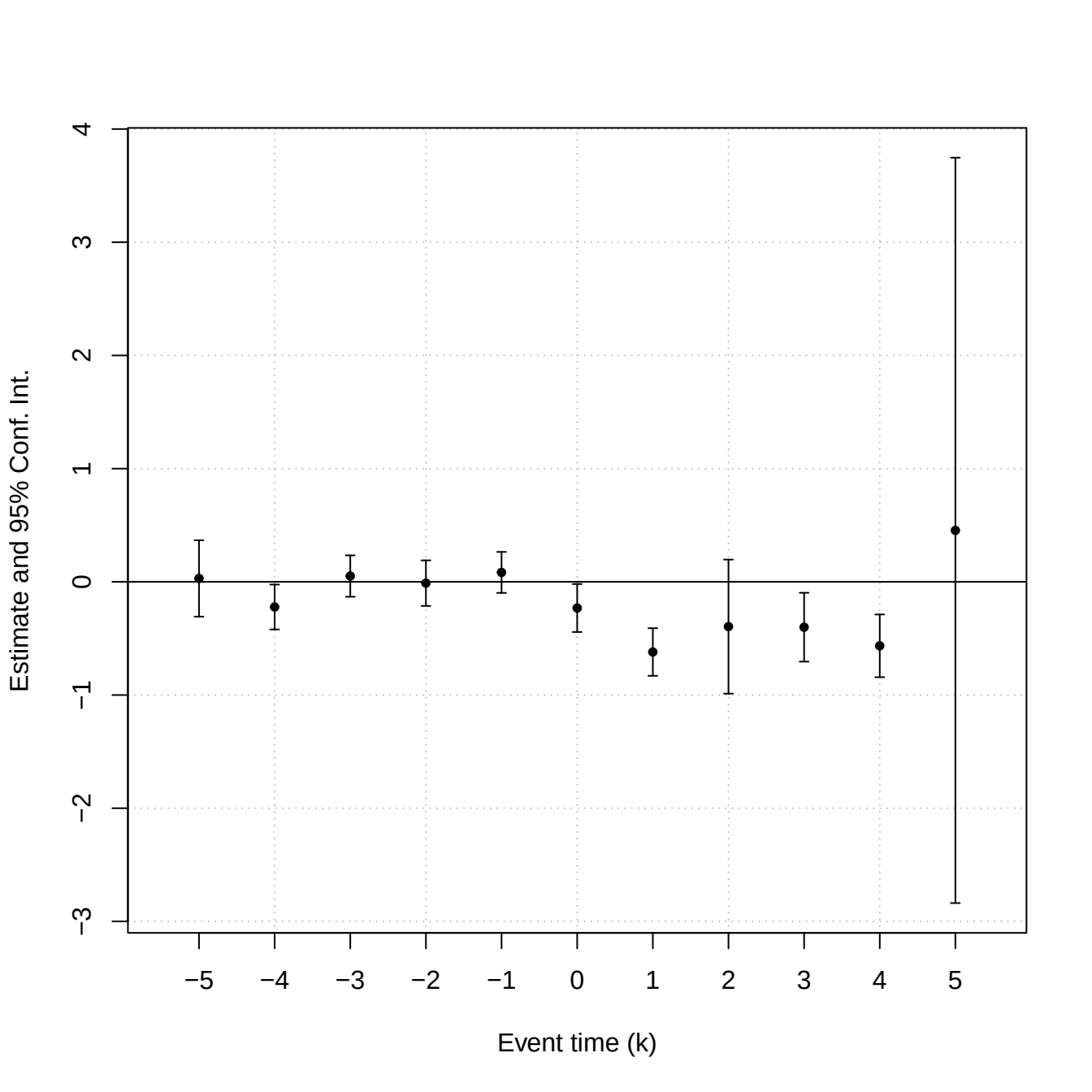

pull_request_opened
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_approved
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.090
Pretrend (Low) p−value: 0.404
Wald test p−value: 0.529
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

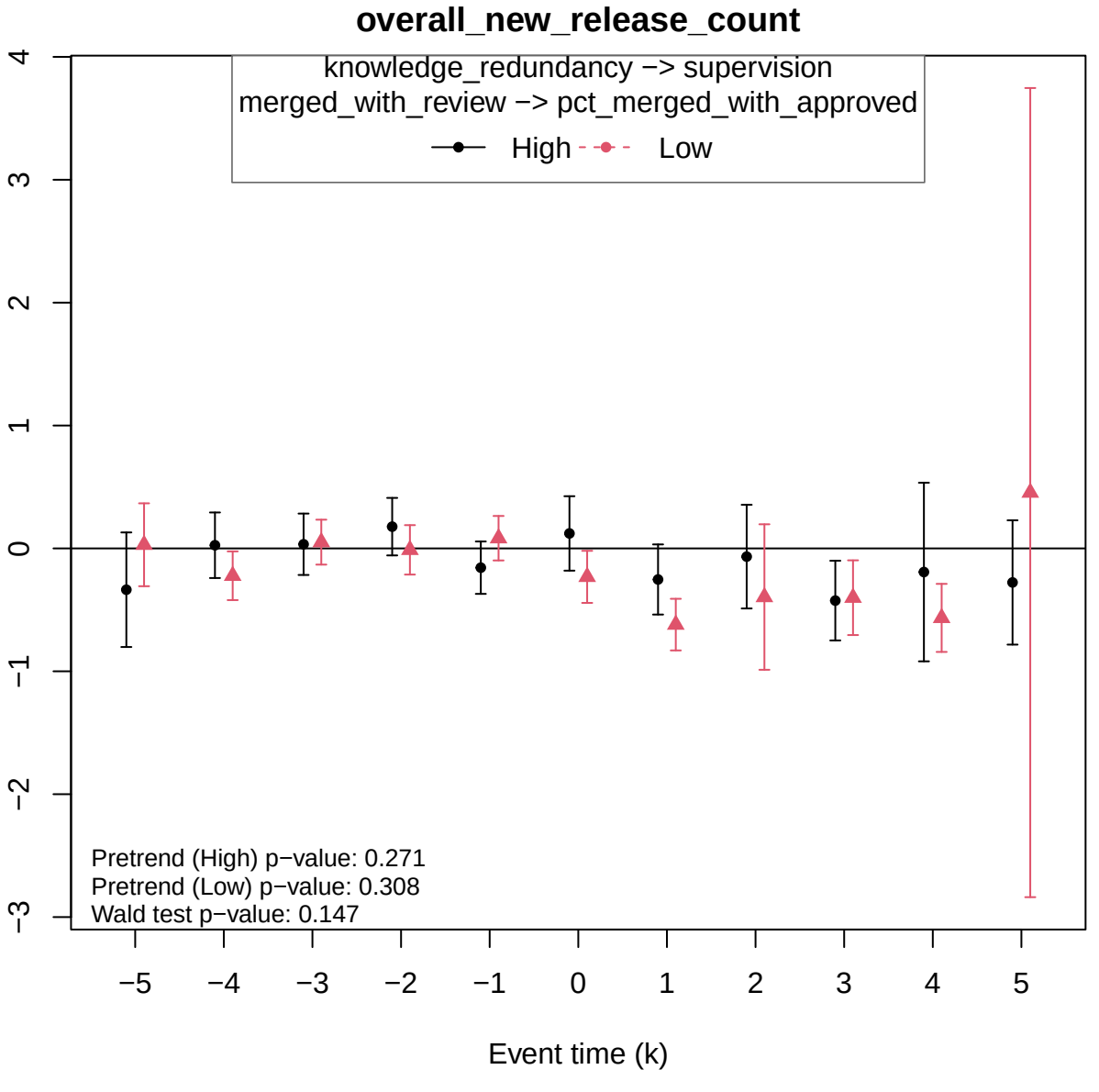

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

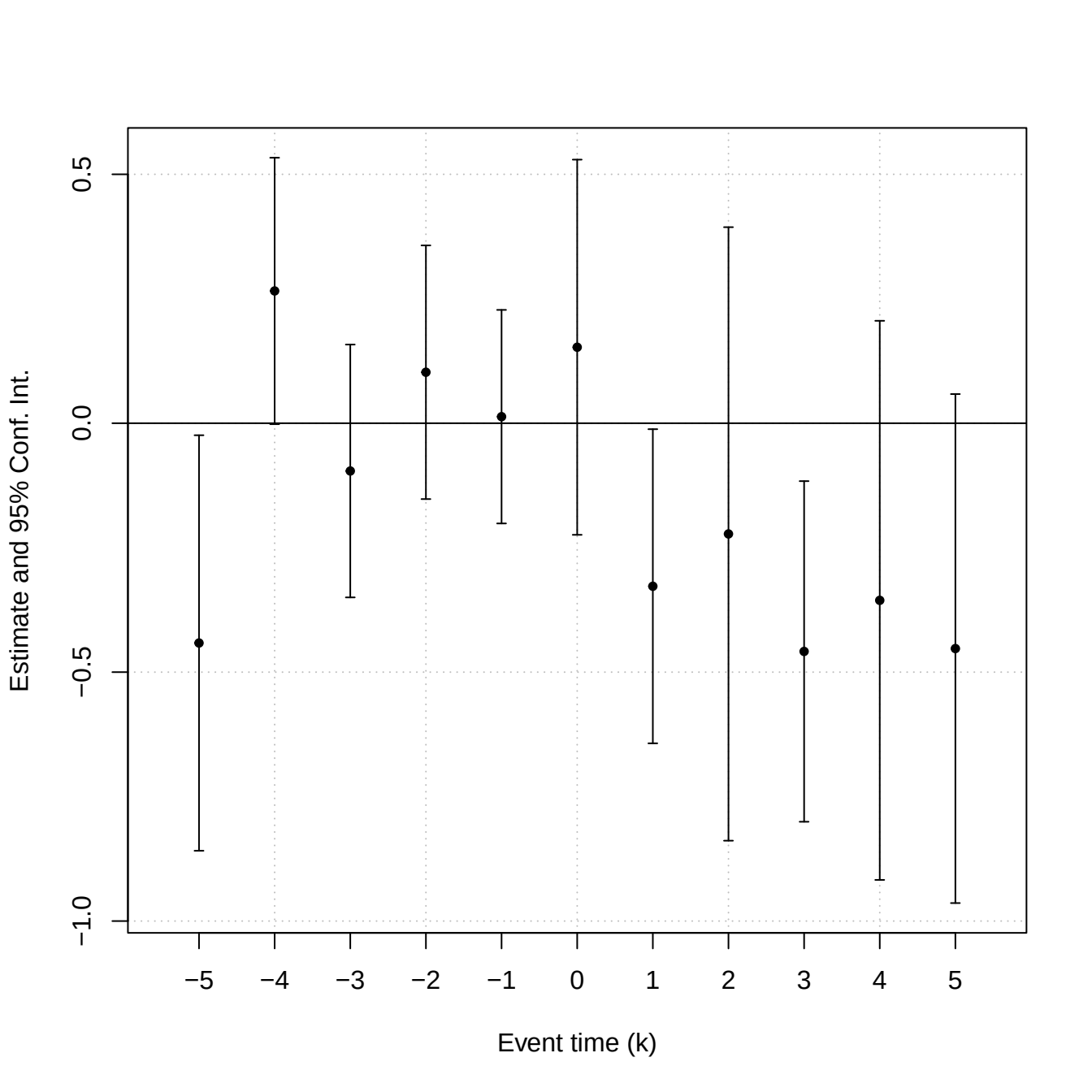

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

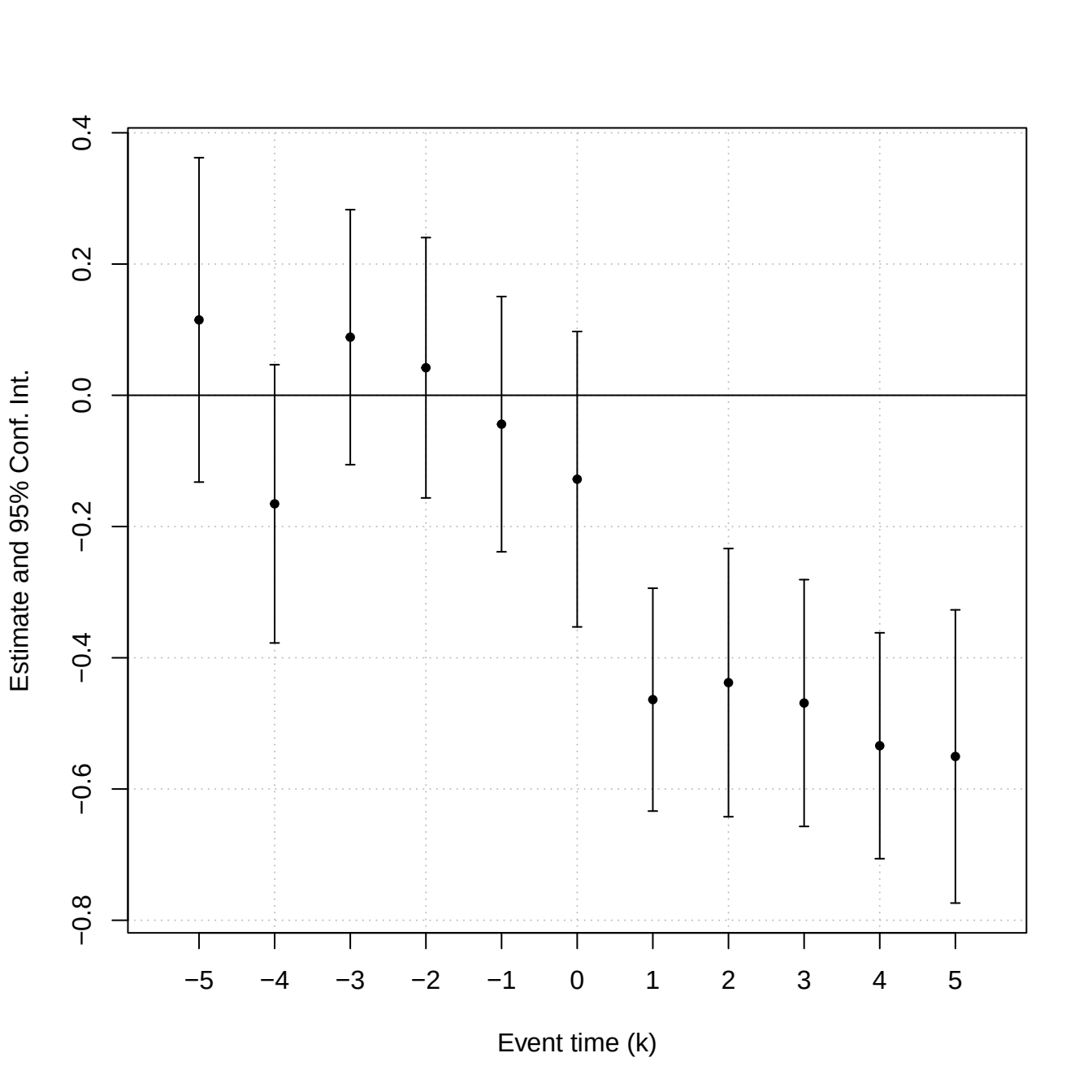

pull_request_merged
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_approved
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.144
Pretrend (Low) p−value: 0.144
Wald test p−value: 0.800
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

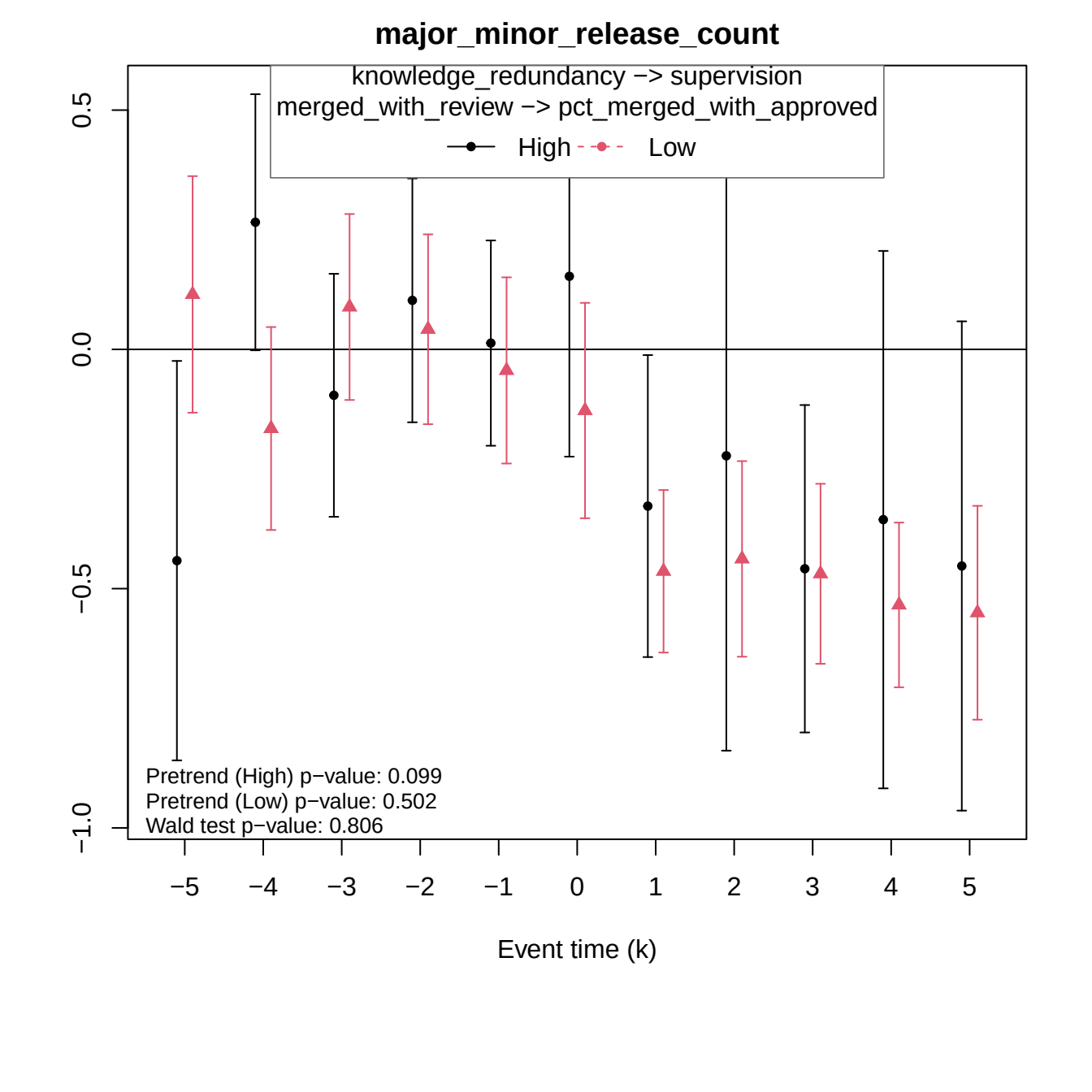

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

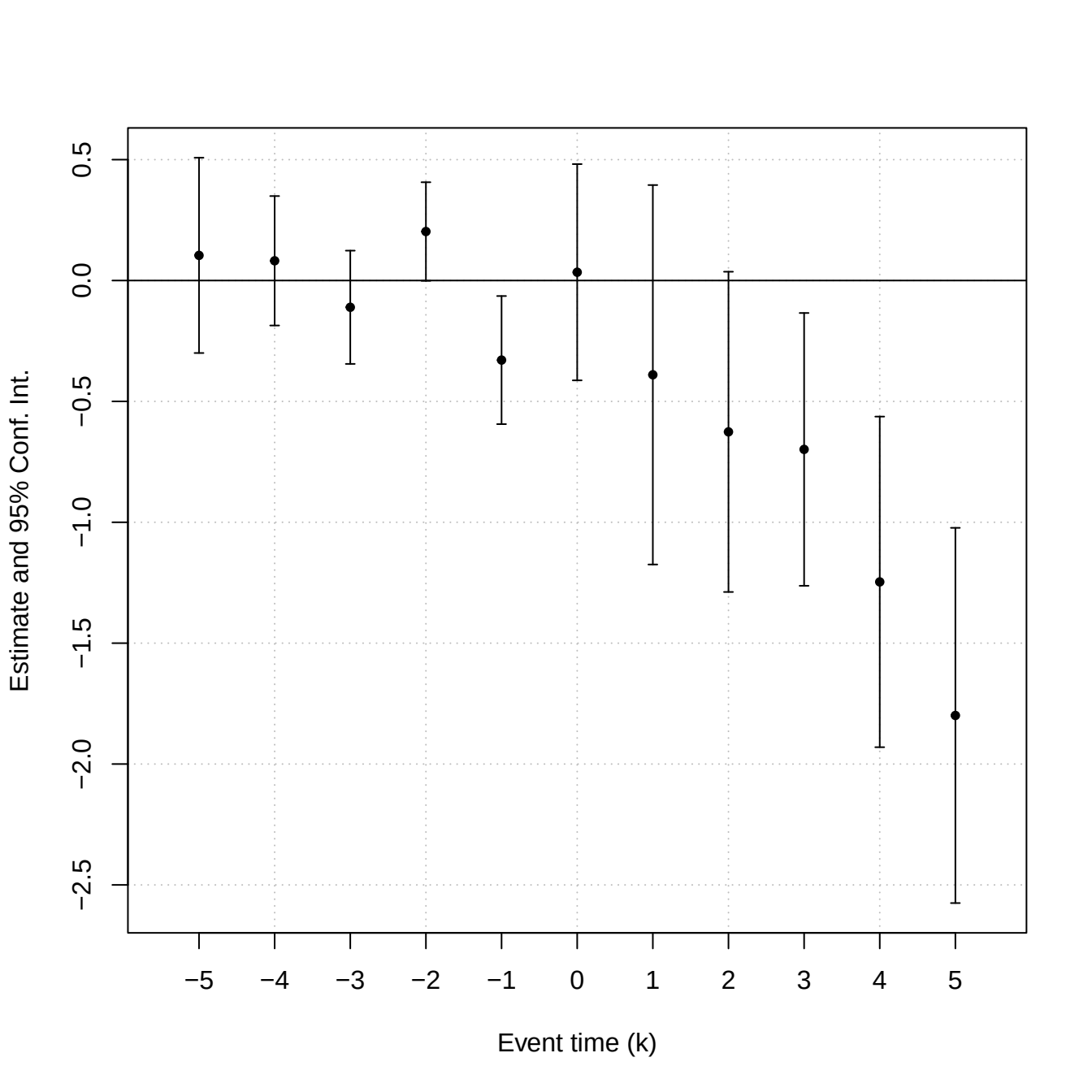

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

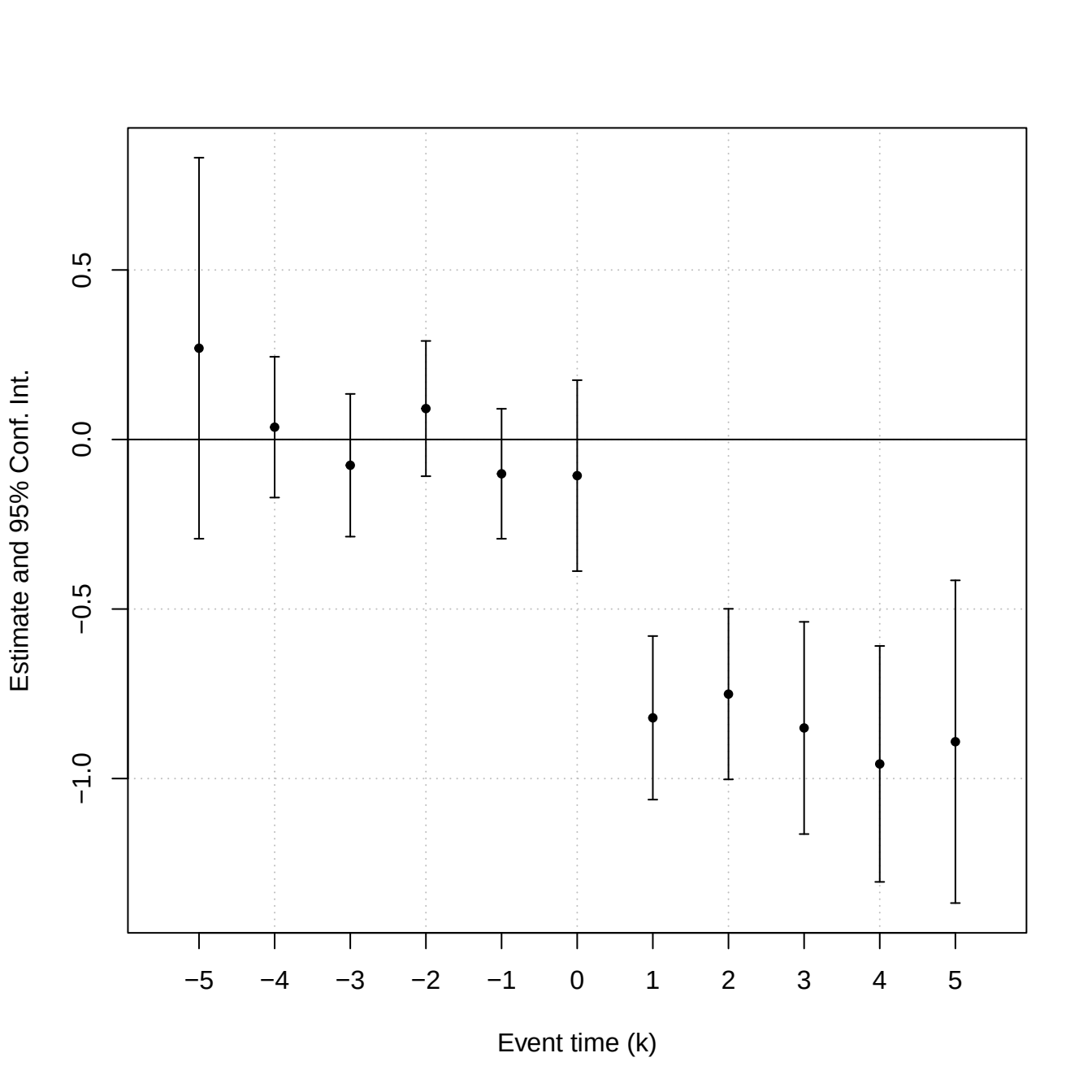

overall_new_release_count
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_approved
High
Low
Pretrend (High) p−value: 0.271
Pretrend (Low) p−value: 0.308
Wald test p−value: 0.147
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

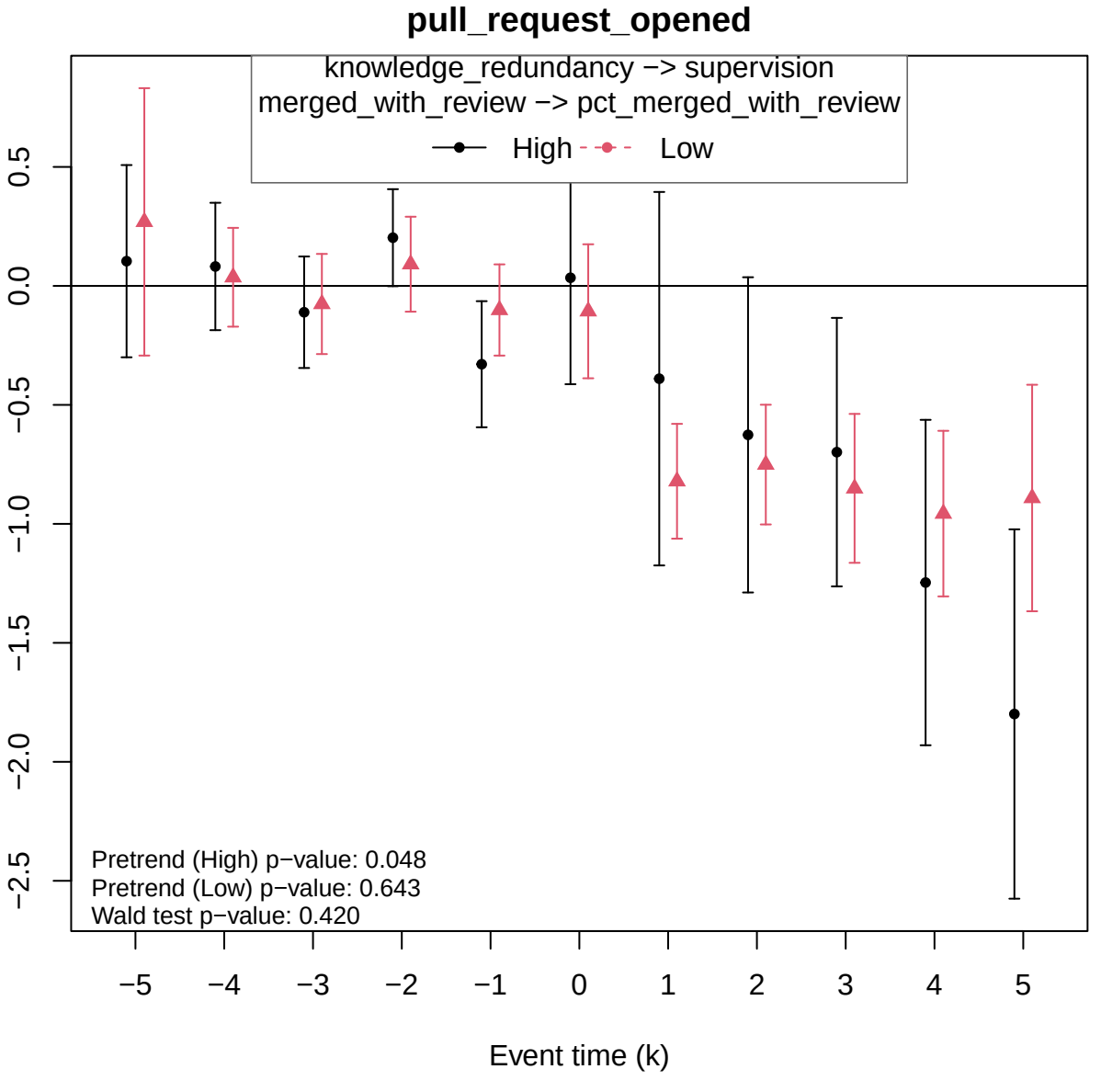

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

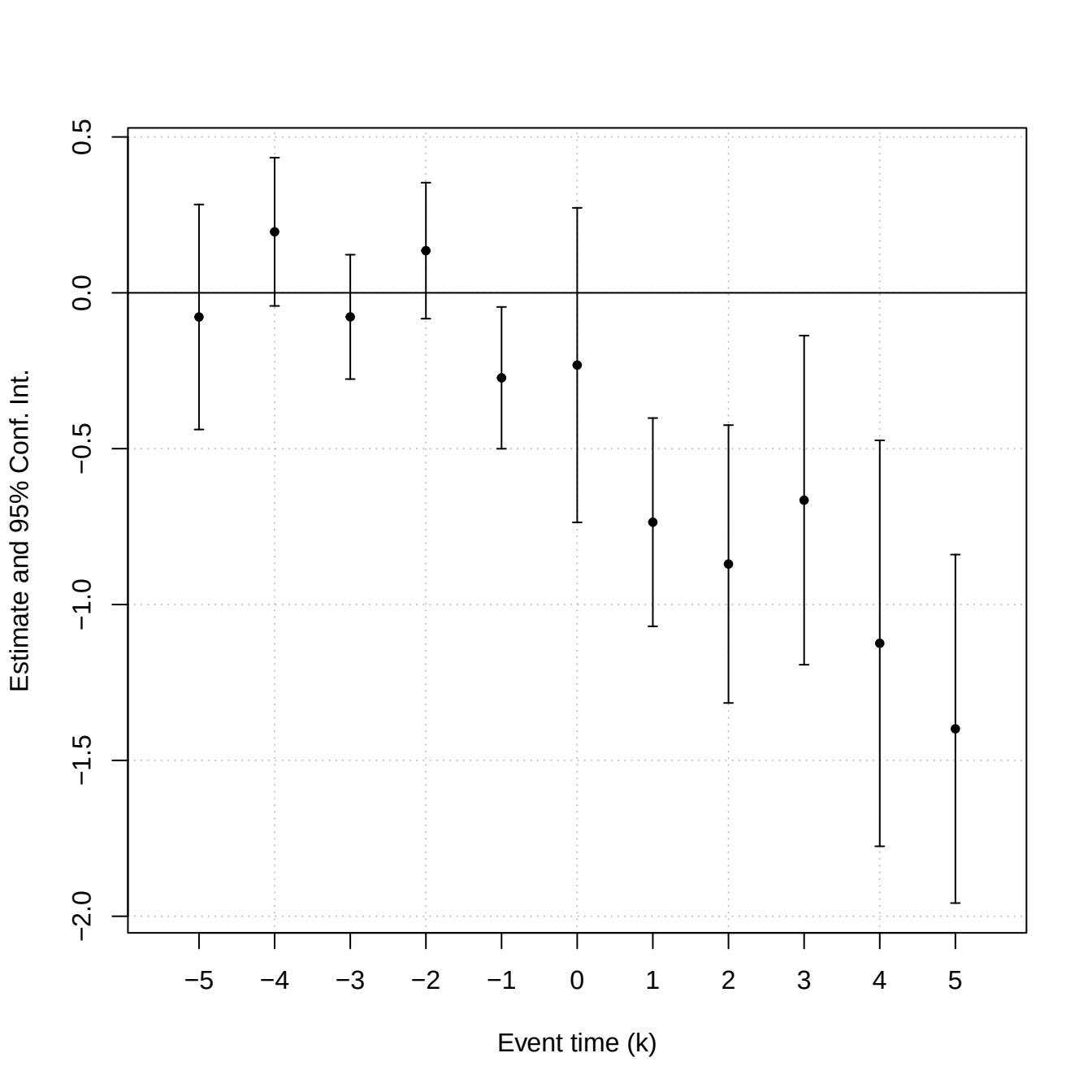

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

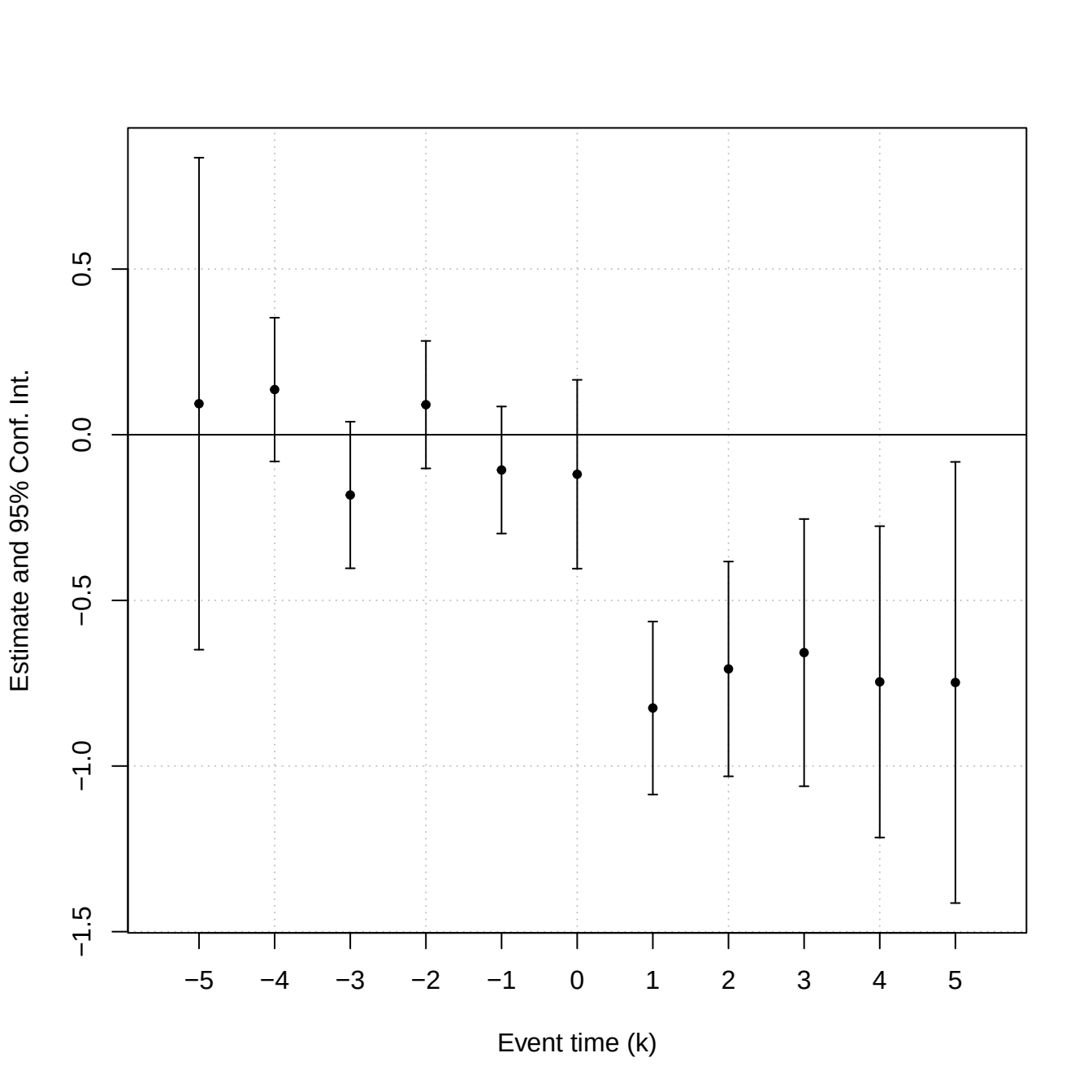

major_minor_release_count
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_approved
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.099
Pretrend (Low) p−value: 0.502
Wald test p−value: 0.806
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

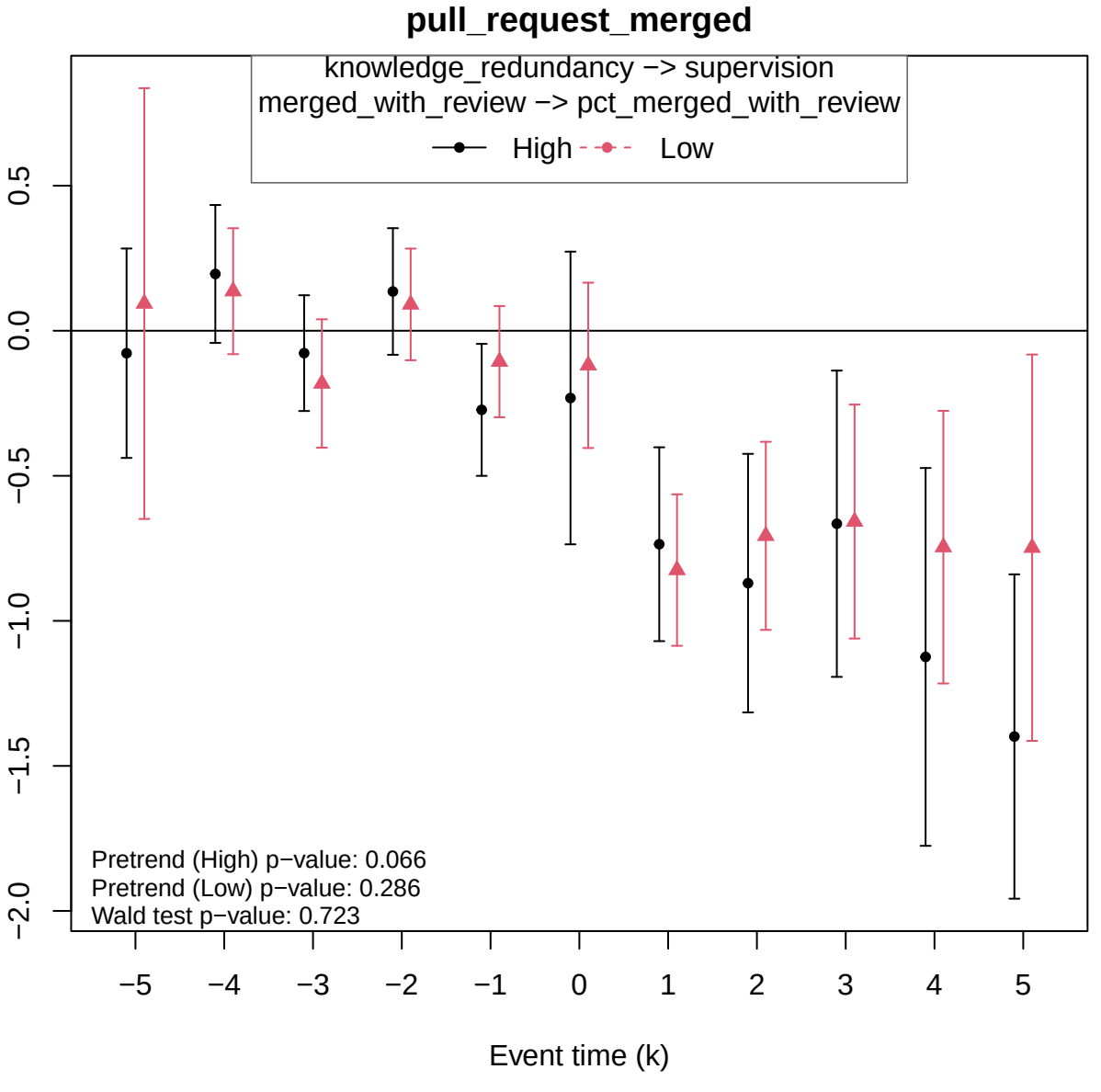

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

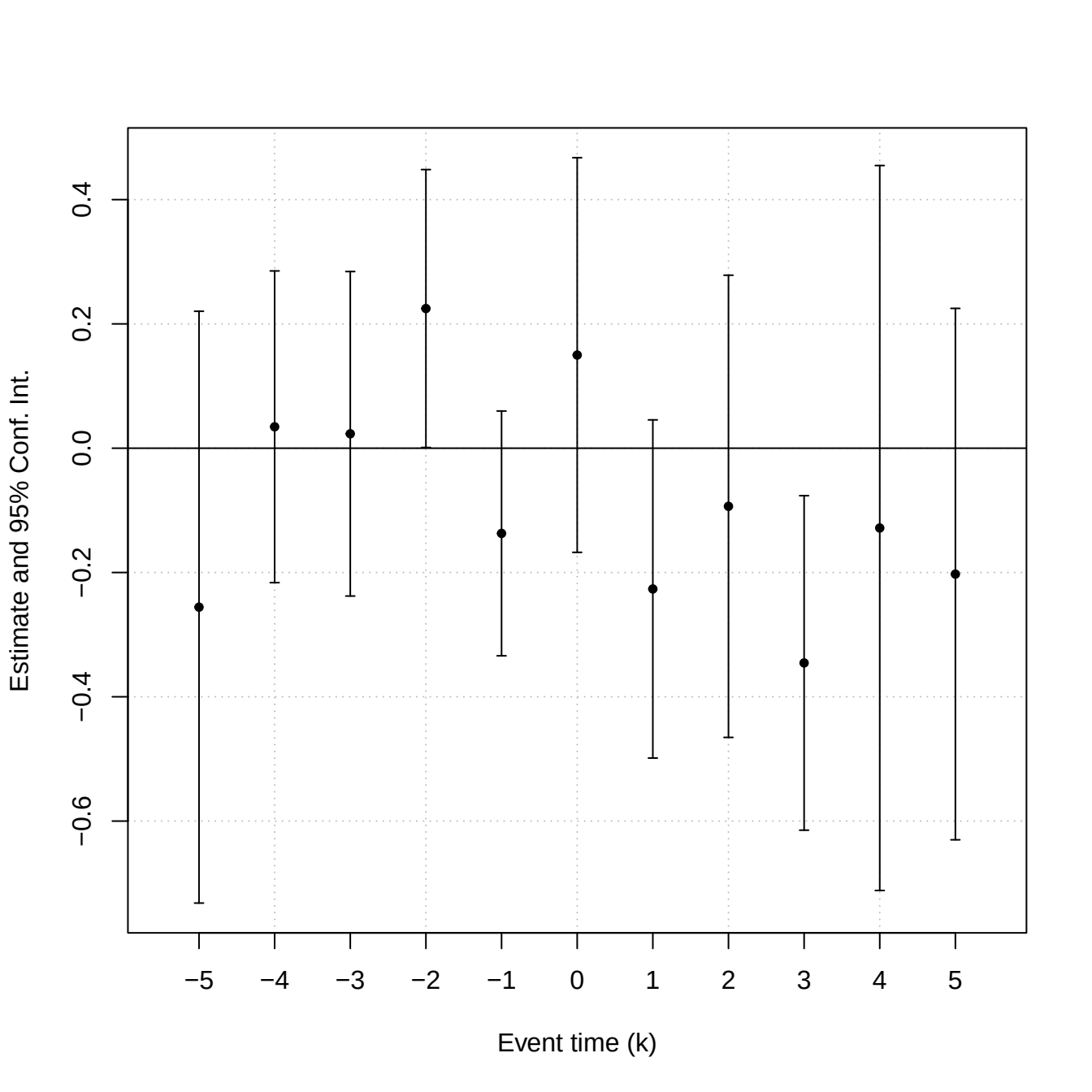

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

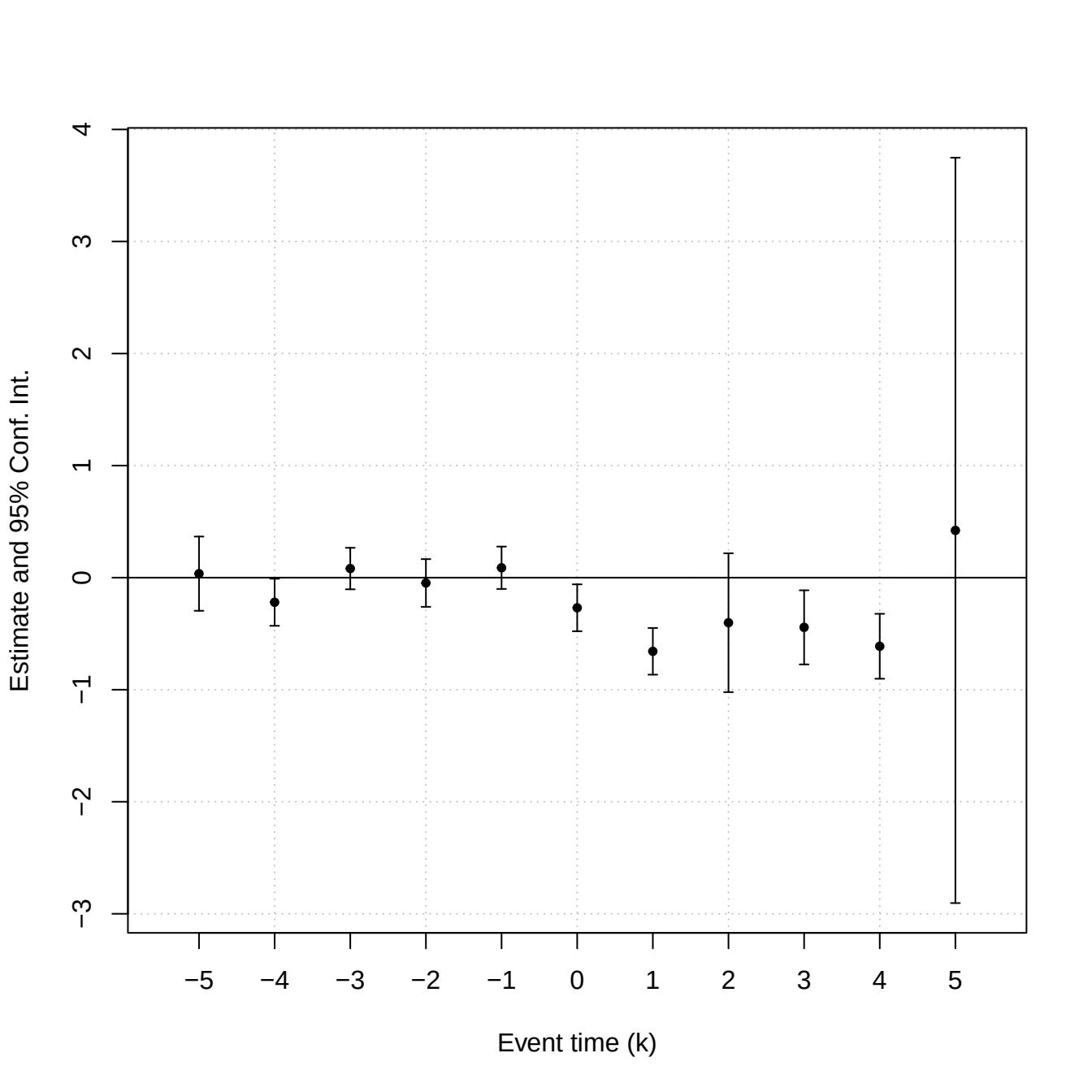

pull_request_opened
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_review
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
Pretrend (High) p−value: 0.048
Pretrend (Low) p−value: 0.643
Wald test p−value: 0.420
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

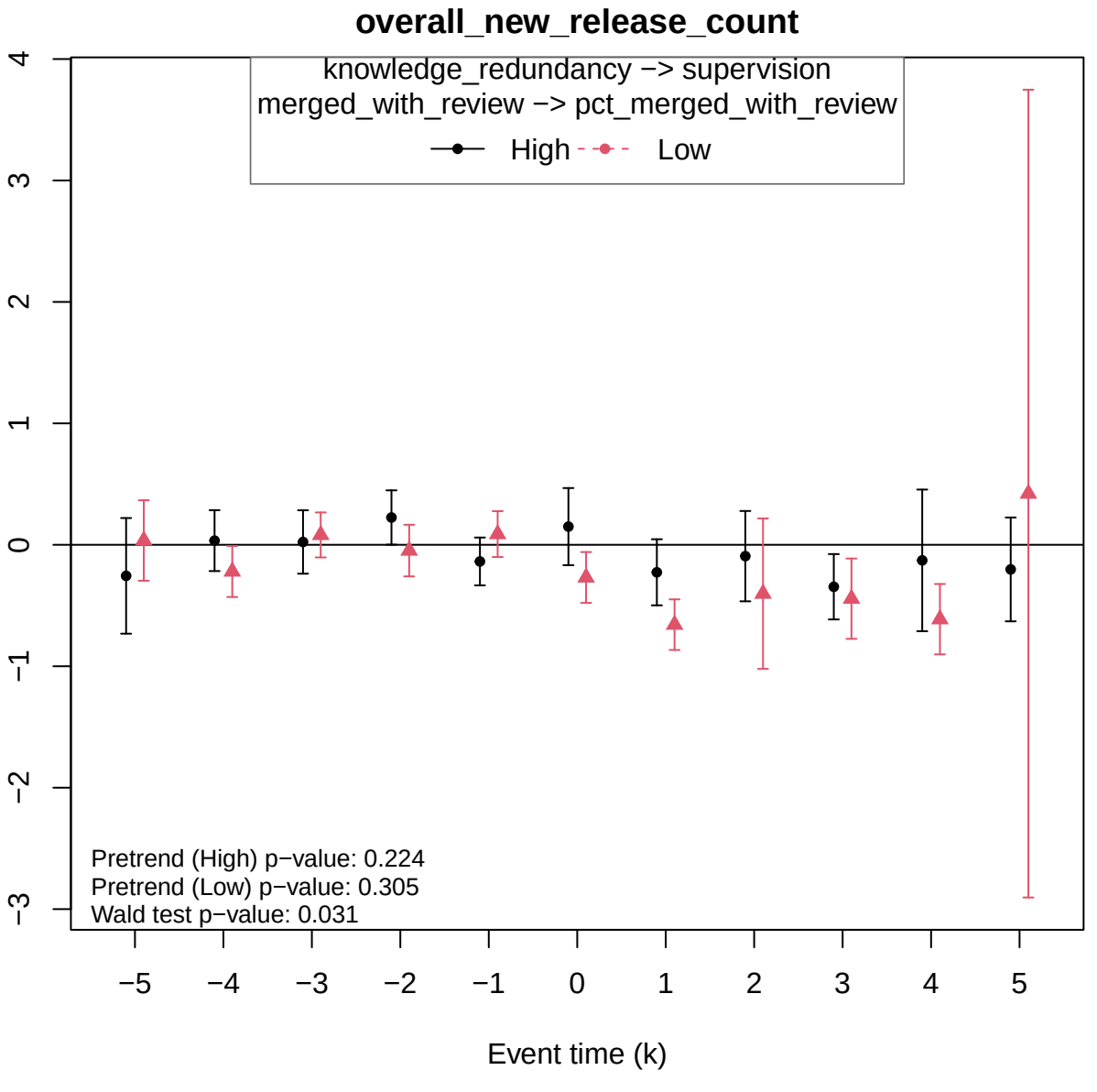

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

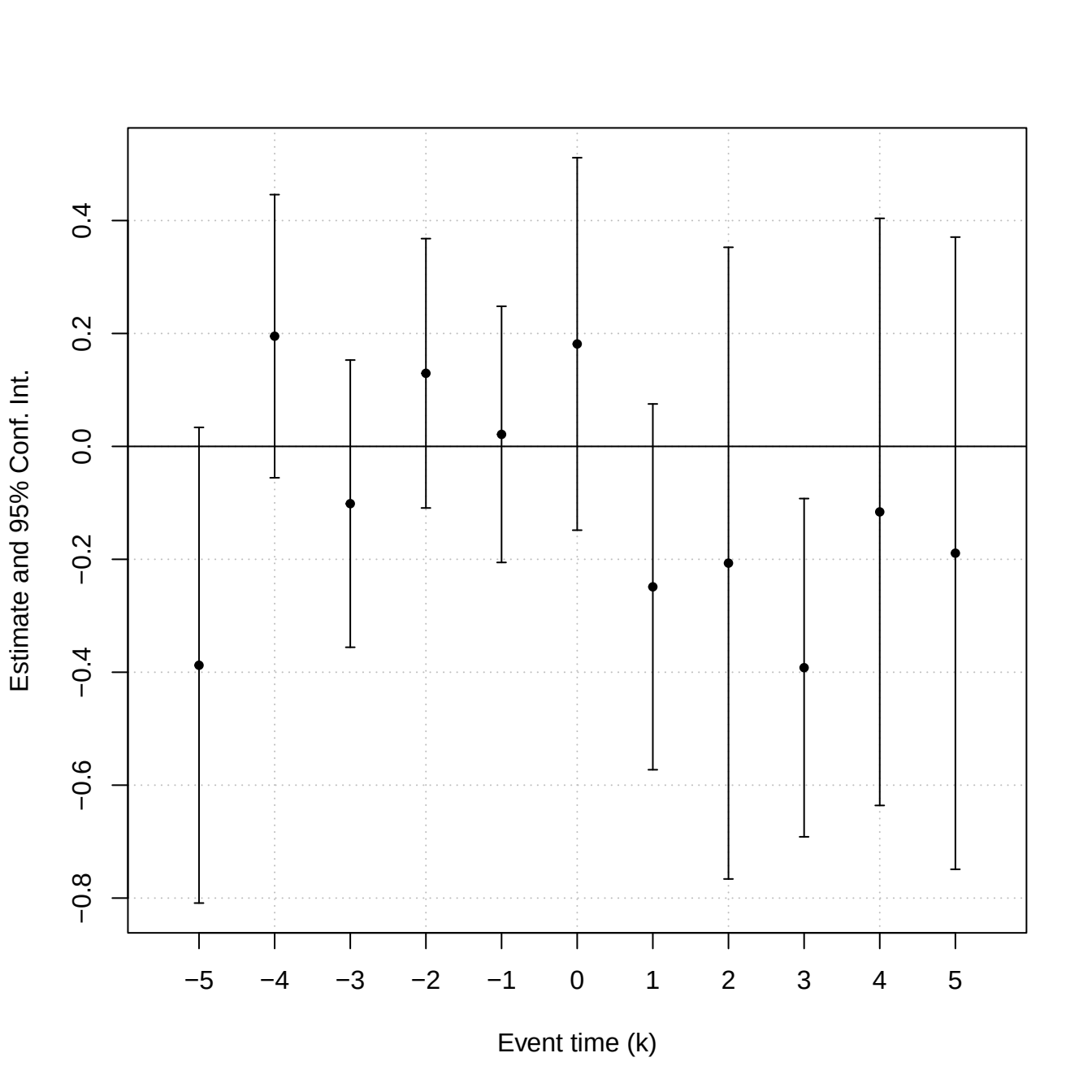

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

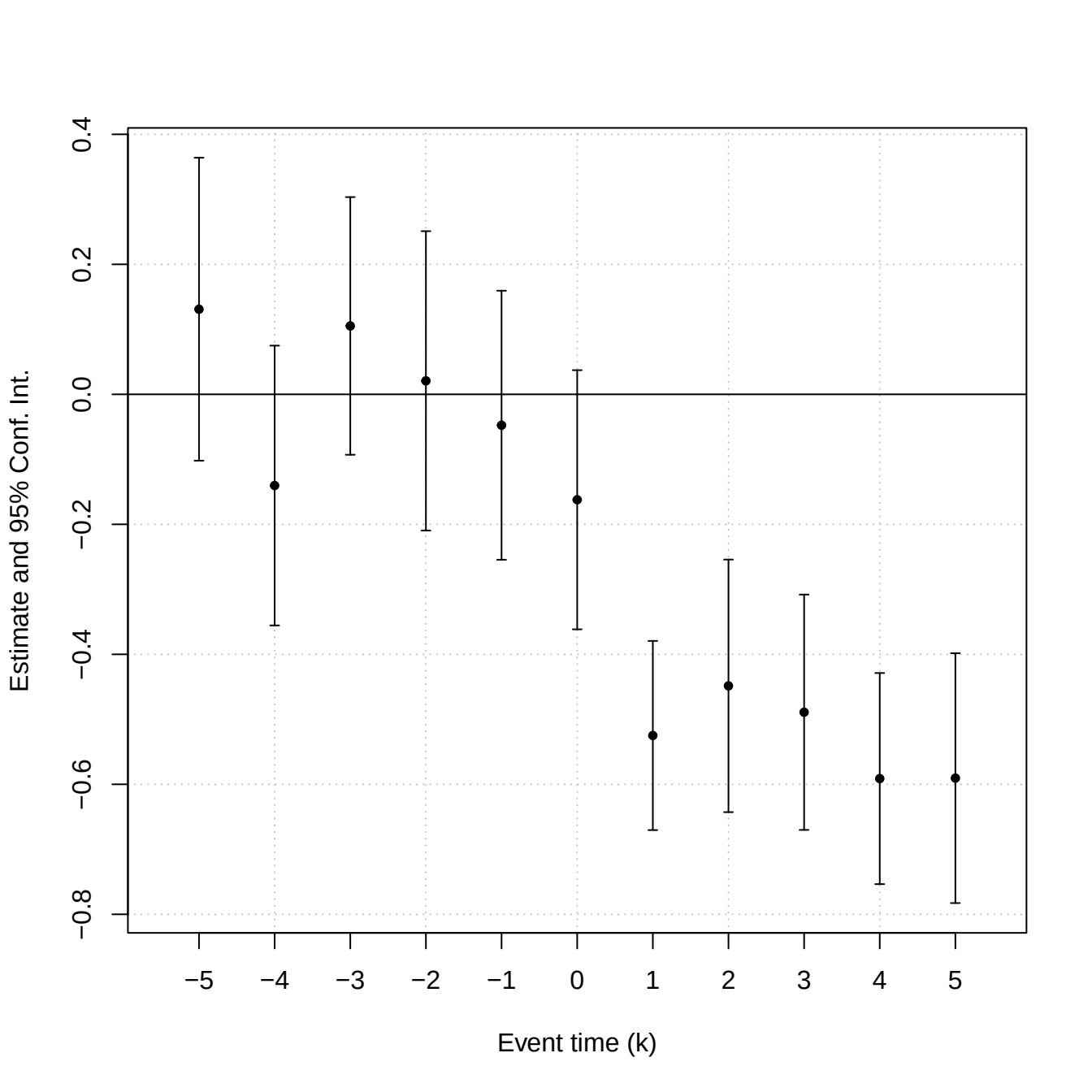

pull_request_merged
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_review
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.066
Pretrend (Low) p−value: 0.286
Wald test p−value: 0.723
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

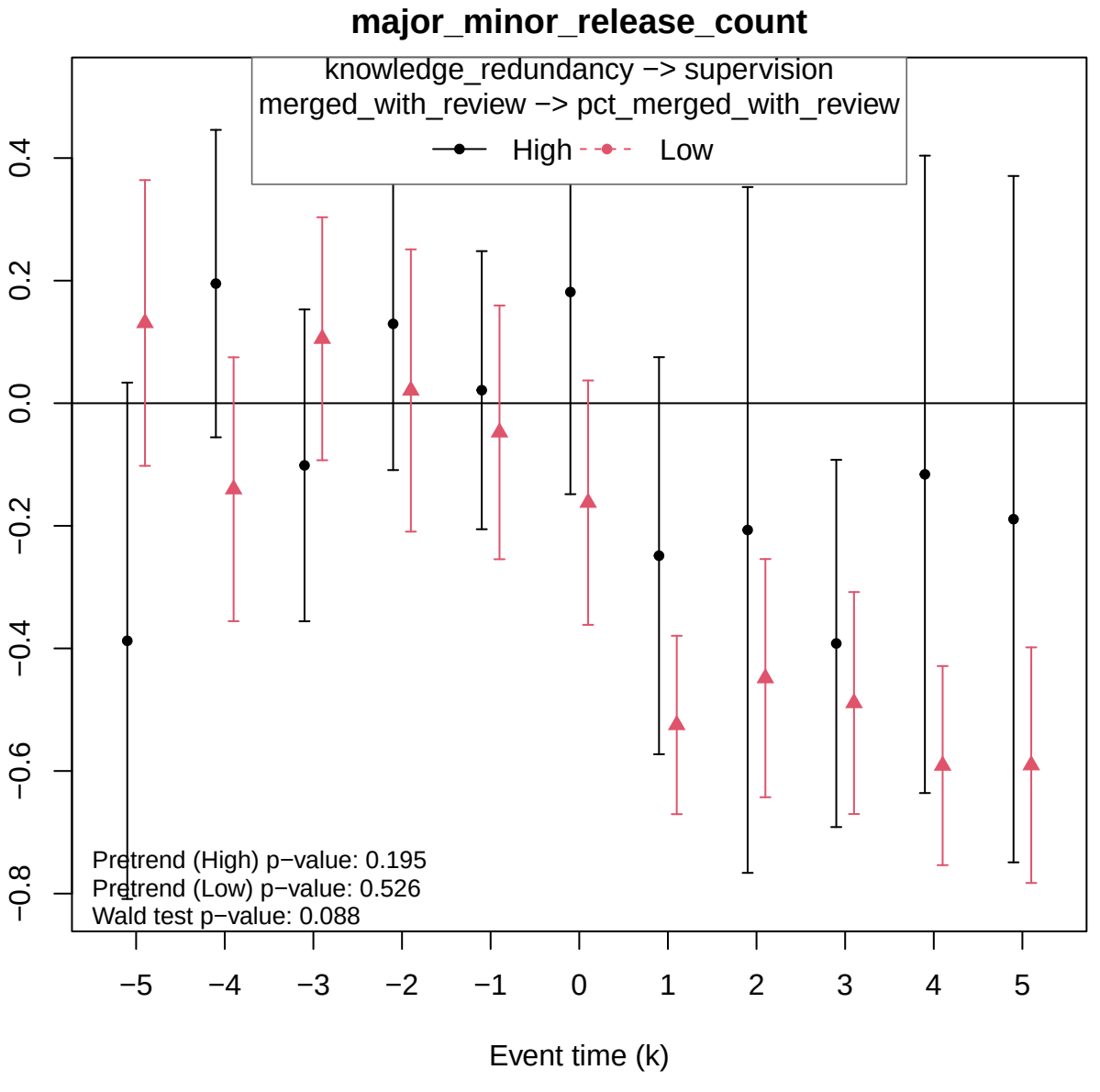

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

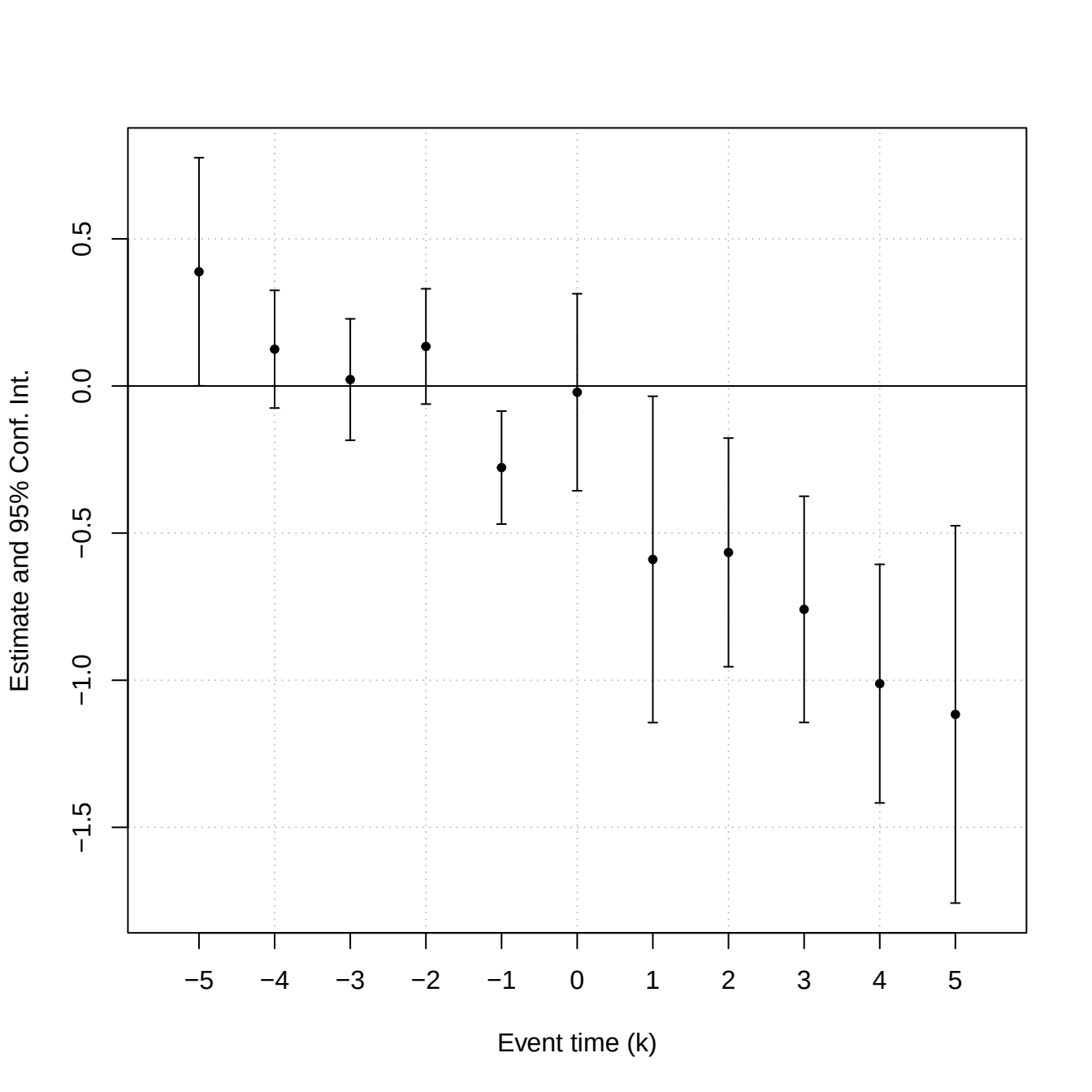

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

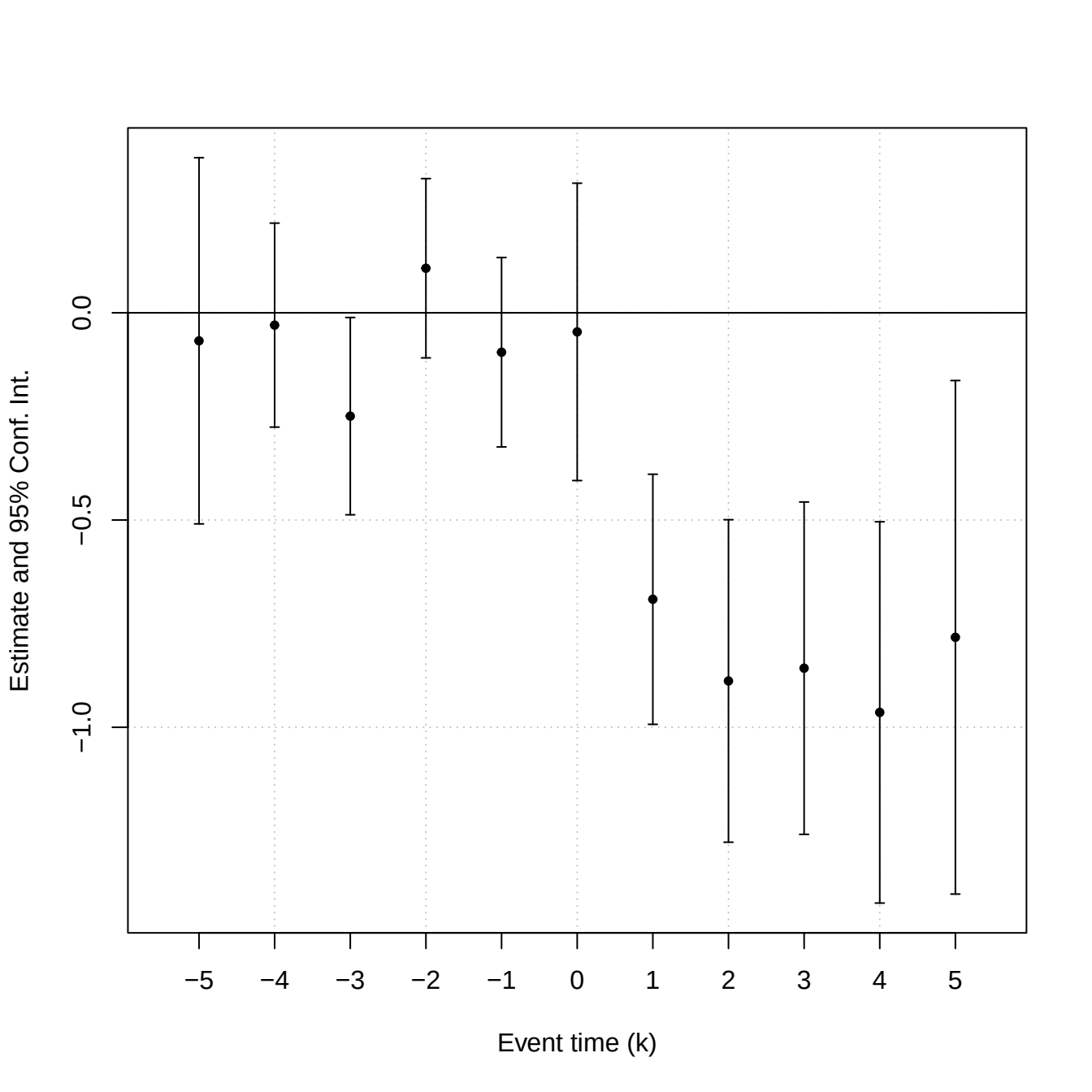

overall_new_release_count
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_review
High
Low
Pretrend (High) p−value: 0.224
Pretrend (Low) p−value: 0.305
Wald test p−value: 0.031
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

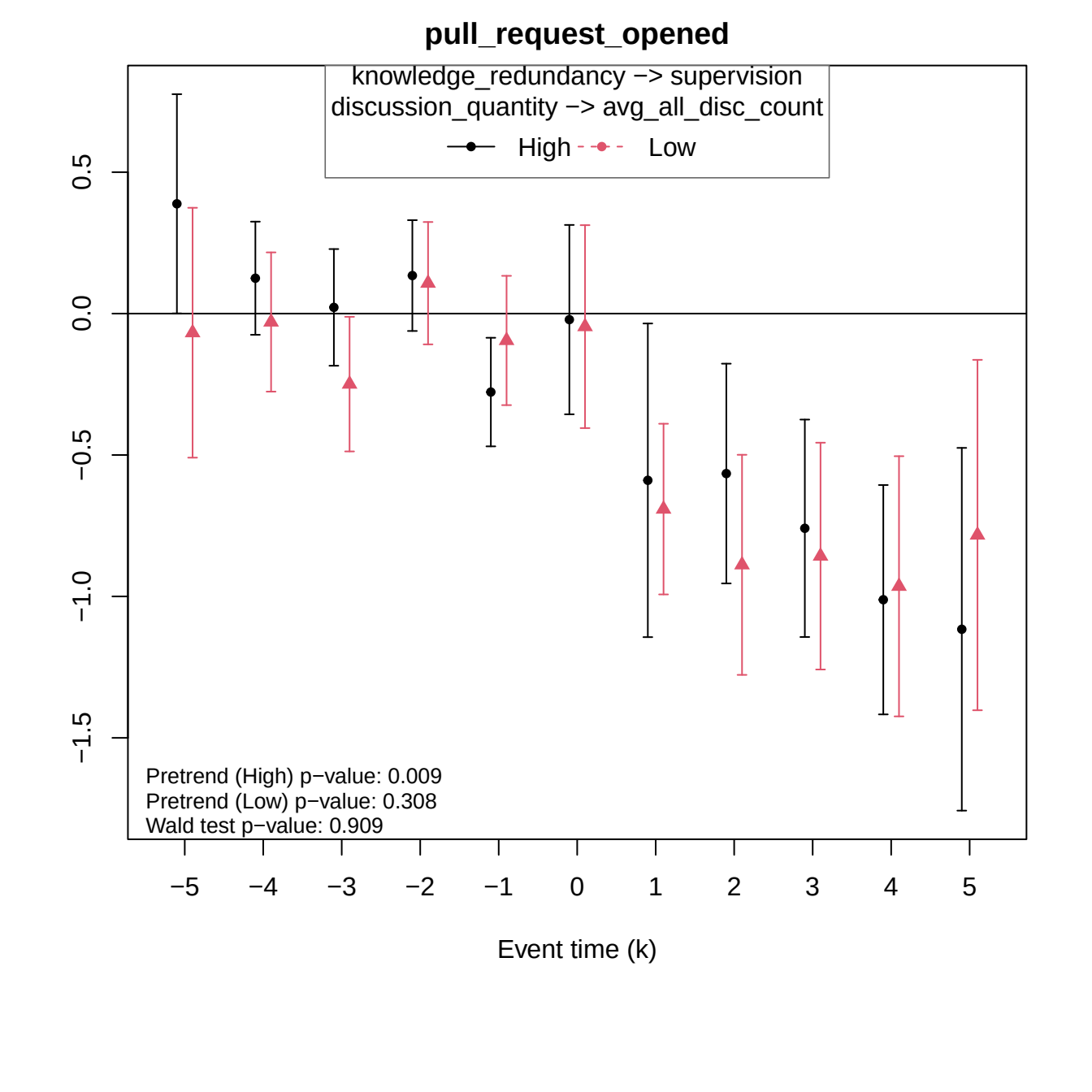

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

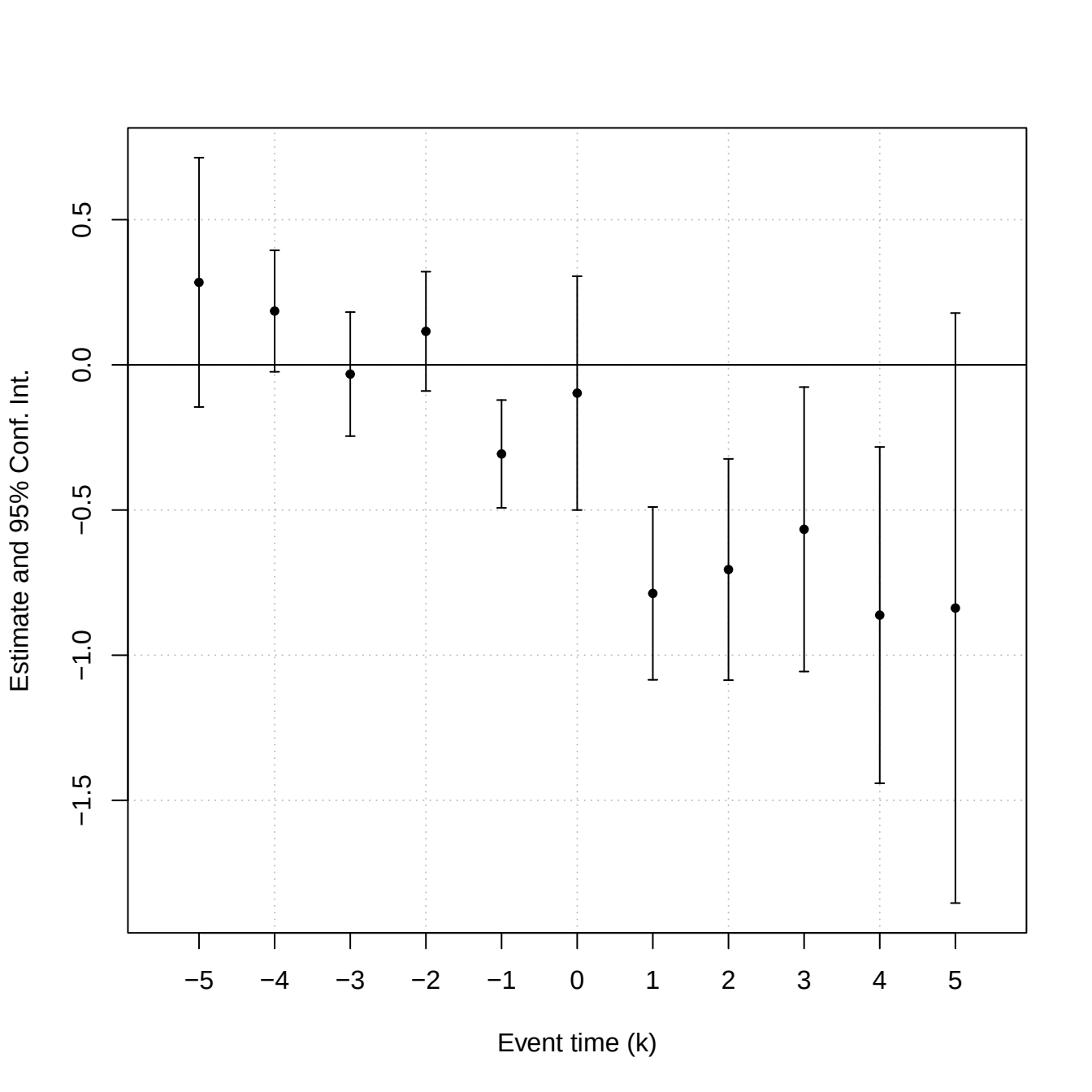

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

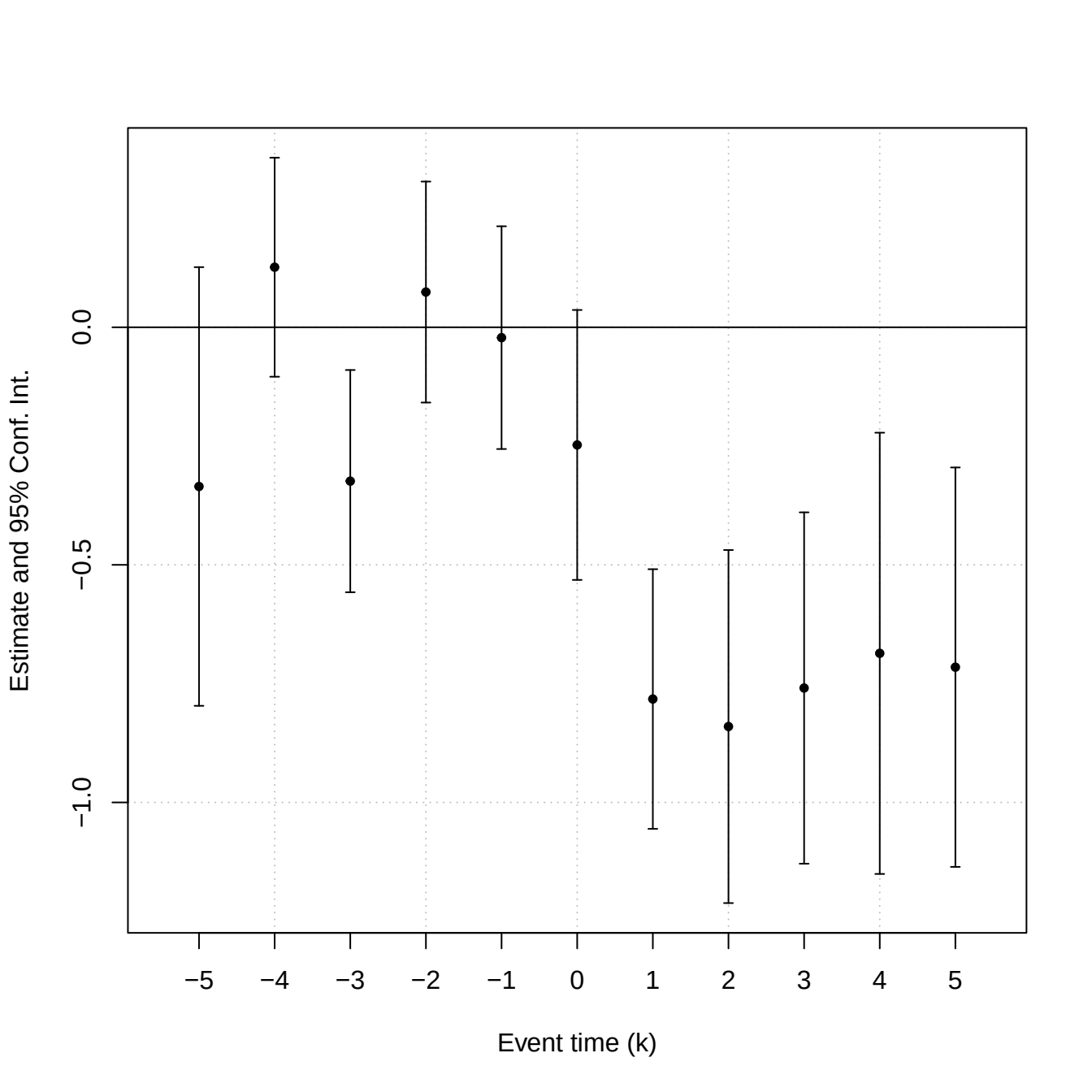

major_minor_release_count
knowledge_redundancy −> supervision
merged_with_review −> pct_merged_with_review
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.195
Pretrend (Low) p−value: 0.526
Wald test p−value: 0.088
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

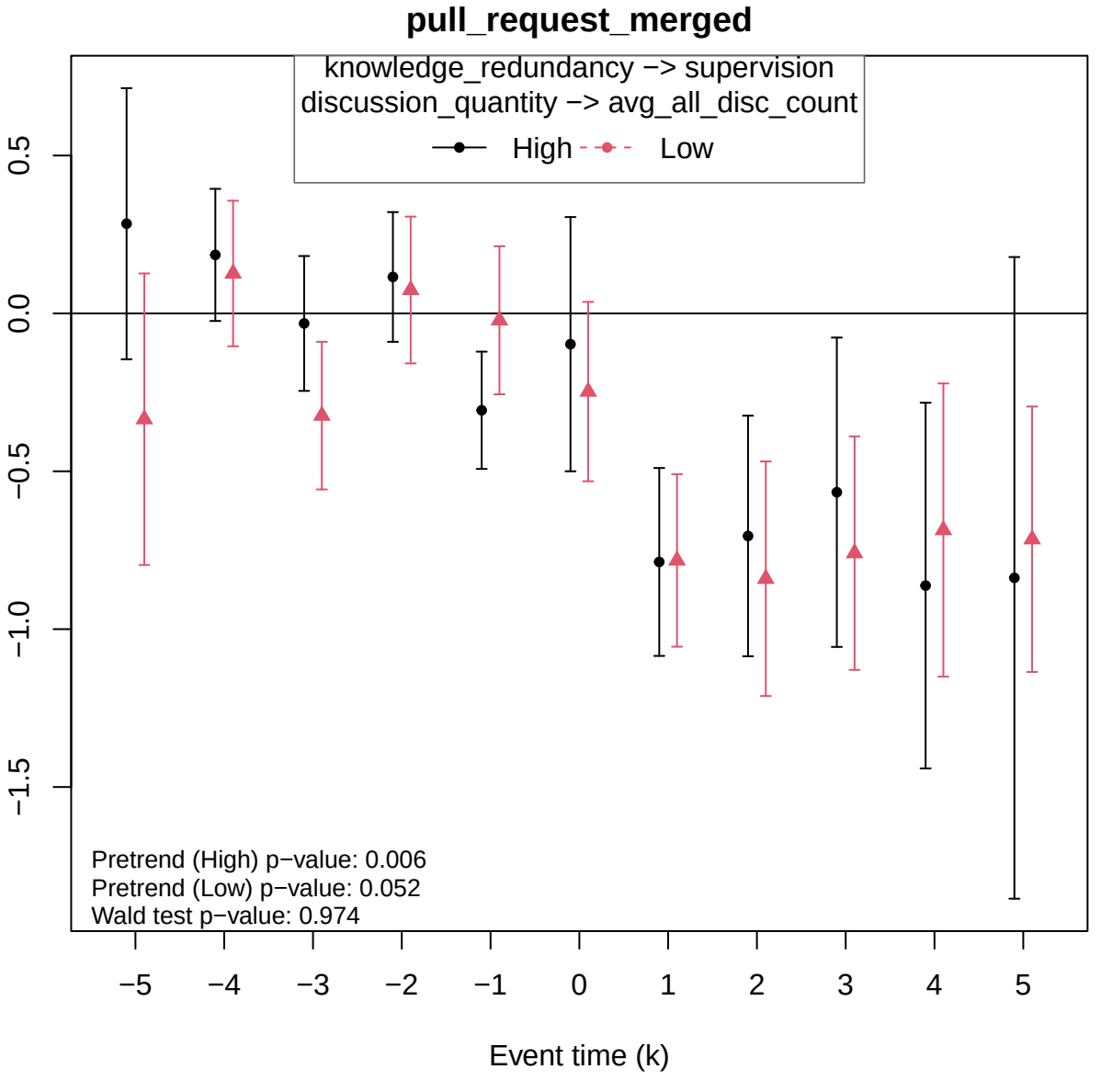

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

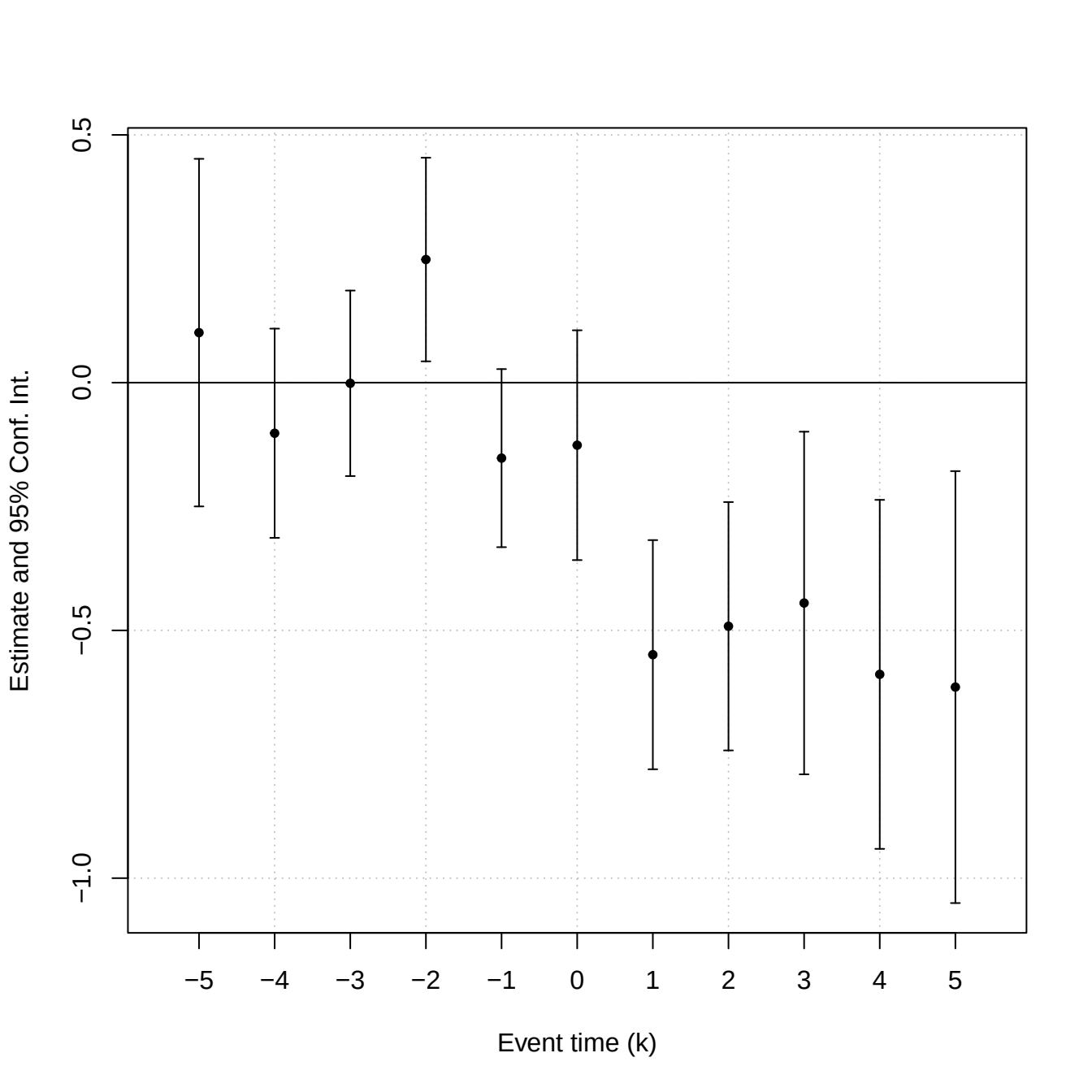

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

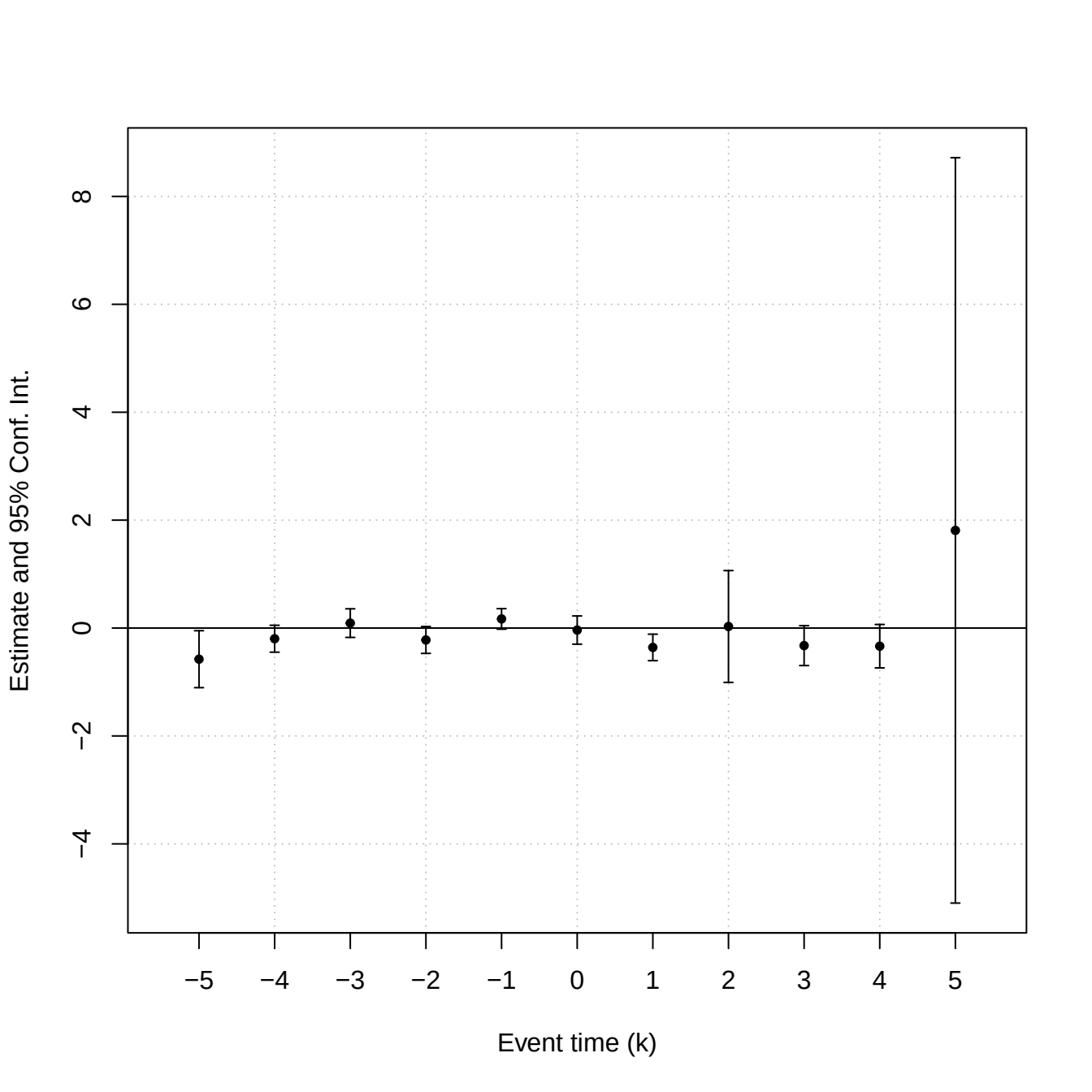

pull_request_opened
knowledge_redundancy −> supervision
discussion_quantity −> avg_all_disc_count
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.009
Pretrend (Low) p−value: 0.308
Wald test p−value: 0.909
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

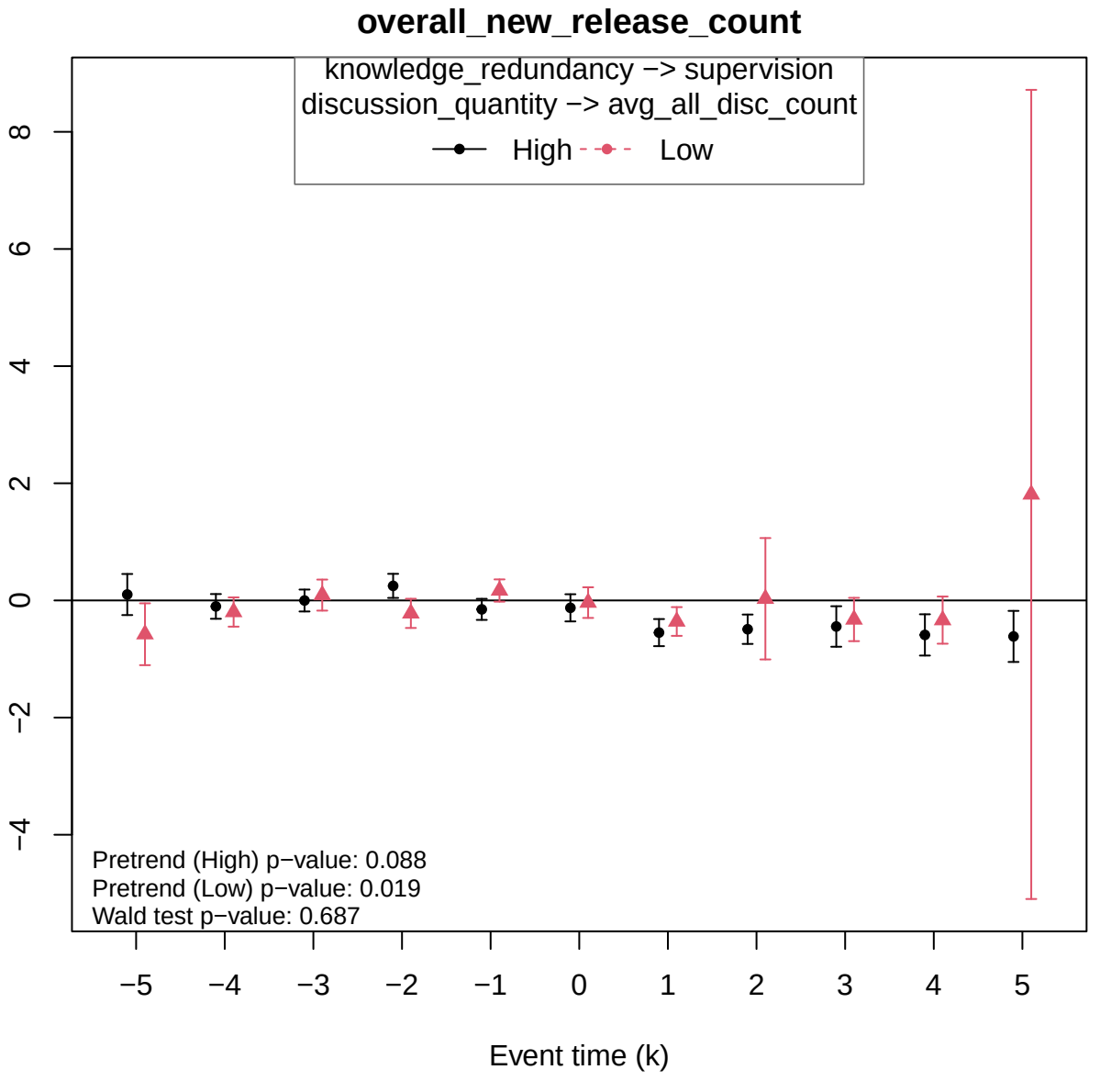

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

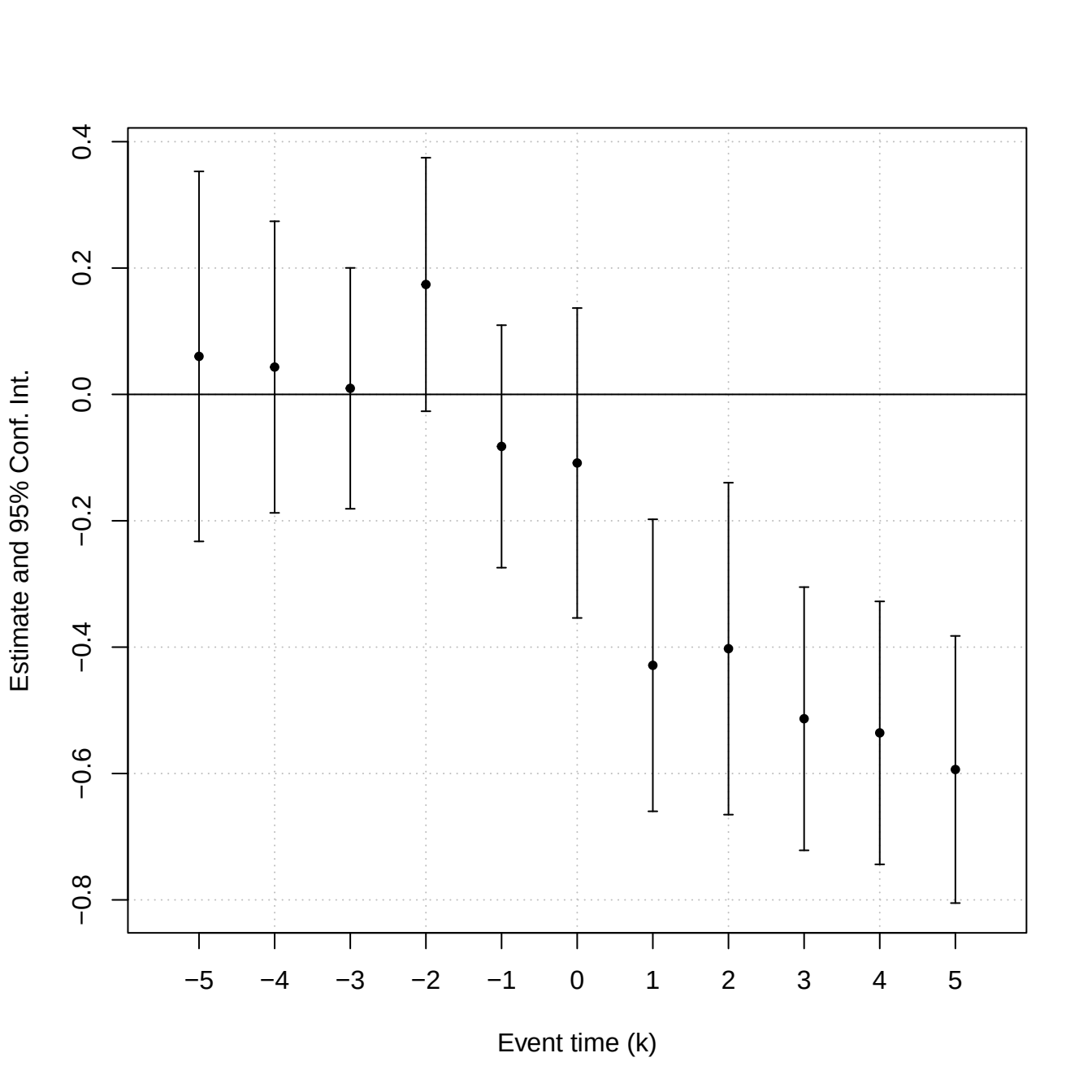

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

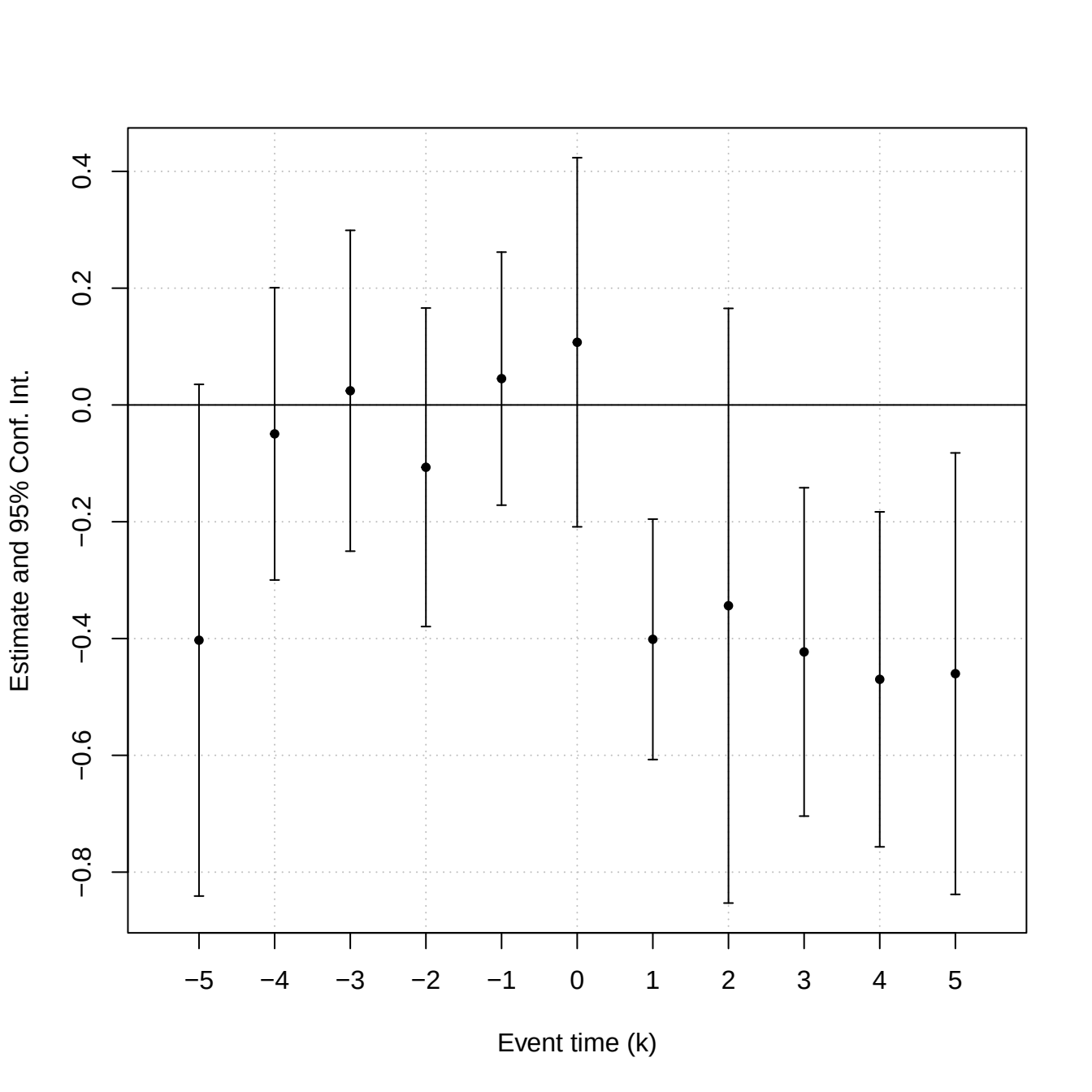

pull_request_merged
knowledge_redundancy −> supervision
discussion_quantity −> avg_all_disc_count
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.006
Pretrend (Low) p−value: 0.052
Wald test p−value: 0.974
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

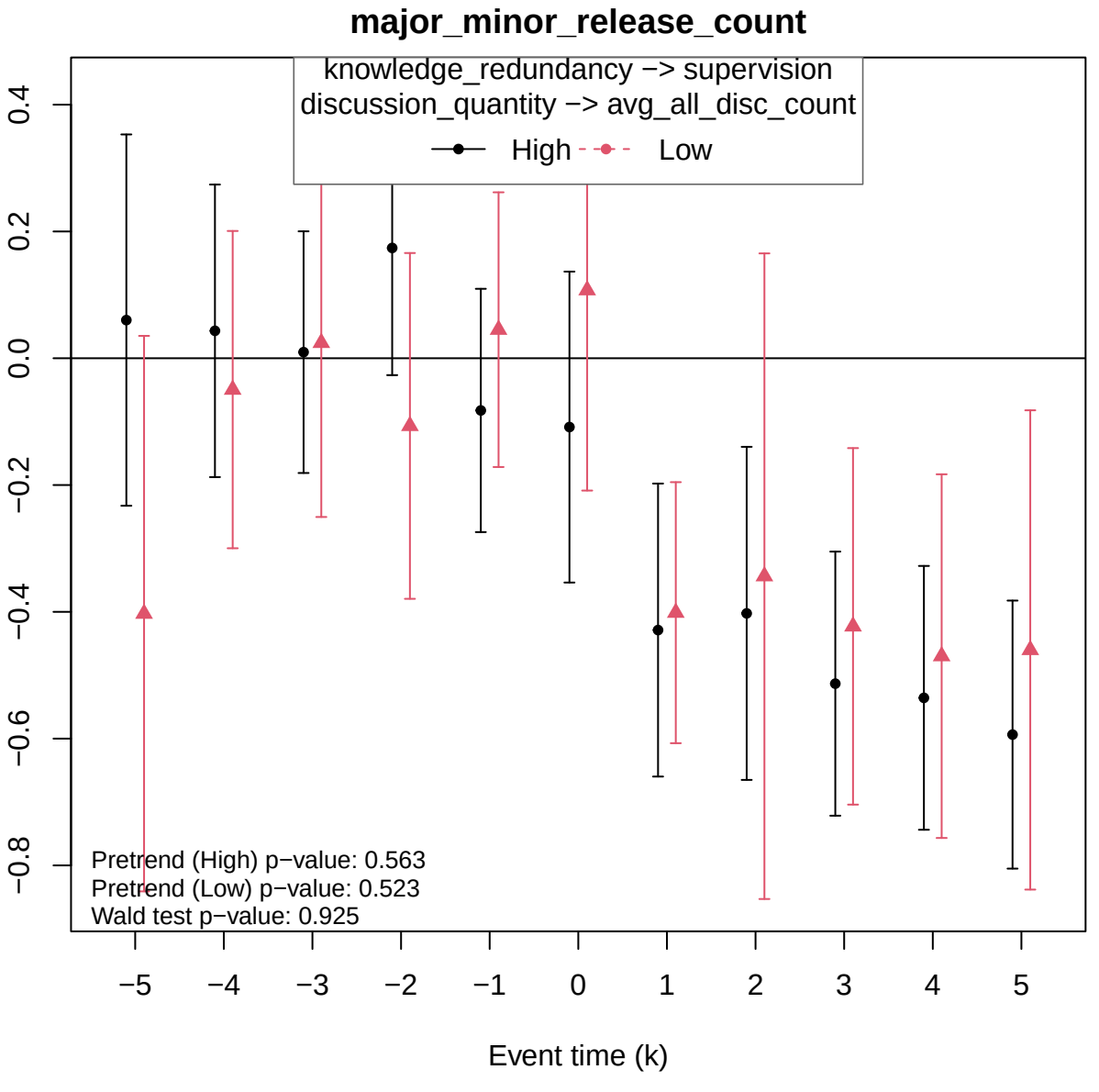

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

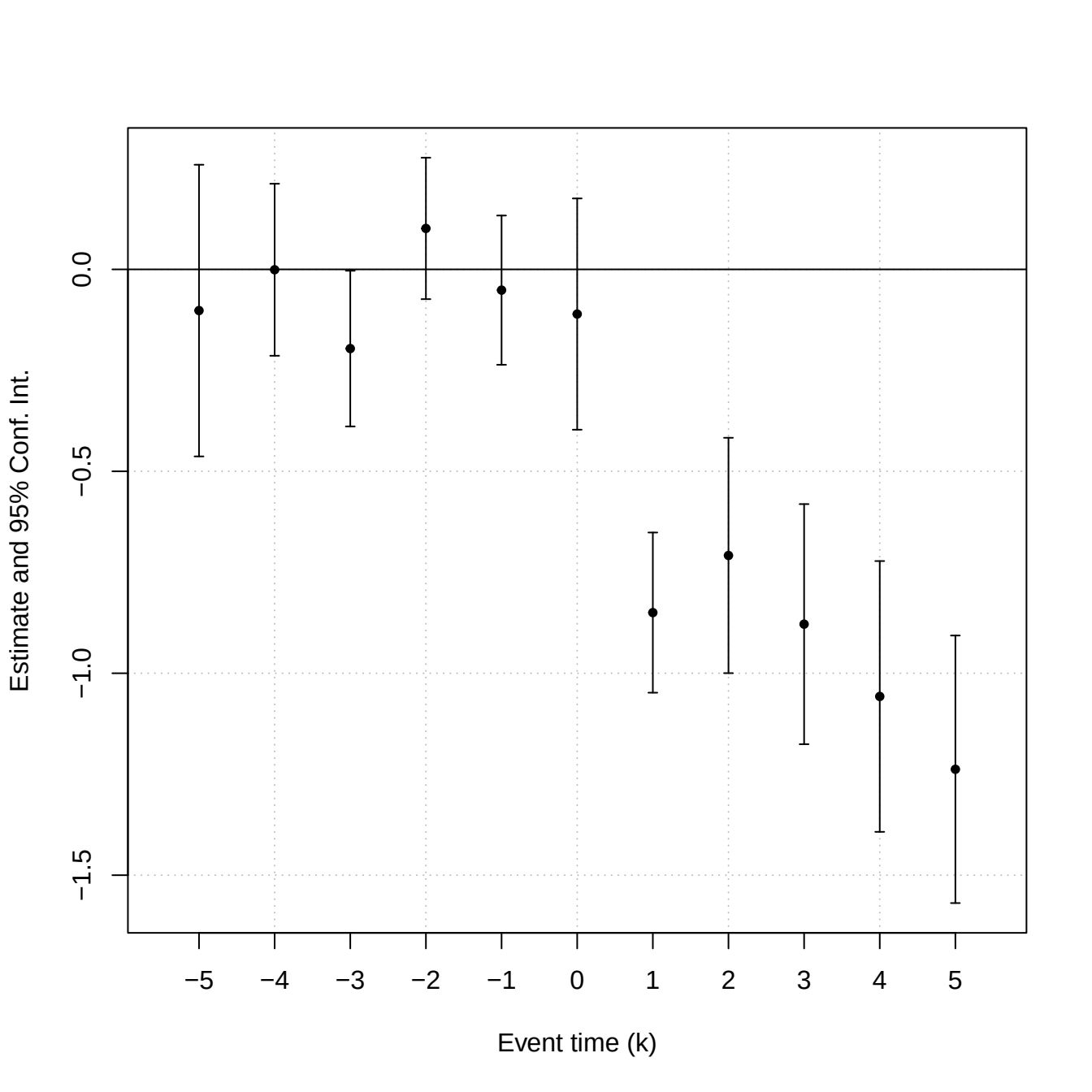

Estimate and 95% Conf. Int.
8
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

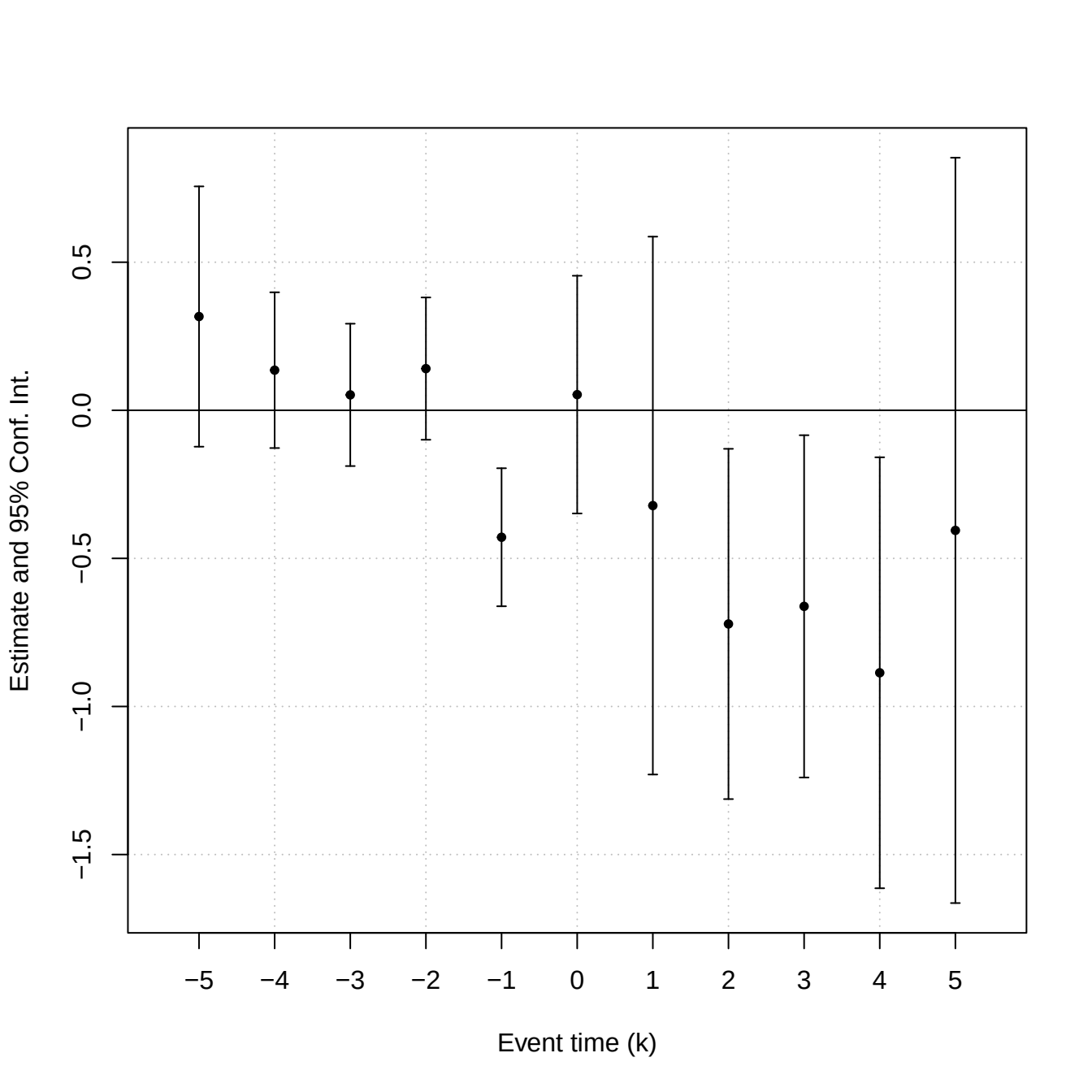

overall_new_release_count
knowledge_redundancy −> supervision
discussion_quantity −> avg_all_disc_count
High
Low
8
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.088
Pretrend (Low) p−value: 0.019
Wald test p−value: 0.687
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

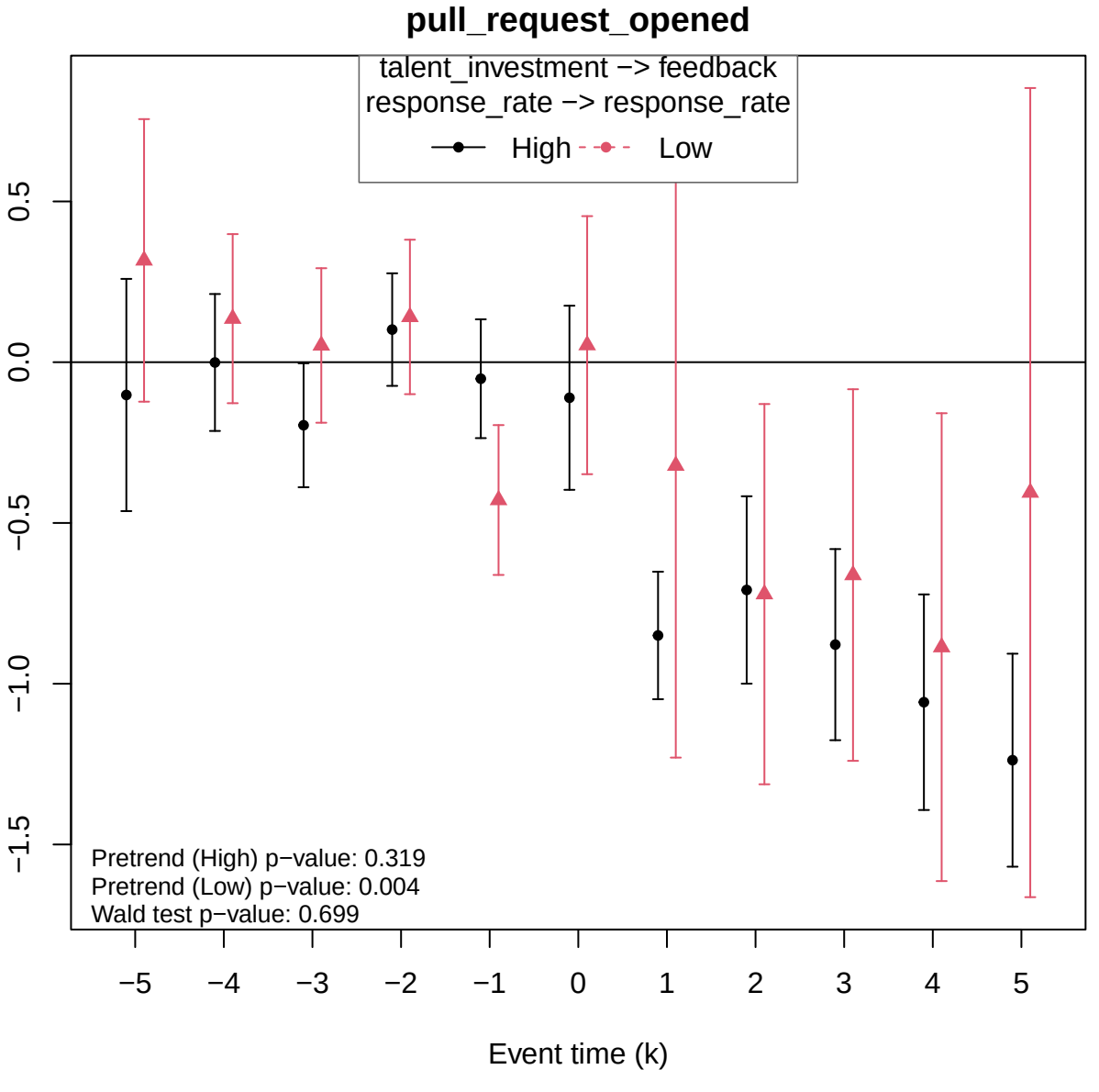

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

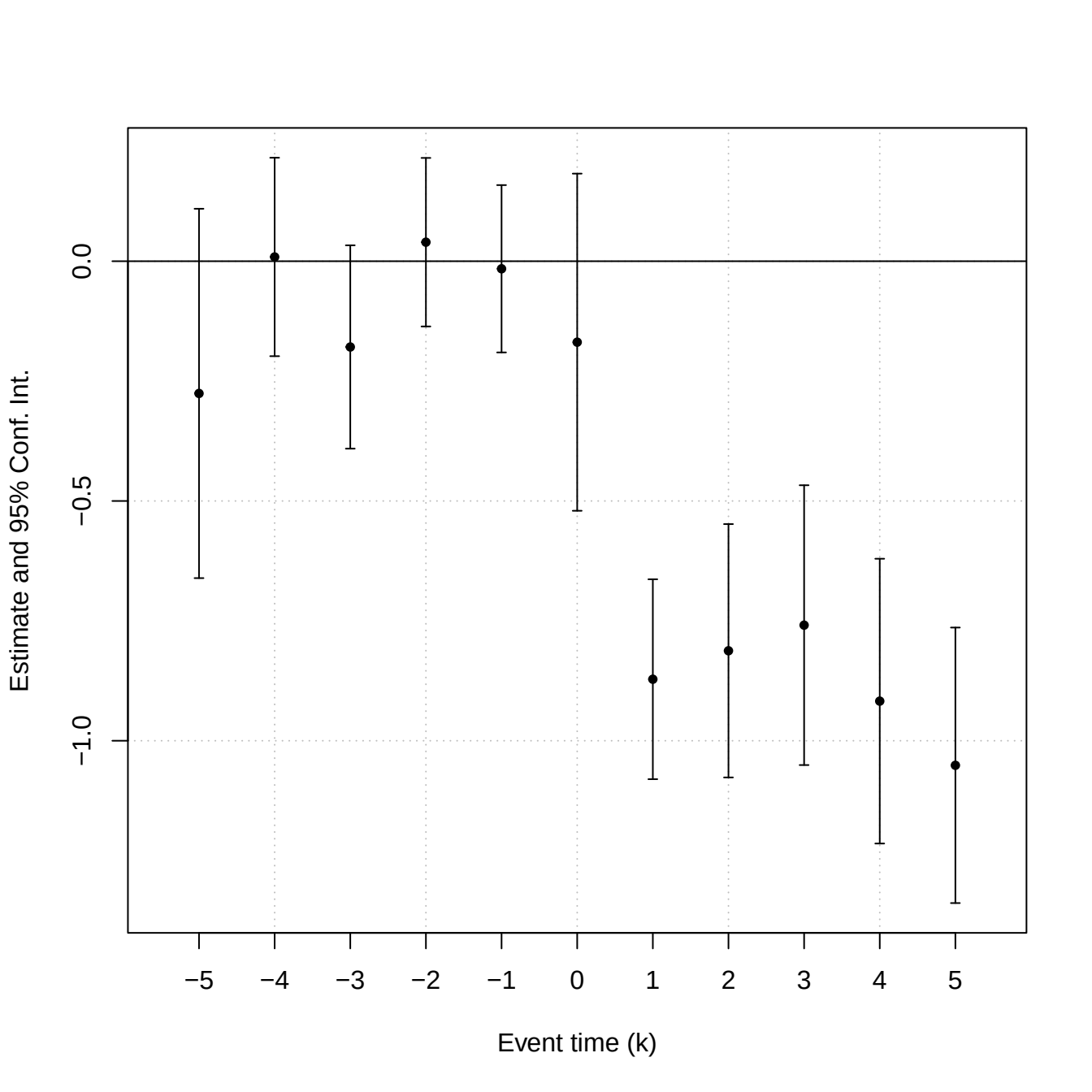

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

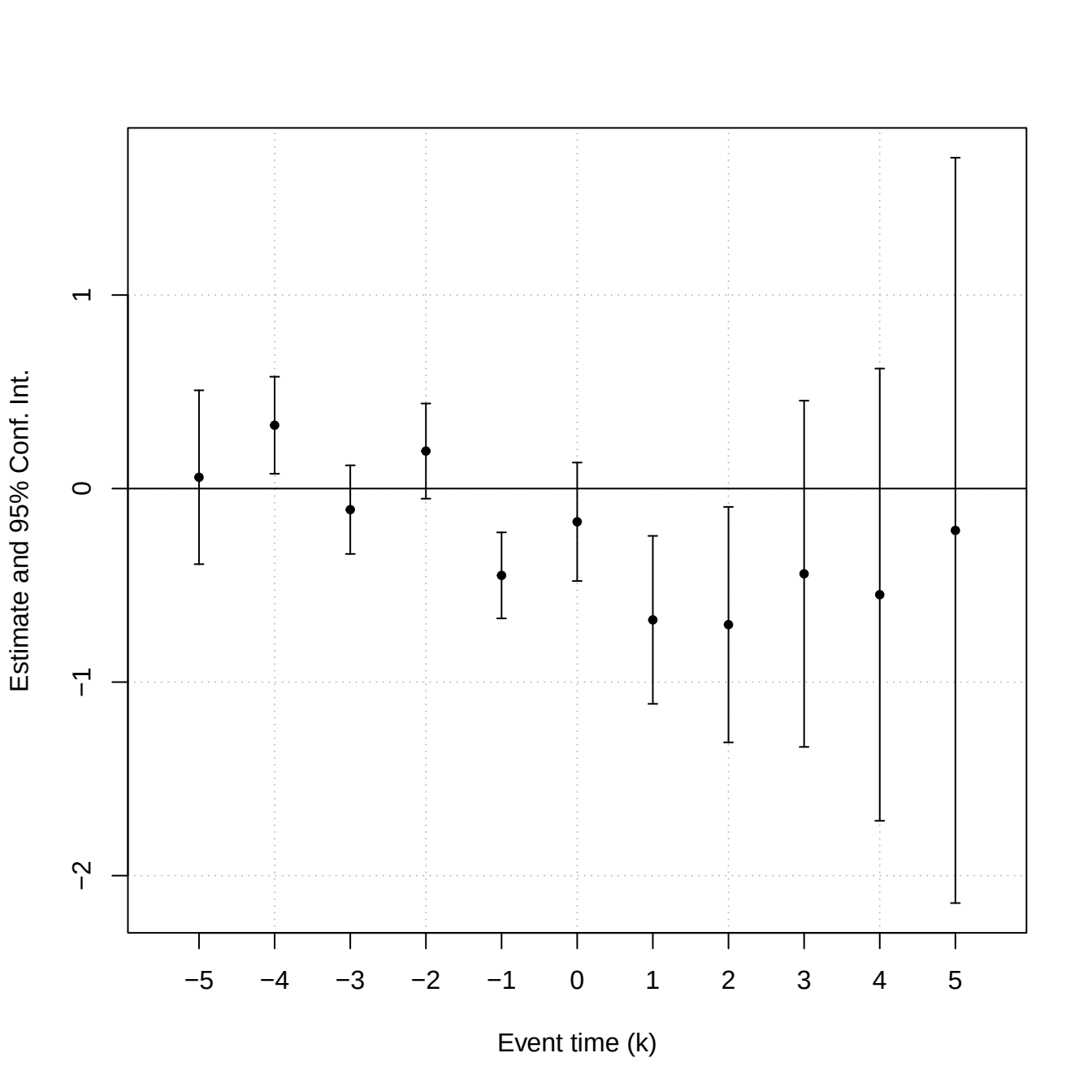

major_minor_release_count
knowledge_redundancy −> supervision
discussion_quantity −> avg_all_disc_count
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.563
Pretrend (Low) p−value: 0.523
Wald test p−value: 0.925
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

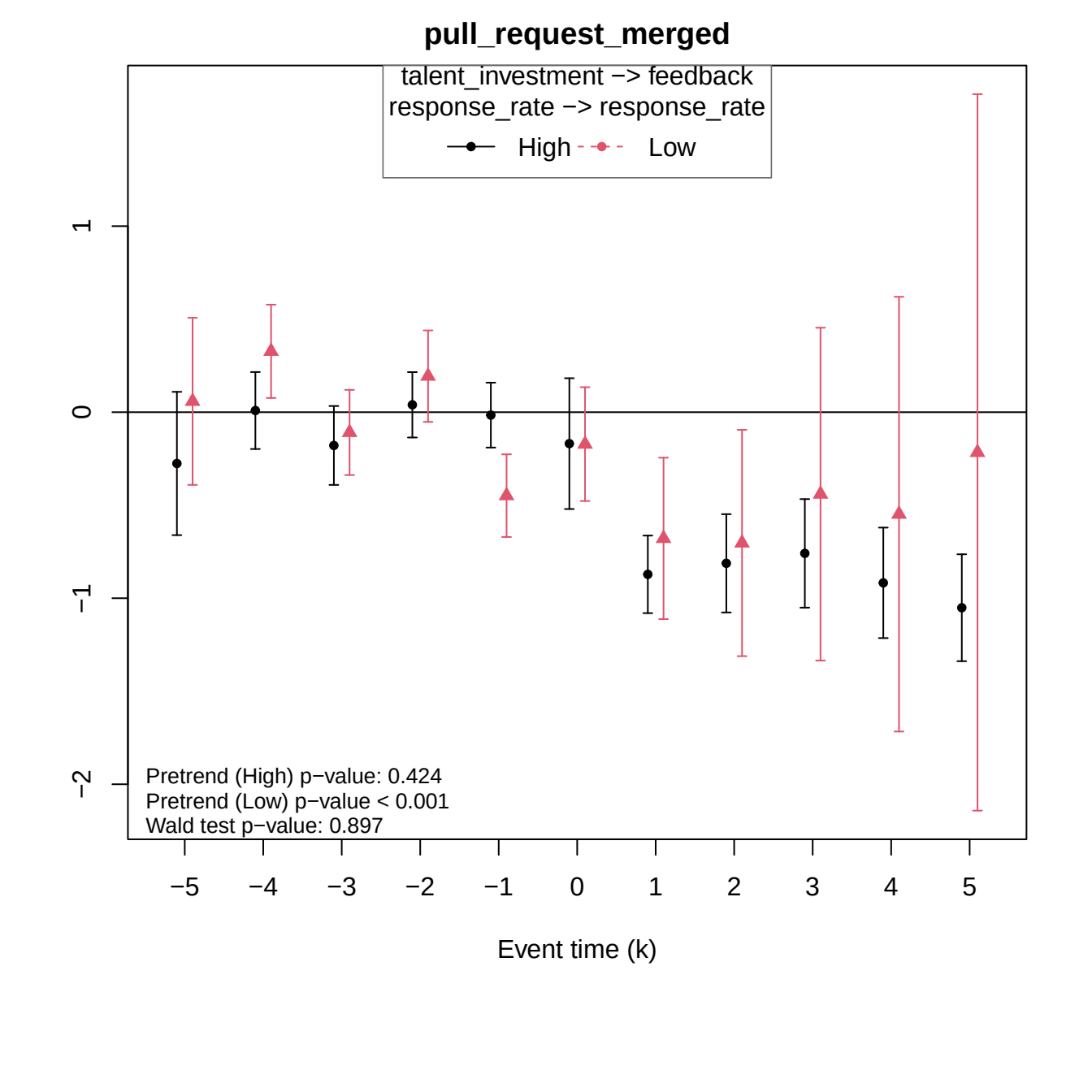

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

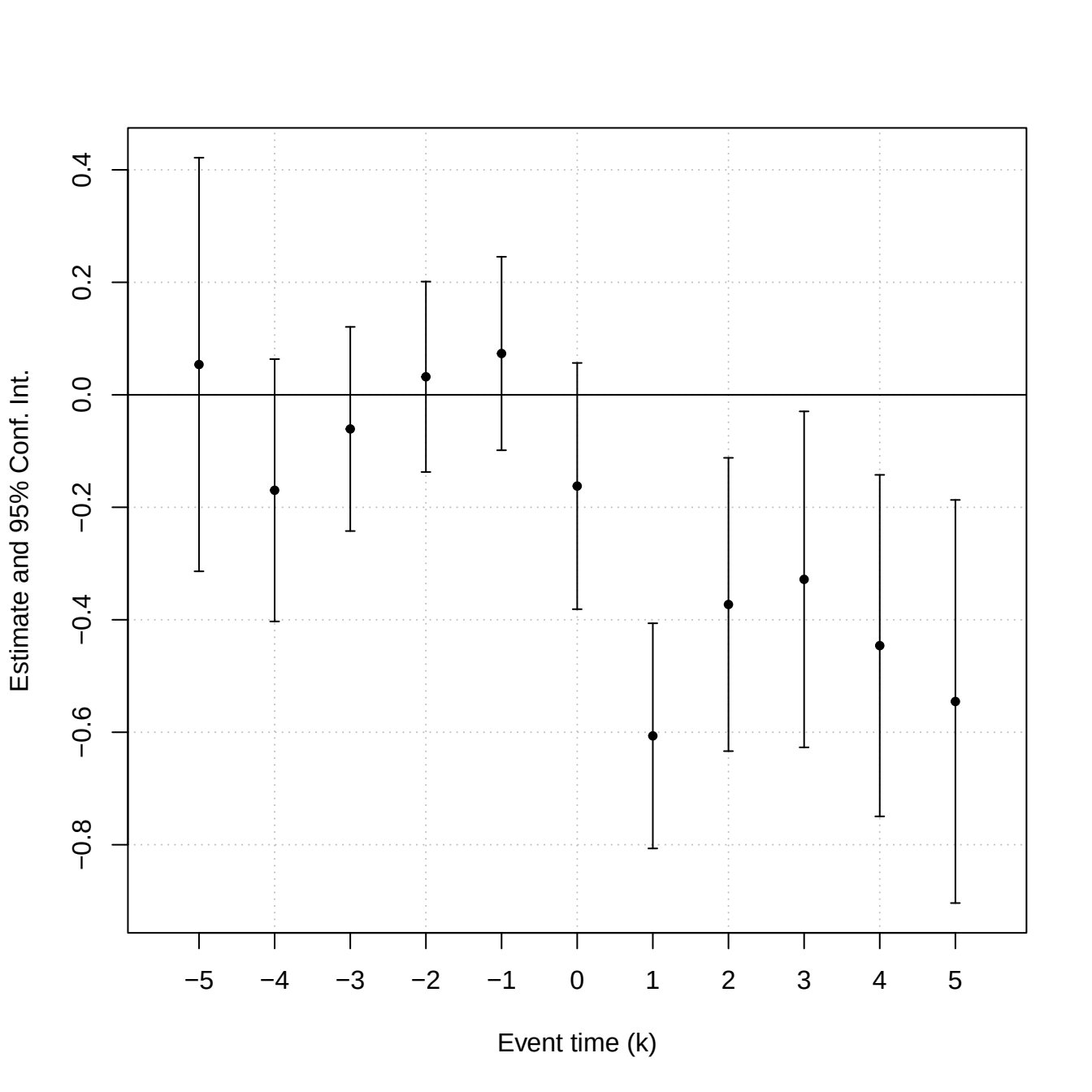

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

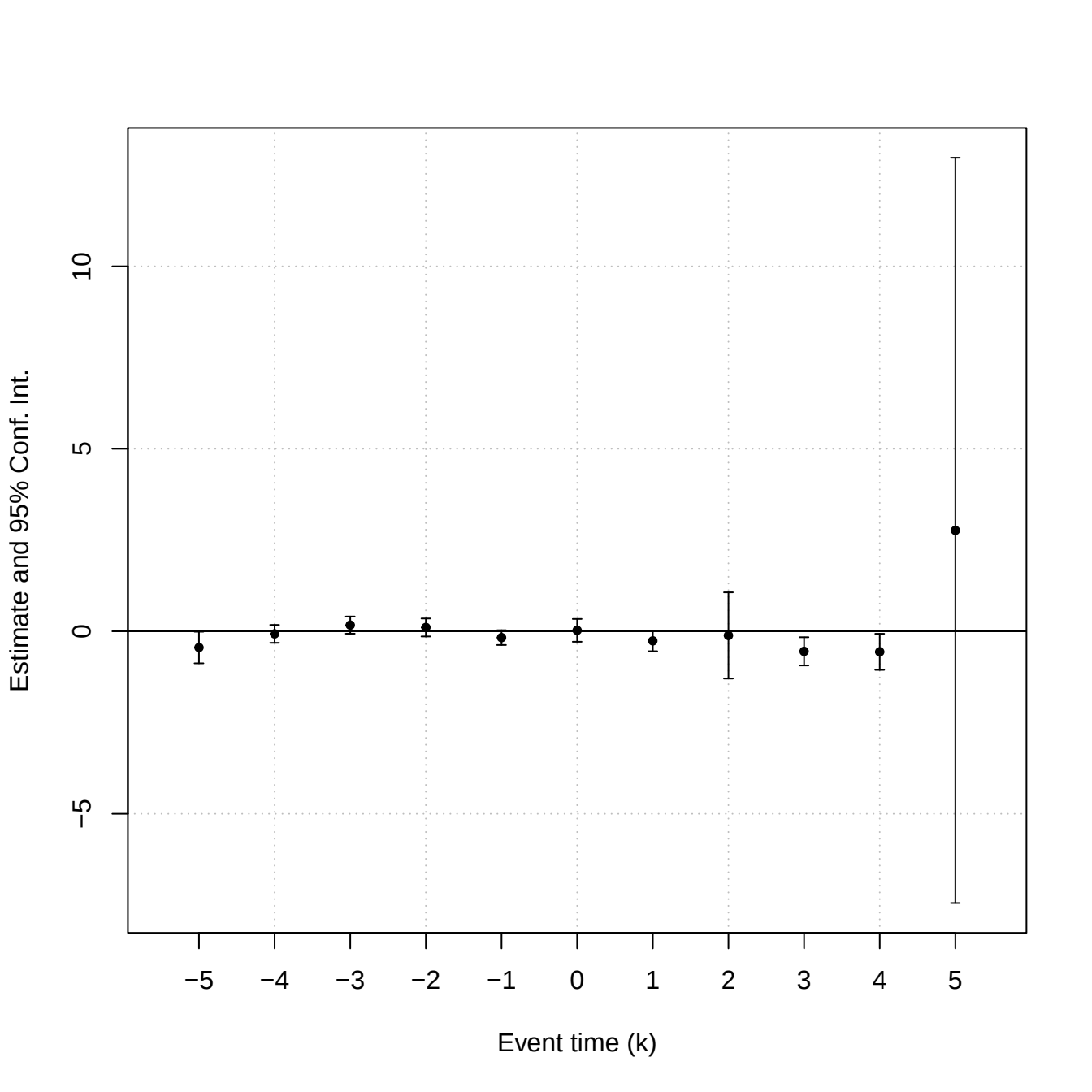

pull_request_opened
talent_investment −> feedback
response_rate −> response_rate
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.319
Pretrend (Low) p−value: 0.004
Wald test p−value: 0.699
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

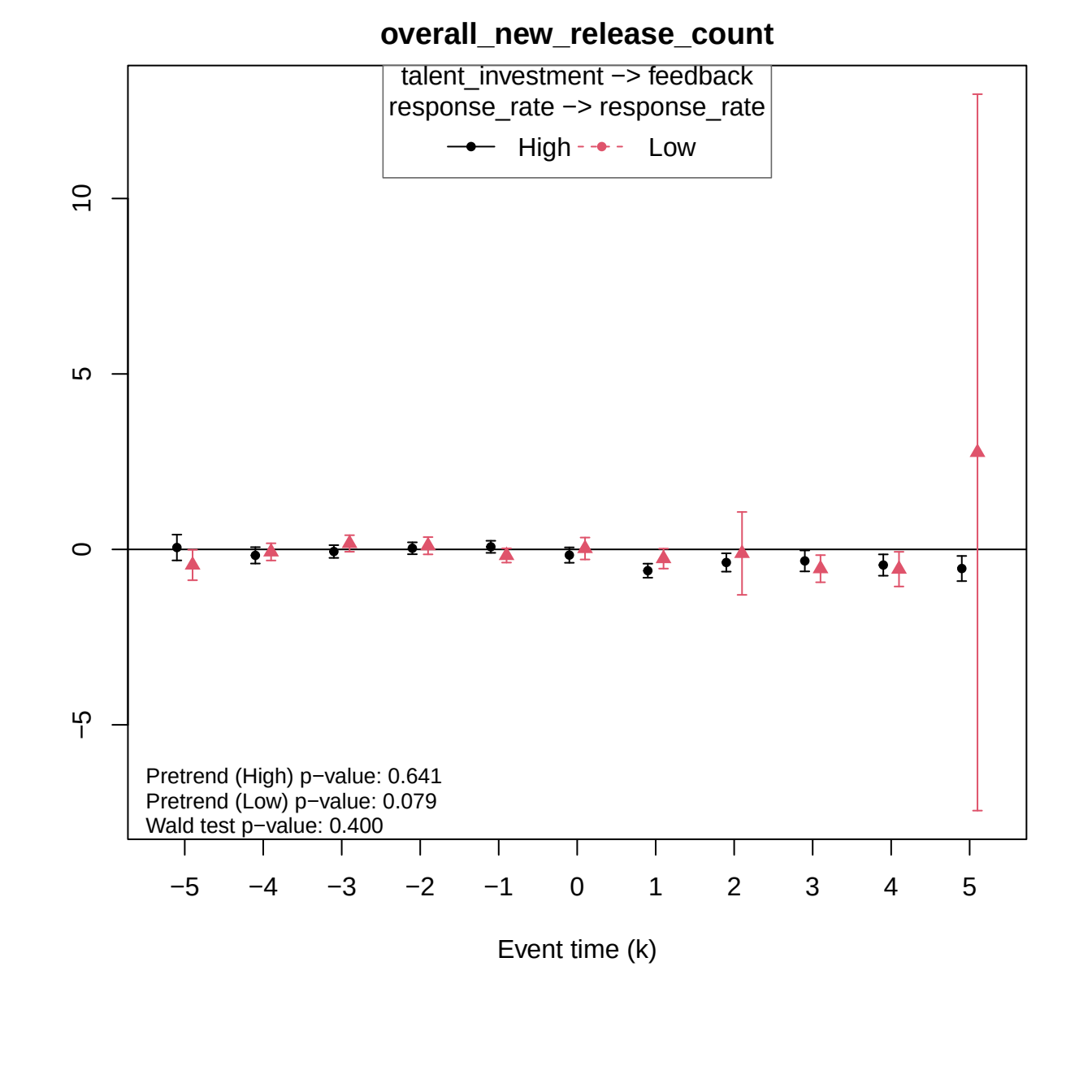

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

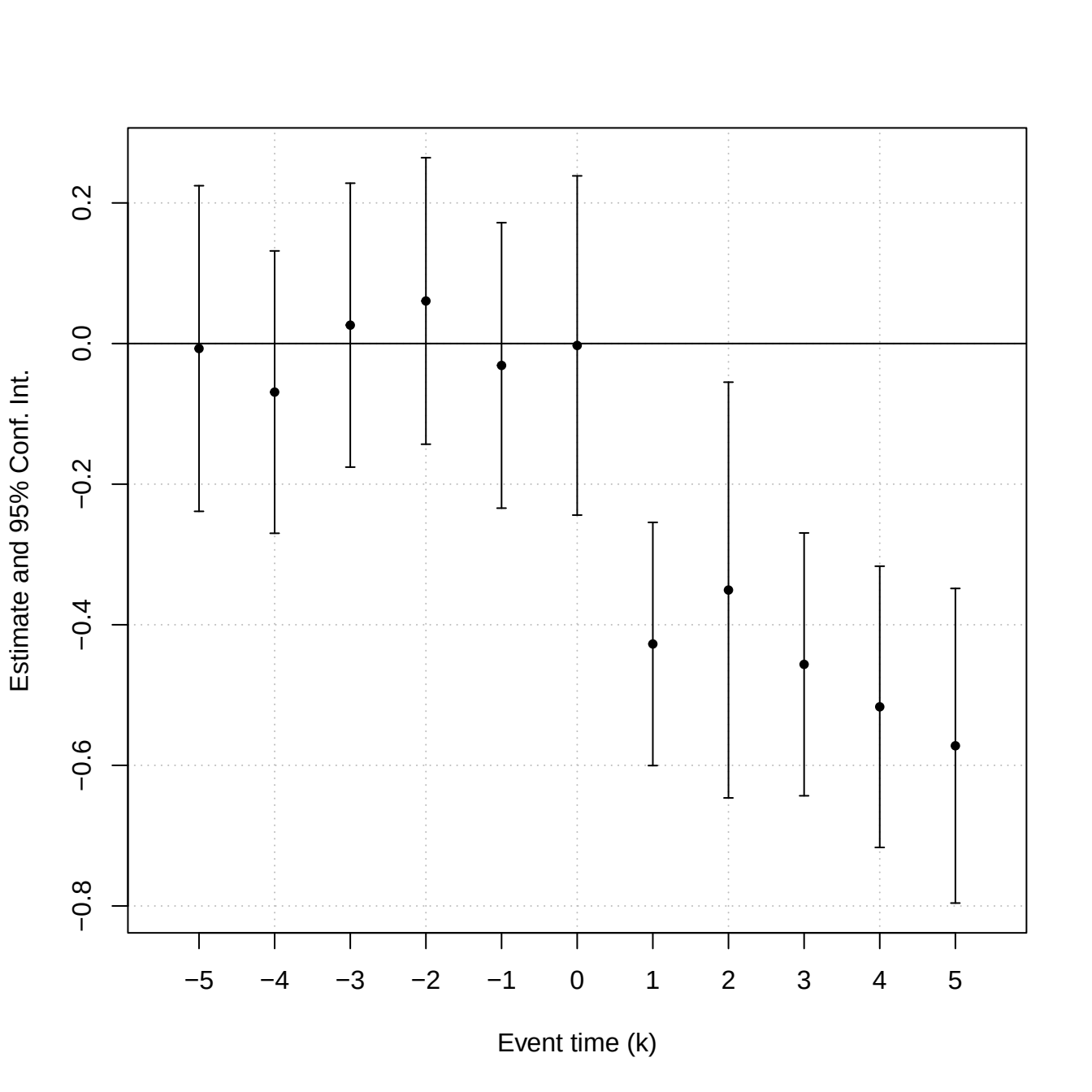

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

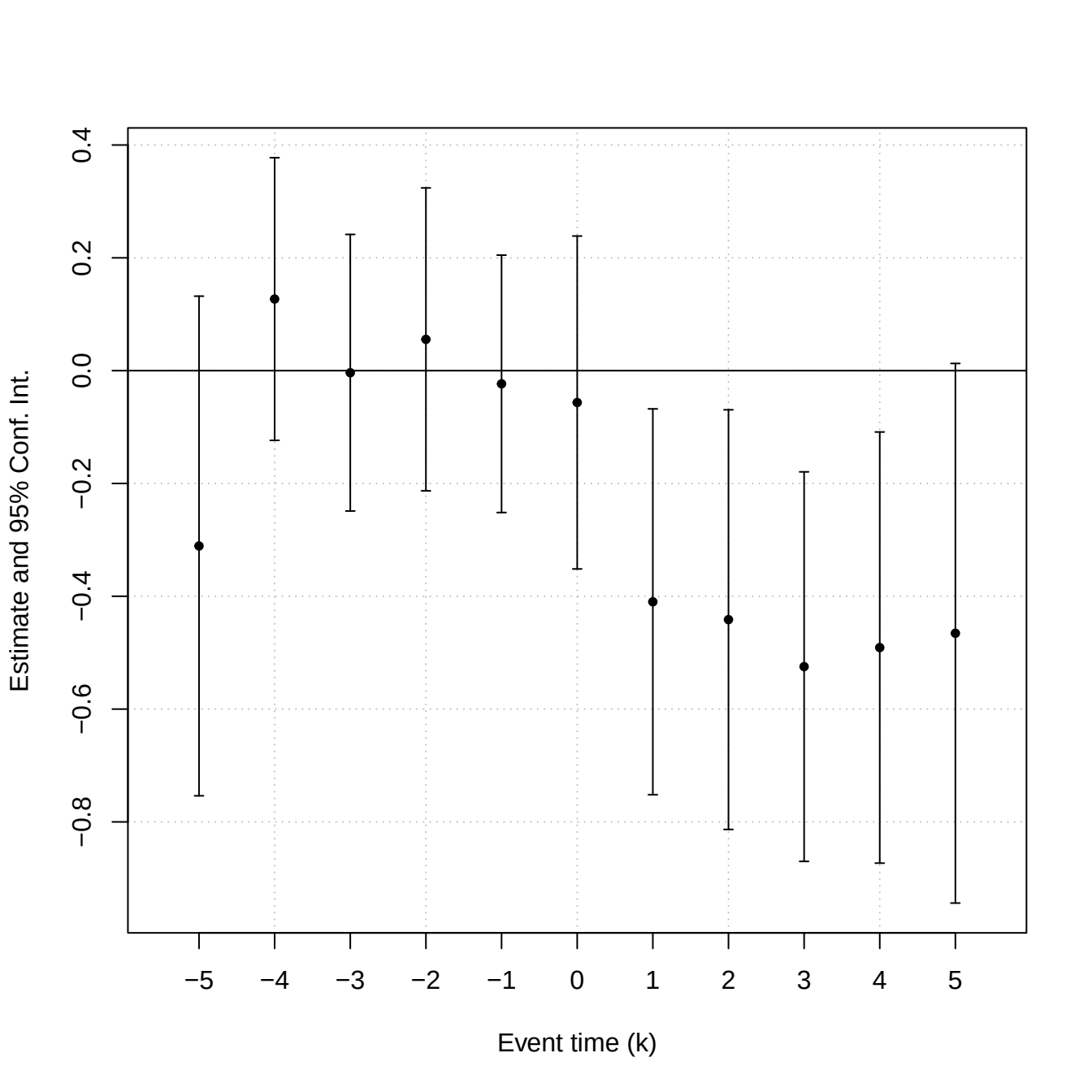

pull_request_merged
talent_investment −> feedback
response_rate −> response_rate
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.424
Pretrend (Low) p−value < 0.001
Wald test p−value: 0.897
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

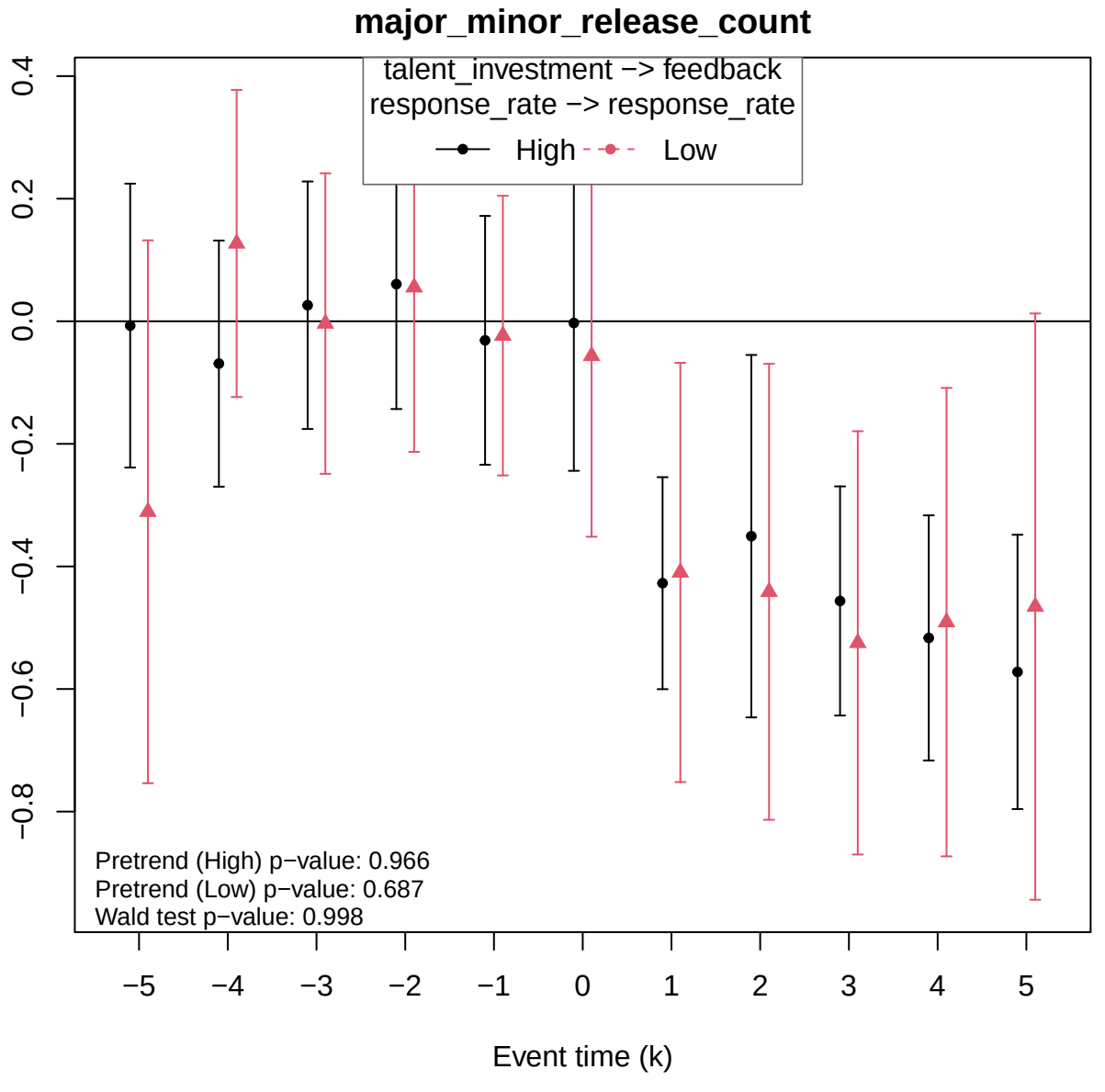

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

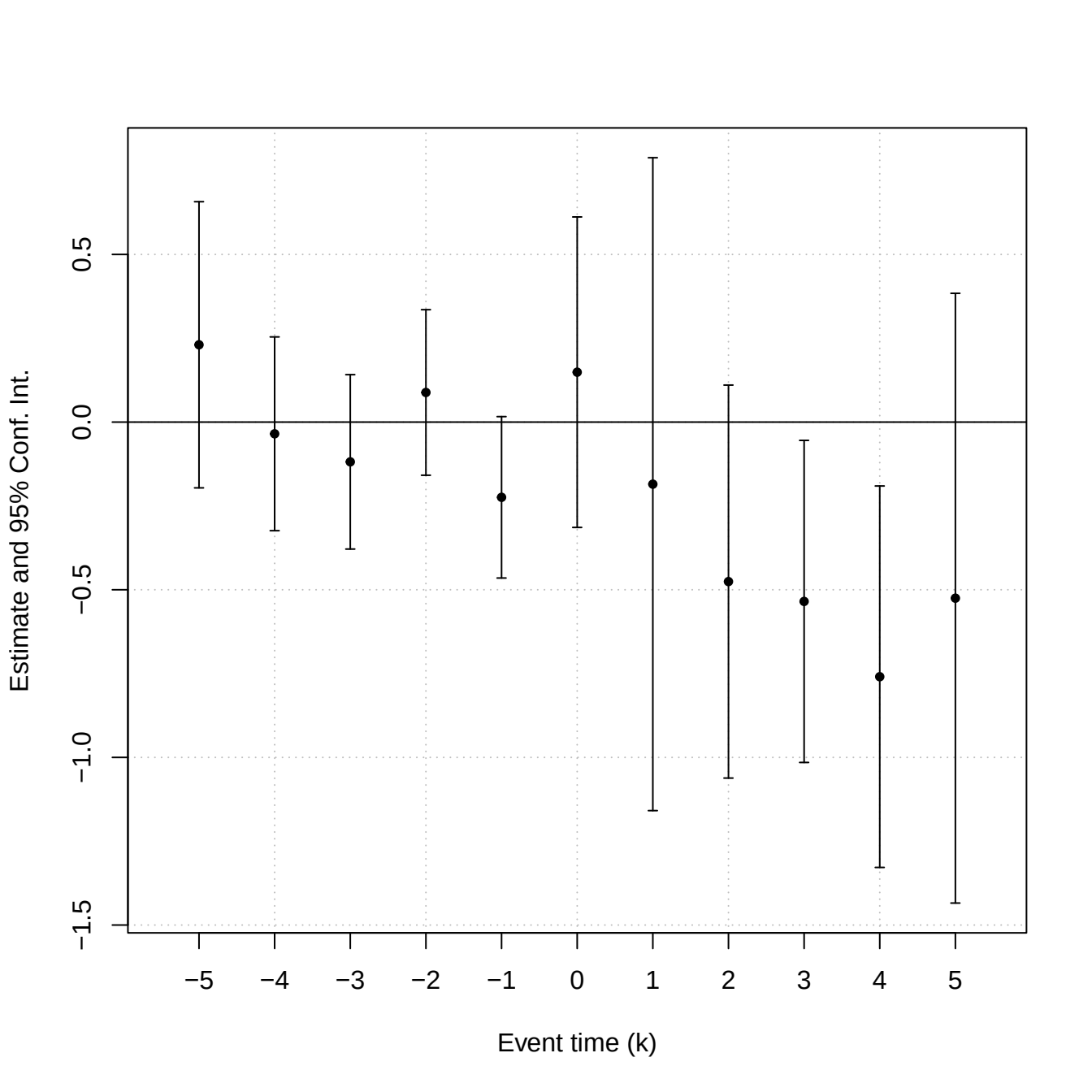

Estimate and 95% Conf. Int.
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

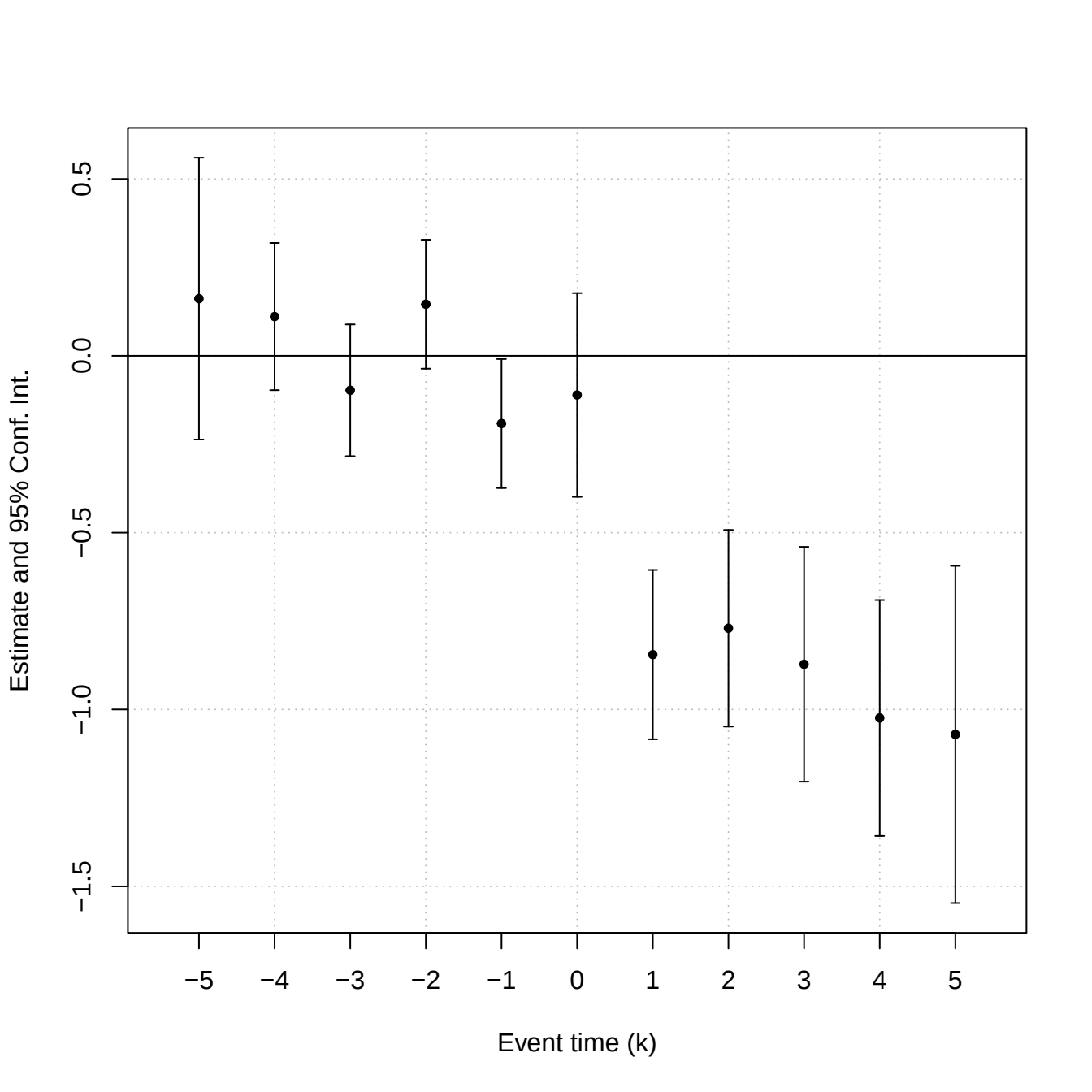

overall_new_release_count
talent_investment −> feedback
response_rate −> response_rate
High
Low
10
5
0
−5
Pretrend (High) p−value: 0.641
Pretrend (Low) p−value: 0.079
Wald test p−value: 0.400
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

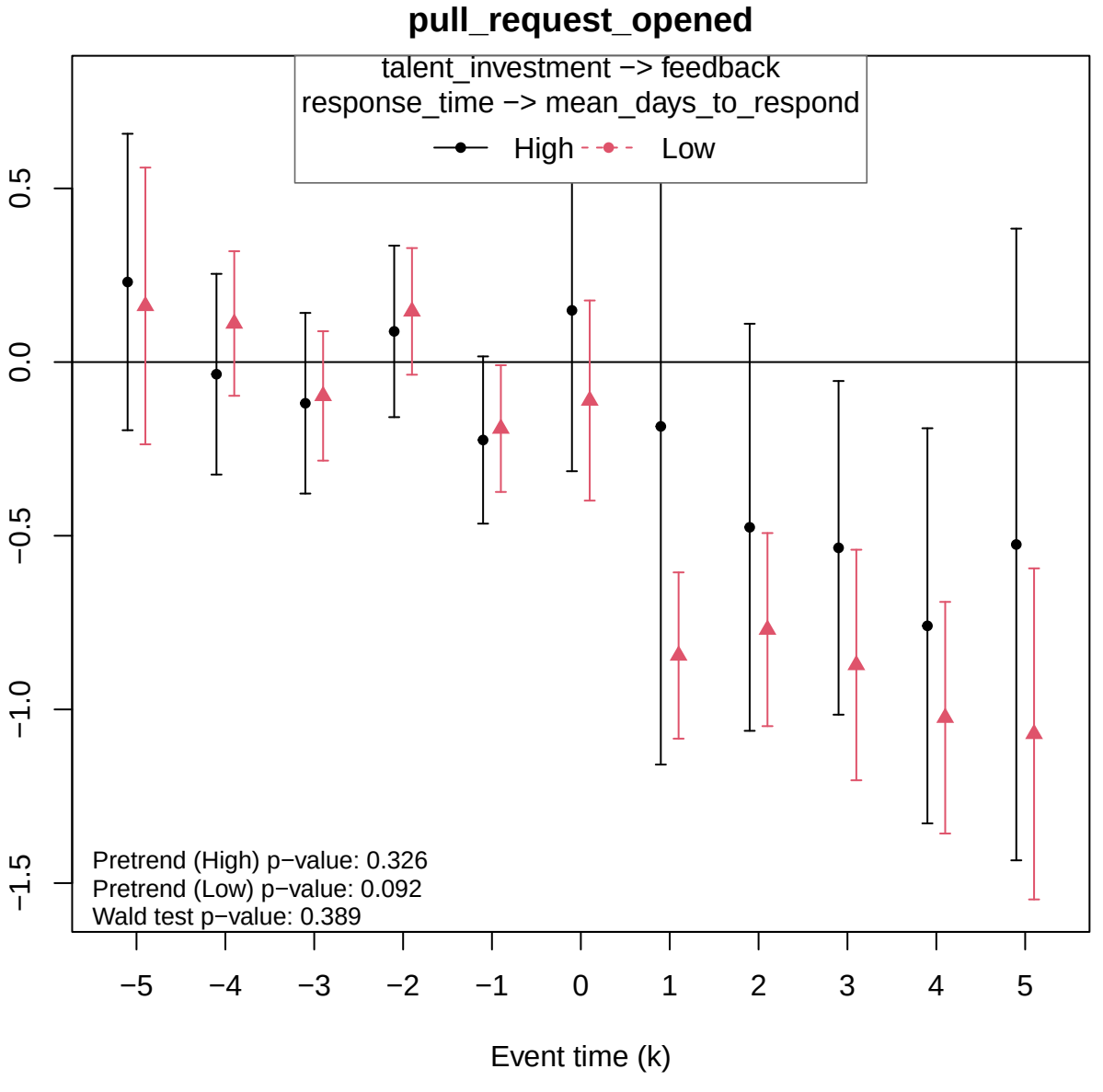

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

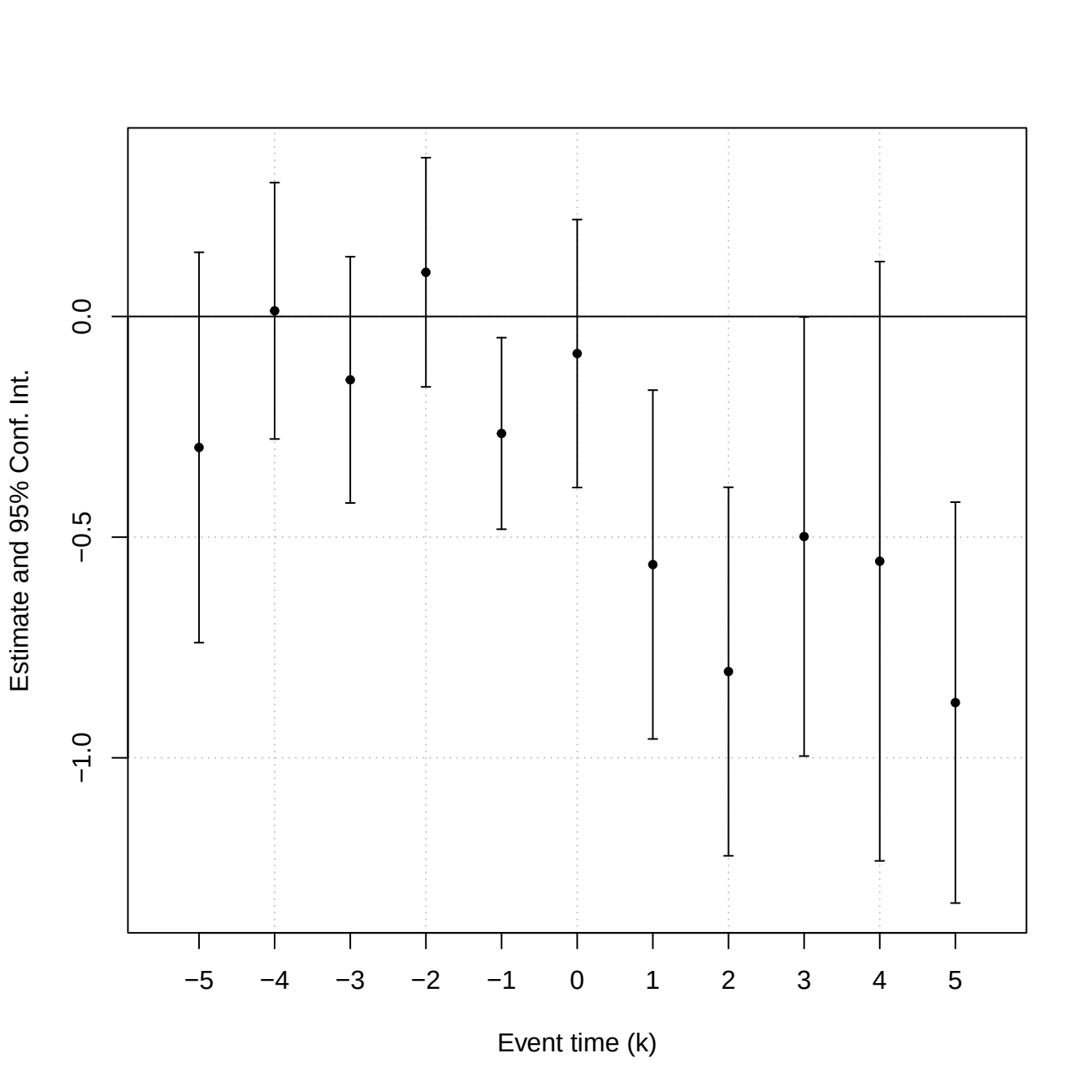

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

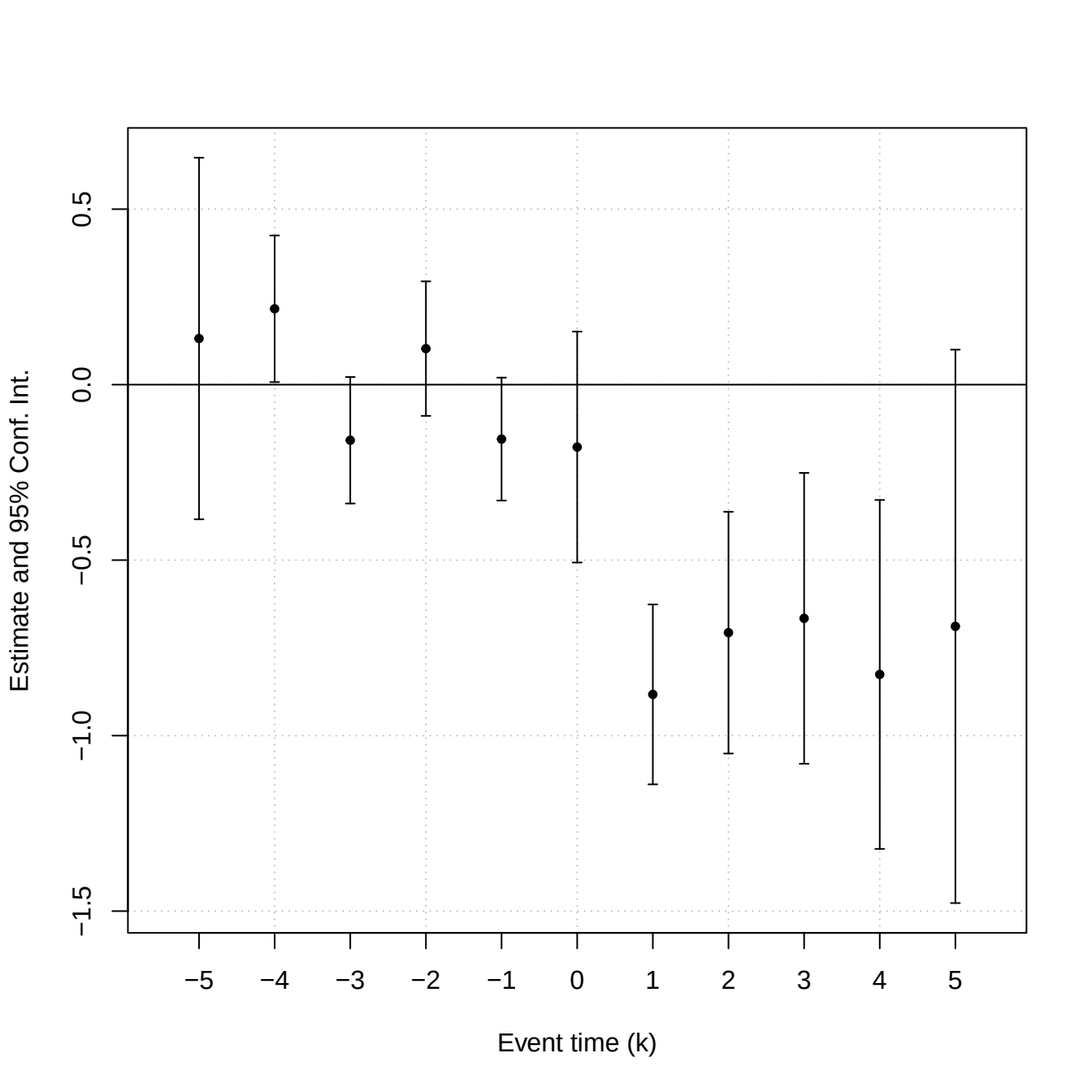

major_minor_release_count
talent_investment −> feedback
response_rate −> response_rate
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.966
Pretrend (Low) p−value: 0.687
Wald test p−value: 0.998
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

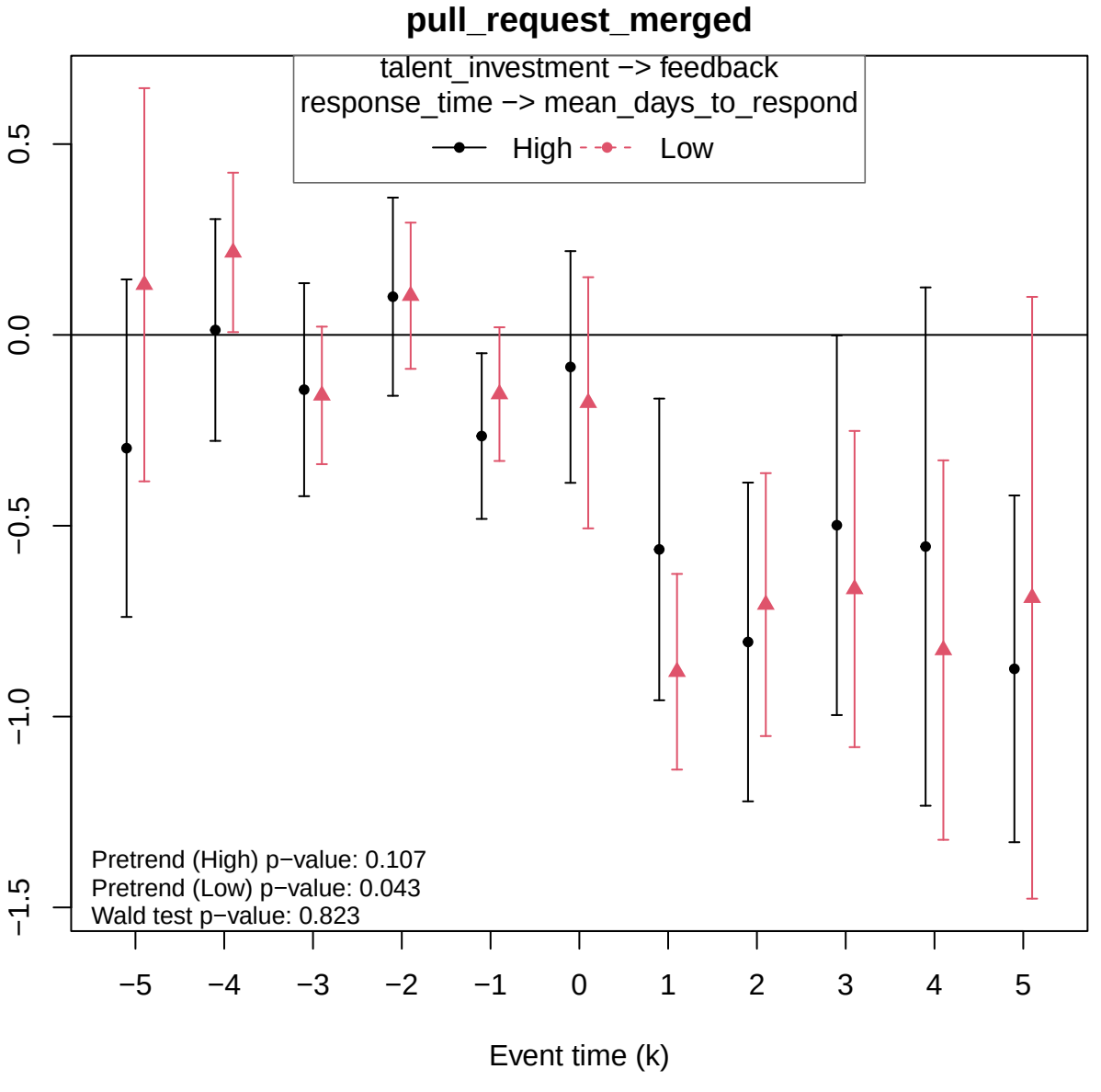

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

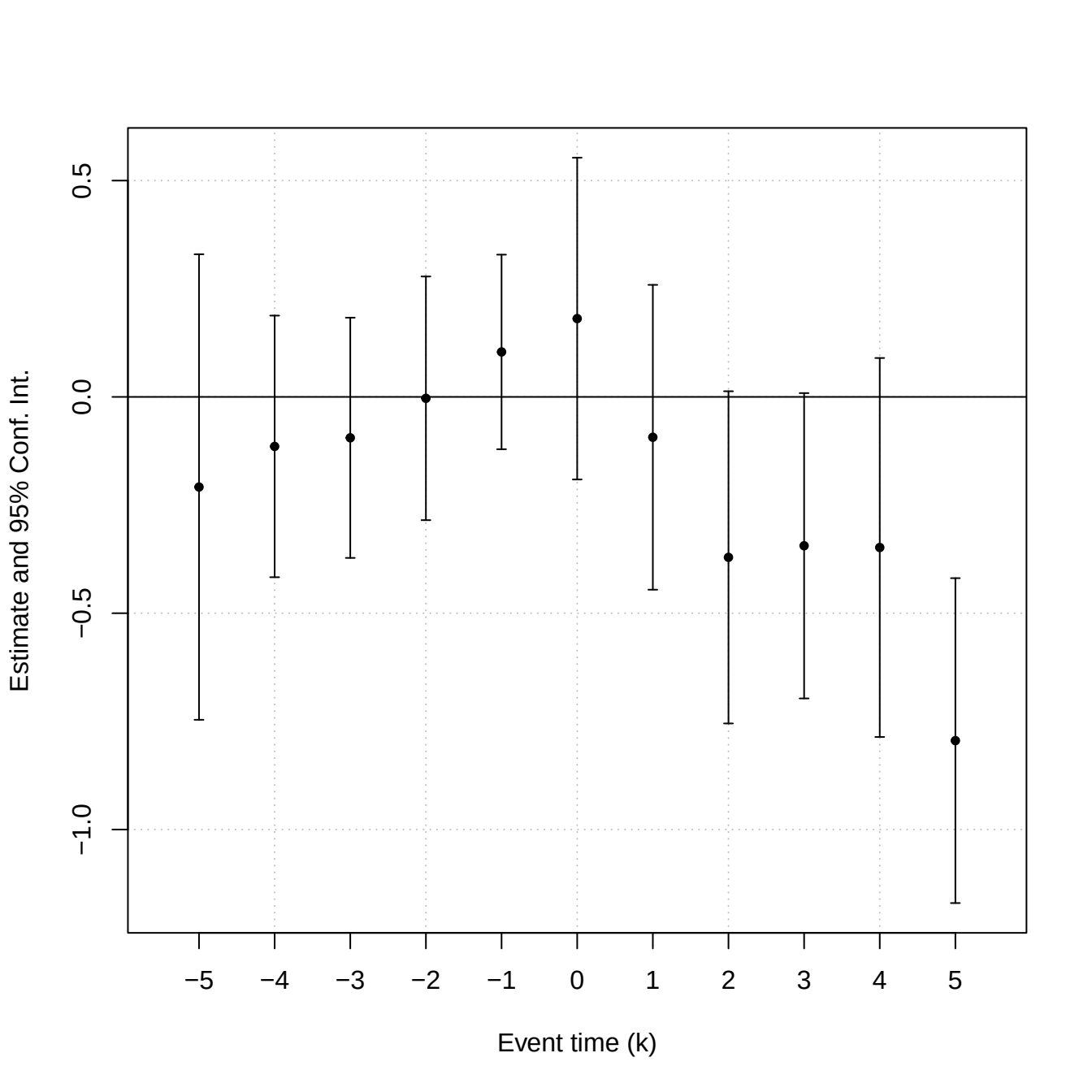

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

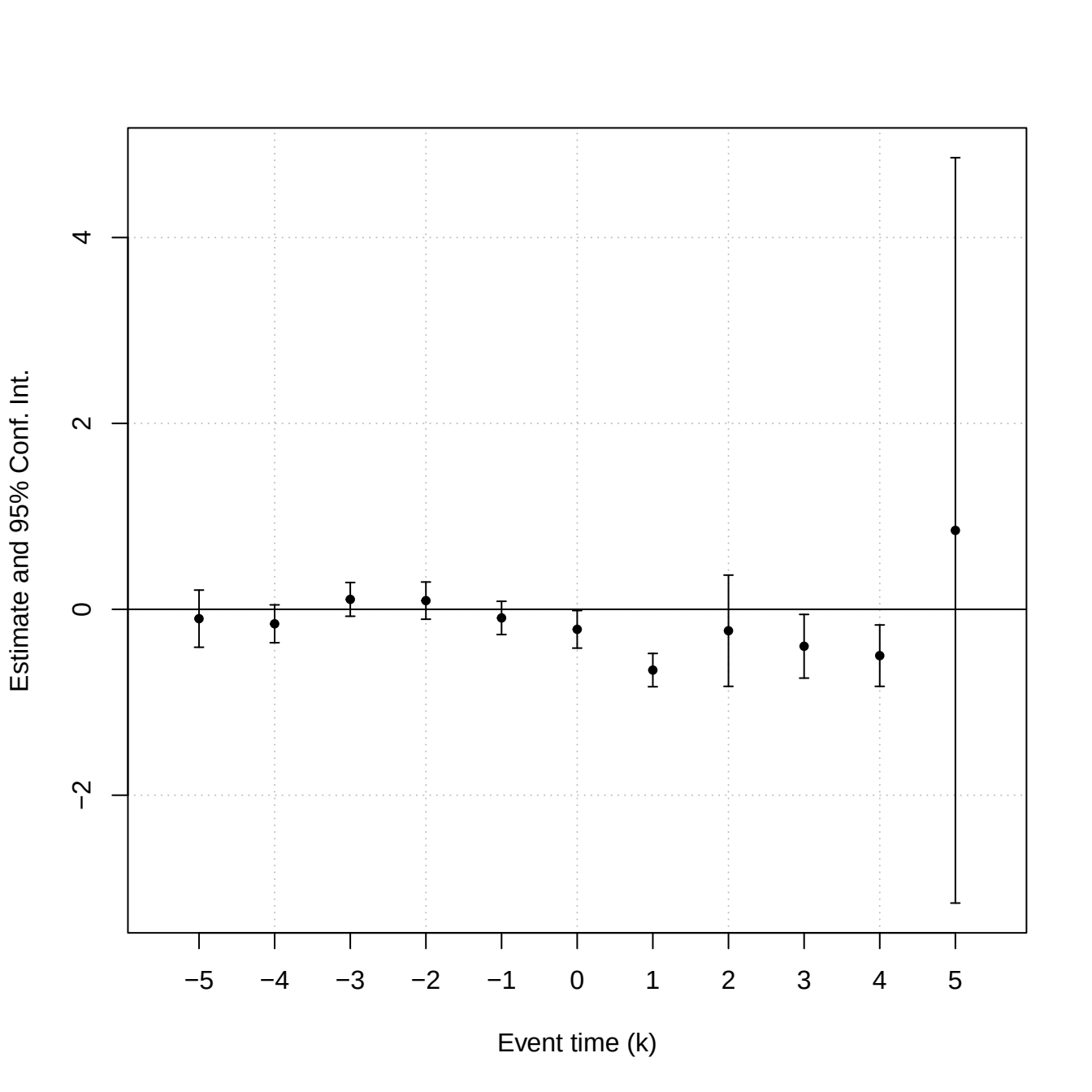

pull_request_opened
talent_investment −> feedback
response_time −> mean_days_to_respond
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.326
Pretrend (Low) p−value: 0.092
Wald test p−value: 0.389
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

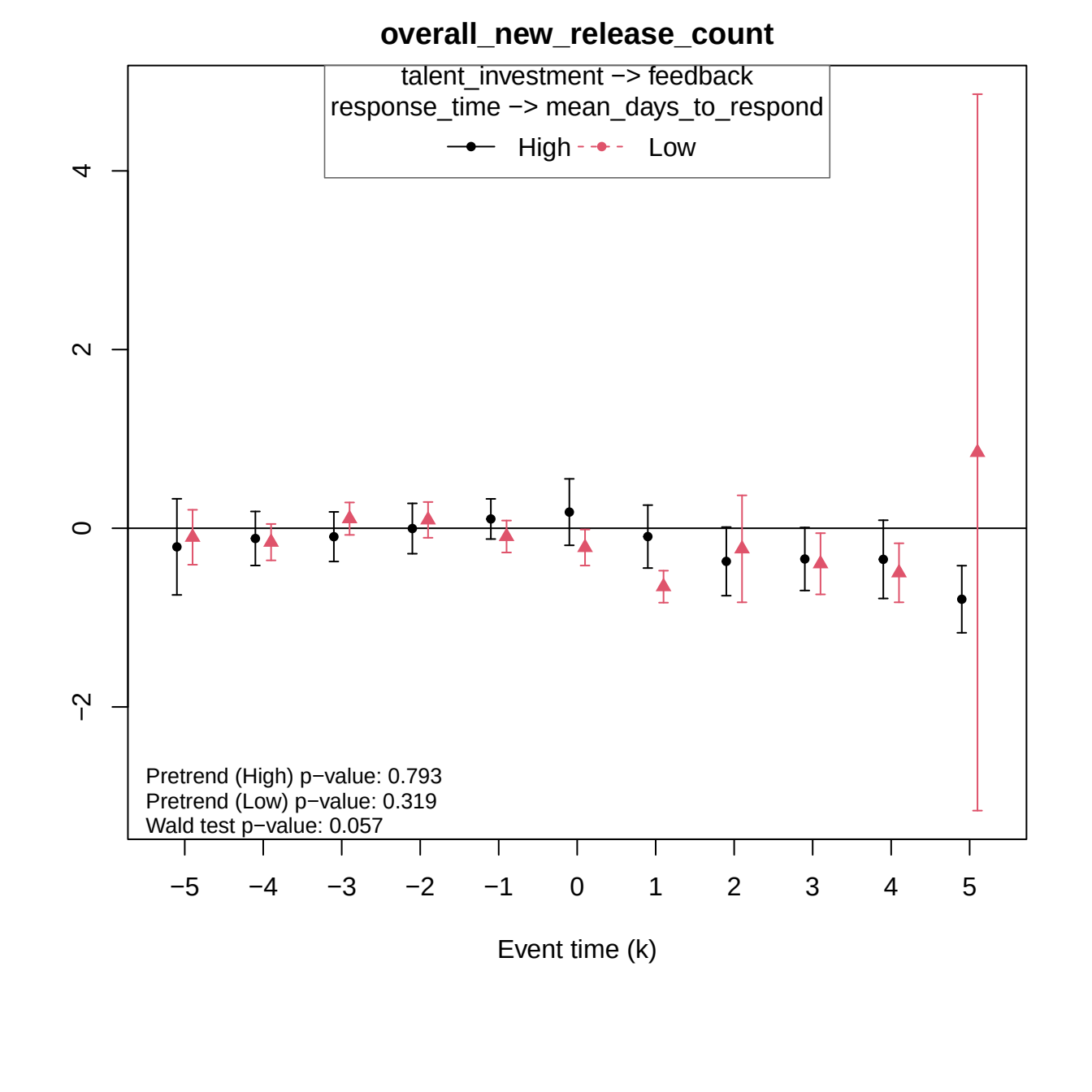

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

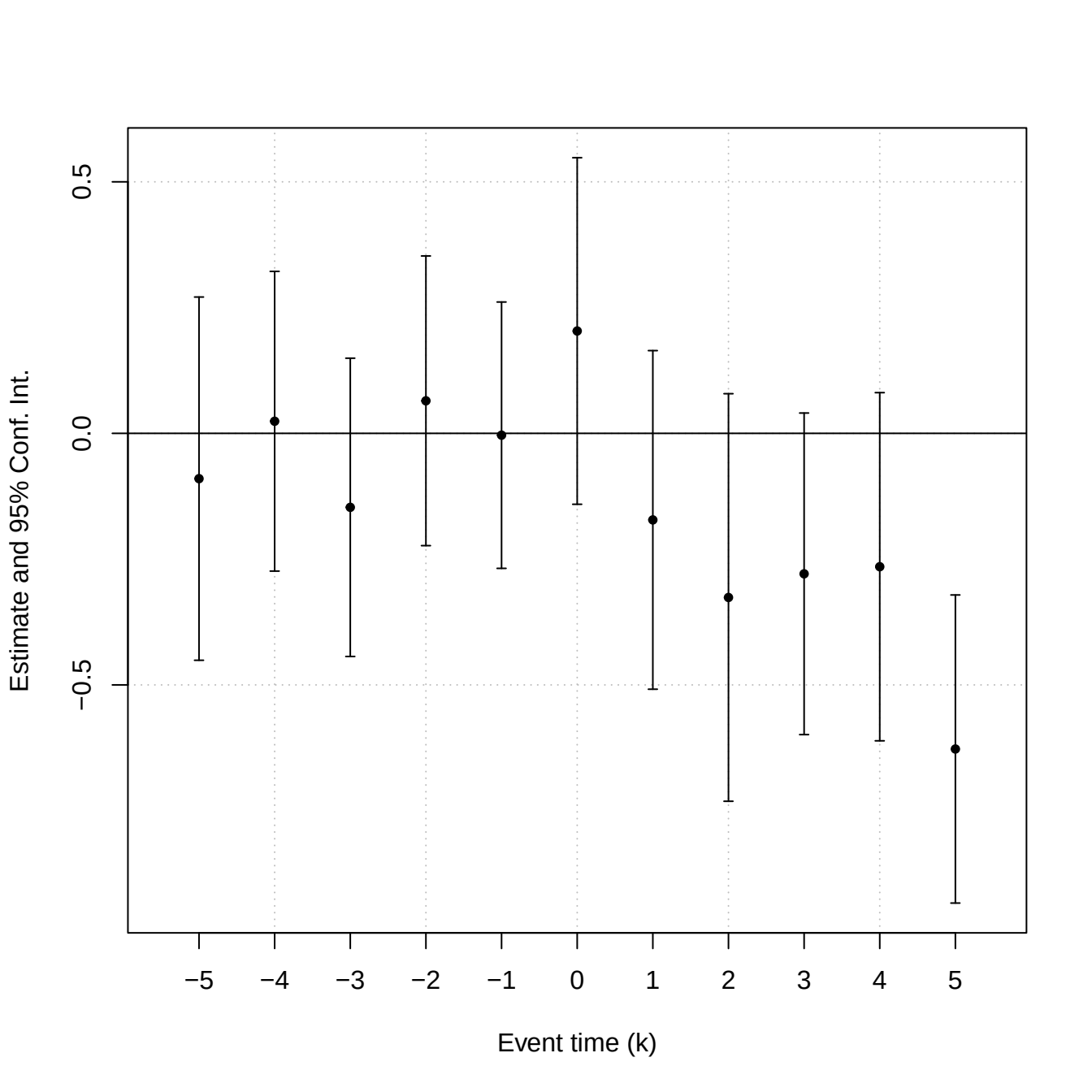

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

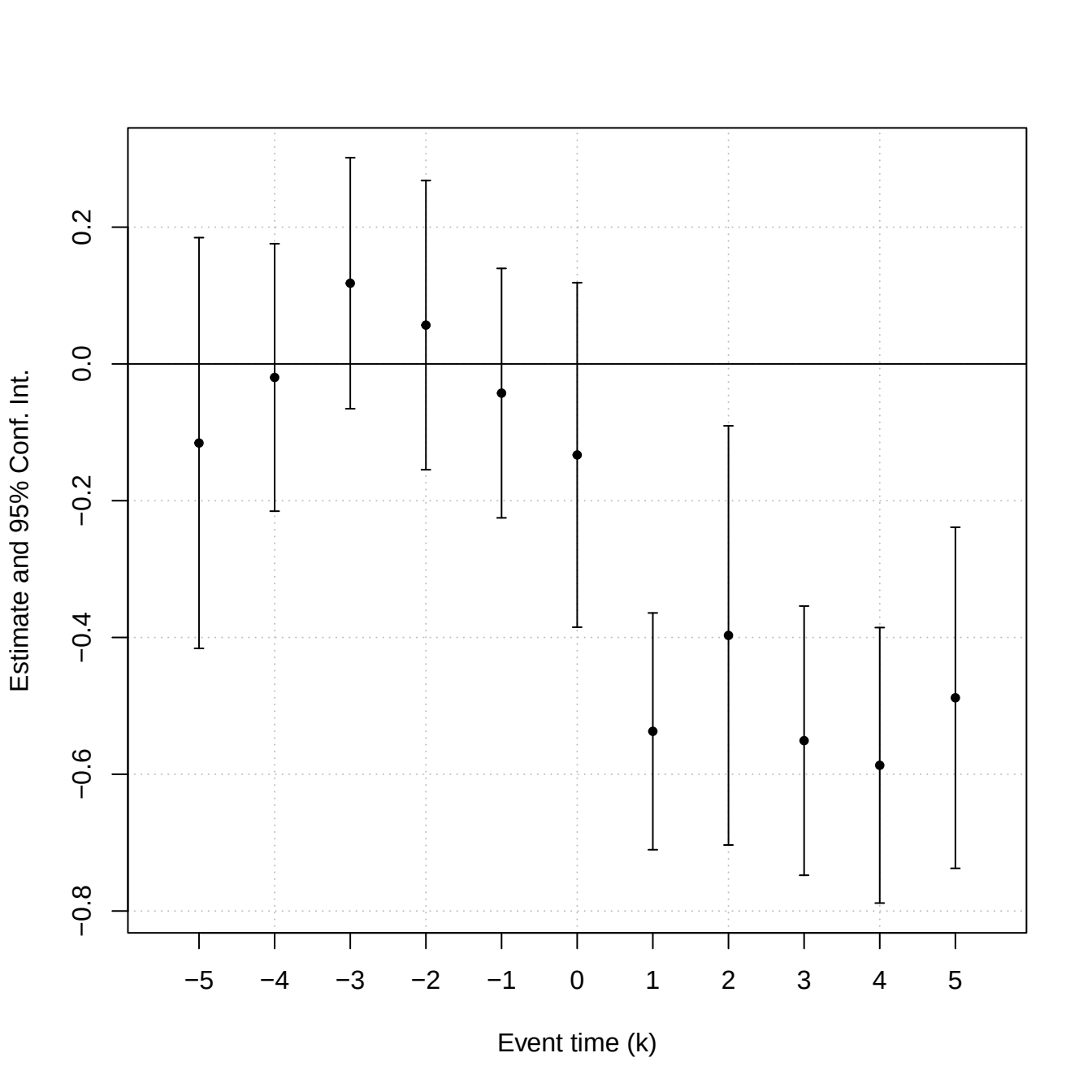

pull_request_merged
talent_investment −> feedback
response_time −> mean_days_to_respond
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.107
Pretrend (Low) p−value: 0.043
Wald test p−value: 0.823
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

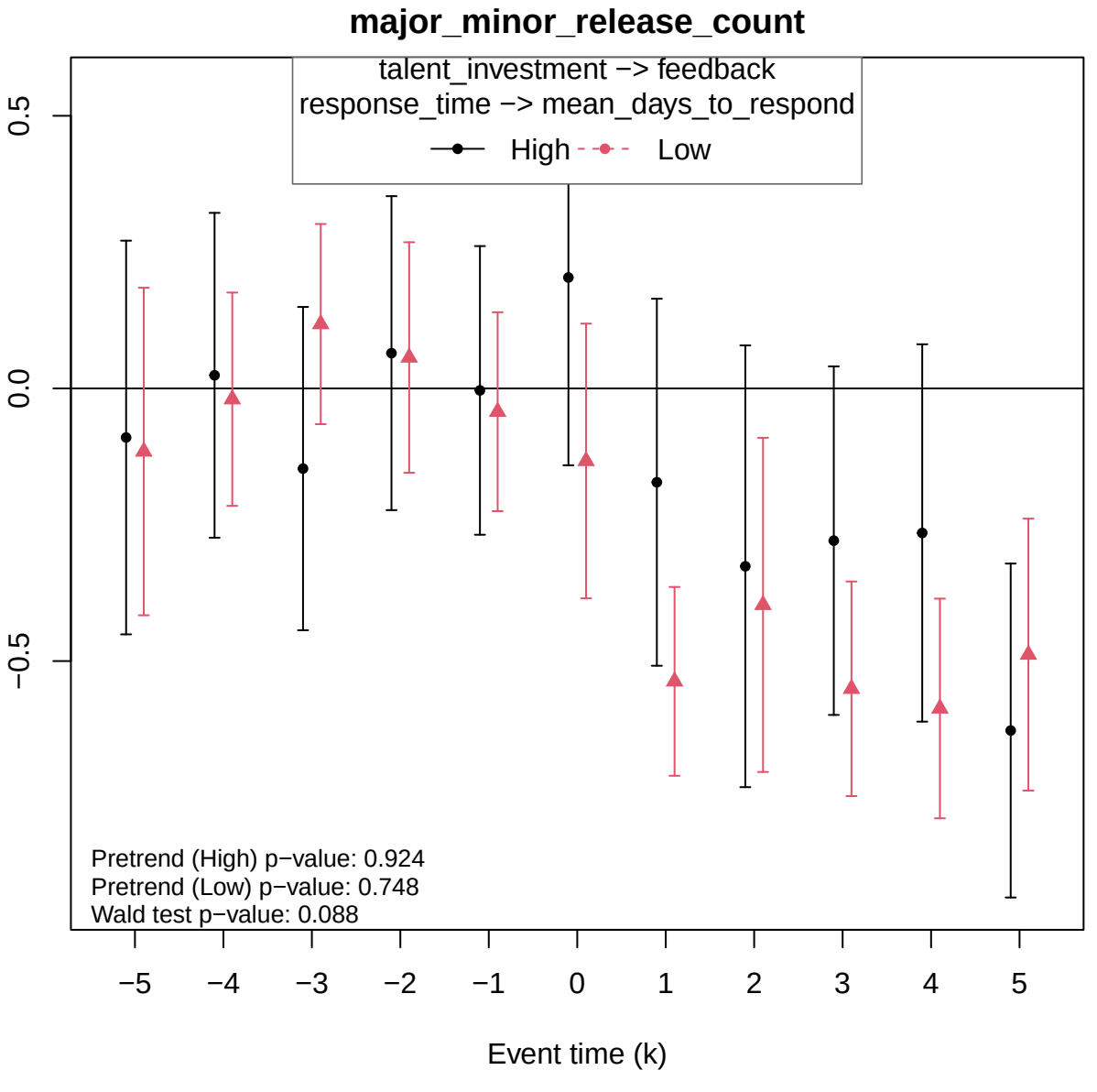

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

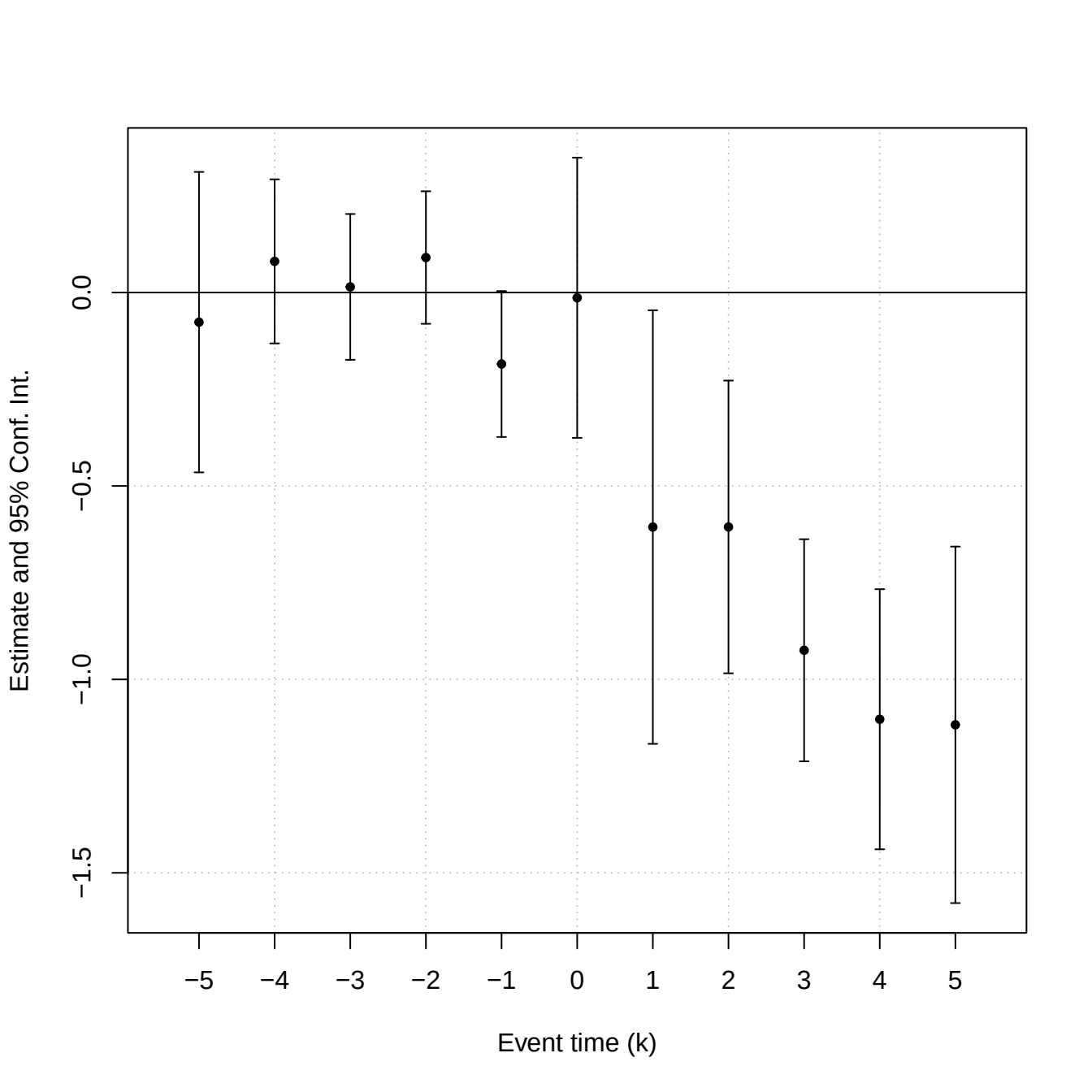

Estimate and 95% Conf. Int.
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

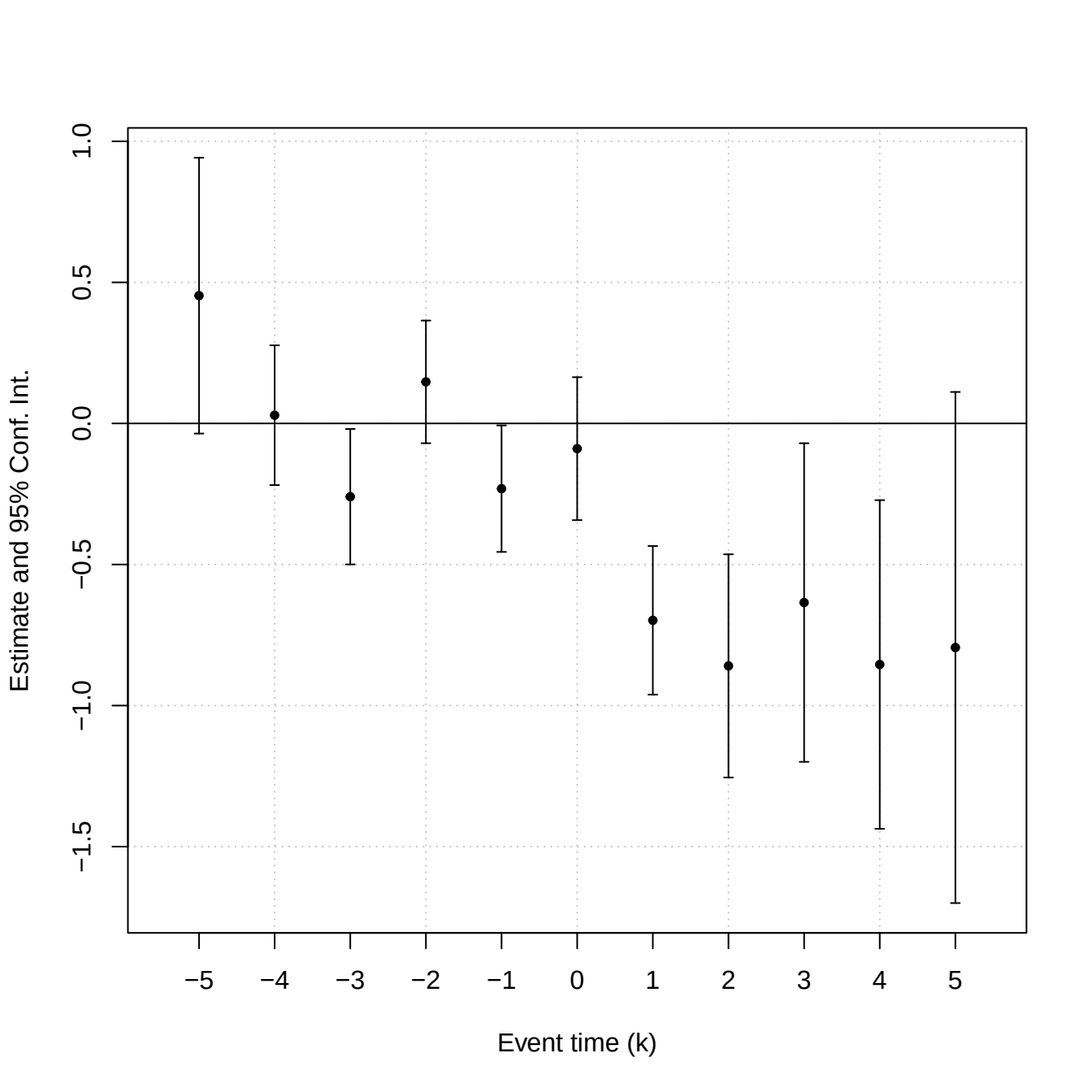

overall_new_release_count
talent_investment −> feedback
response_time −> mean_days_to_respond
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.793
Pretrend (Low) p−value: 0.319
Wald test p−value: 0.057
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

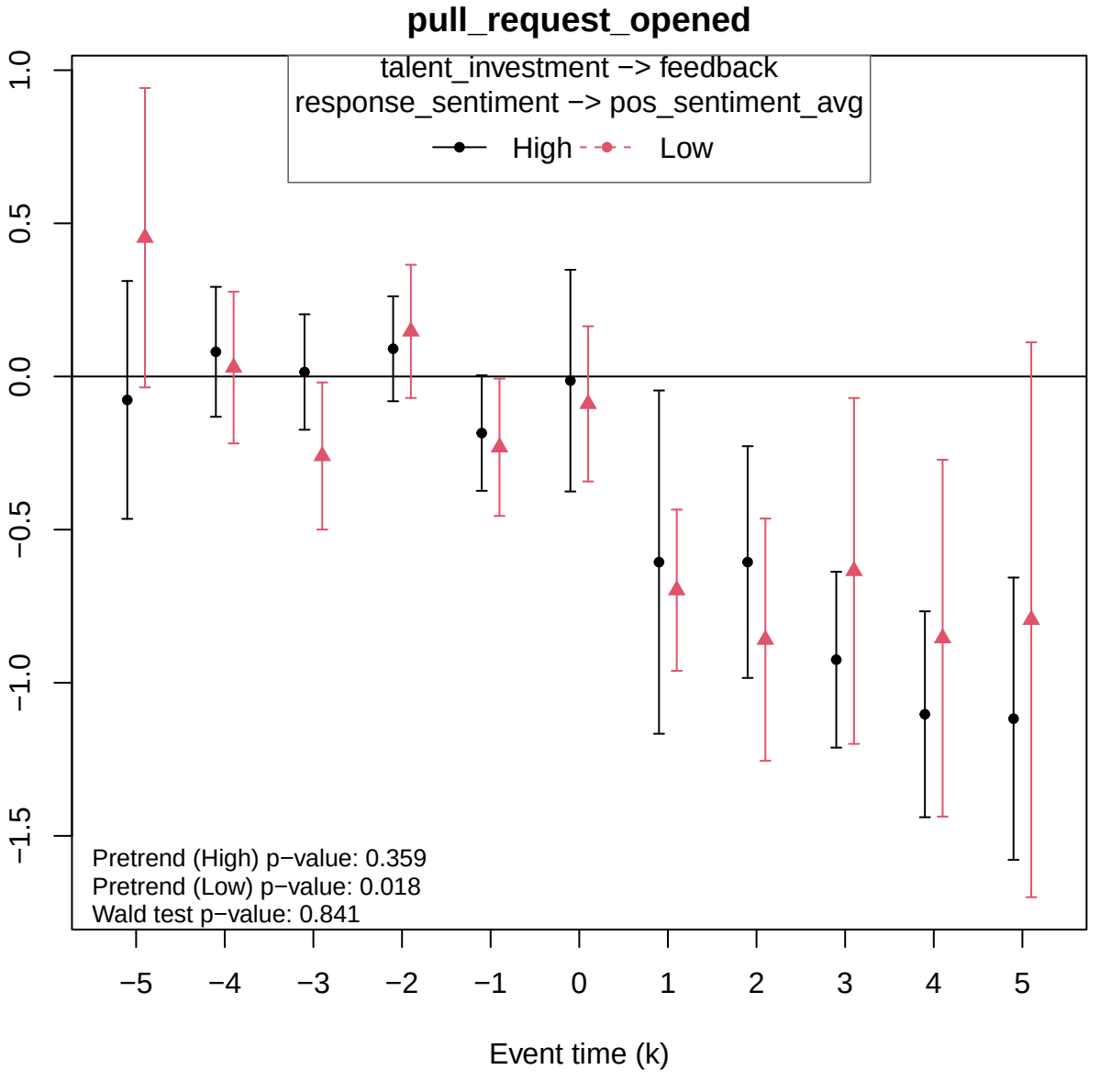

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

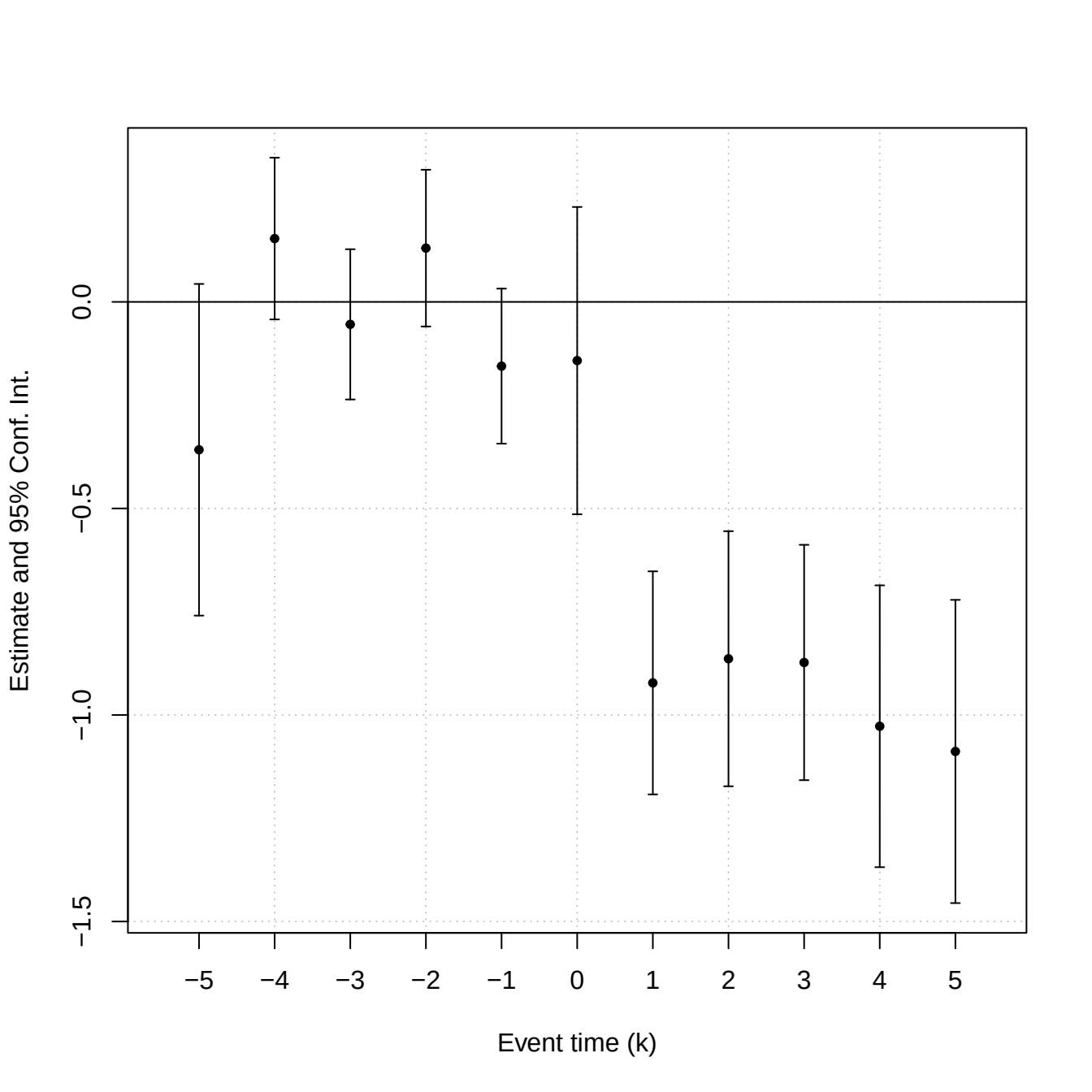

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

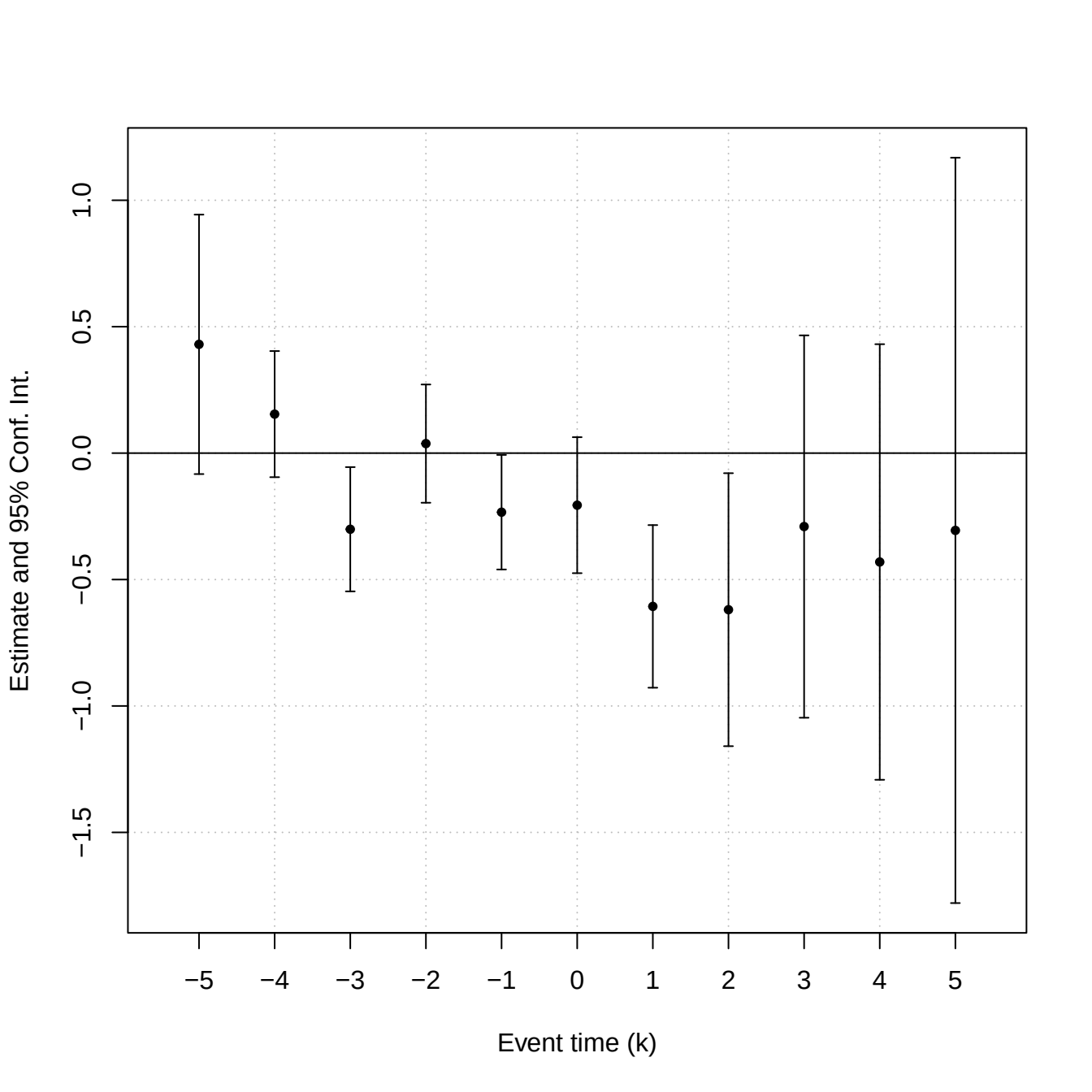

major_minor_release_count
talent_investment −> feedback
response_time −> mean_days_to_respond
High
Low
0.5
0.0
−0.5
Pretrend (High) p−value: 0.924
Pretrend (Low) p−value: 0.748
Wald test p−value: 0.088
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

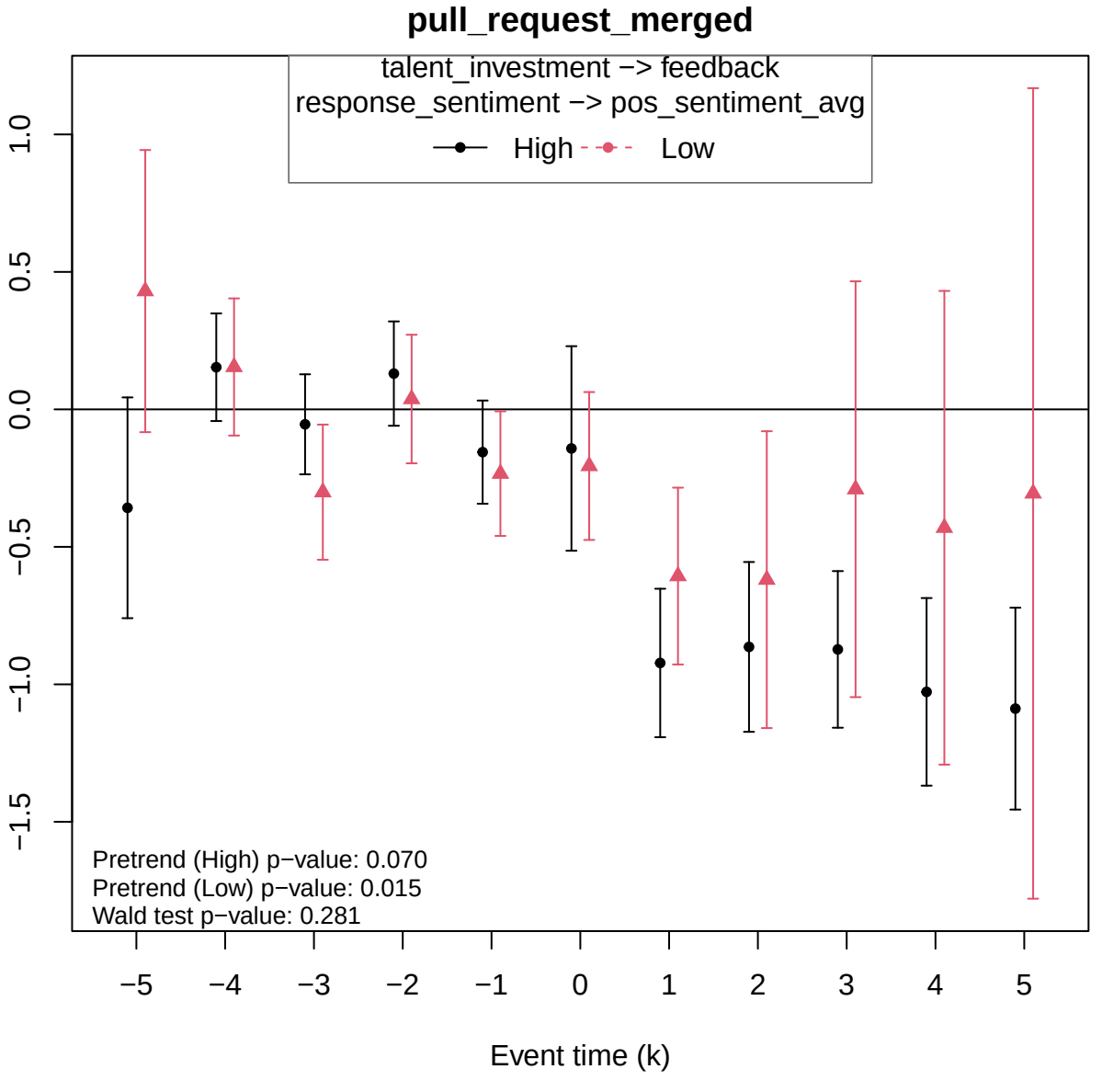

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

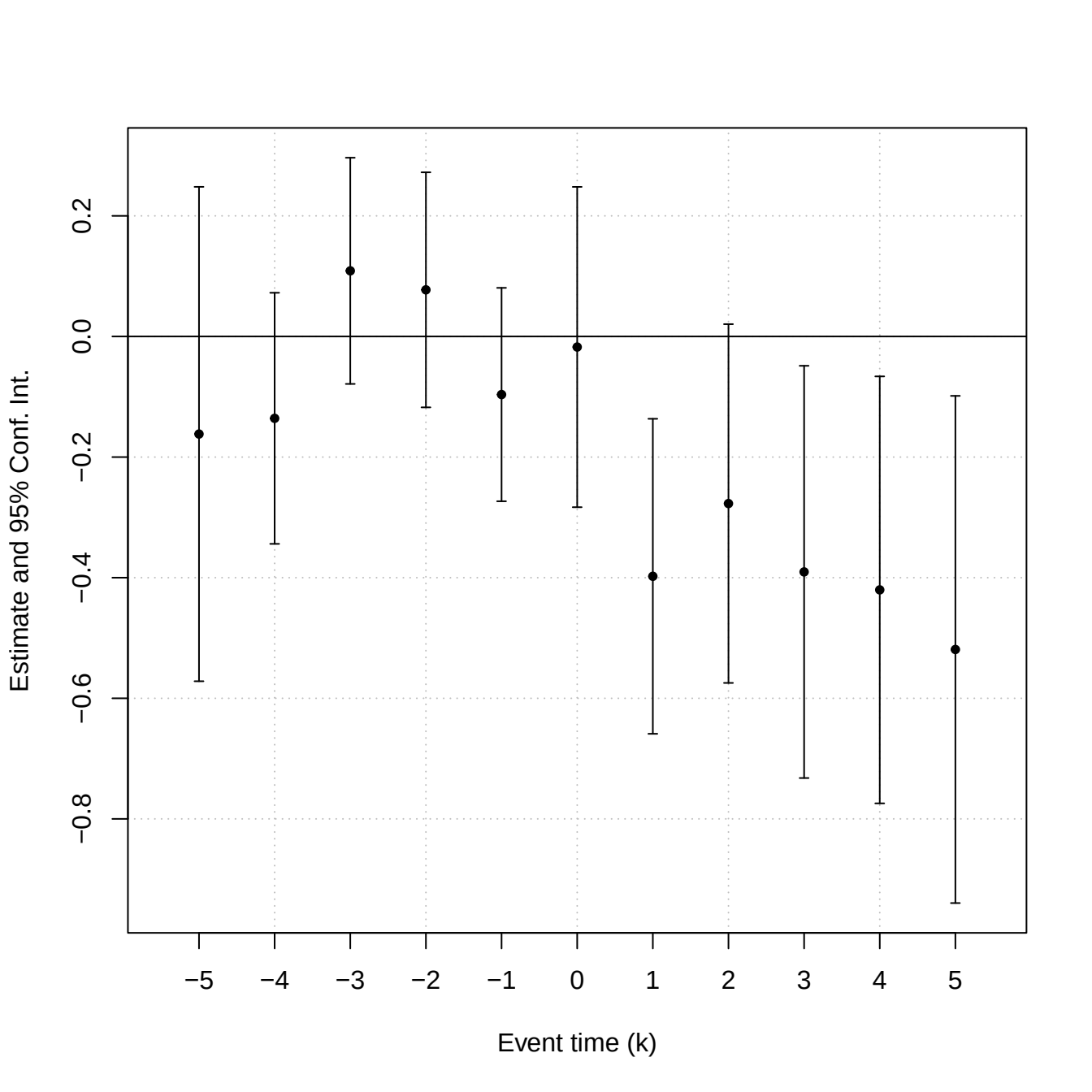

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

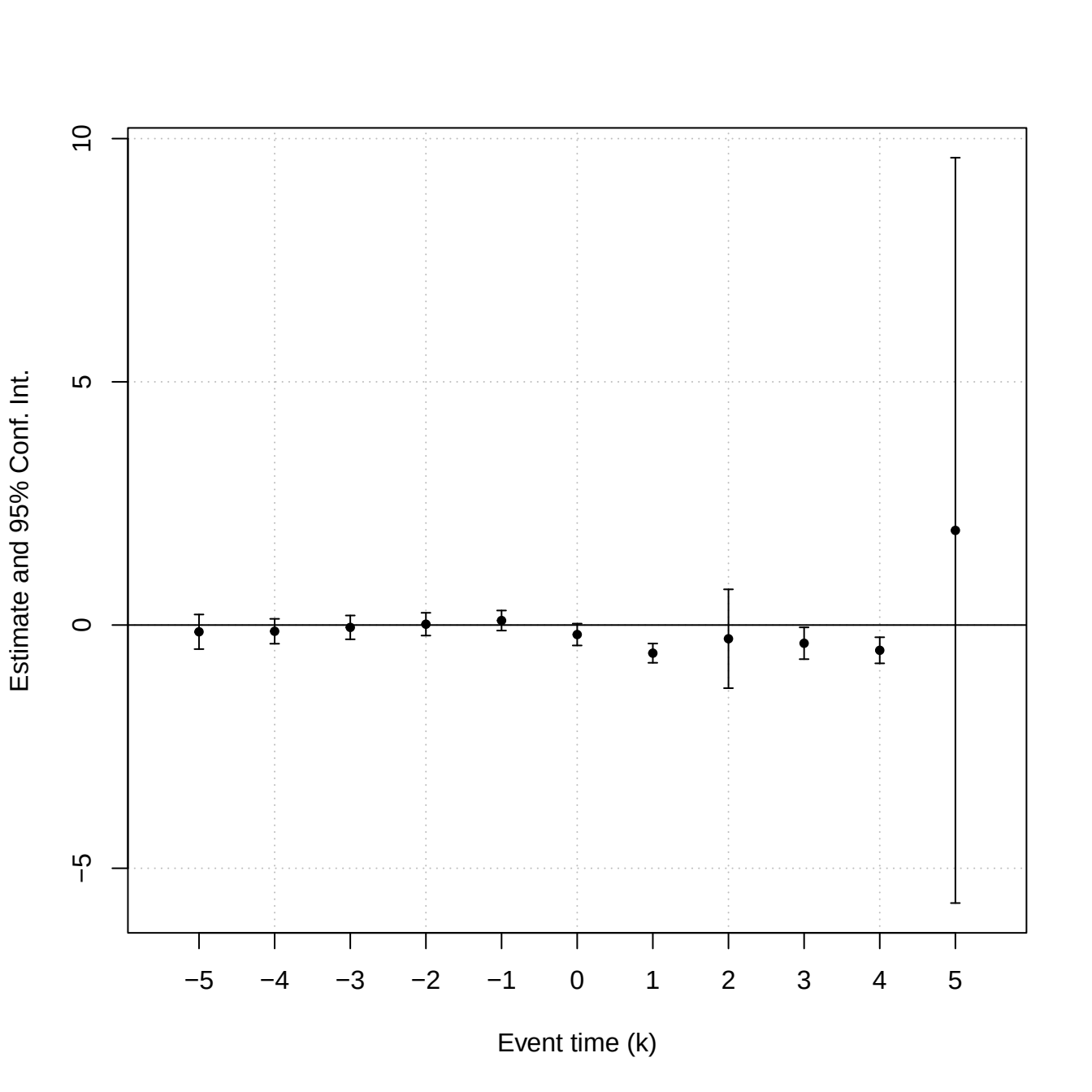

pull_request_opened
talent_investment −> feedback
response_sentiment −> pos_sentiment_avg
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.359
Pretrend (Low) p−value: 0.018
Wald test p−value: 0.841
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

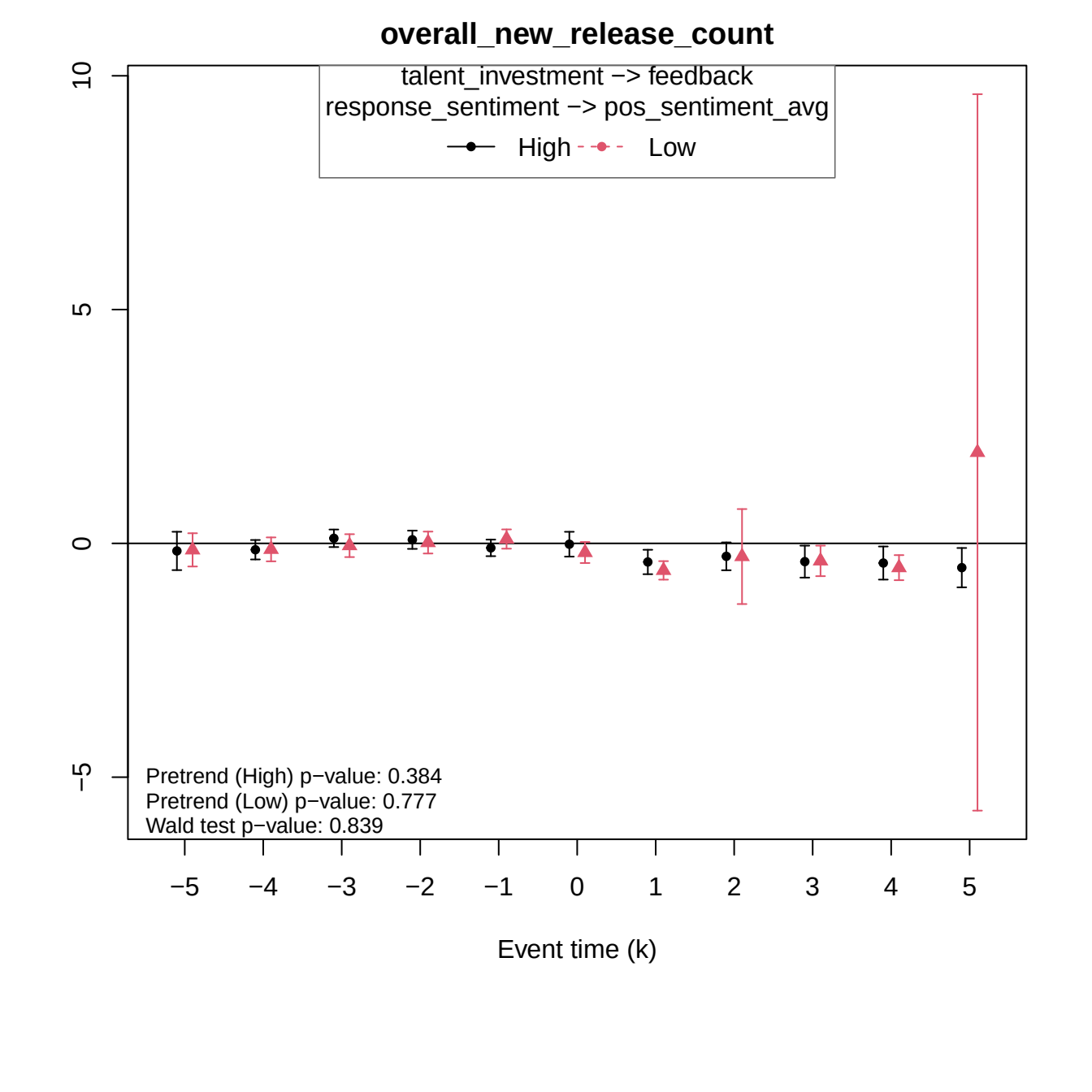

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

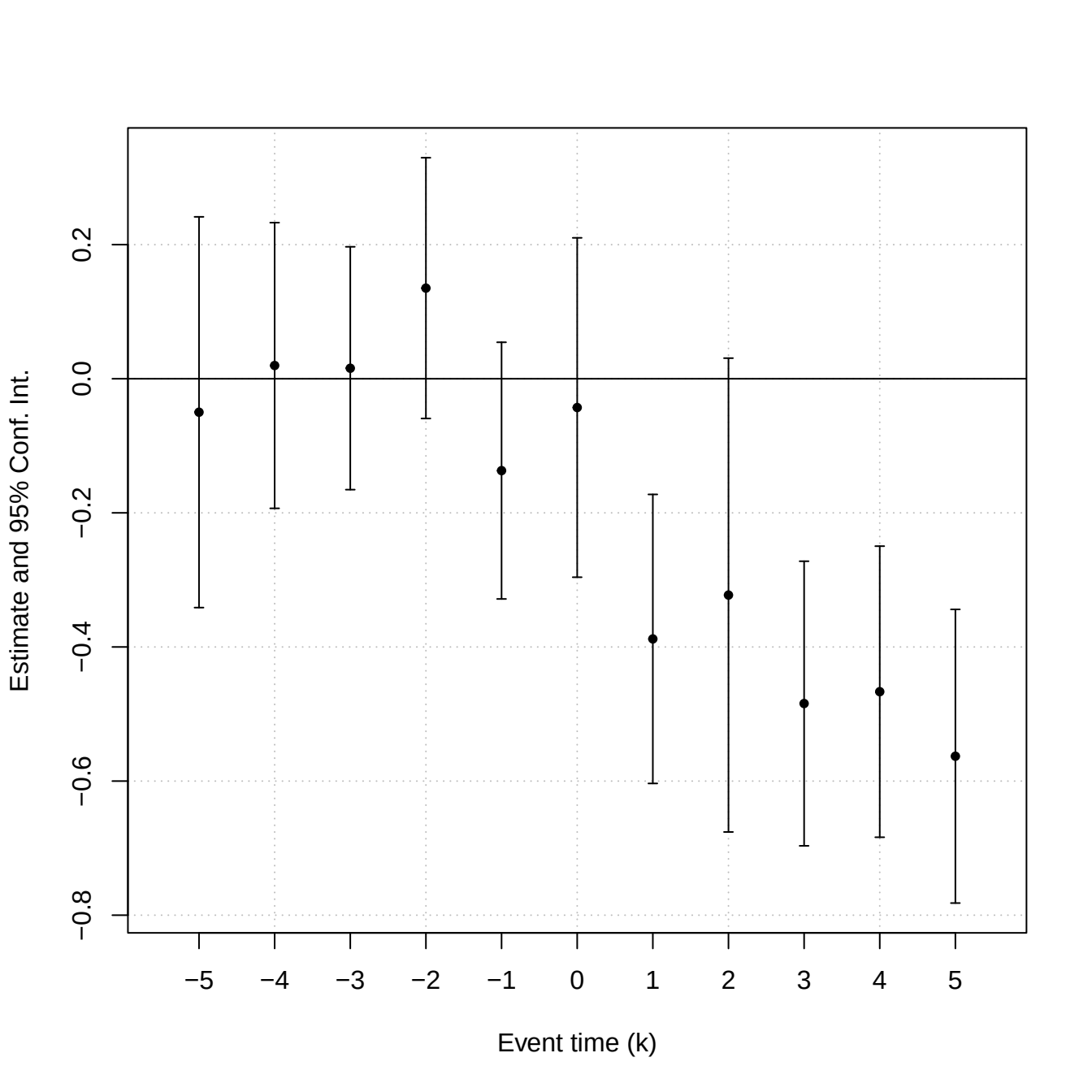

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

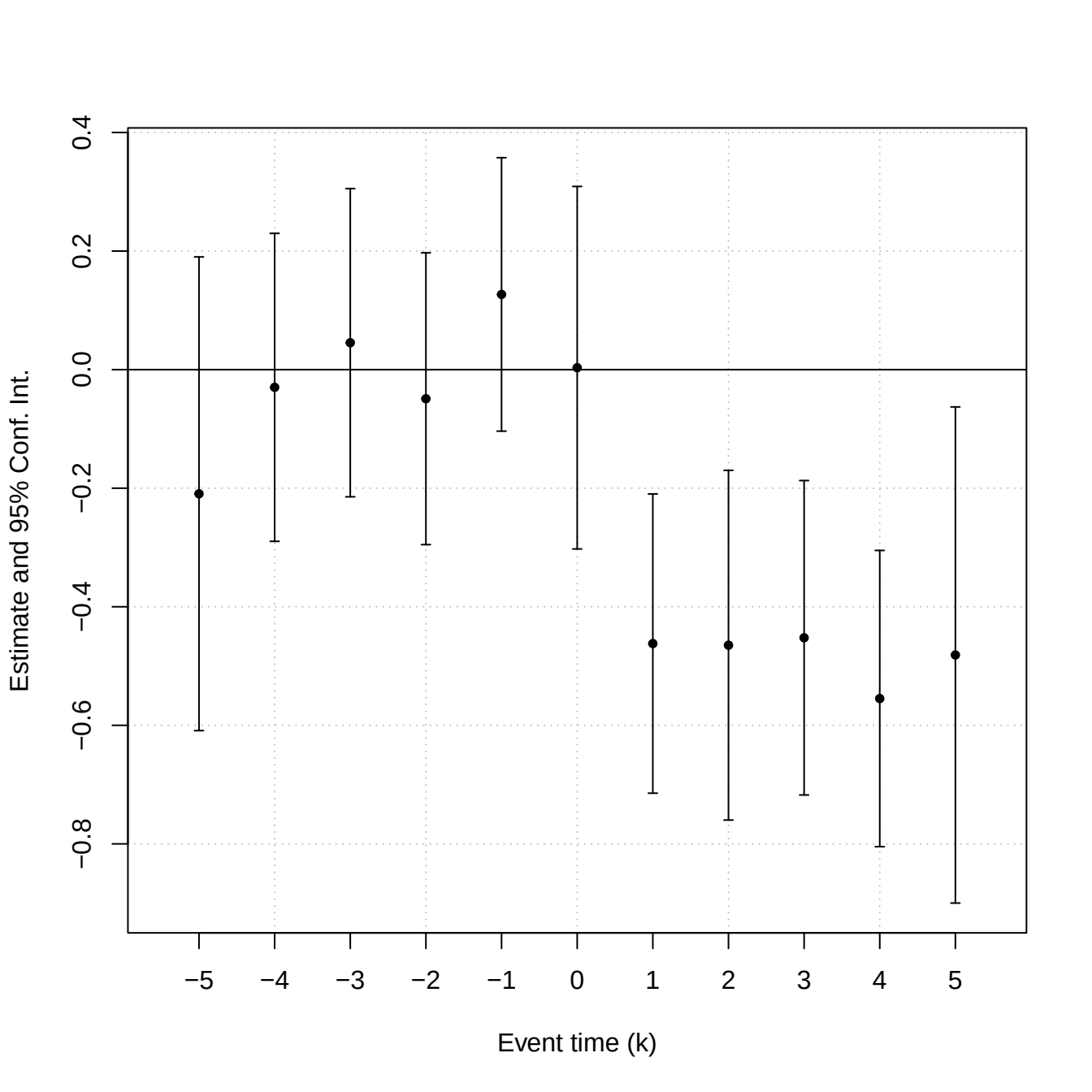

pull_request_merged
talent_investment −> feedback
response_sentiment −> pos_sentiment_avg
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.070
Pretrend (Low) p−value: 0.015
Wald test p−value: 0.281
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

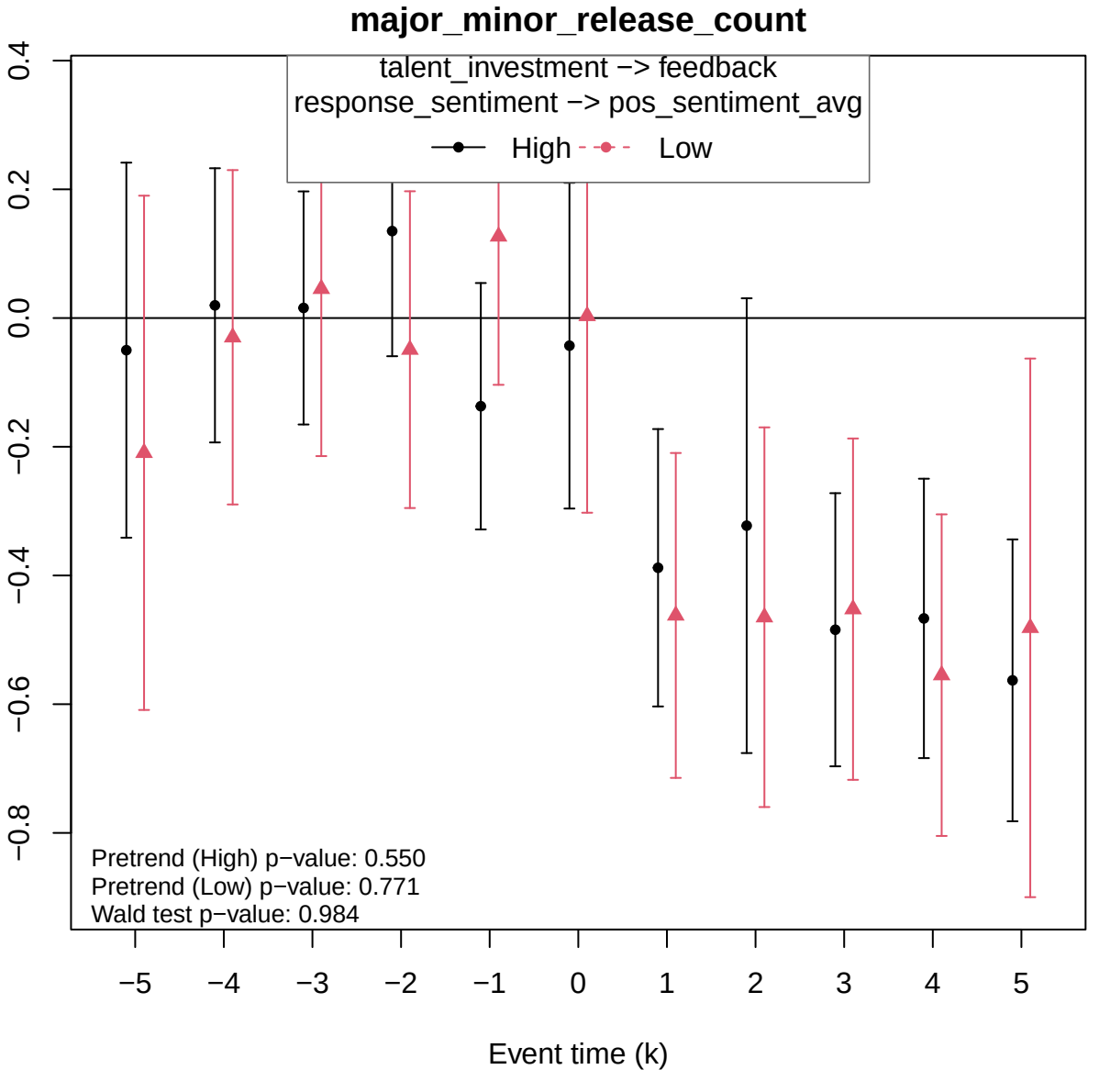

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

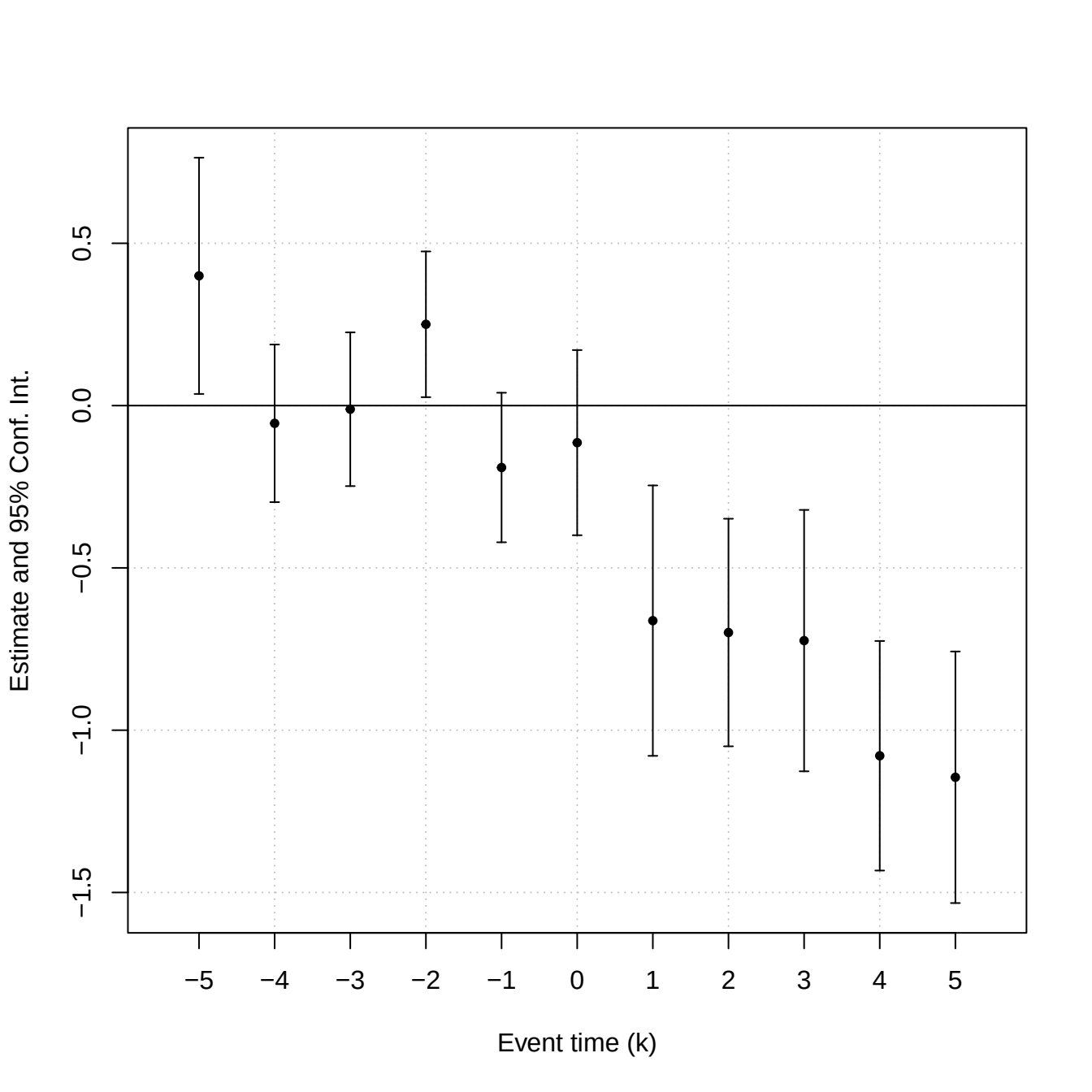

Estimate and 95% Conf. Int.
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

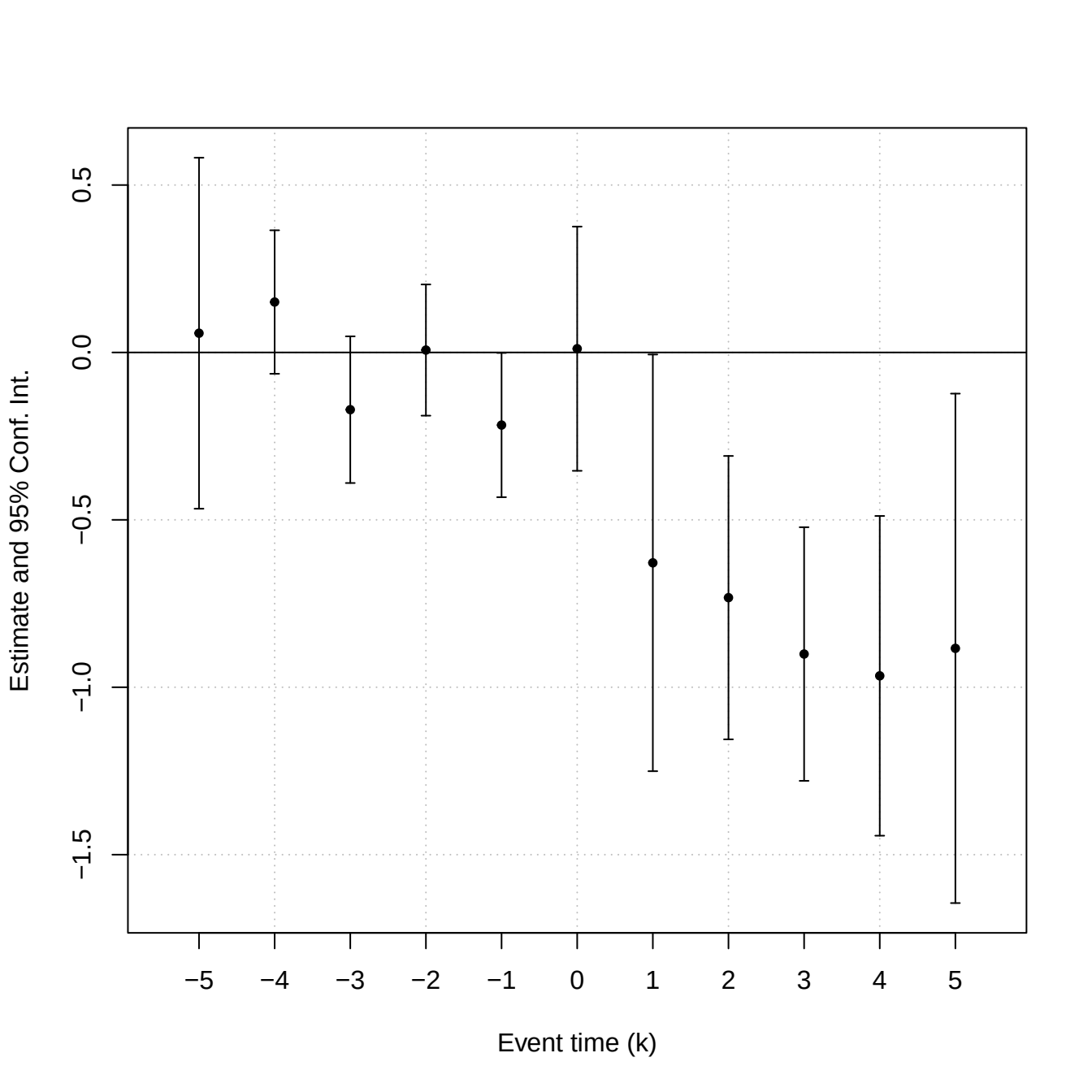

overall_new_release_count
talent_investment −> feedback
response_sentiment −> pos_sentiment_avg
High
Low
10
5
0
−5
Pretrend (High) p−value: 0.384
Pretrend (Low) p−value: 0.777
Wald test p−value: 0.839
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

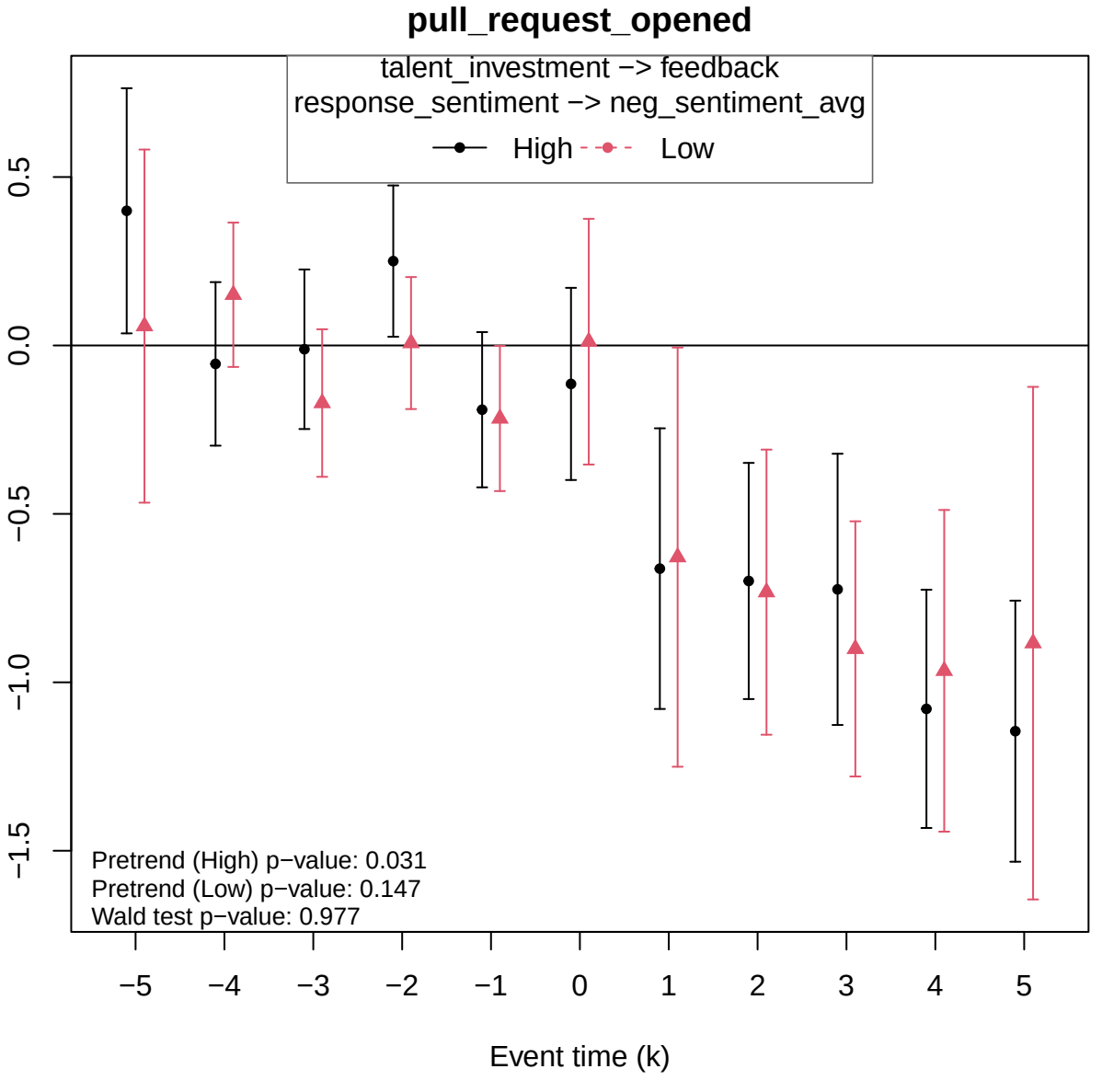

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

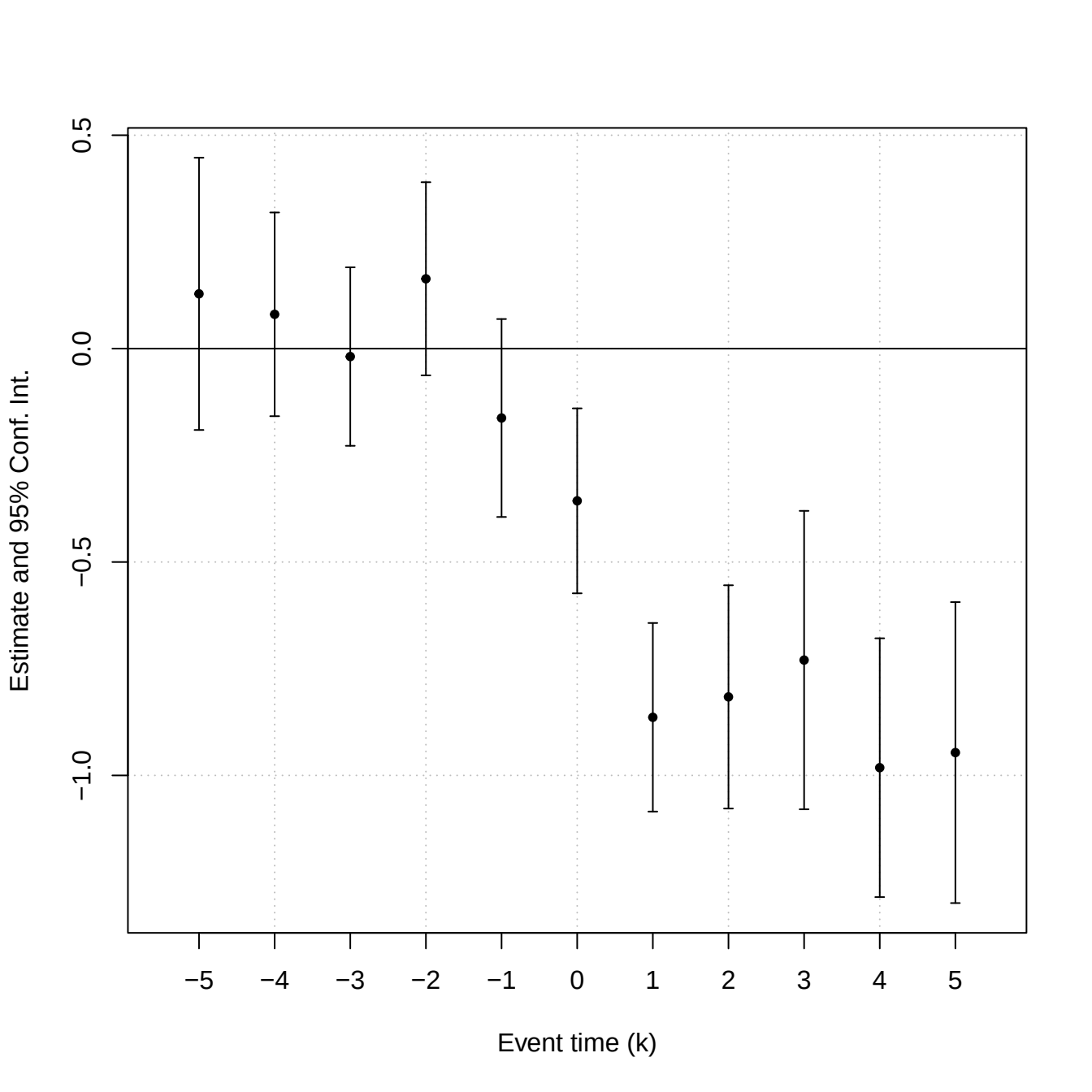

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

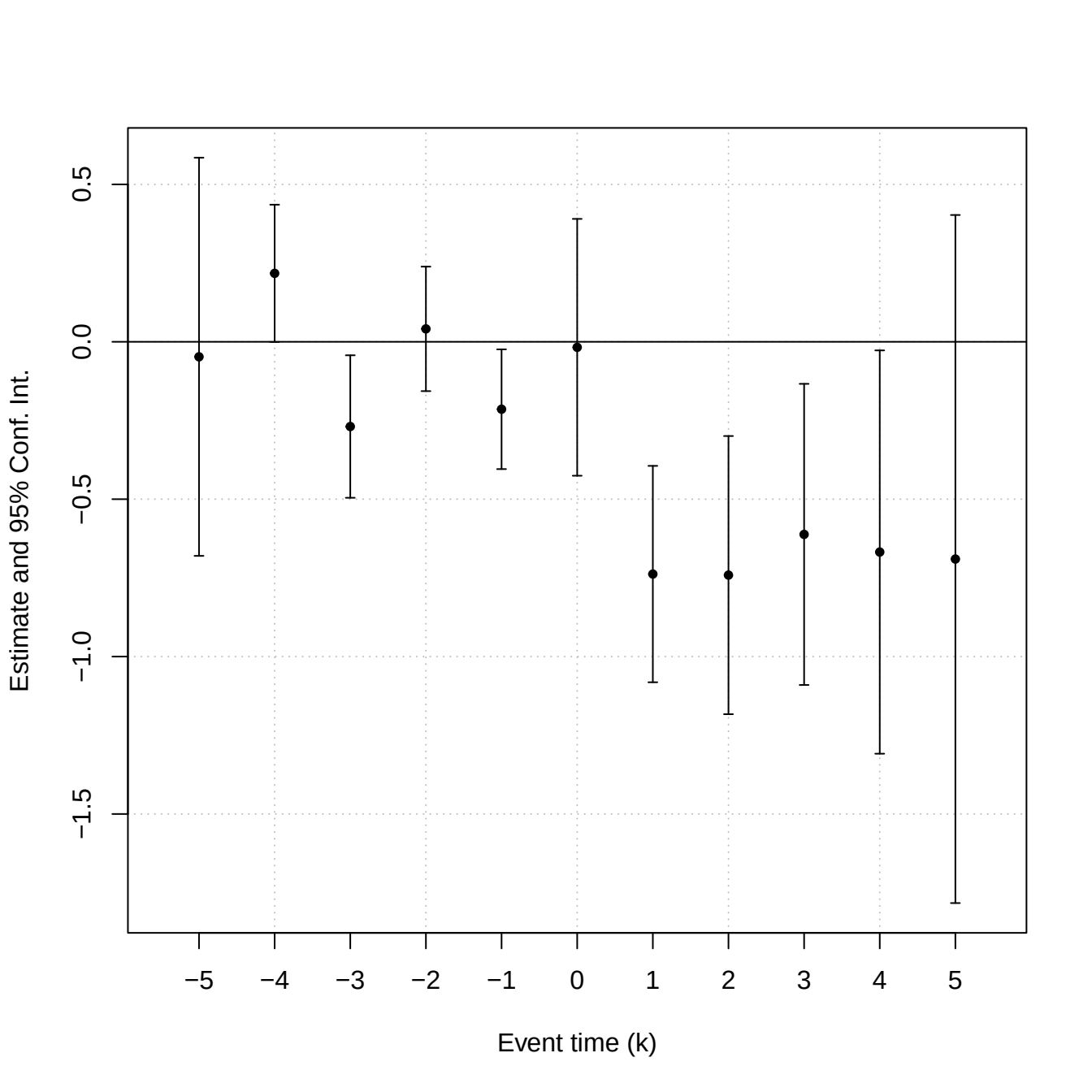

major_minor_release_count
talent_investment −> feedback
response_sentiment −> pos_sentiment_avg
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.550
Pretrend (Low) p−value: 0.771
Wald test p−value: 0.984
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

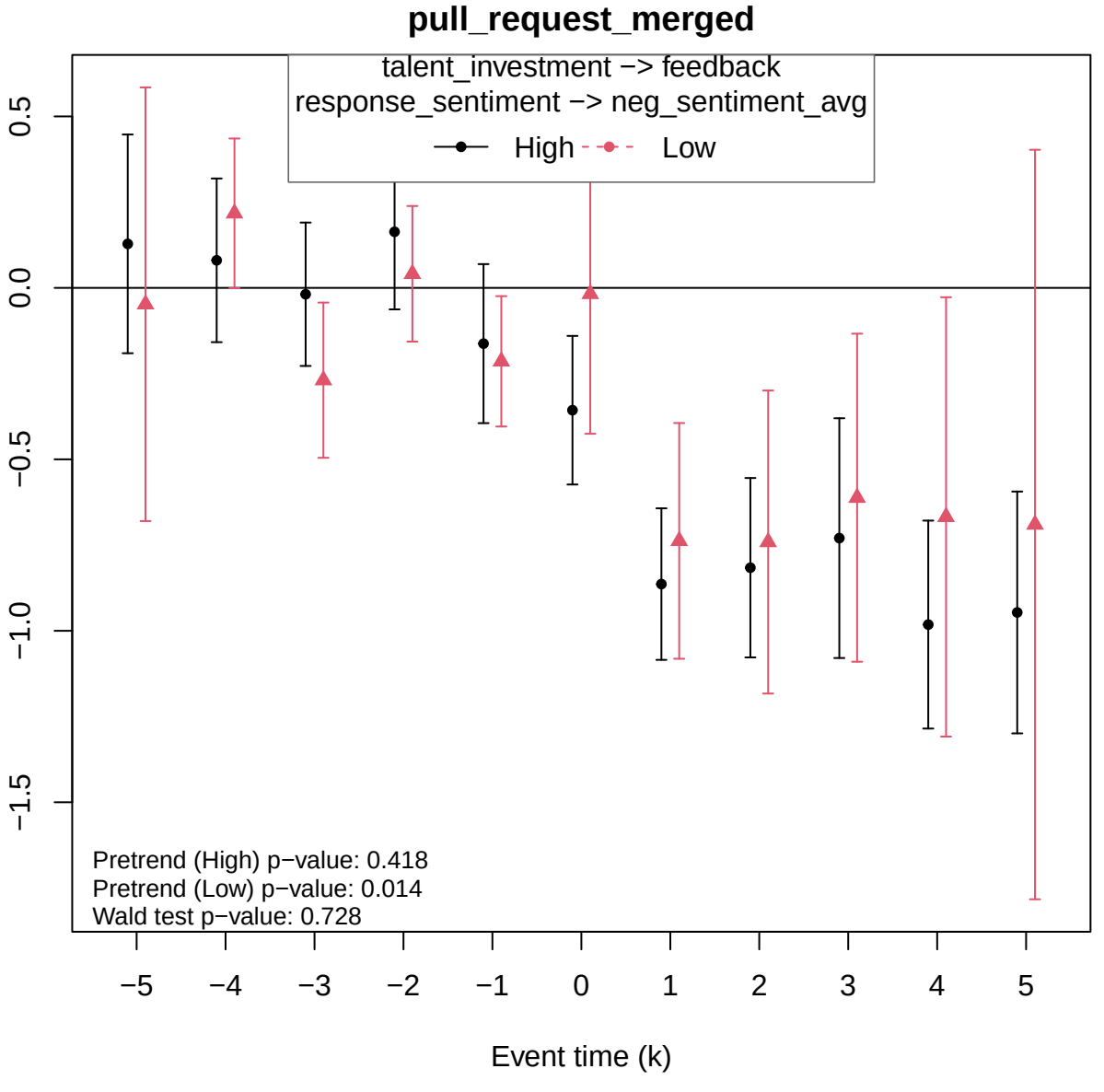

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

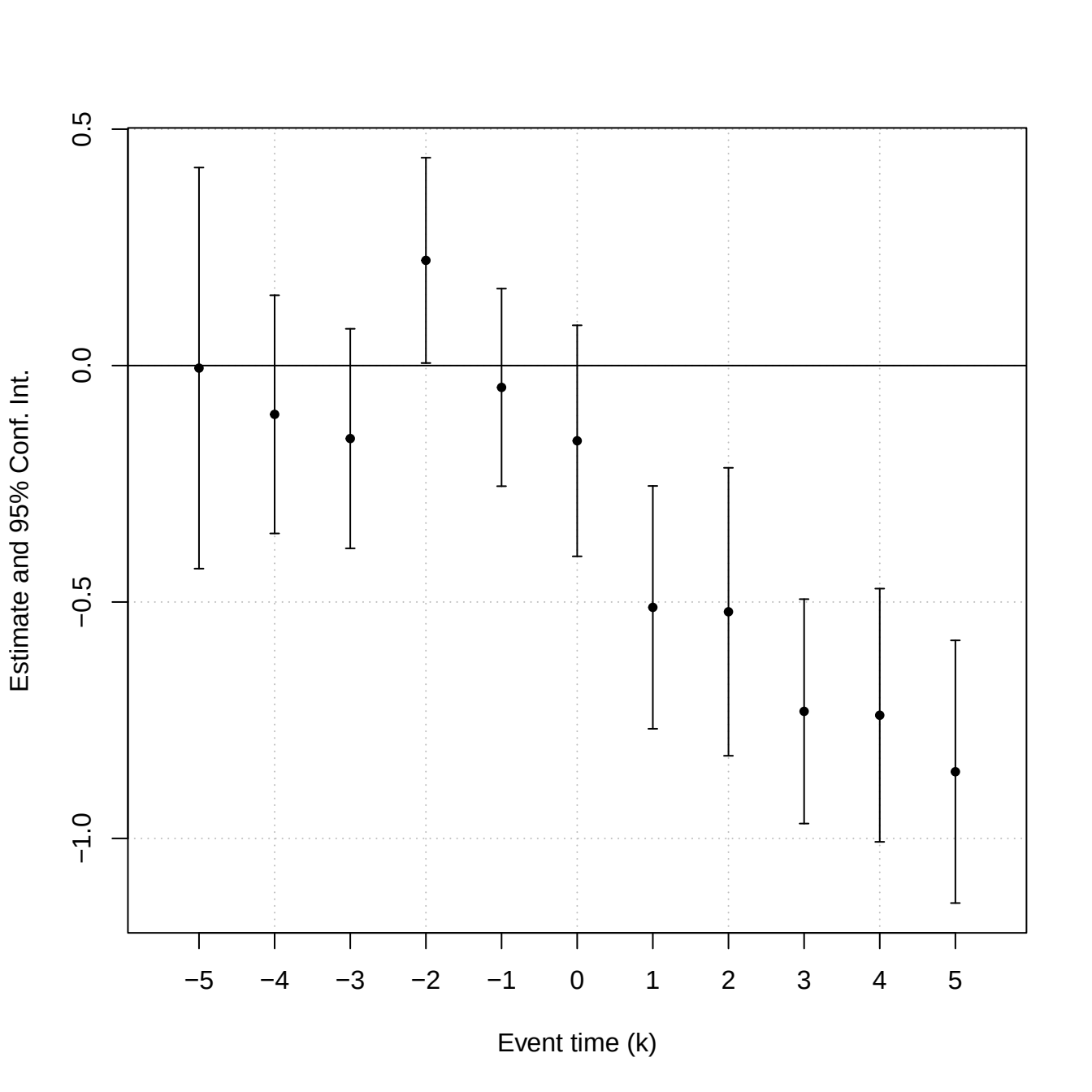

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

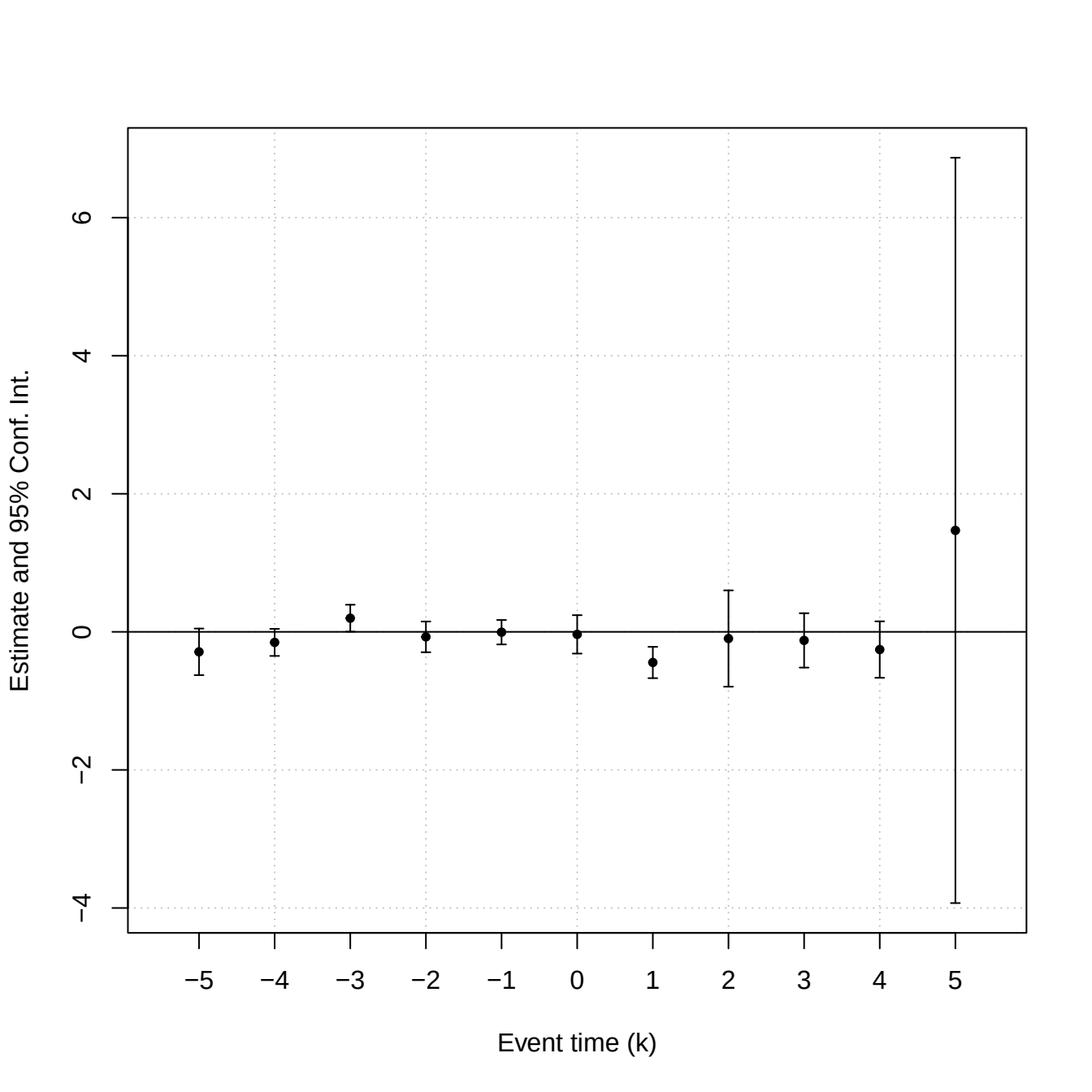

pull_request_opened
talent_investment −> feedback
response_sentiment −> neg_sentiment_avg
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.031
Pretrend (Low) p−value: 0.147
Wald test p−value: 0.977
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

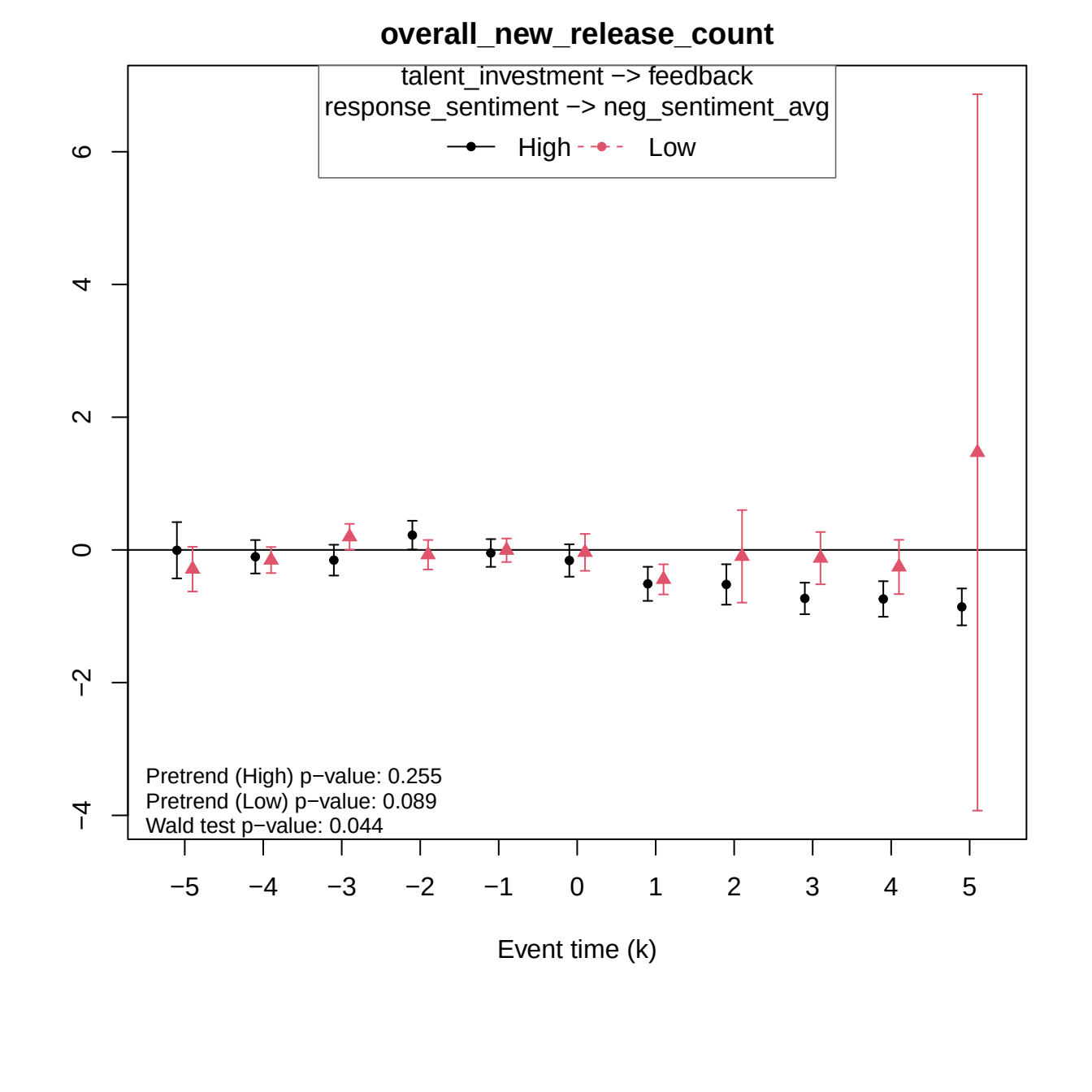

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

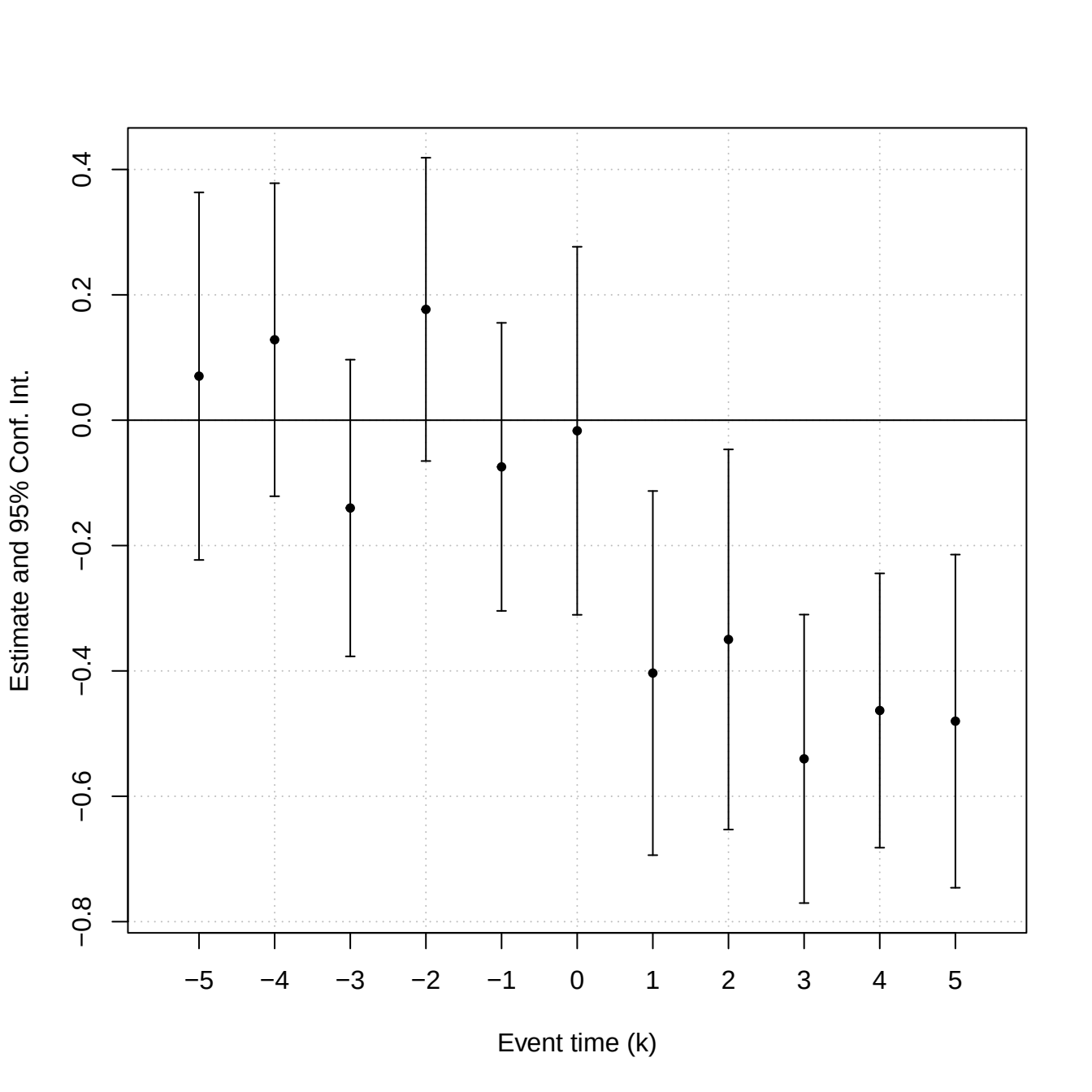

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

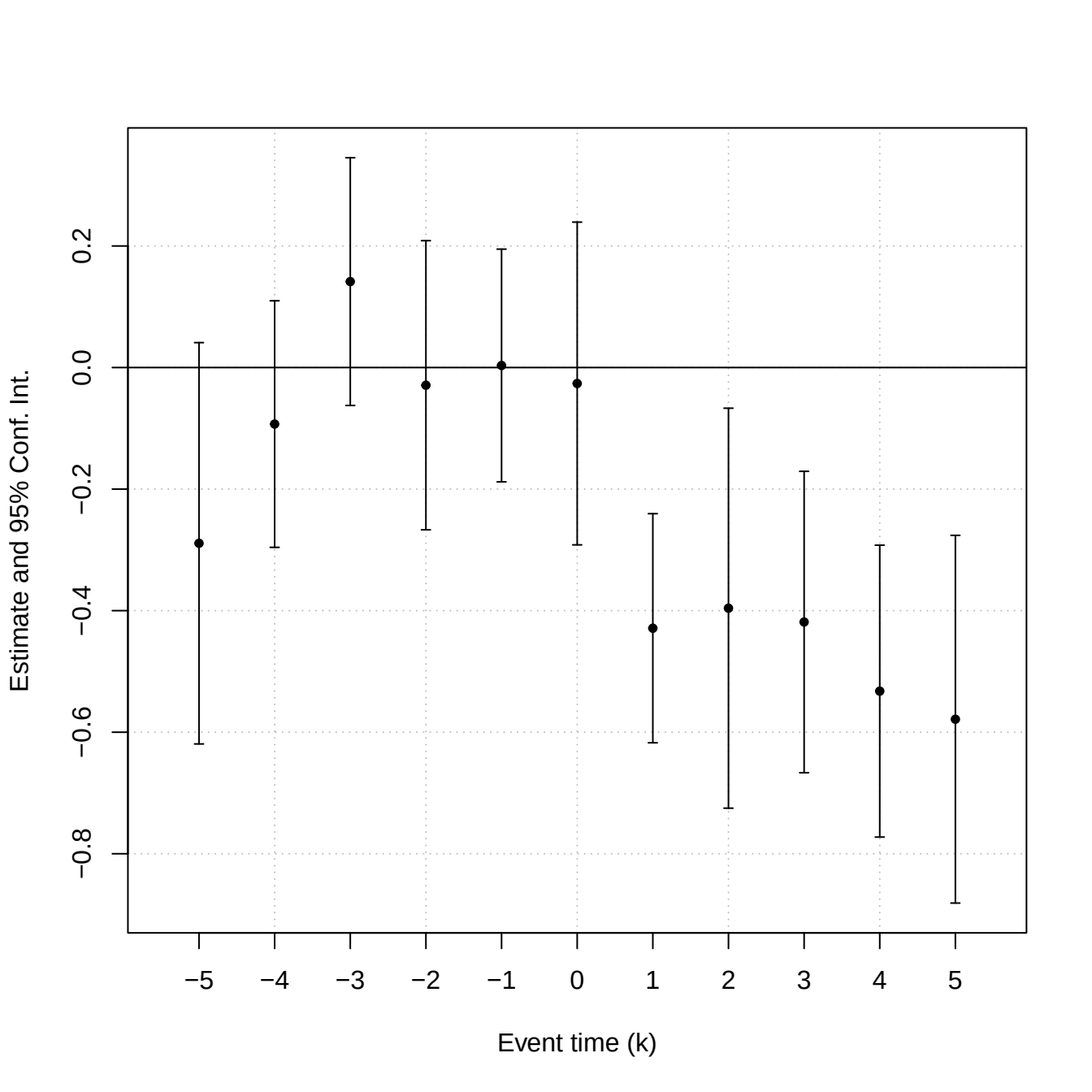

pull_request_merged
talent_investment −> feedback
response_sentiment −> neg_sentiment_avg
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.418
Pretrend (Low) p−value: 0.014
Wald test p−value: 0.728
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

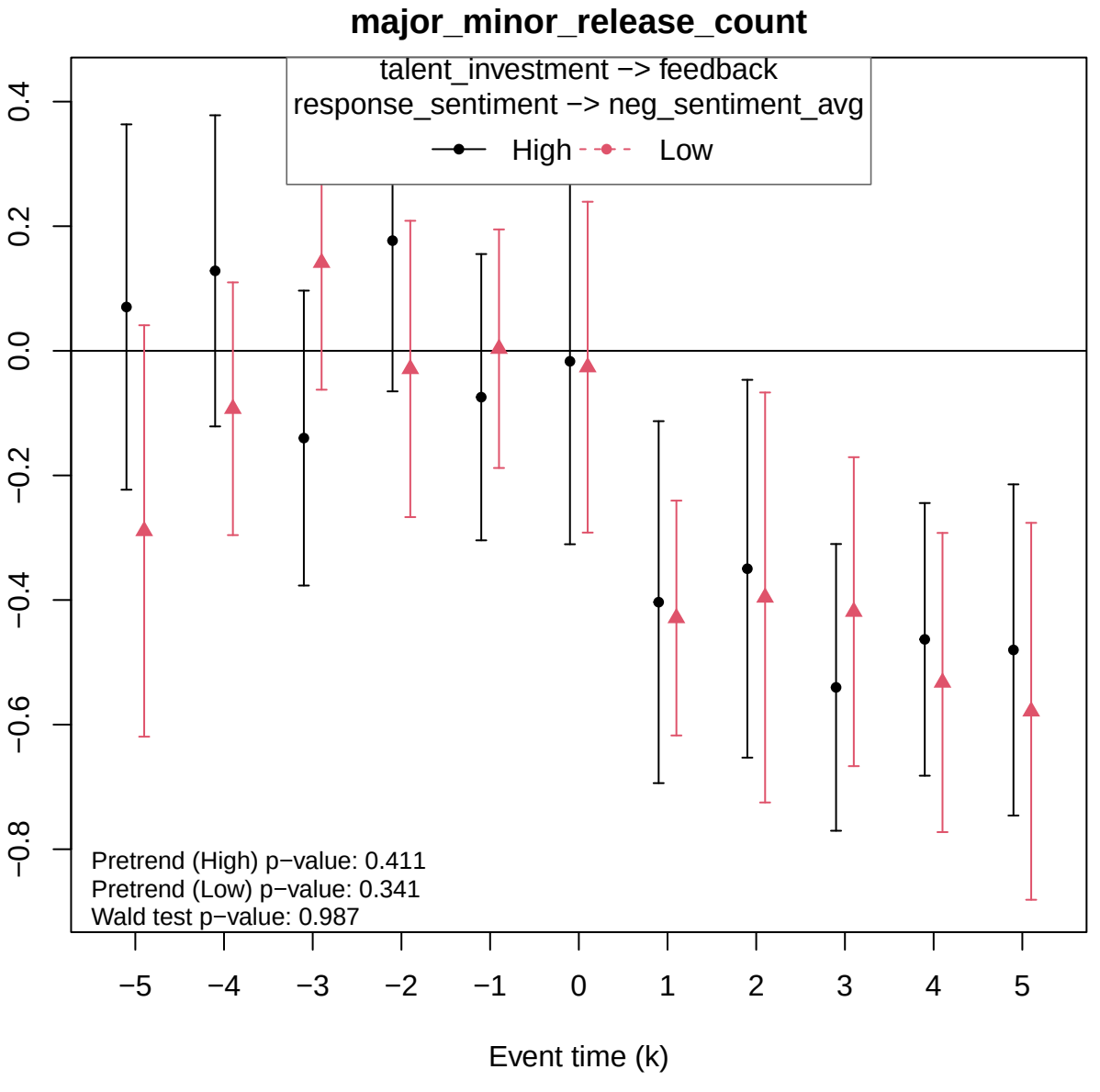

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

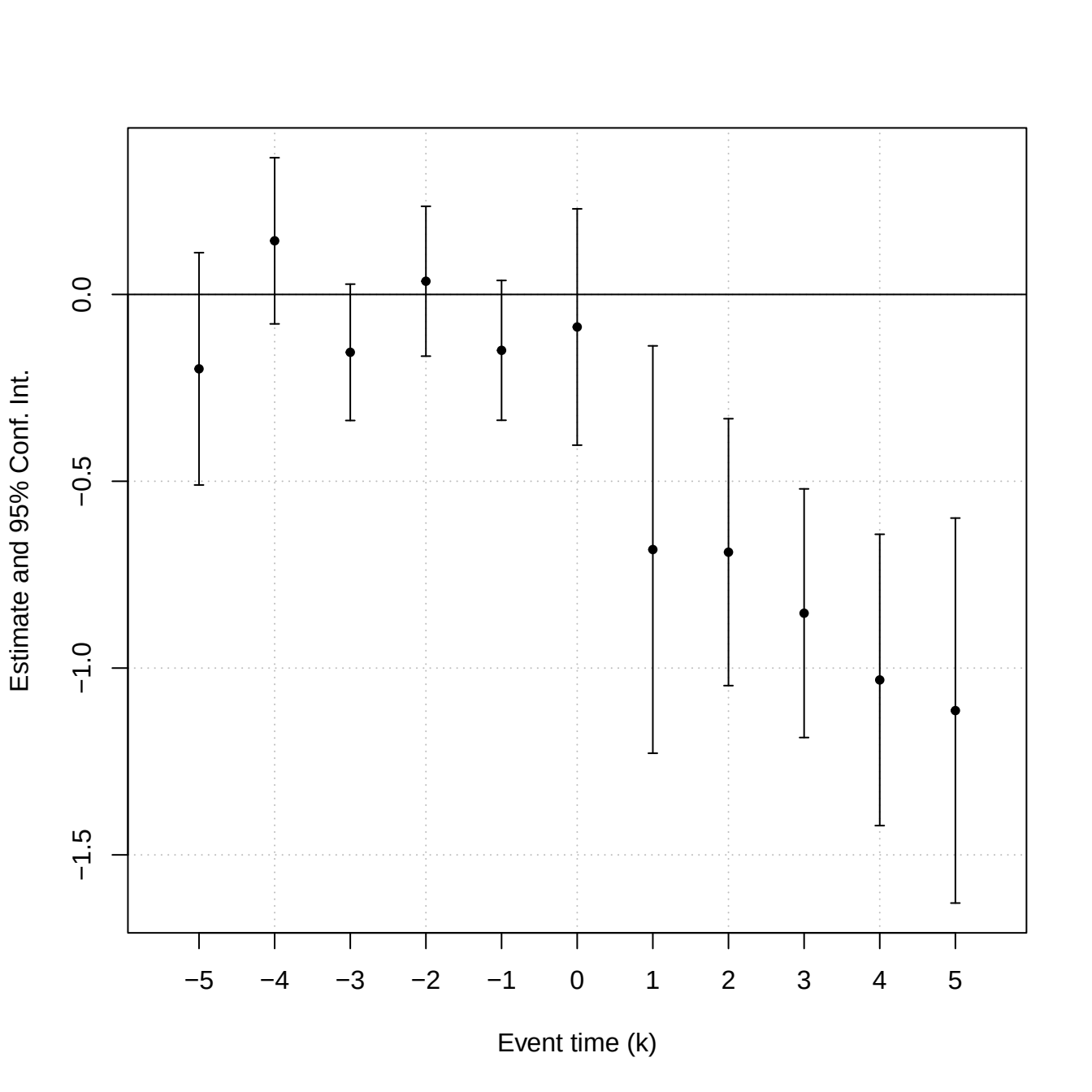

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

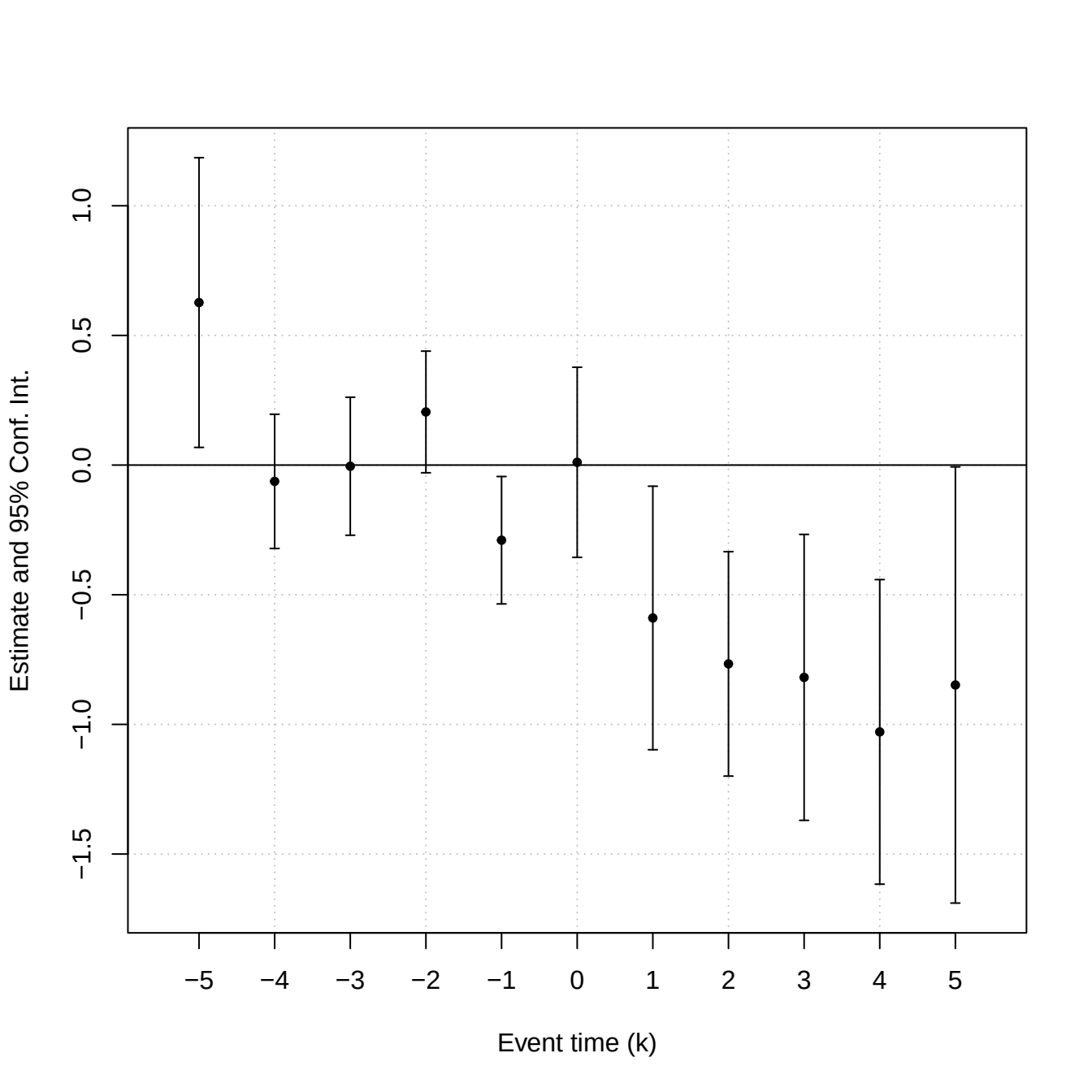

overall_new_release_count
talent_investment −> feedback
response_sentiment −> neg_sentiment_avg
High
Low
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.255
Pretrend (Low) p−value: 0.089
Wald test p−value: 0.044
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

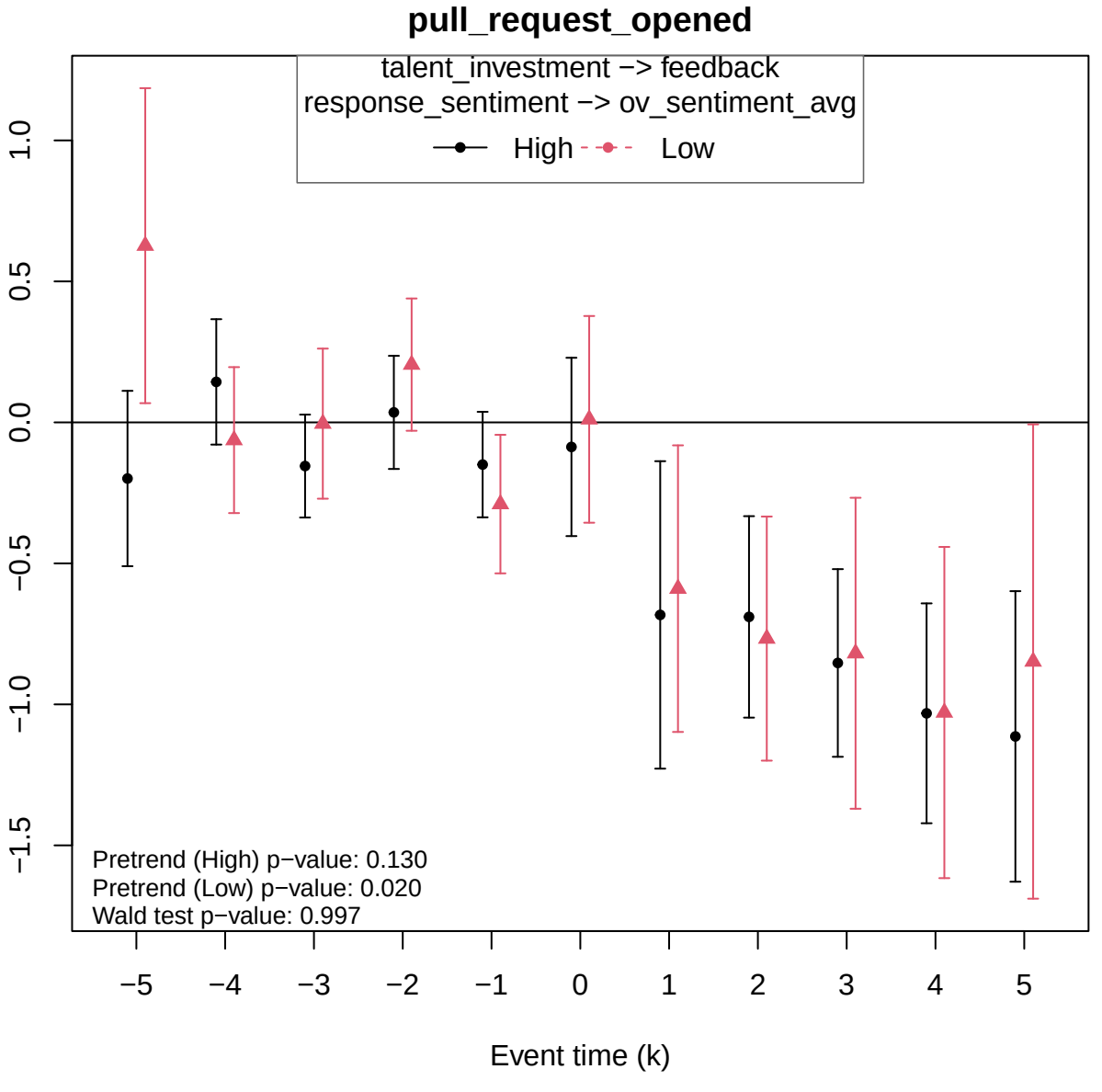

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

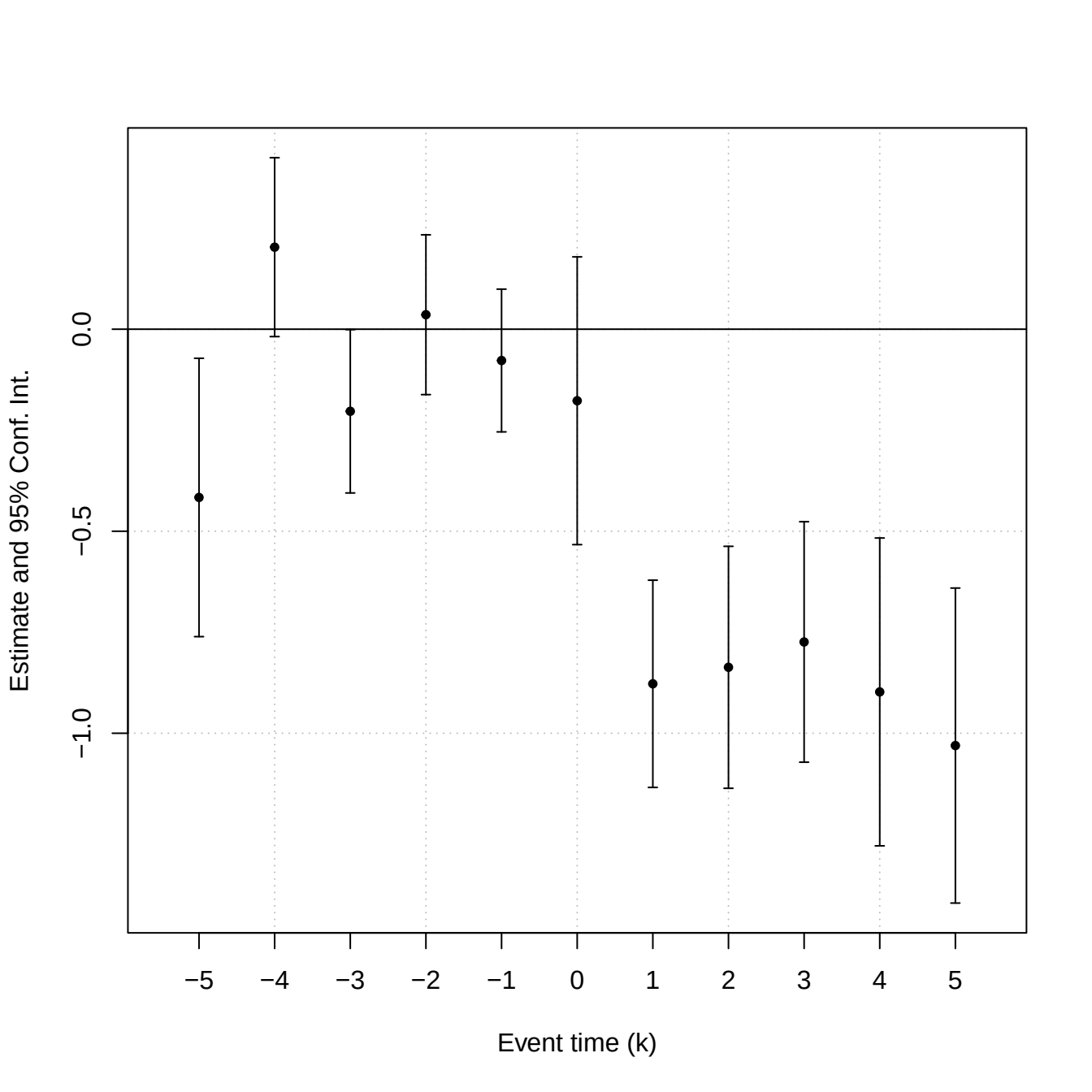

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

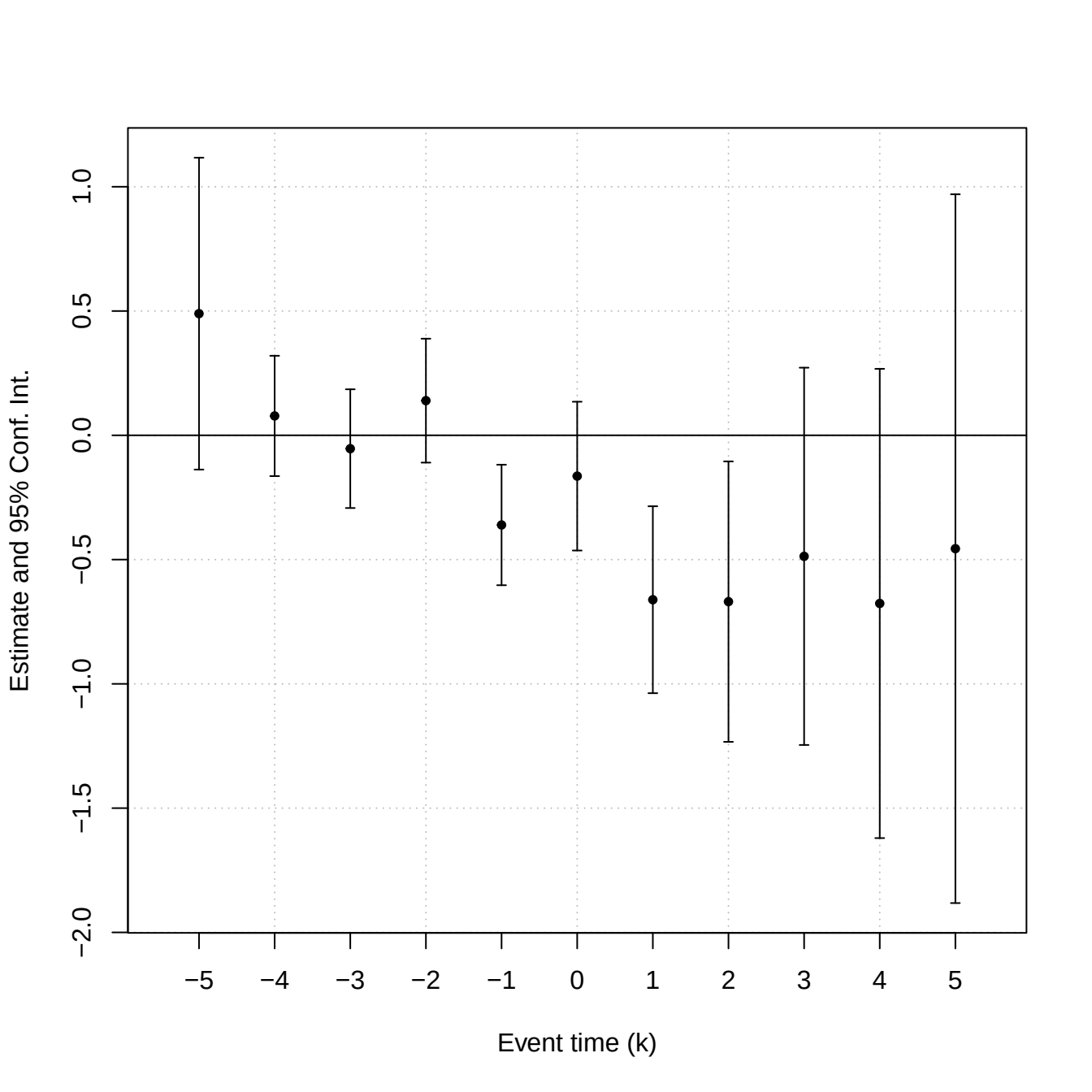

major_minor_release_count
talent_investment −> feedback
response_sentiment −> neg_sentiment_avg
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.411
Pretrend (Low) p−value: 0.341
Wald test p−value: 0.987
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

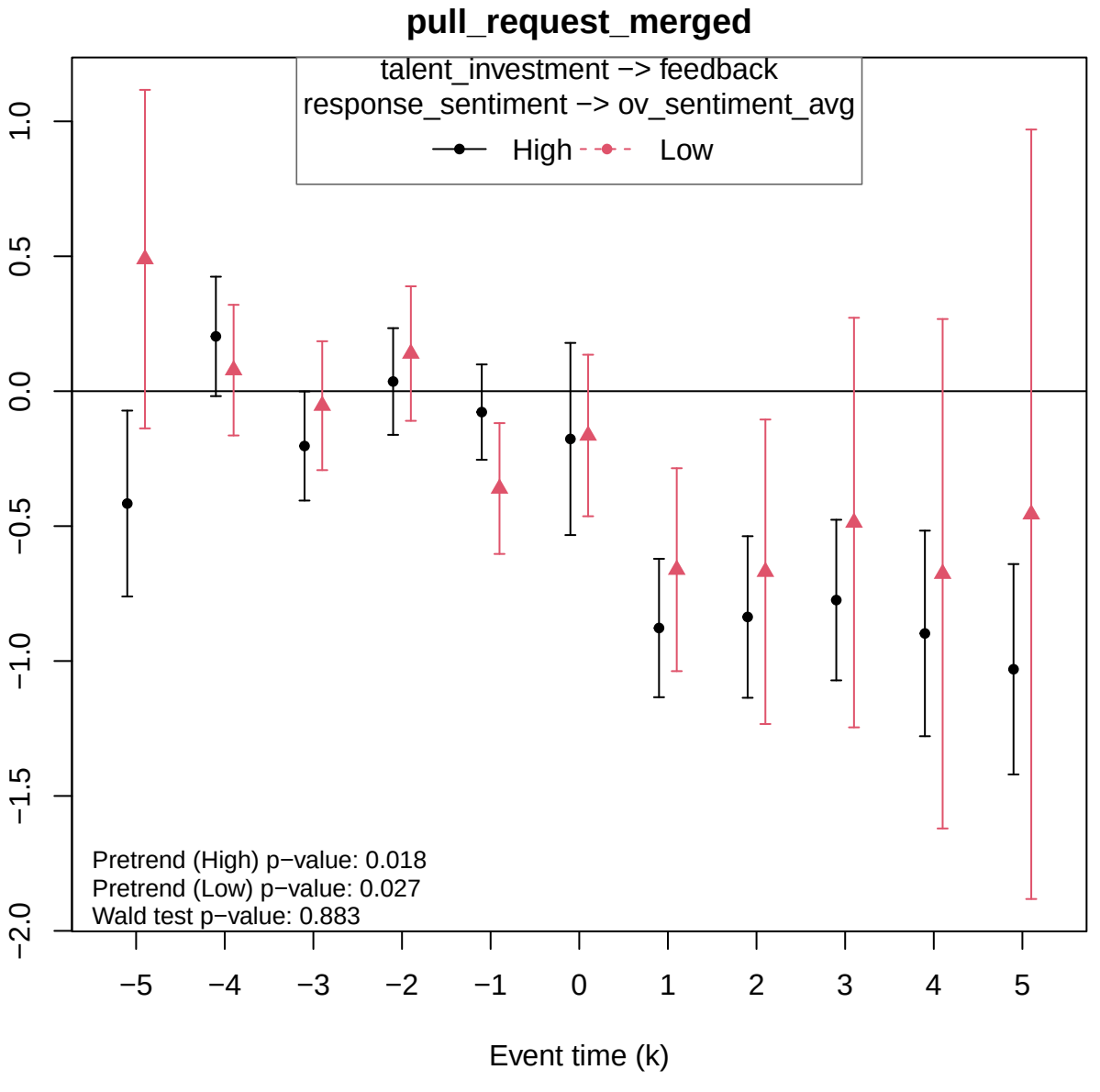

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

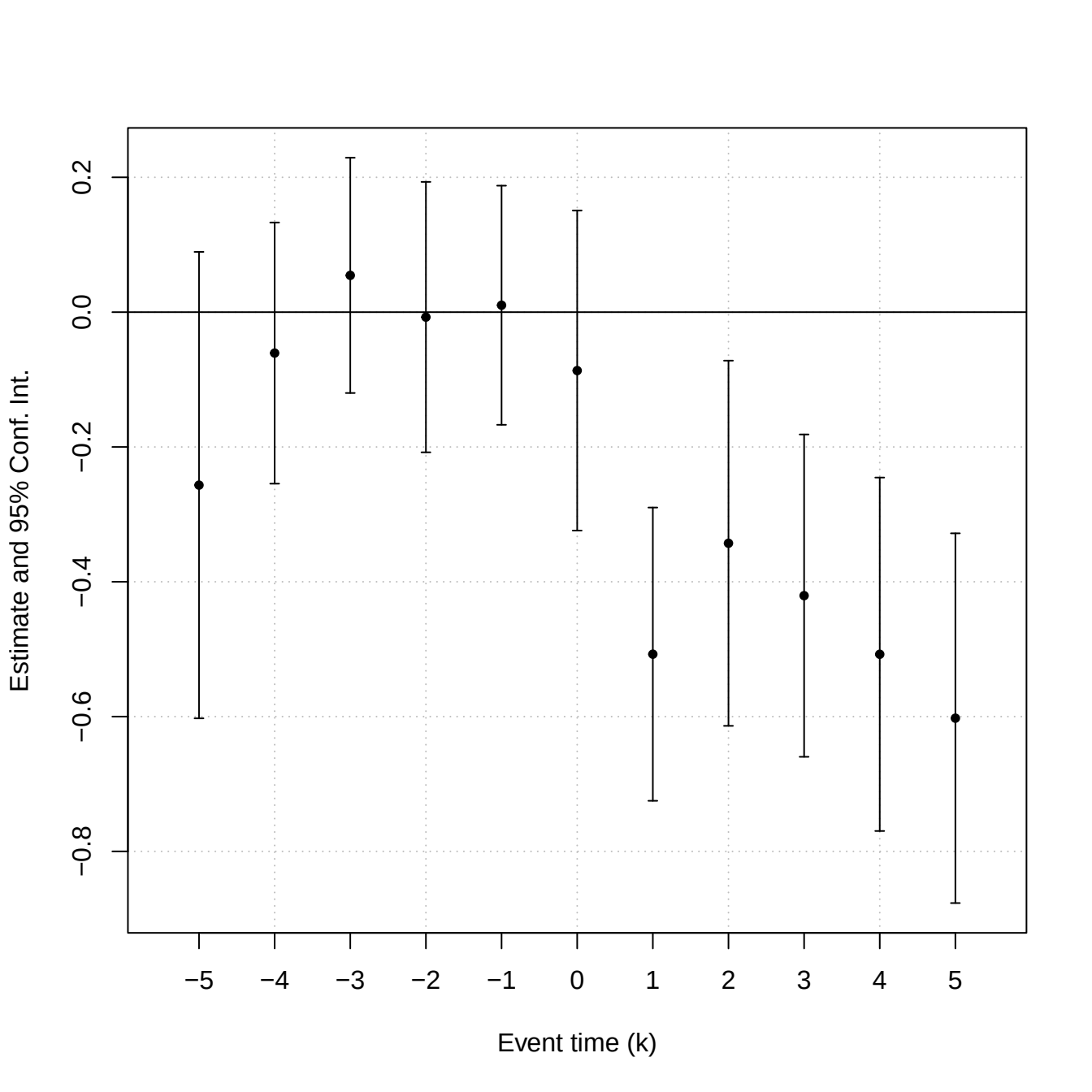

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

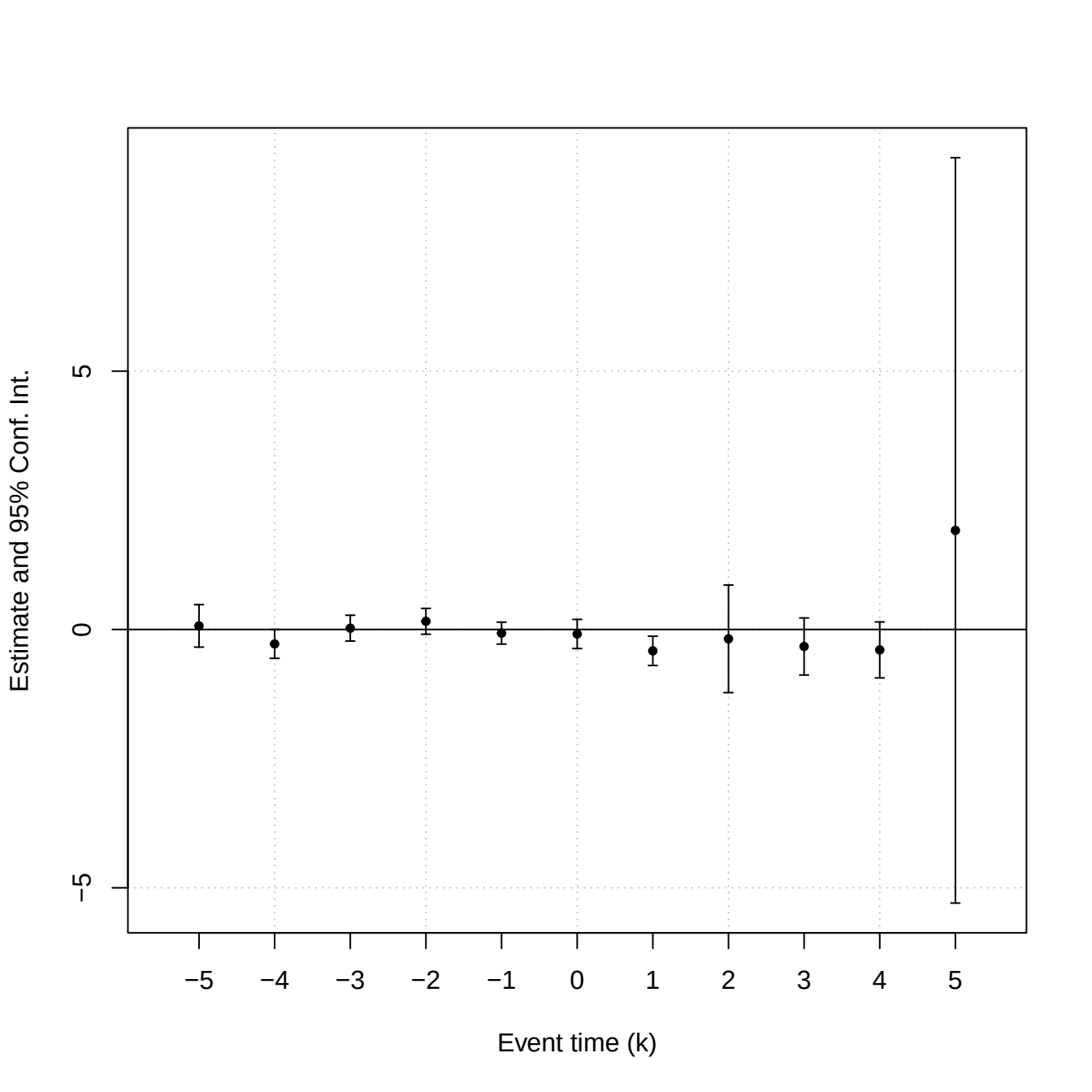

pull_request_opened
talent_investment −> feedback
response_sentiment −> ov_sentiment_avg
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.130
Pretrend (Low) p−value: 0.020
Wald test p−value: 0.997
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

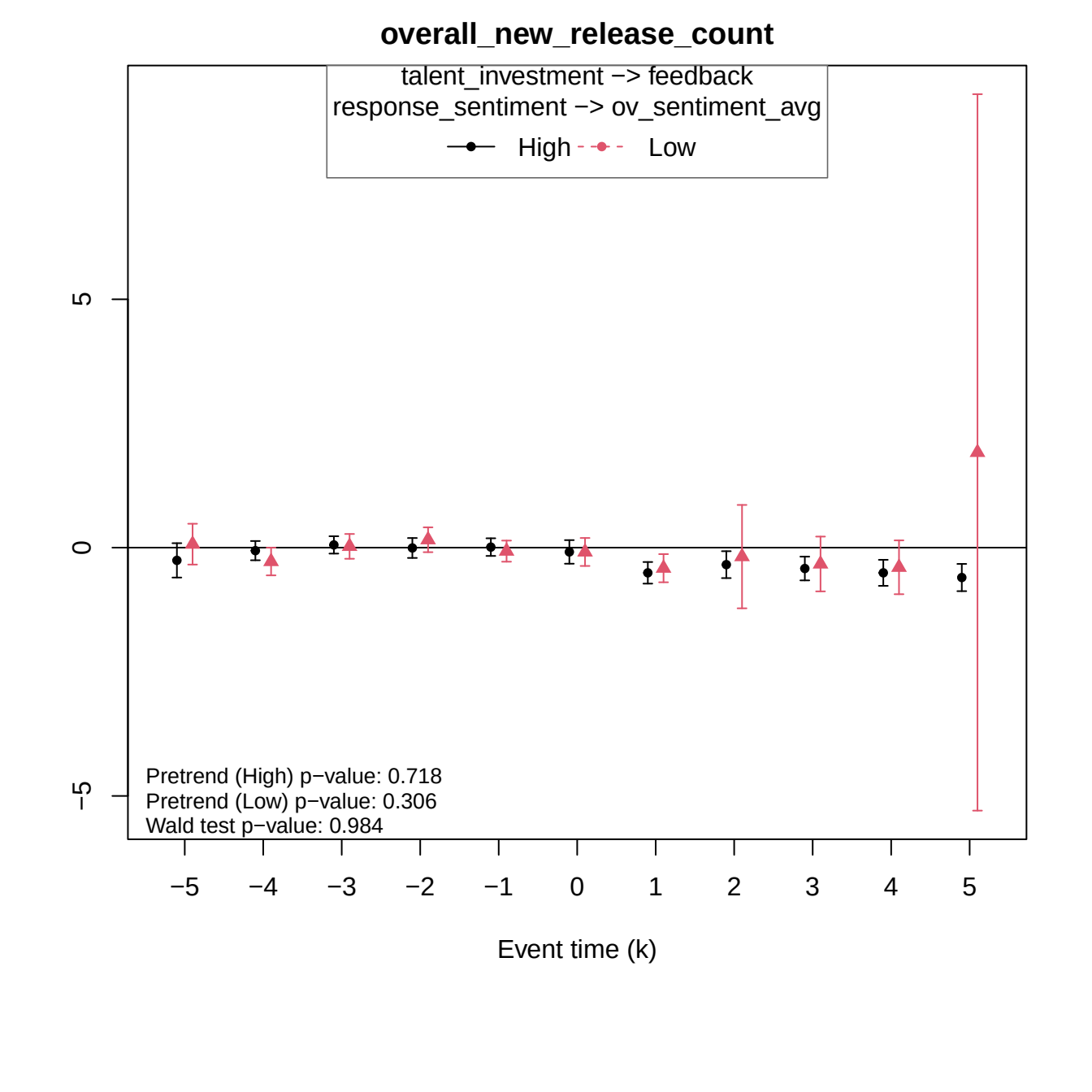

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

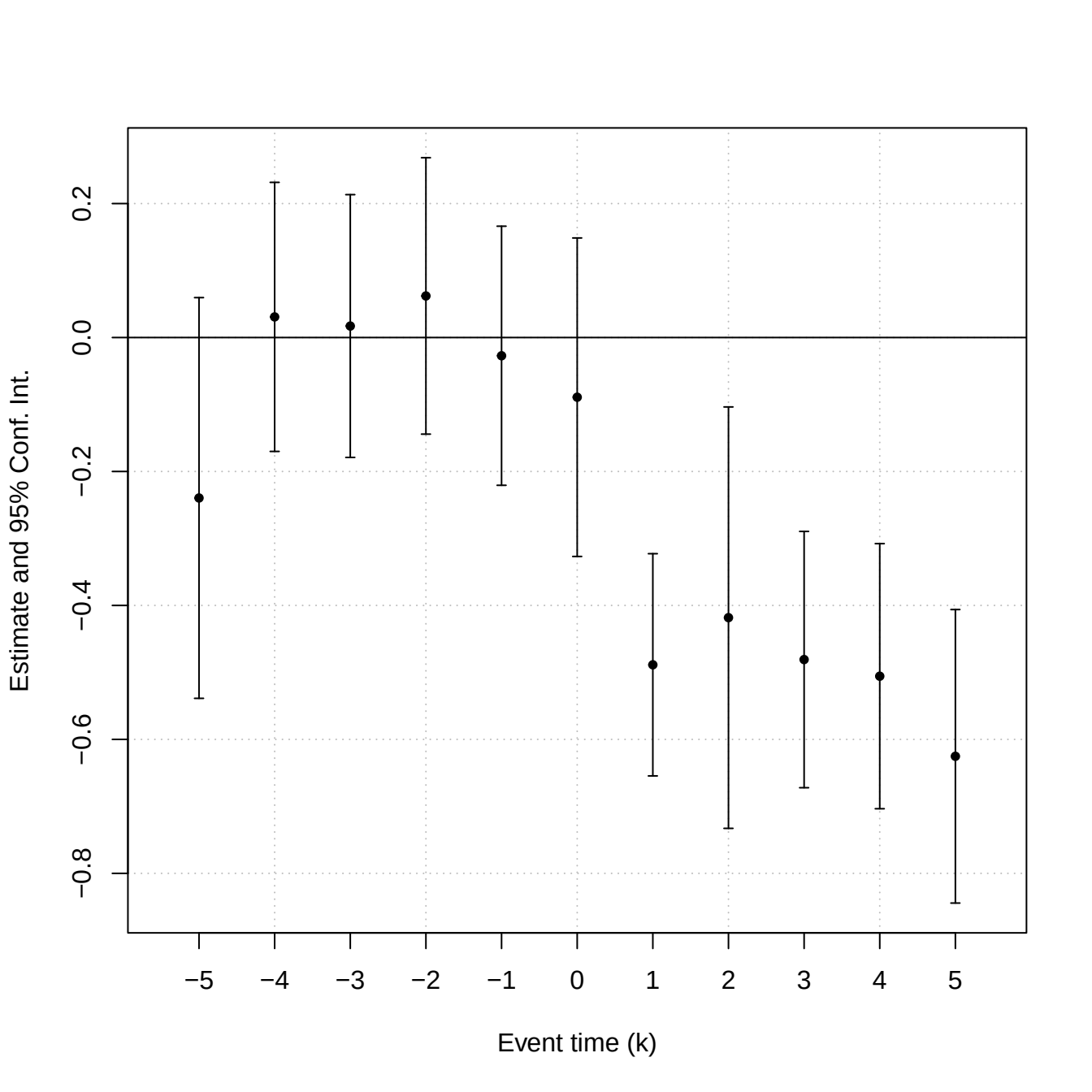

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

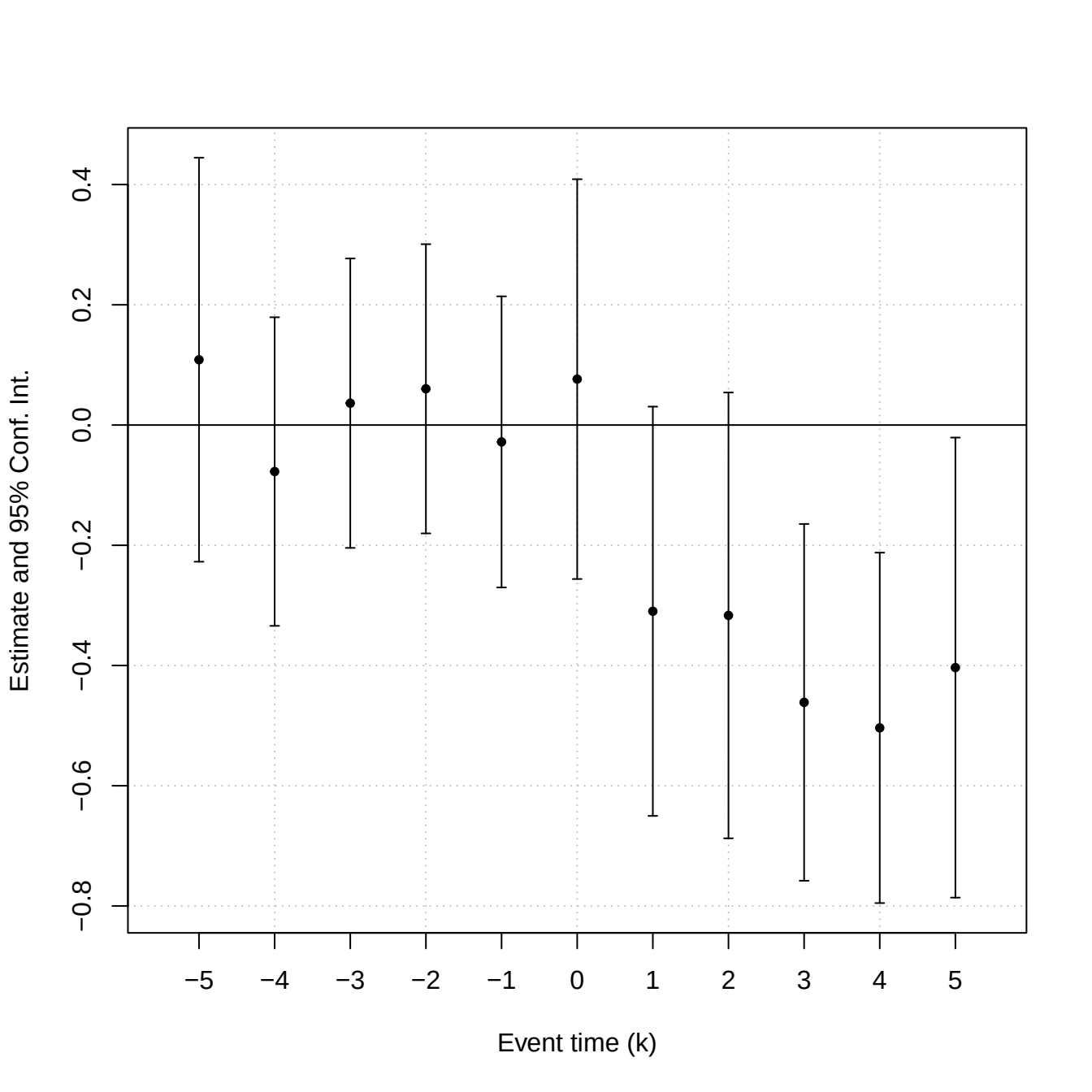

pull_request_merged
talent_investment −> feedback
response_sentiment −> ov_sentiment_avg
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.018
Pretrend (Low) p−value: 0.027
Wald test p−value: 0.883
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

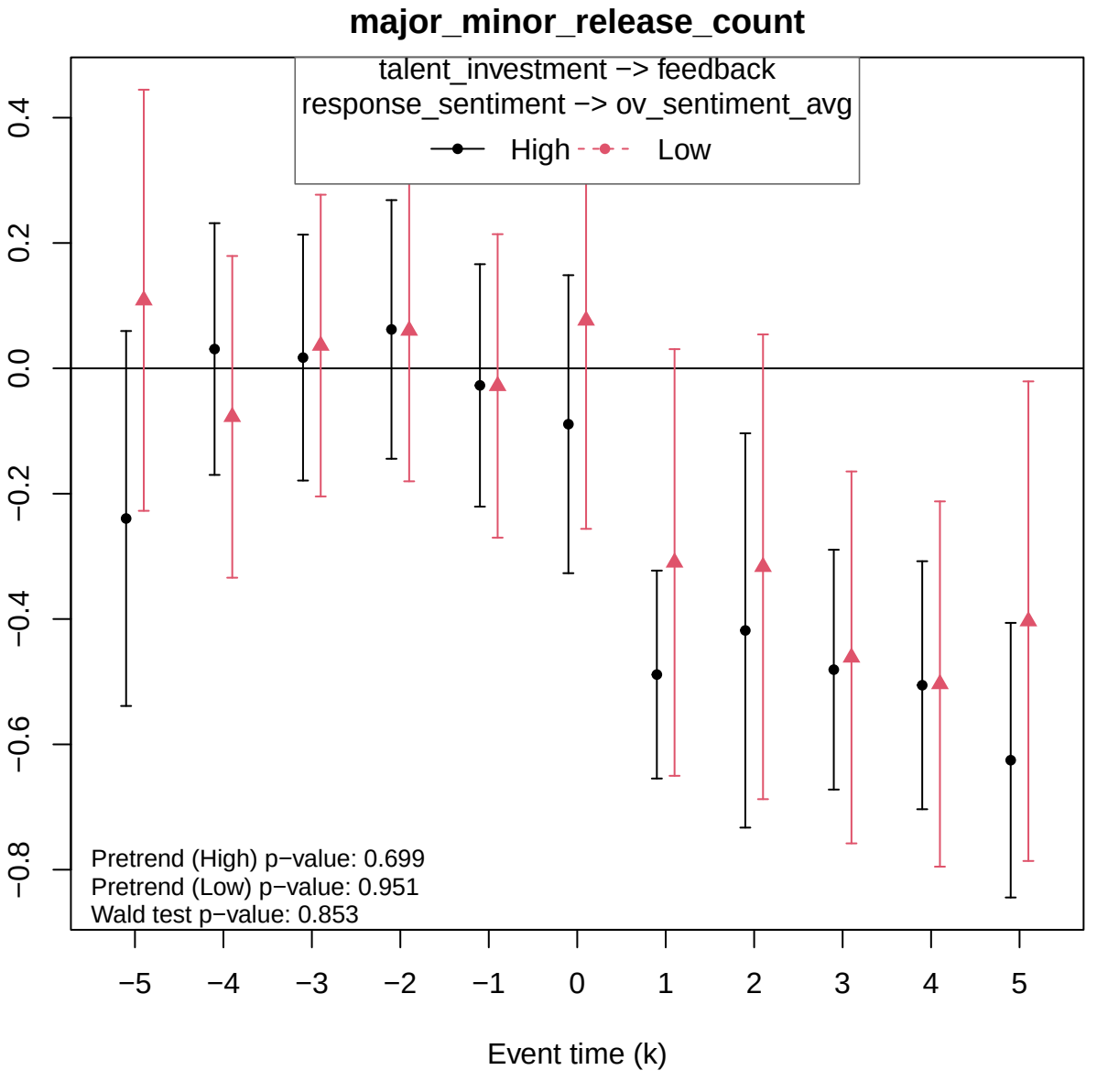

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

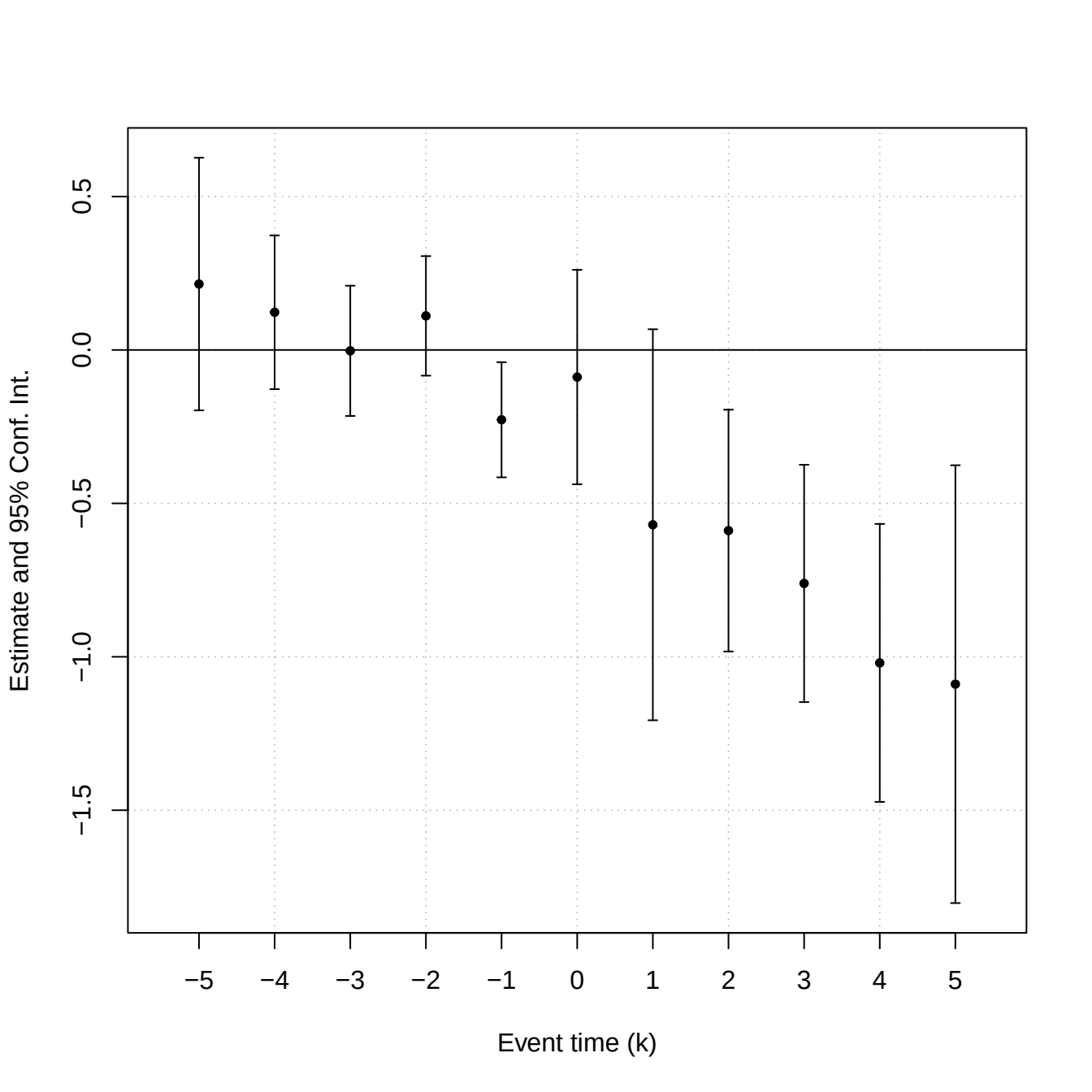

Estimate and 95% Conf. Int.
5
0
−5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

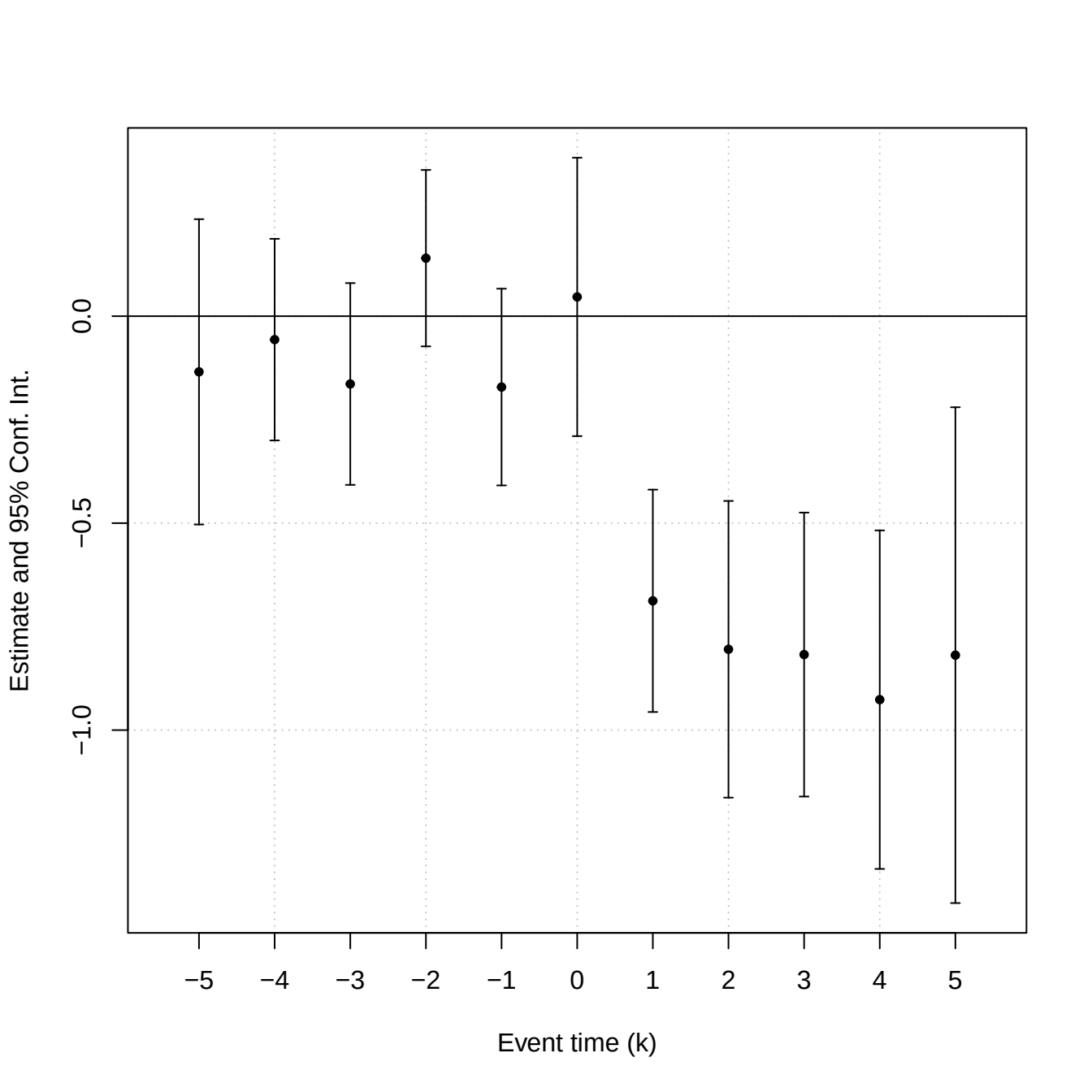

overall_new_release_count
talent_investment −> feedback
response_sentiment −> ov_sentiment_avg
High
Low
5
0
−5
Pretrend (High) p−value: 0.718
Pretrend (Low) p−value: 0.306
Wald test p−value: 0.984
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

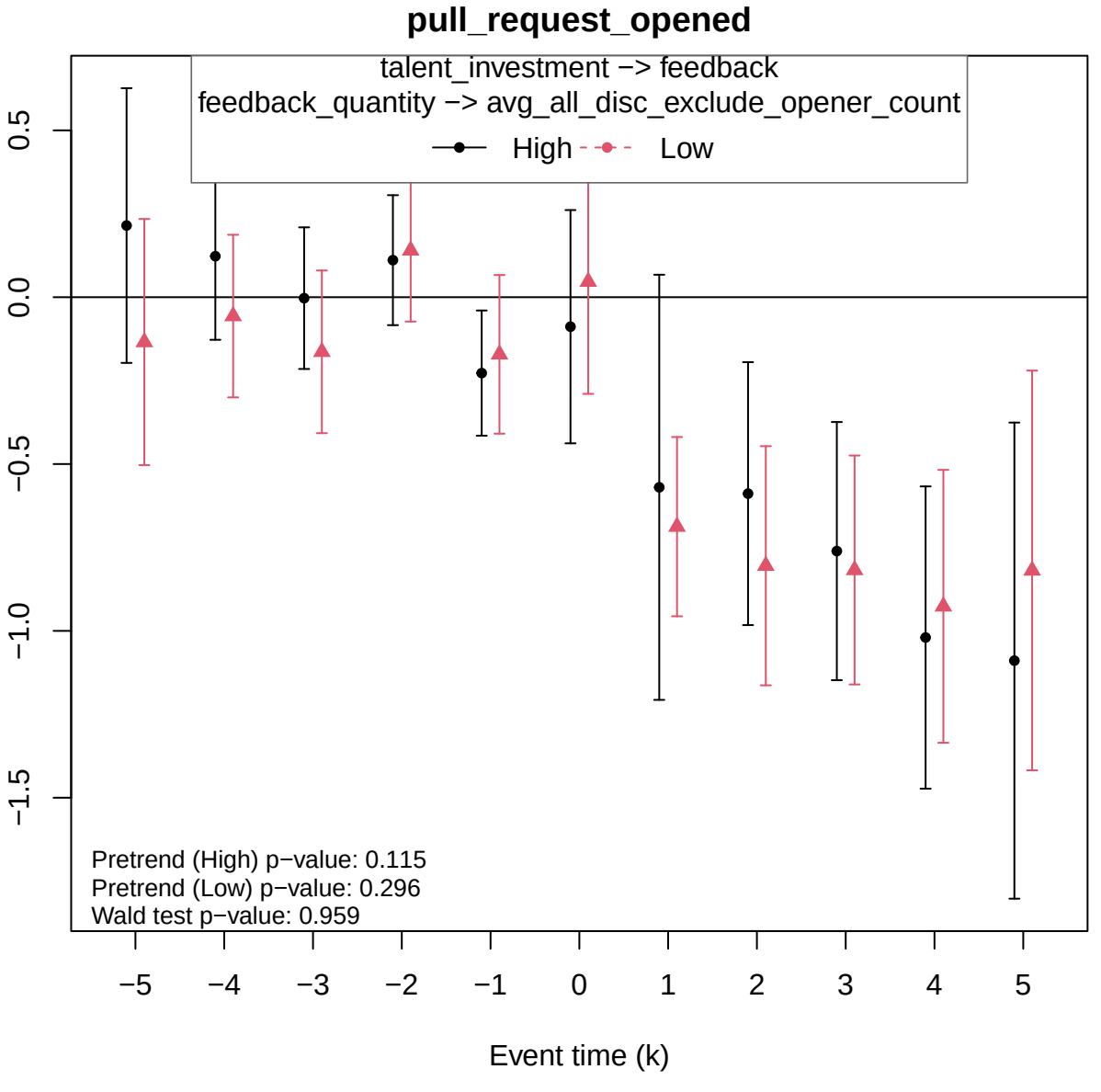

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

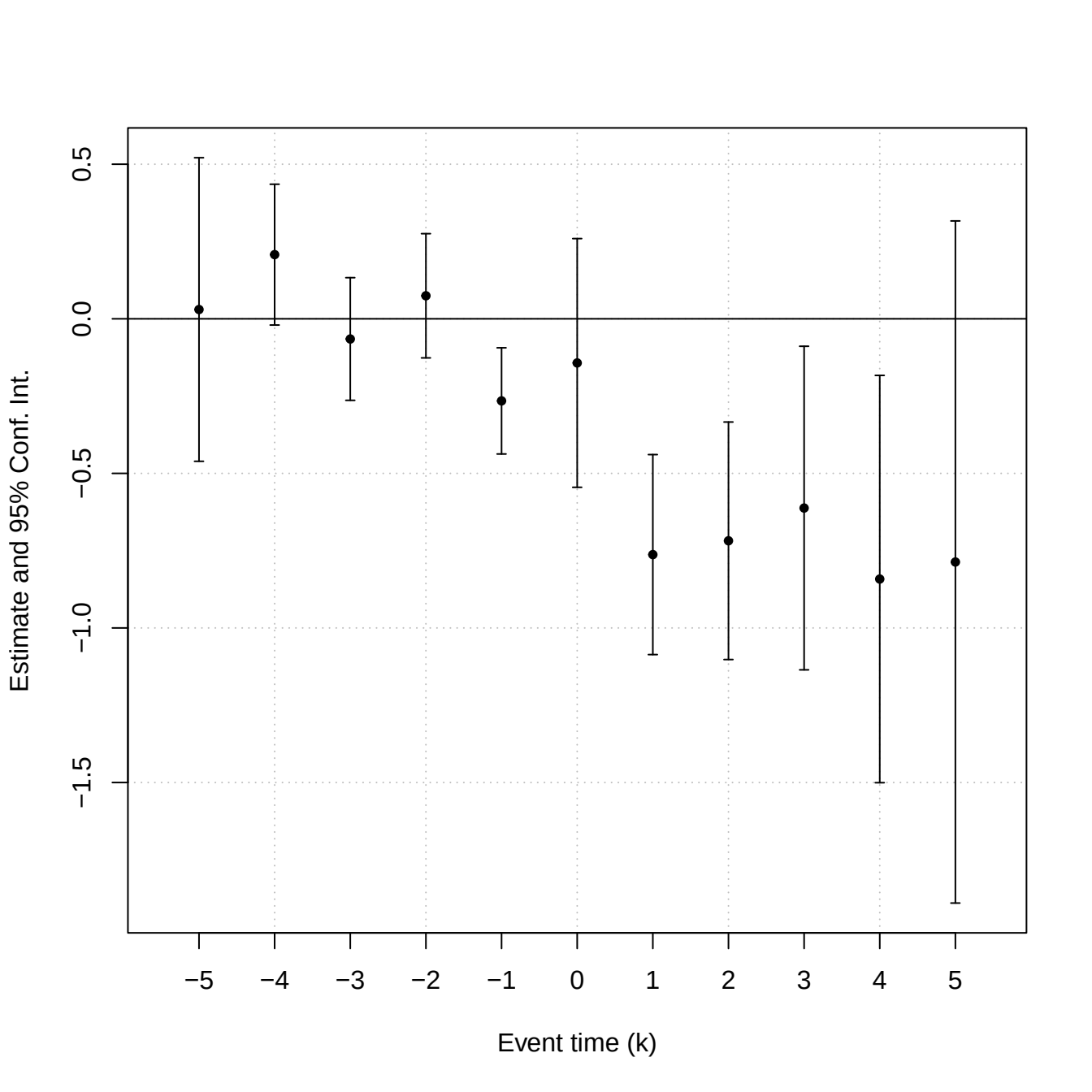

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

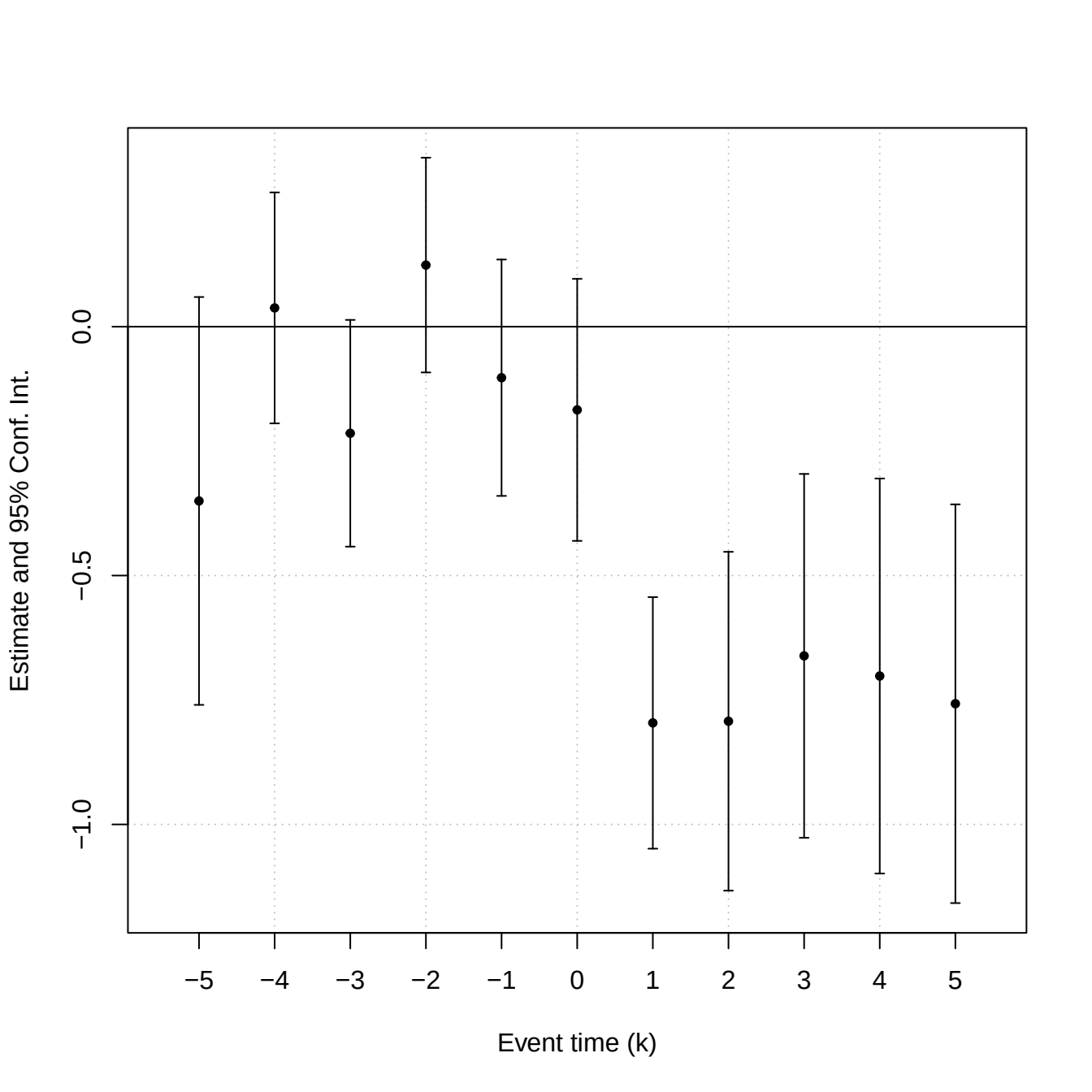

major_minor_release_count
talent_investment −> feedback
response_sentiment −> ov_sentiment_avg
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.699
Pretrend (Low) p−value: 0.951
Wald test p−value: 0.853
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

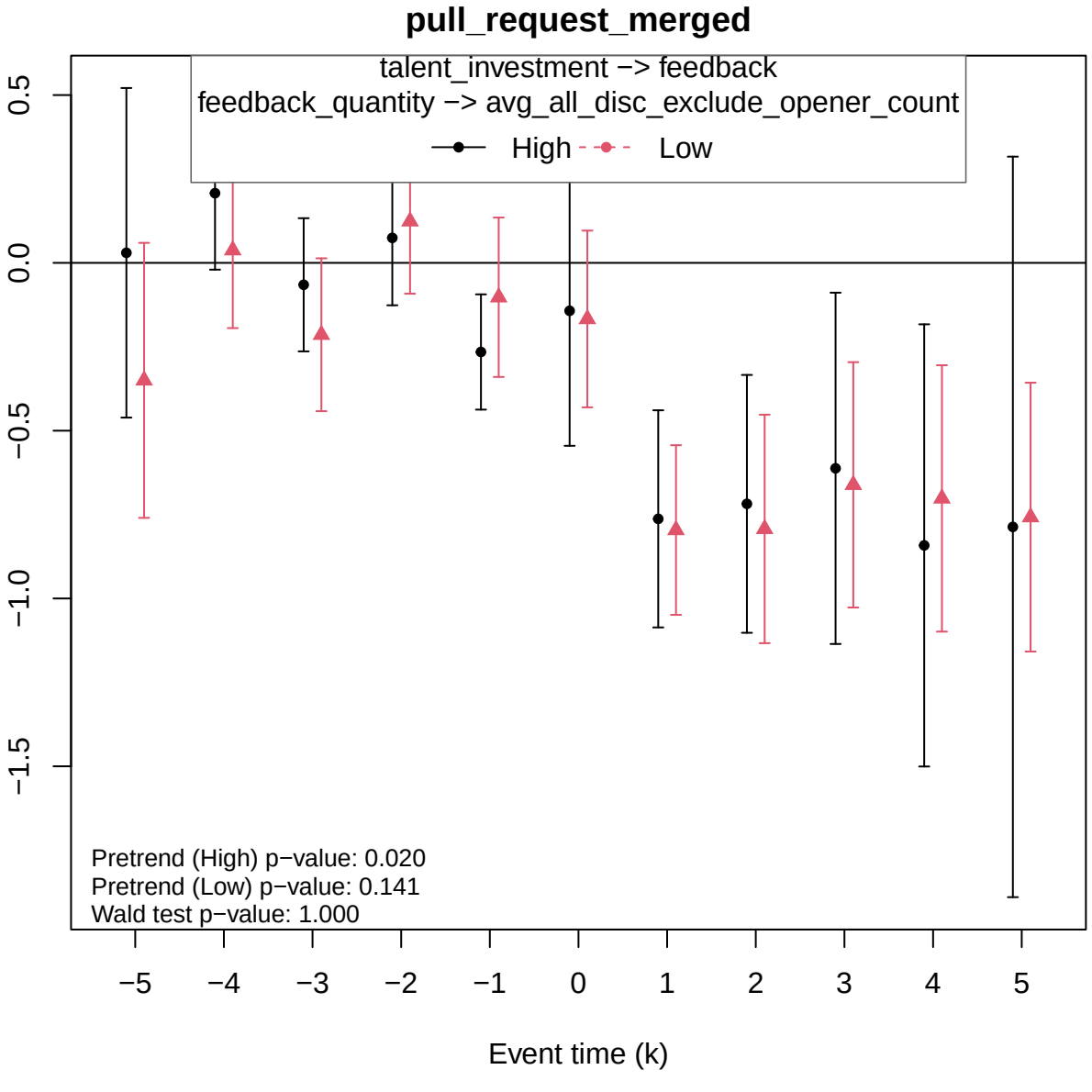

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

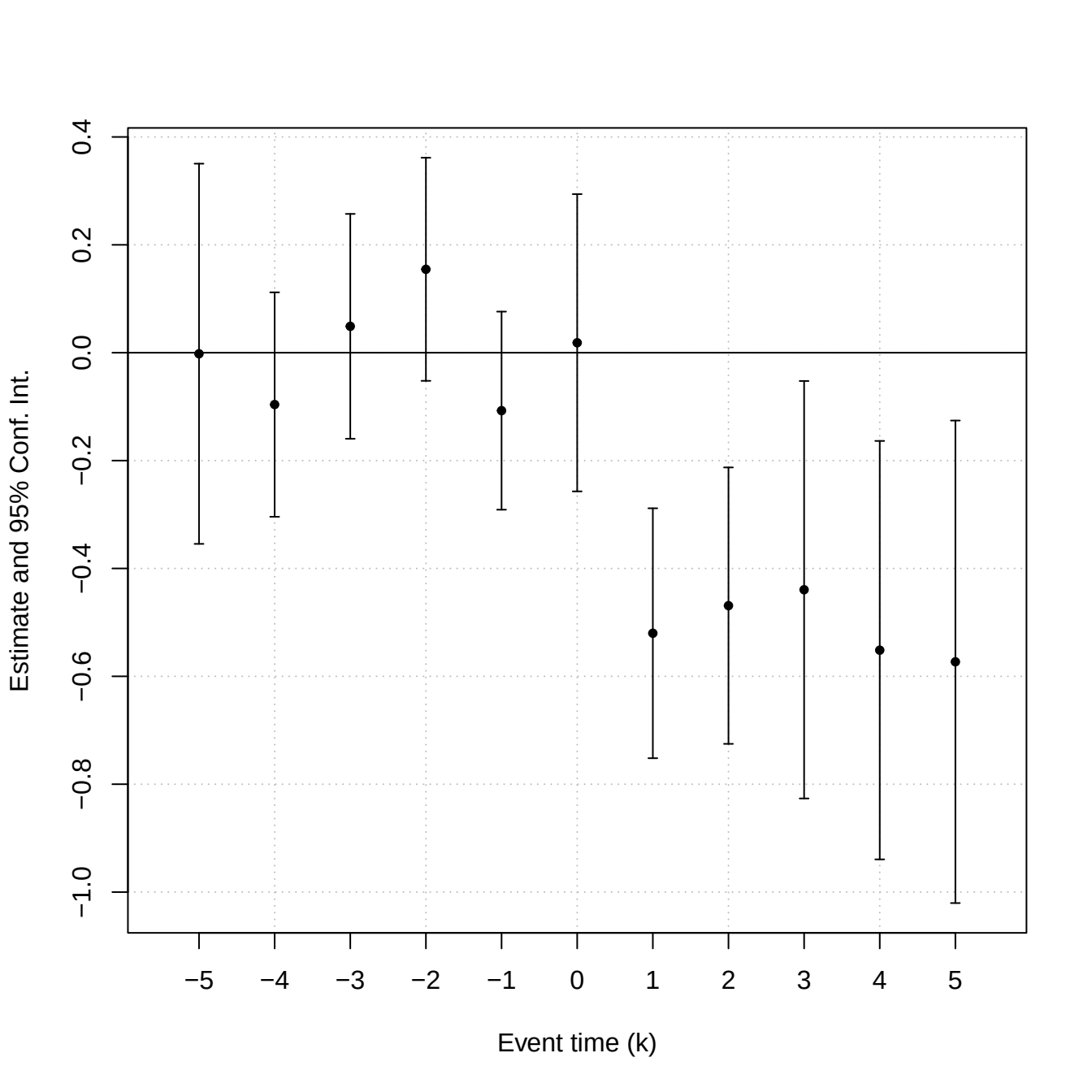

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

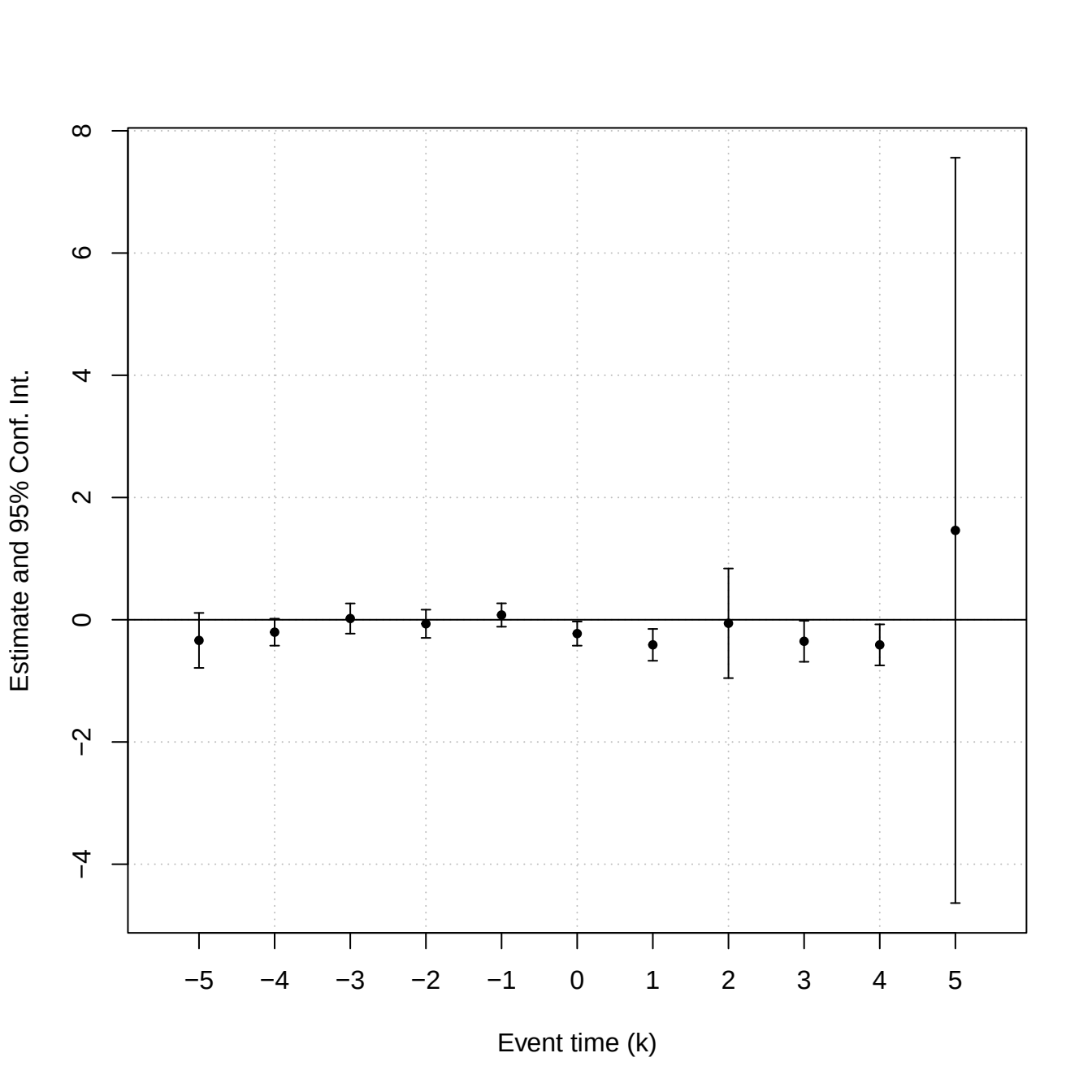

pull_request_opened
talent_investment −> feedback
feedback_quantity −> avg_all_disc_exclude_opener_count
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.115
Pretrend (Low) p−value: 0.296
Wald test p−value: 0.959
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

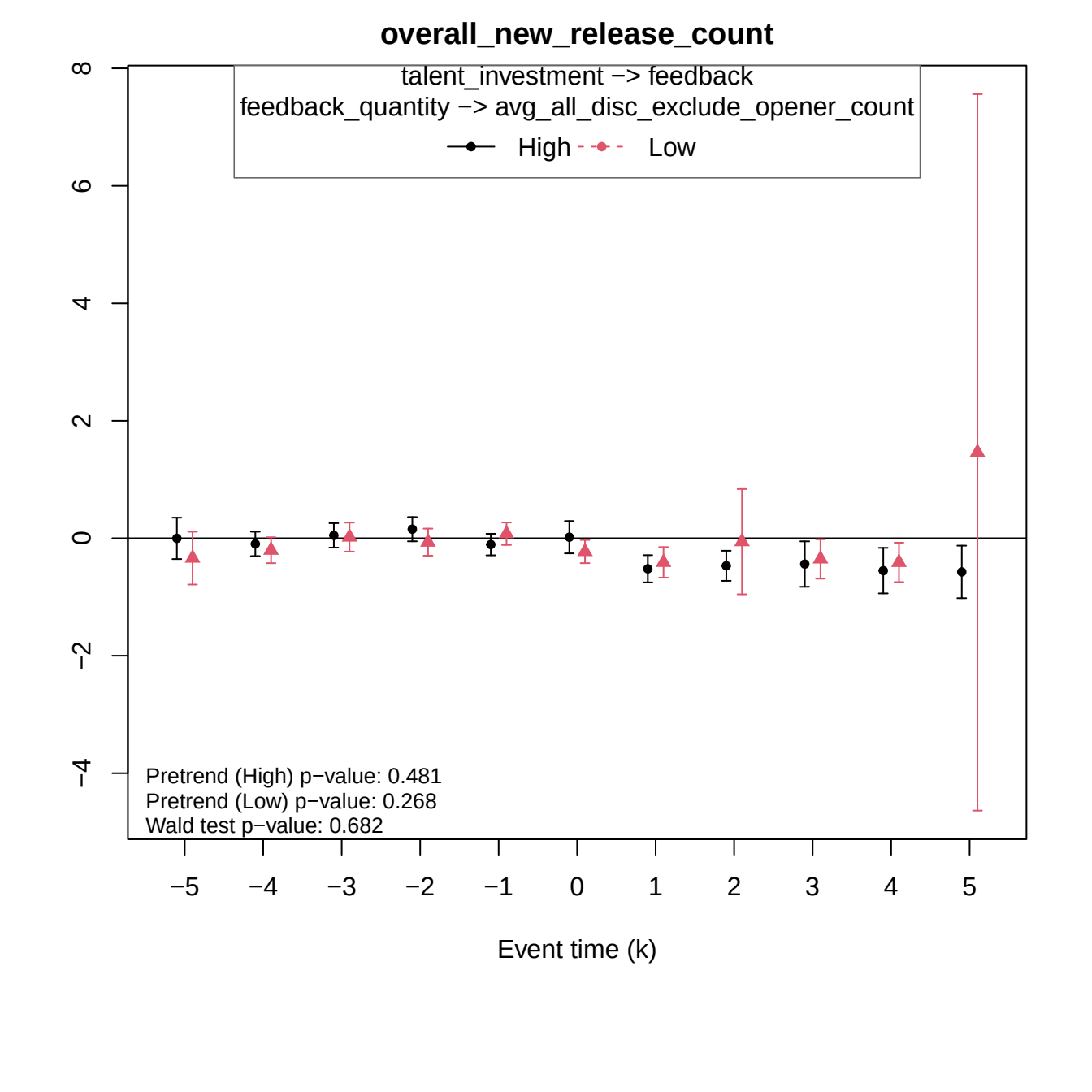

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

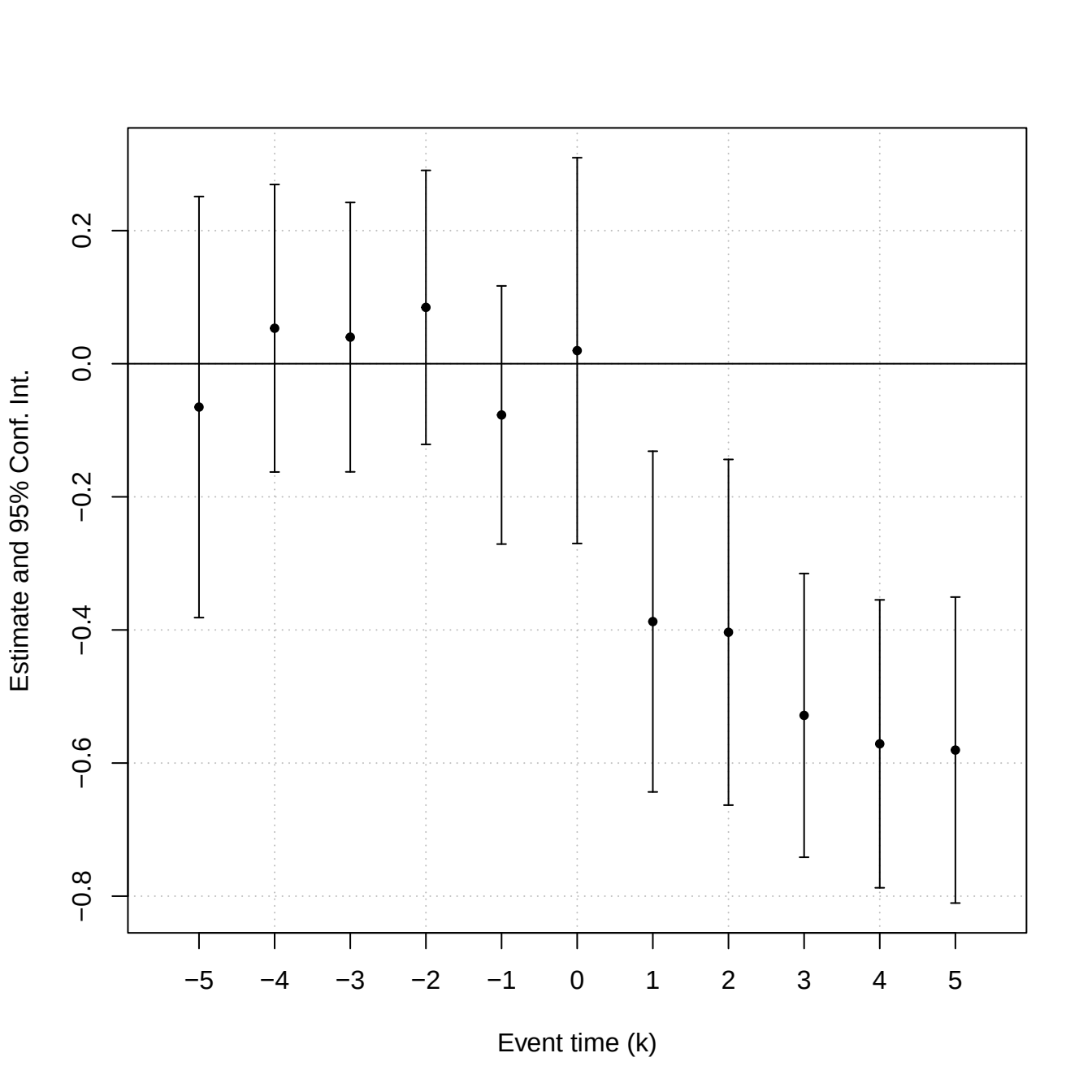

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

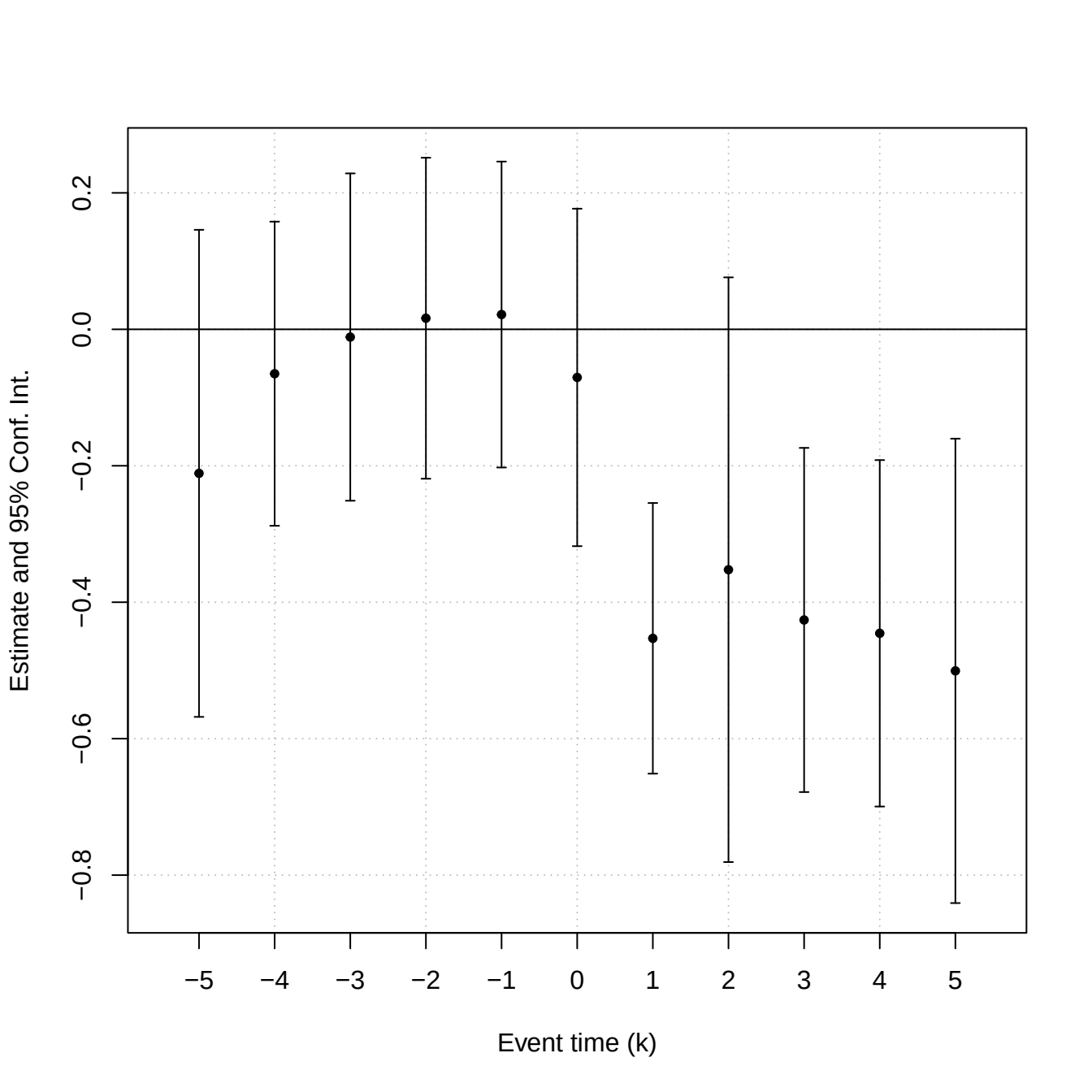

pull_request_merged
talent_investment −> feedback
feedback_quantity −> avg_all_disc_exclude_opener_count
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.020
Pretrend (Low) p−value: 0.141
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

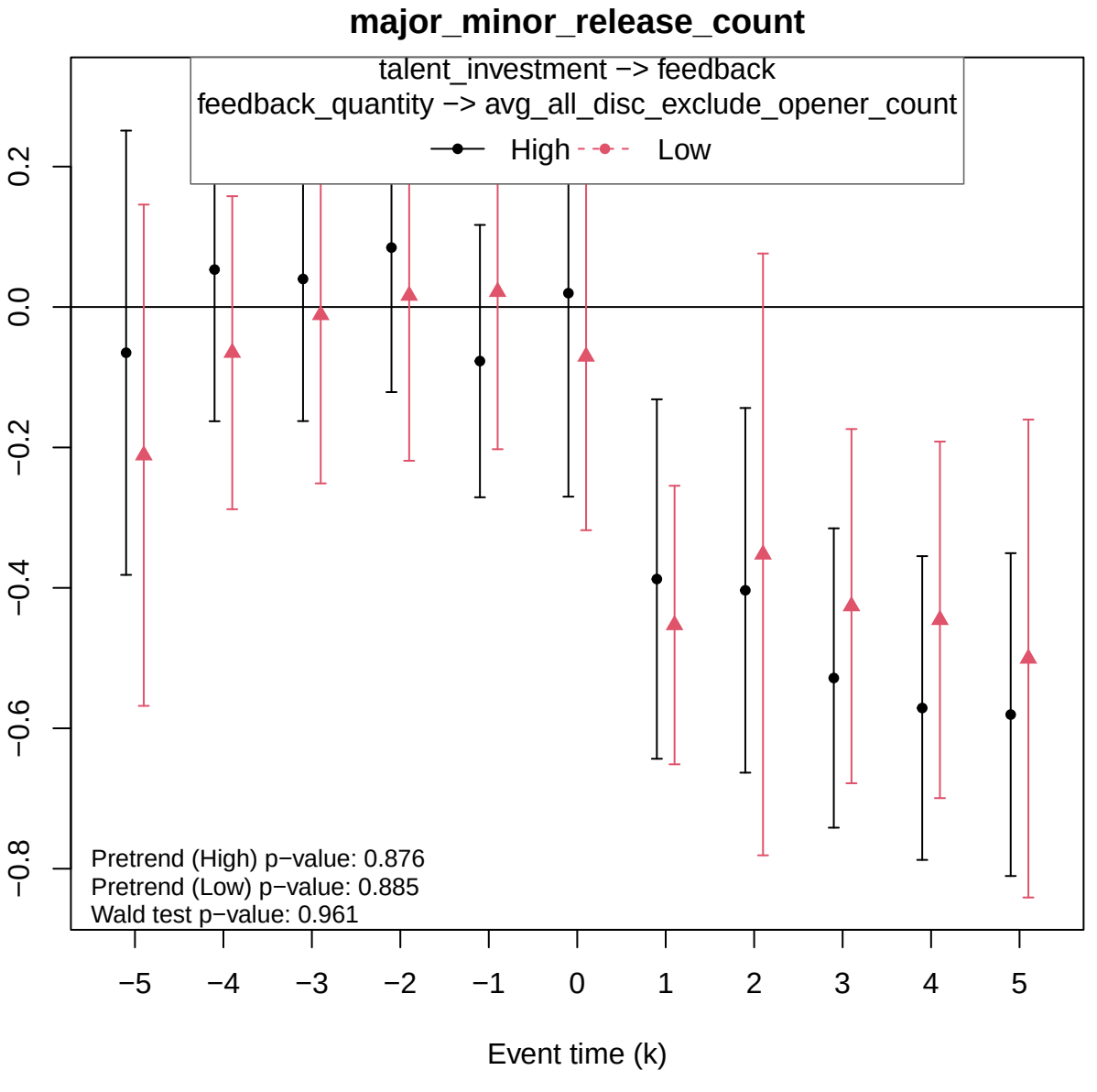

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

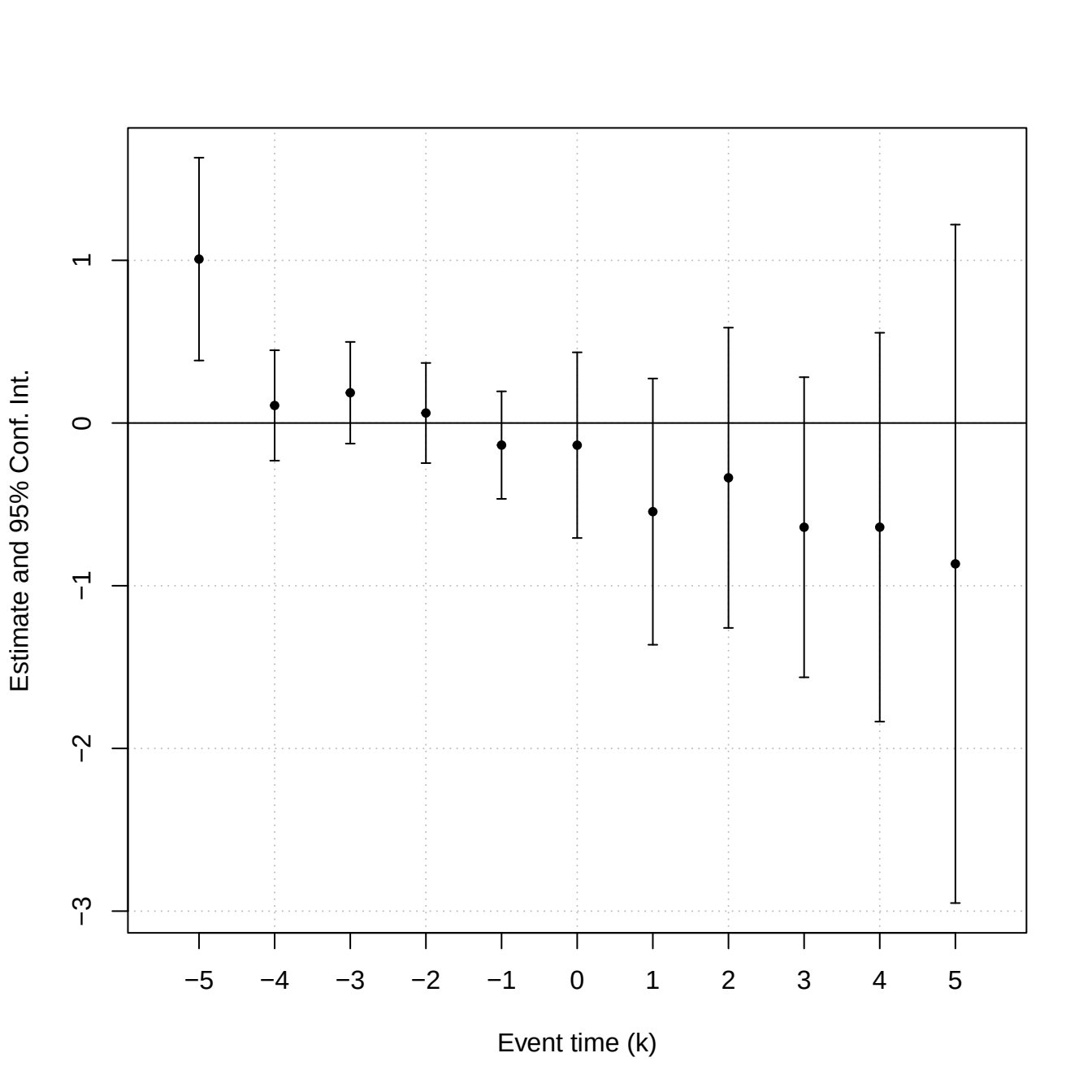

Estimate and 95% Conf. Int.
8
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

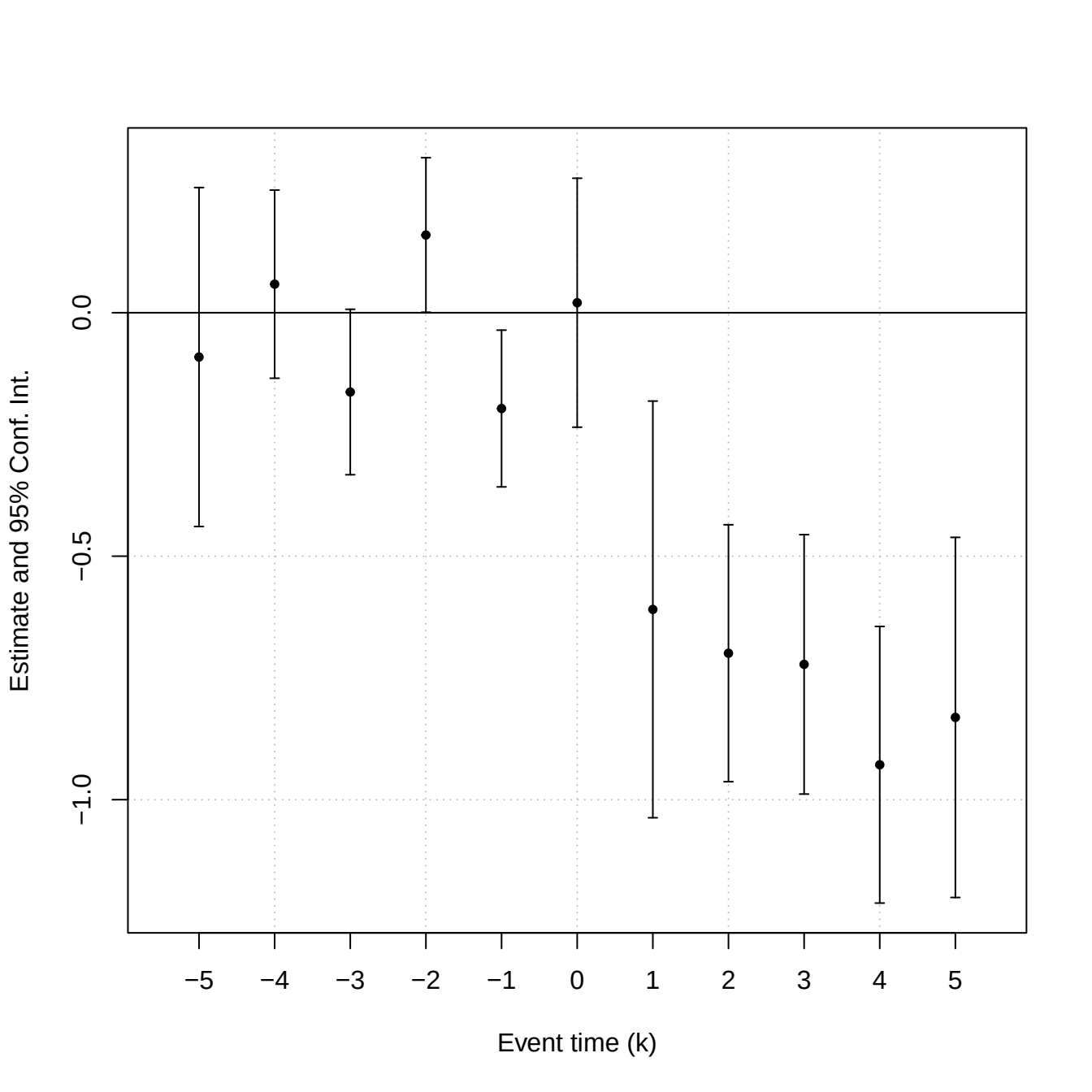

overall_new_release_count
talent_investment −> feedback
feedback_quantity −> avg_all_disc_exclude_opener_count
High
Low
Pretrend (High) p−value: 0.481
Pretrend (Low) p−value: 0.268
Wald test p−value: 0.682
8
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

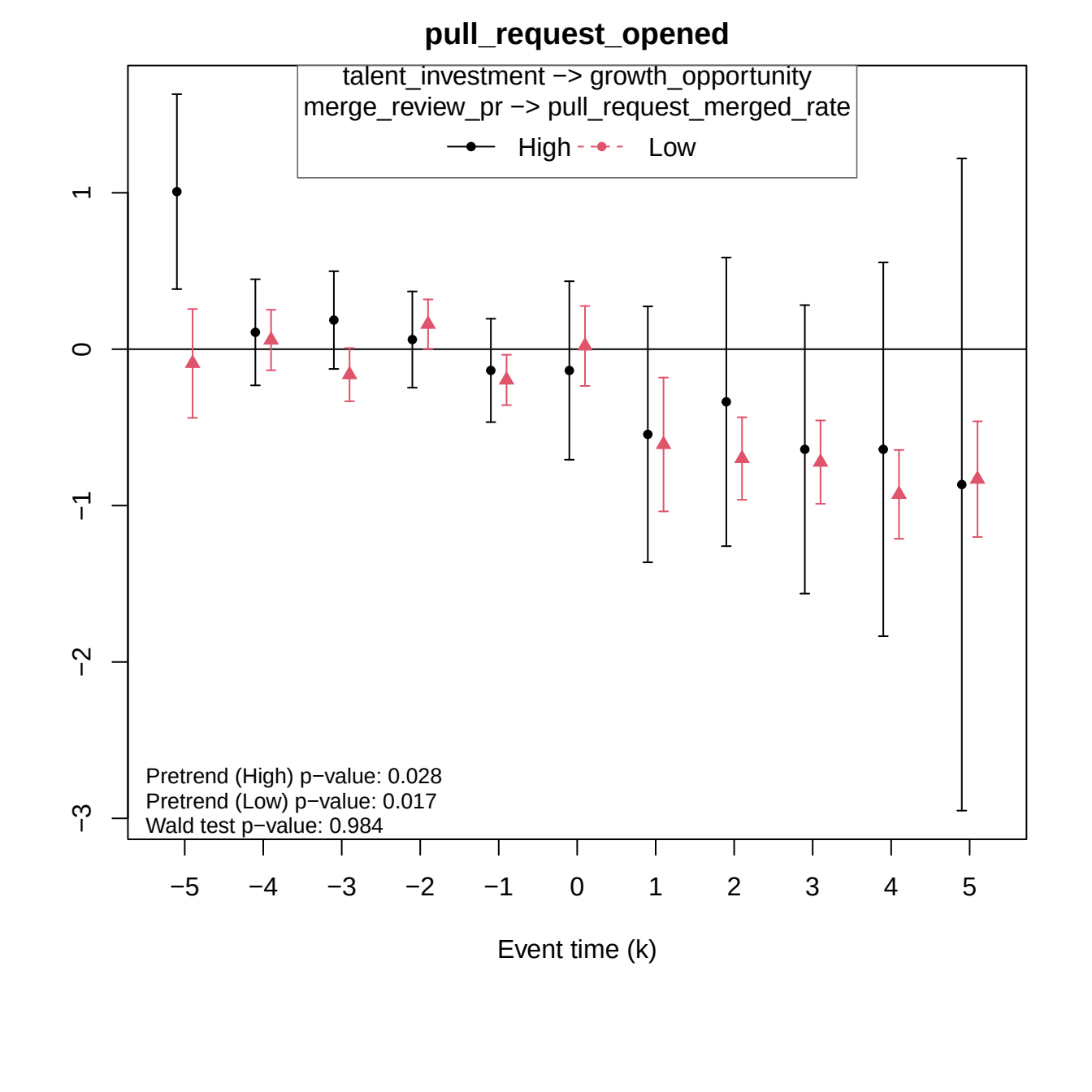

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

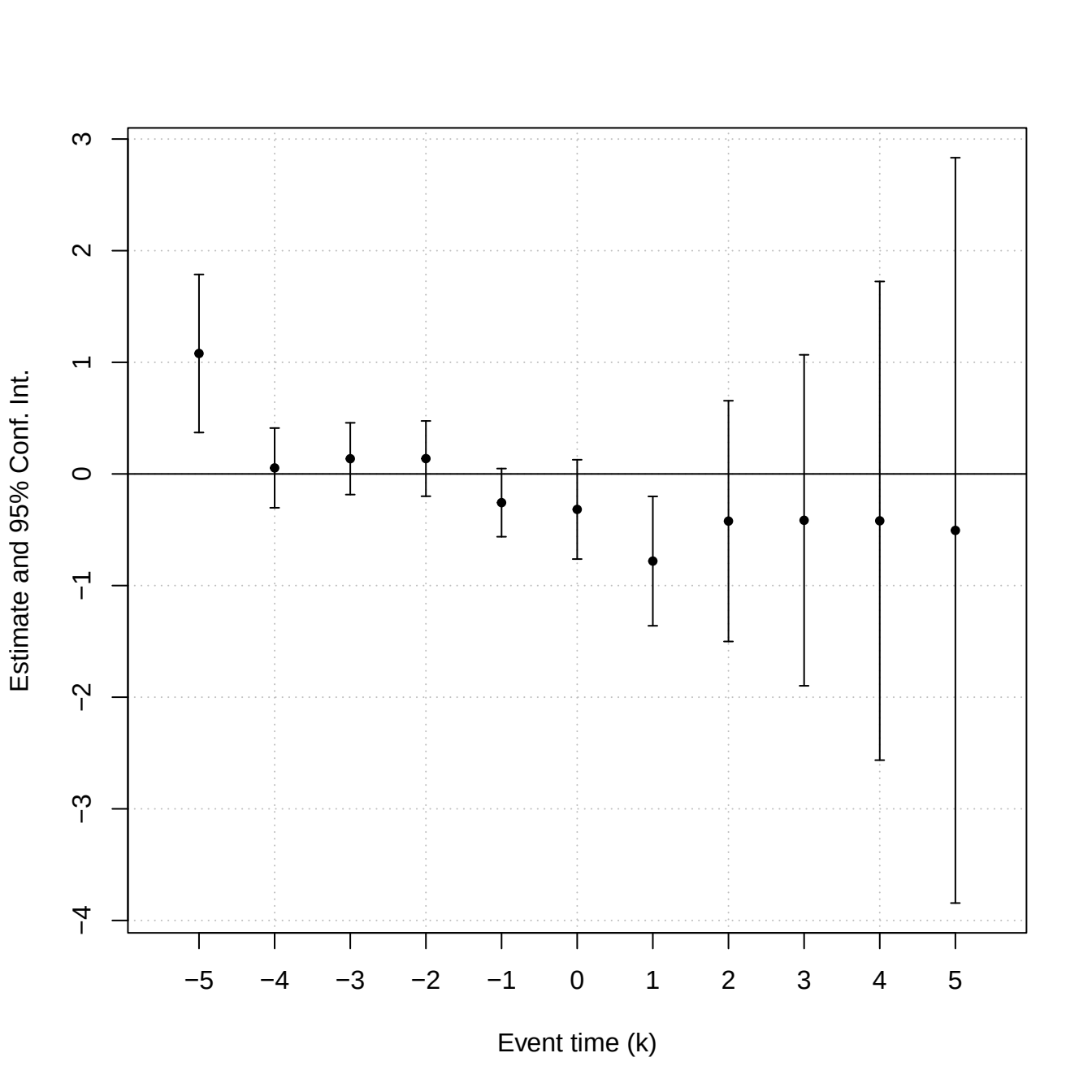

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

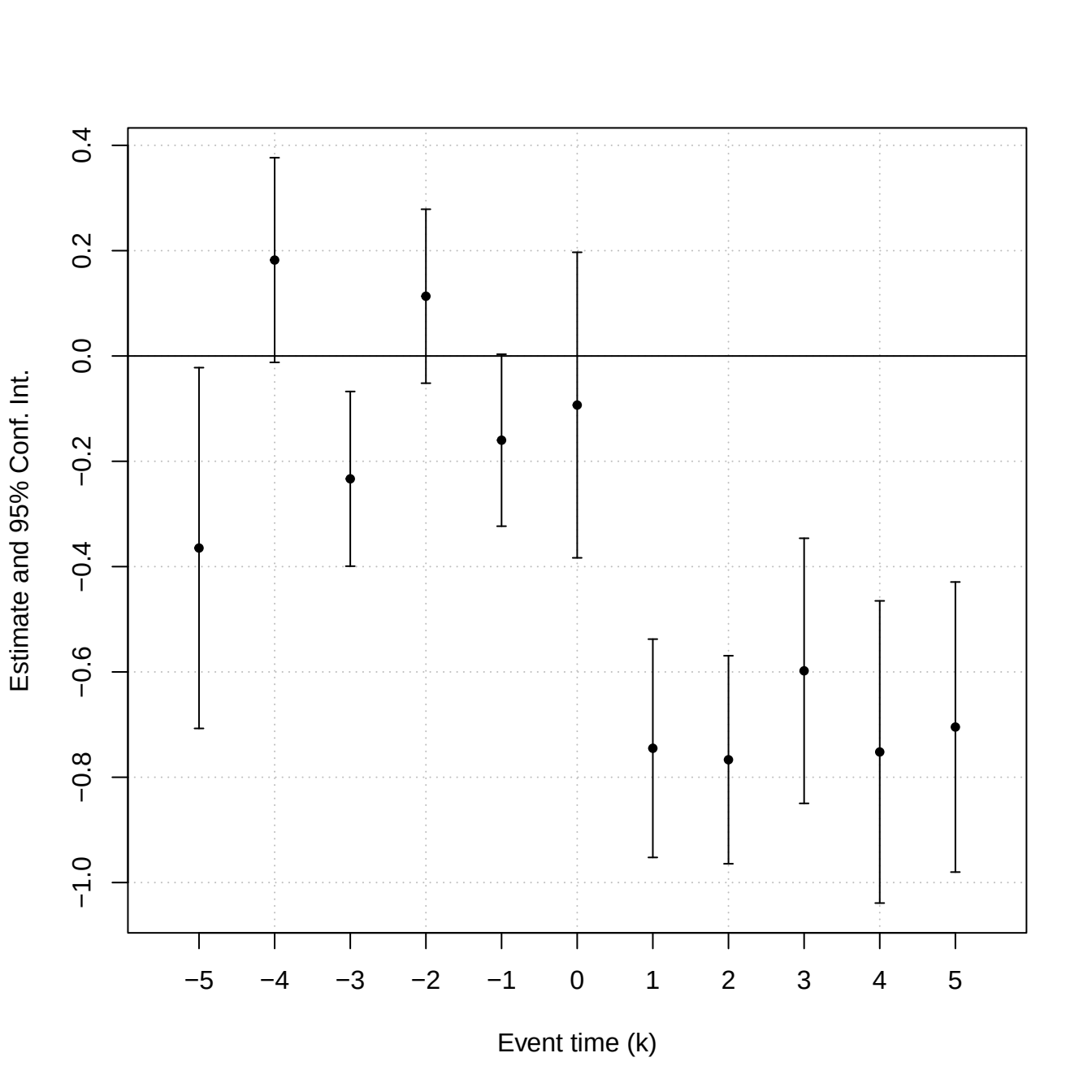

major_minor_release_count
talent_investment −> feedback
feedback_quantity −> avg_all_disc_exclude_opener_count
High
Low
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.876
Pretrend (Low) p−value: 0.885
Wald test p−value: 0.961
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

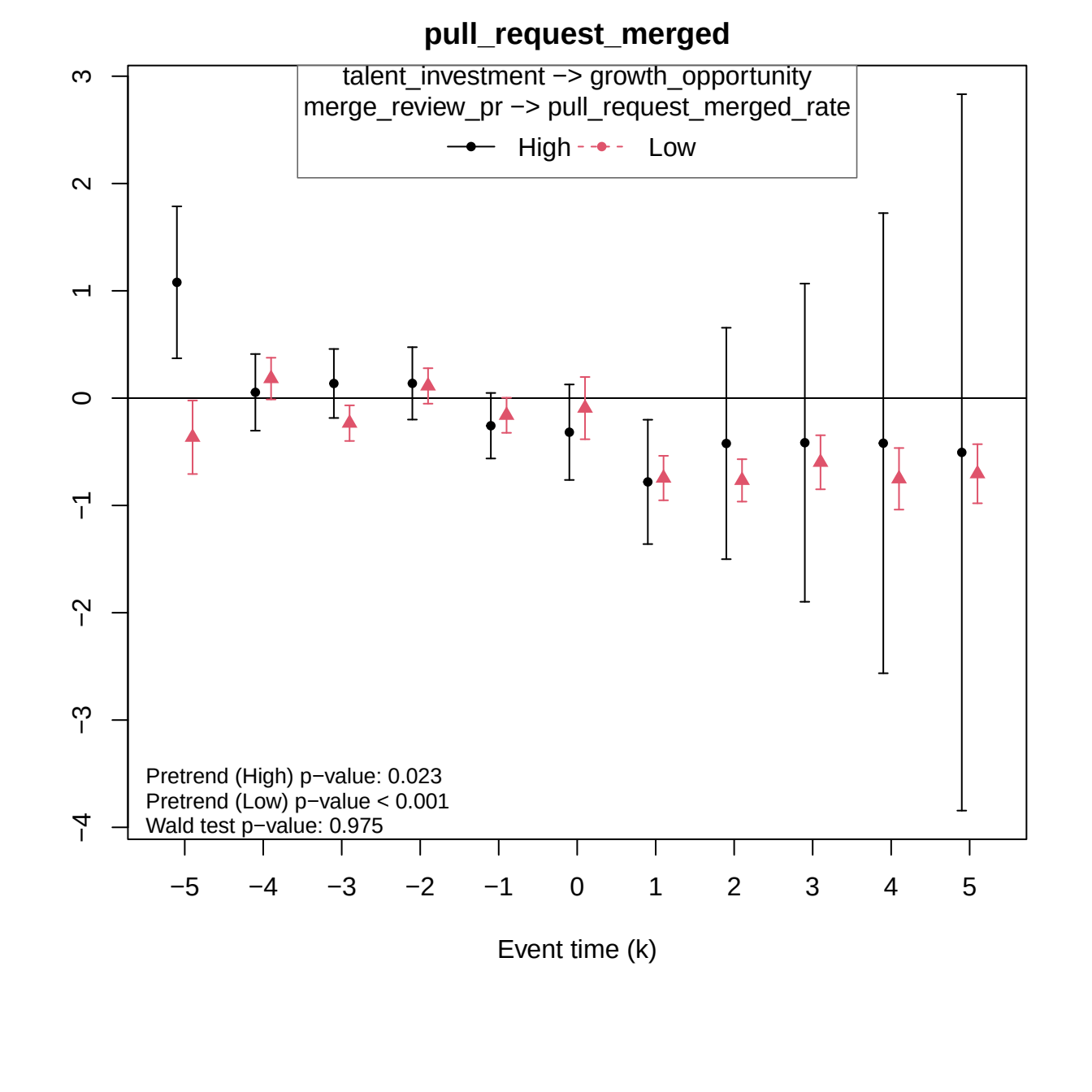

Estimate and 95% Conf. Int.
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

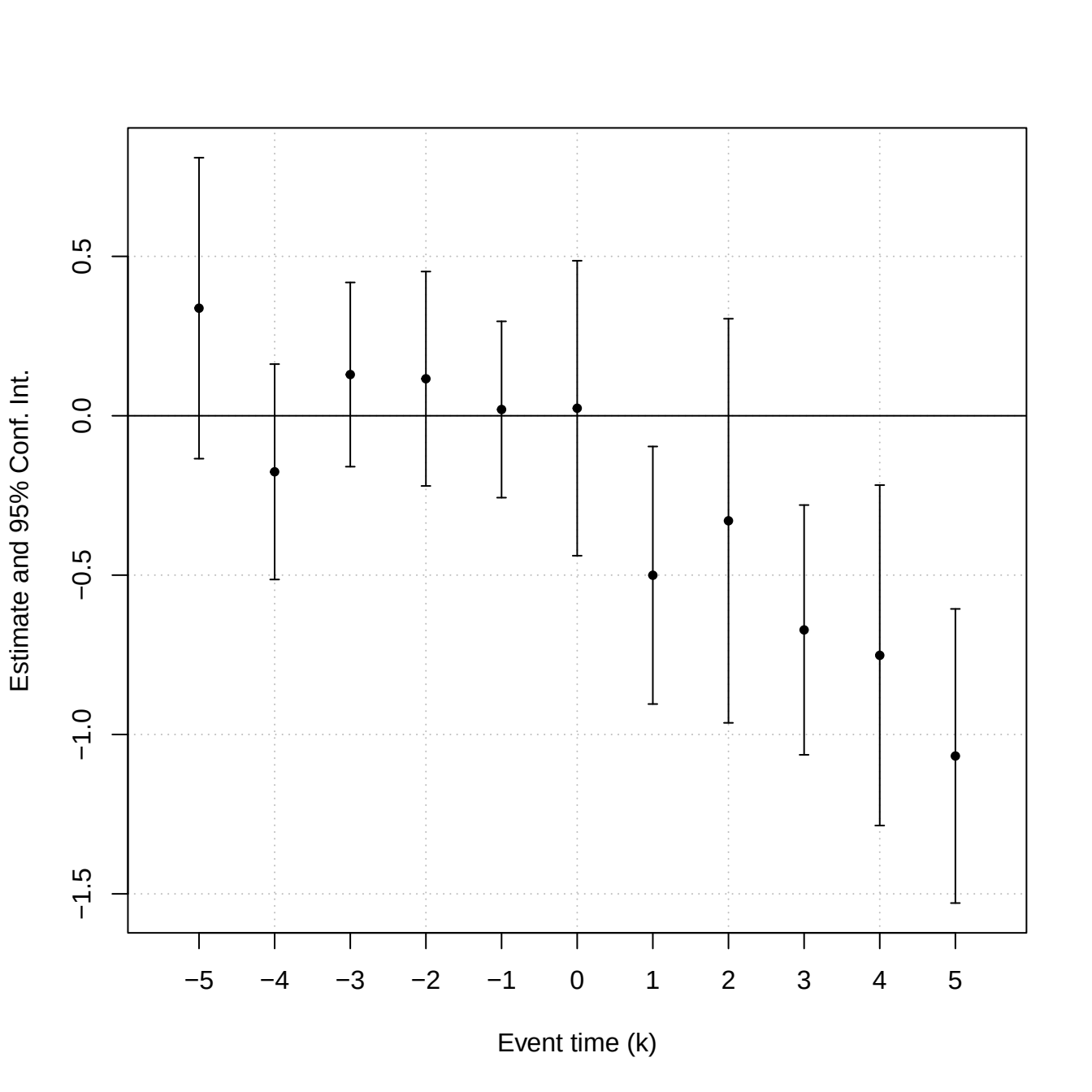

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

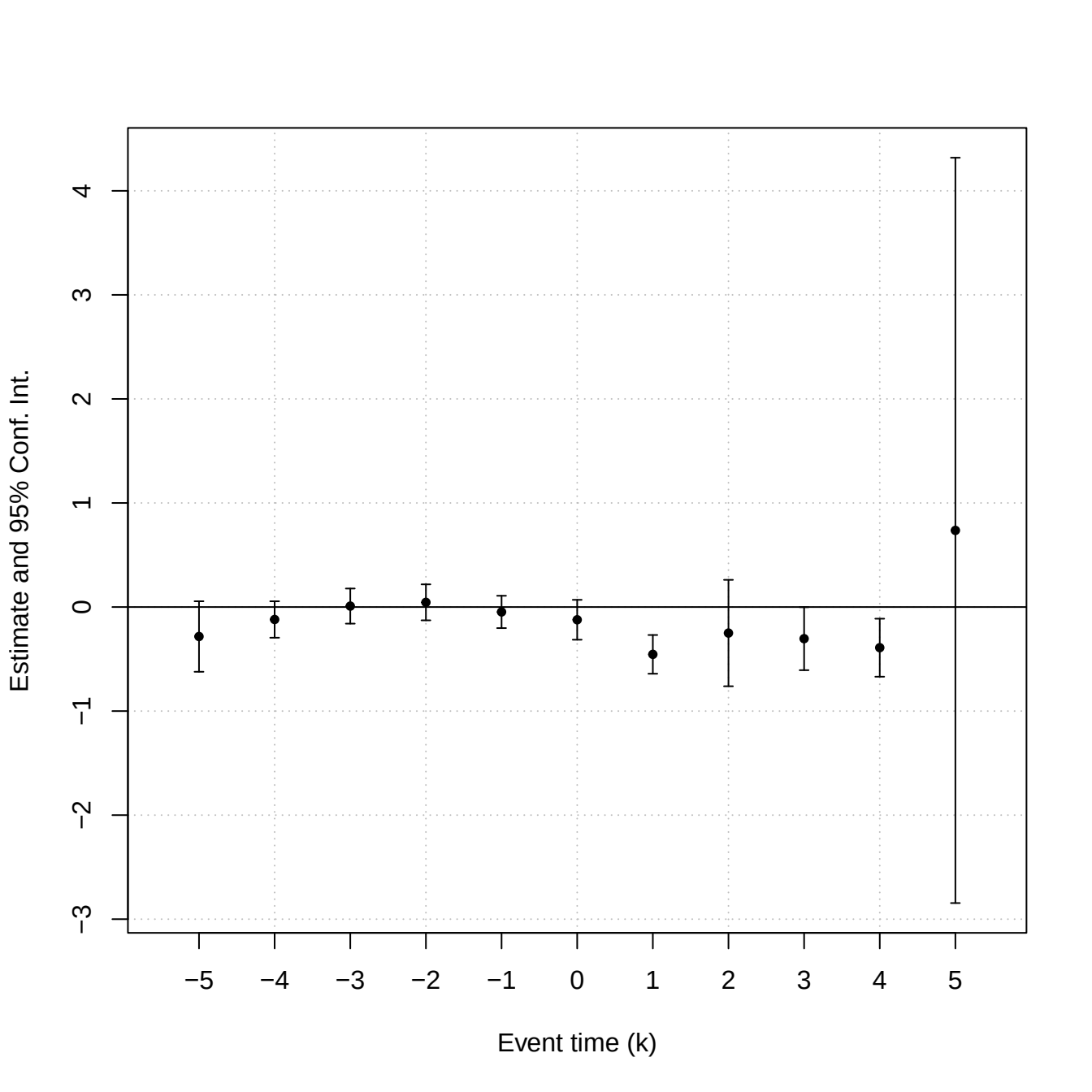

pull_request_opened
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_merged_rate
High
Low
Pretrend (High) p−value: 0.028
Pretrend (Low) p−value: 0.017
Wald test p−value: 0.984
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

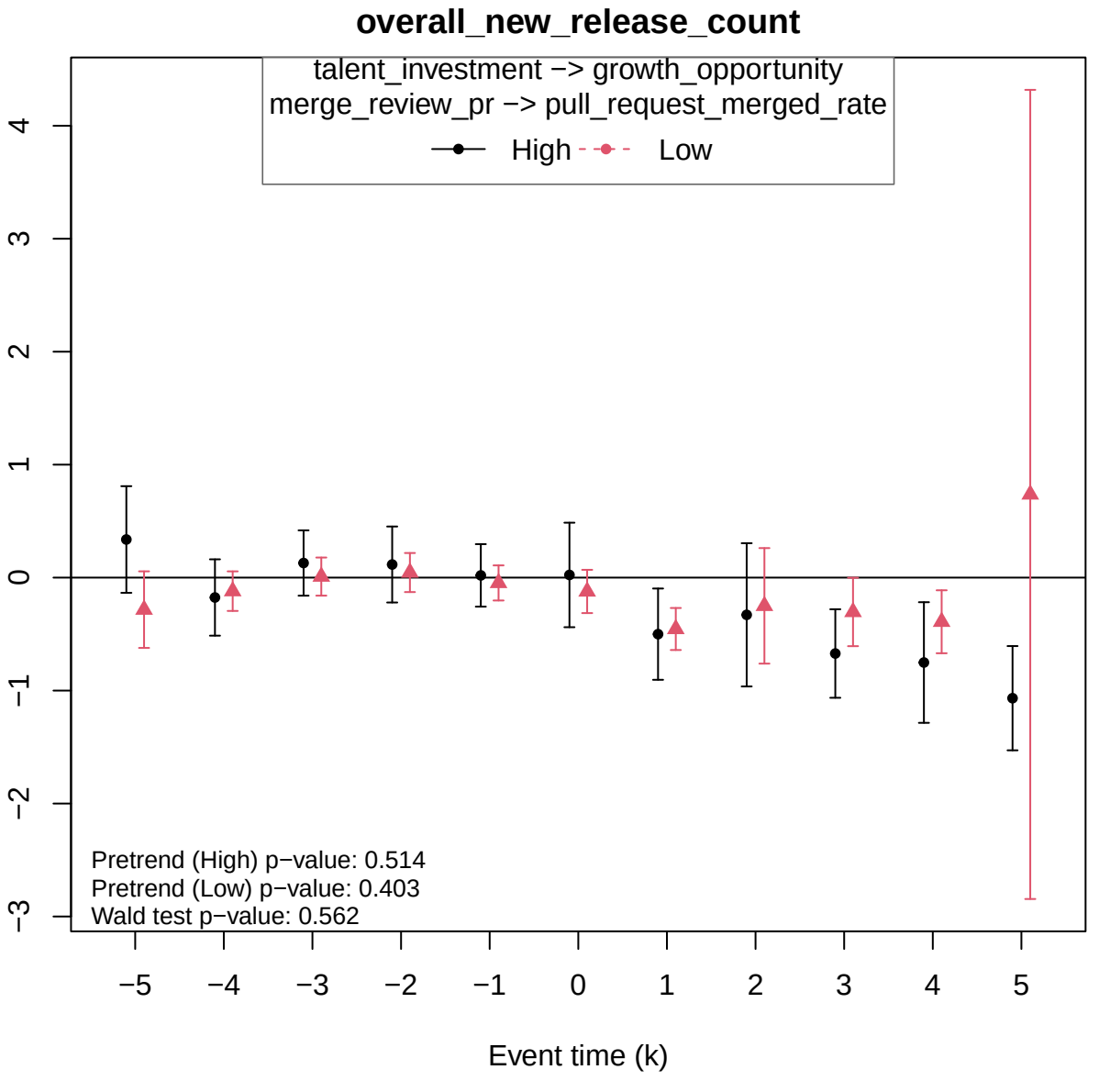

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−3
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

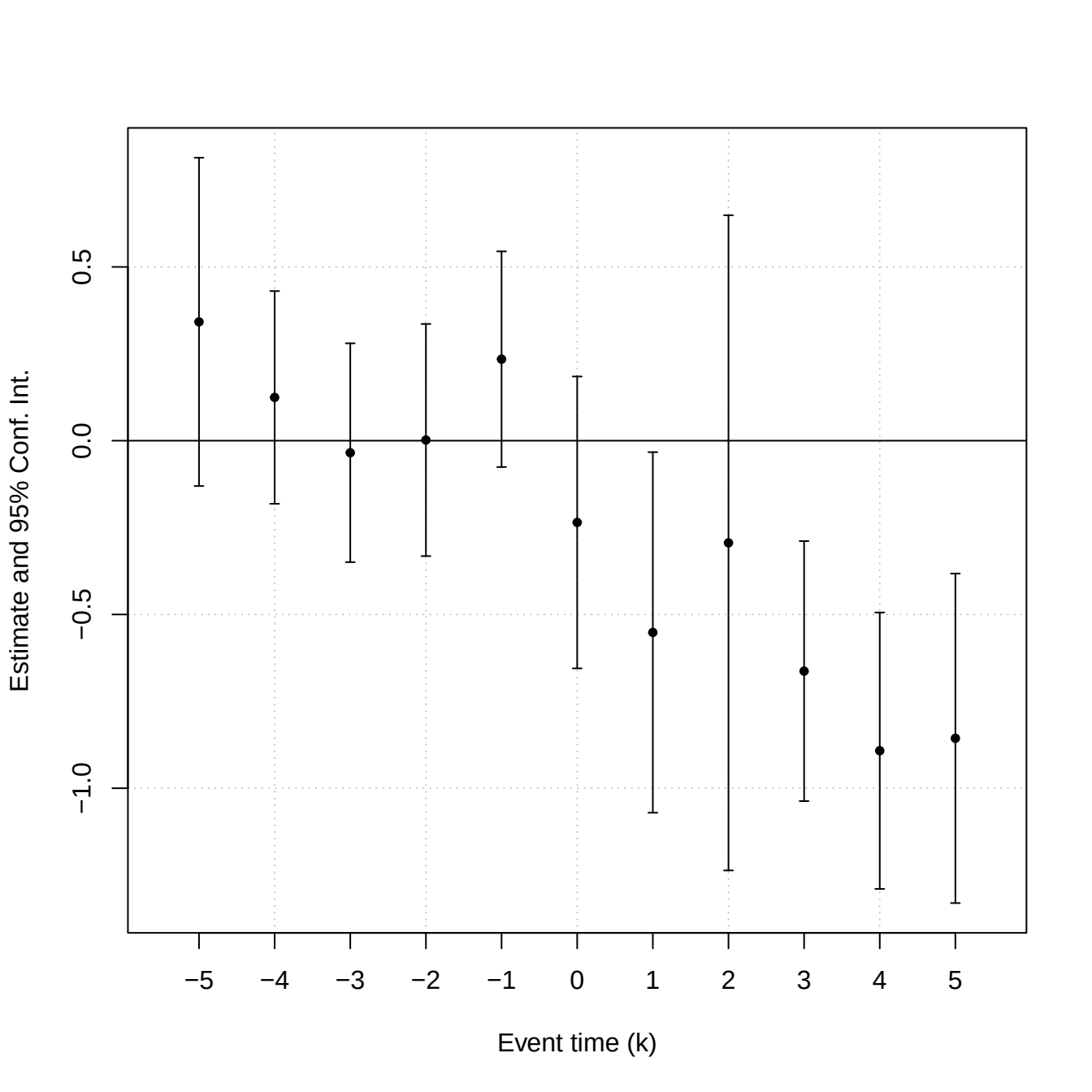

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

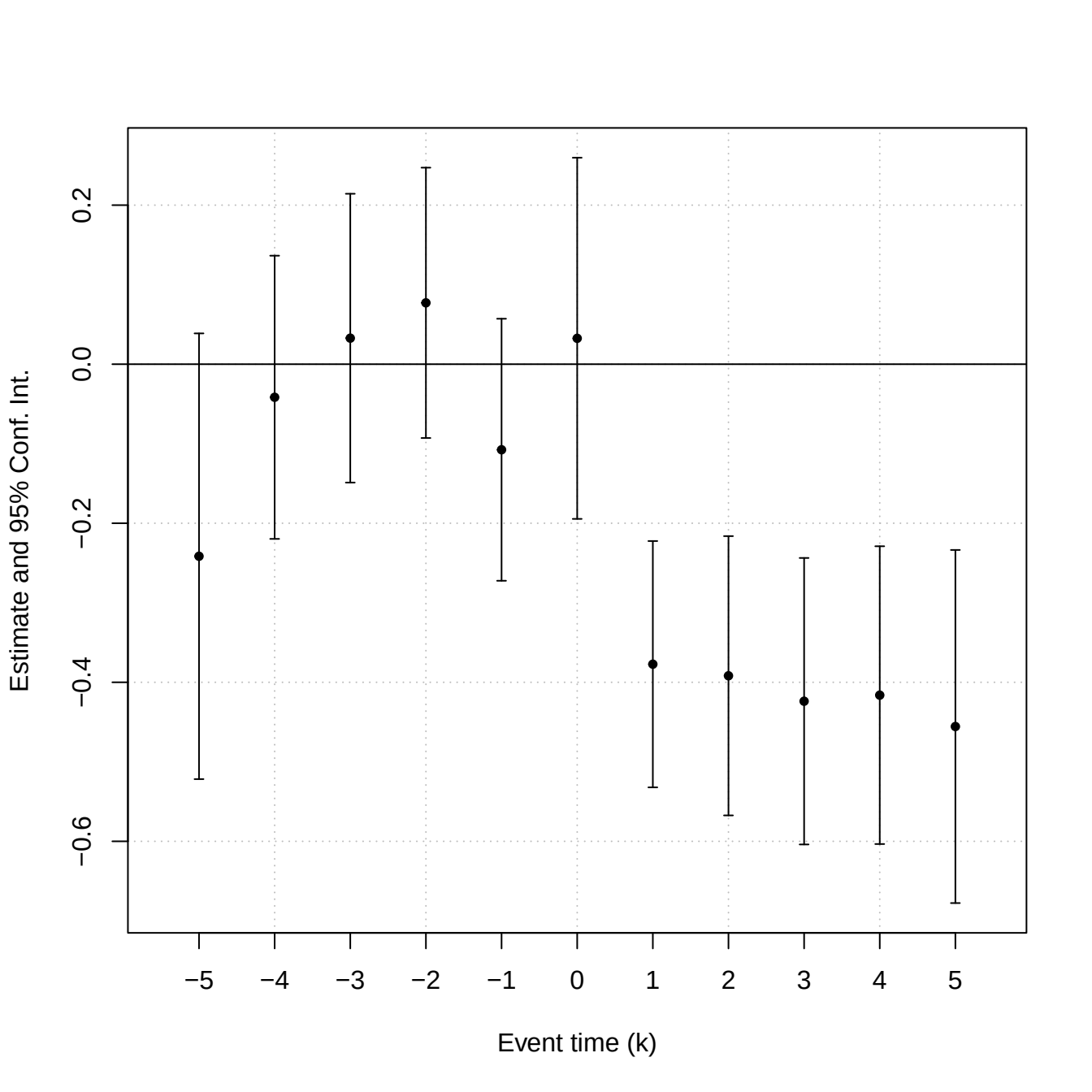

pull_request_merged
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_merged_rate
High
Low
Pretrend (High) p−value: 0.023
Pretrend (Low) p−value < 0.001
Wald test p−value: 0.975
3
2
1
0
−1
−2
−3
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

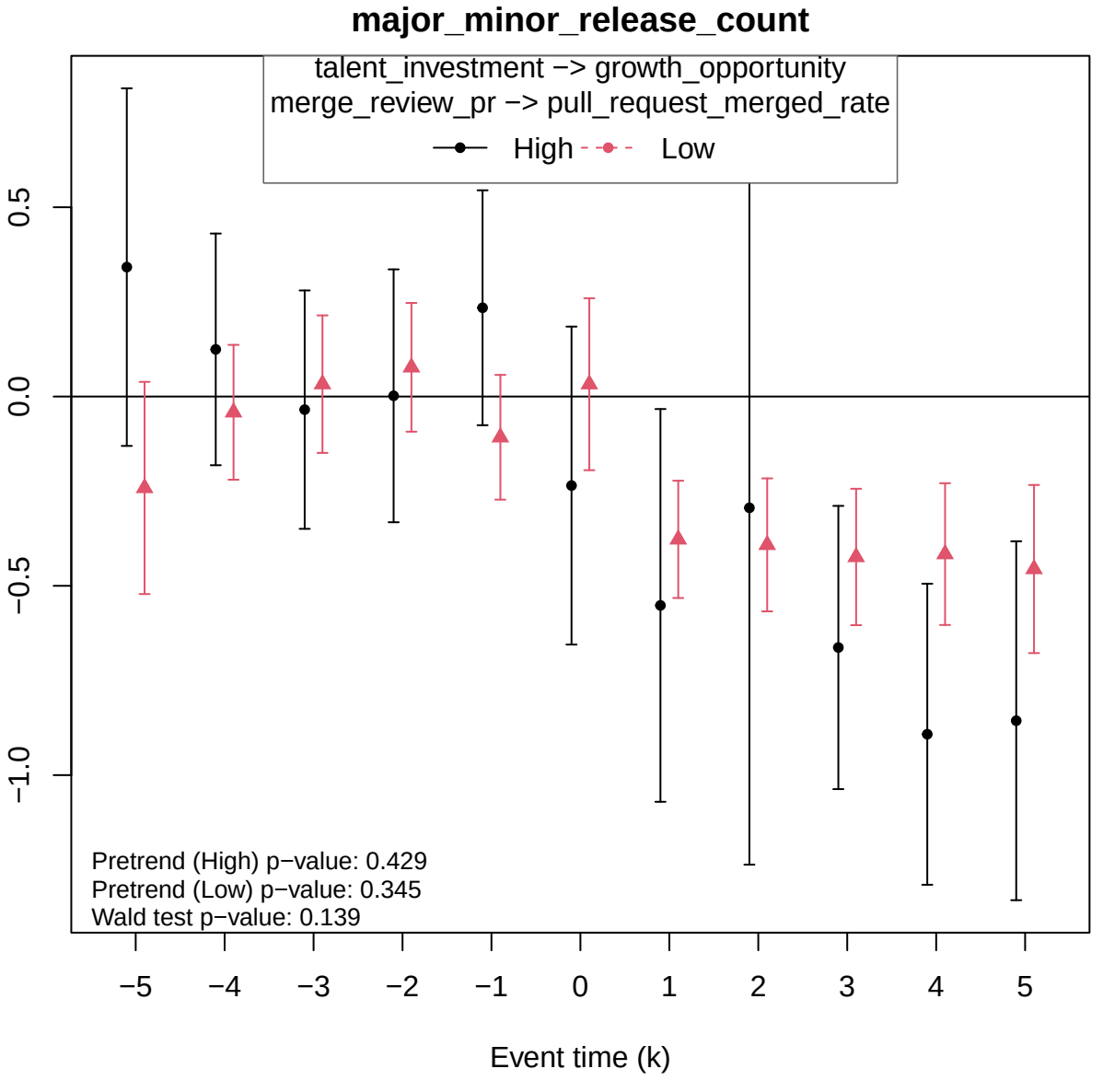

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

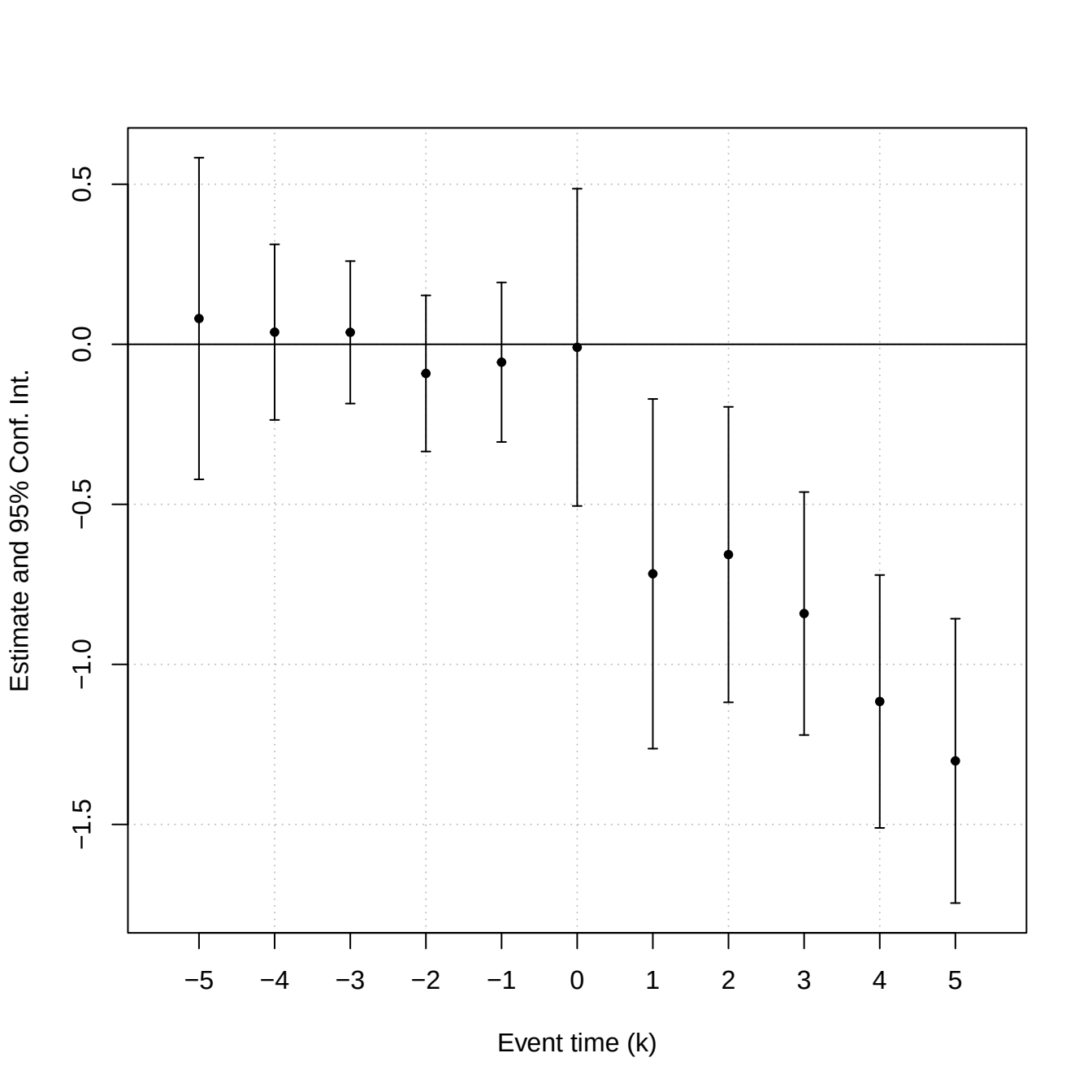

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

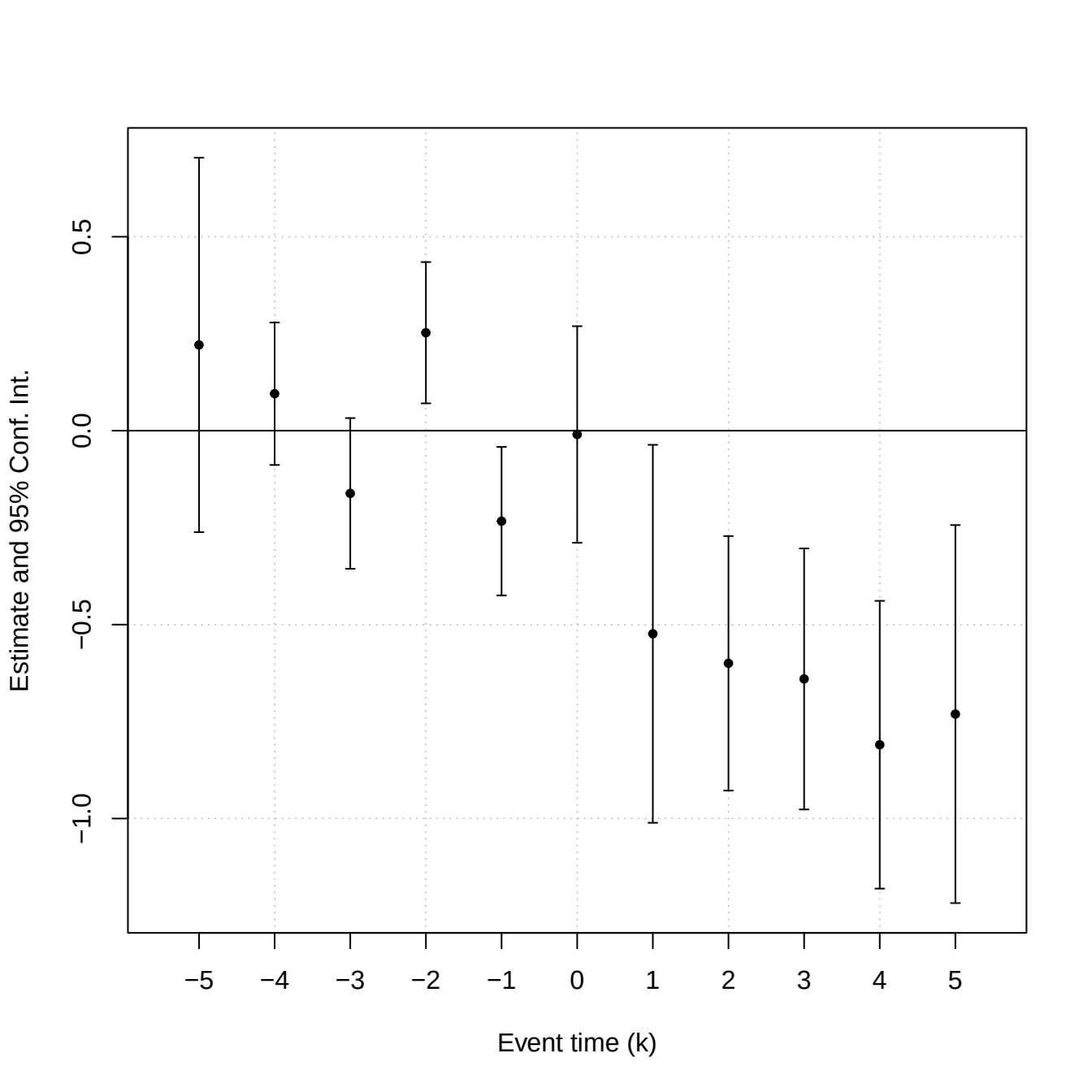

overall_new_release_count
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_merged_rate
High
Low
Pretrend (High) p−value: 0.514
Pretrend (Low) p−value: 0.403
Wald test p−value: 0.562
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

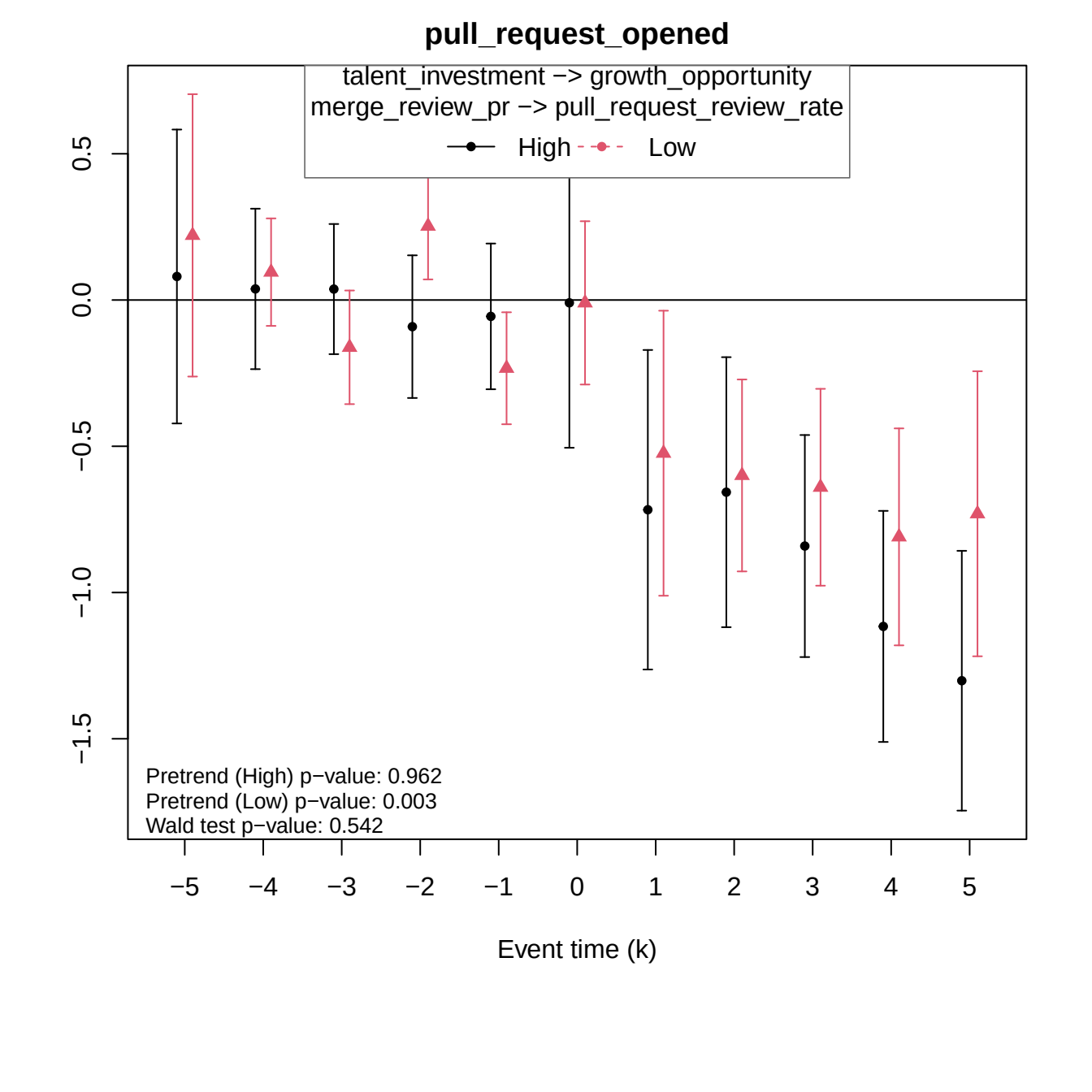

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

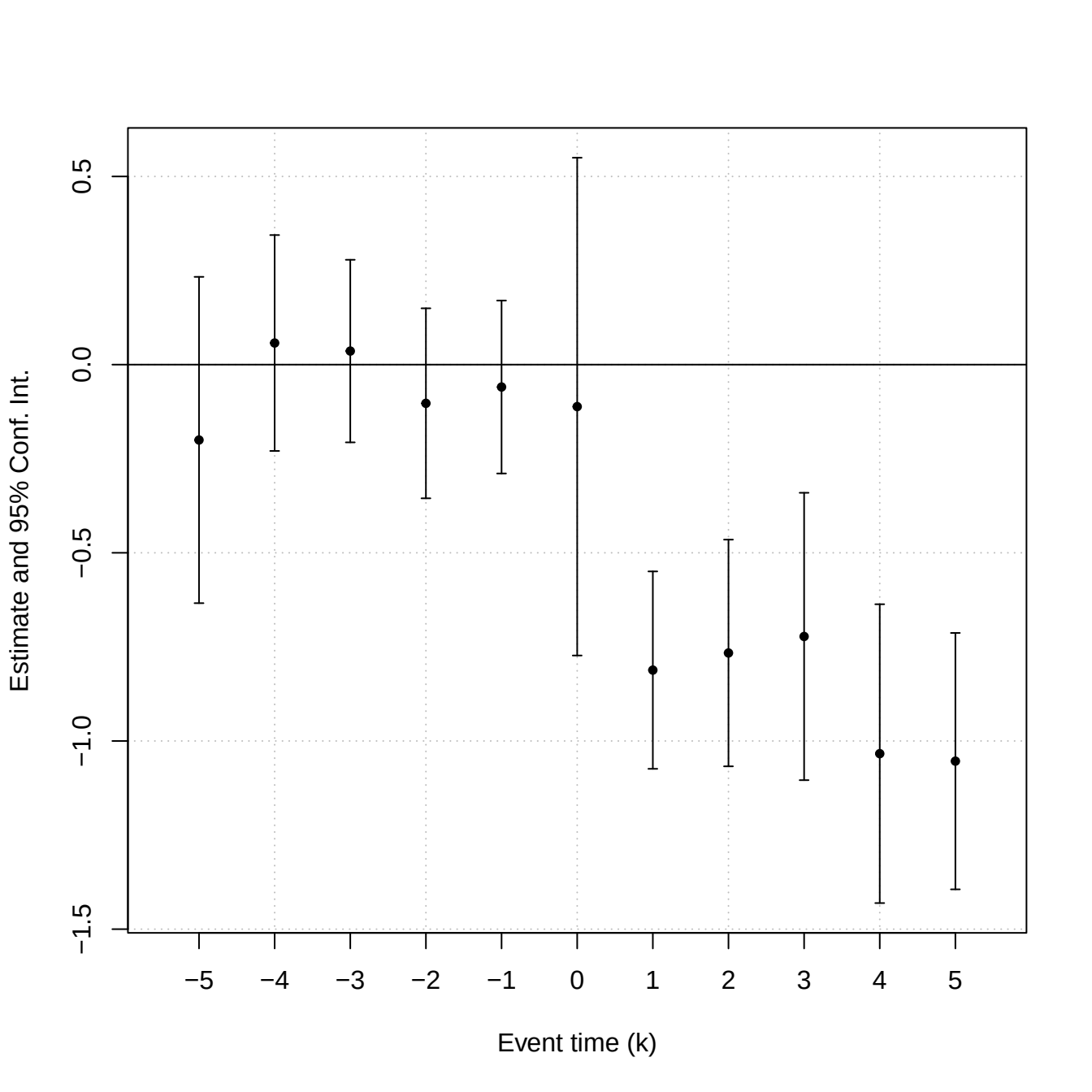

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

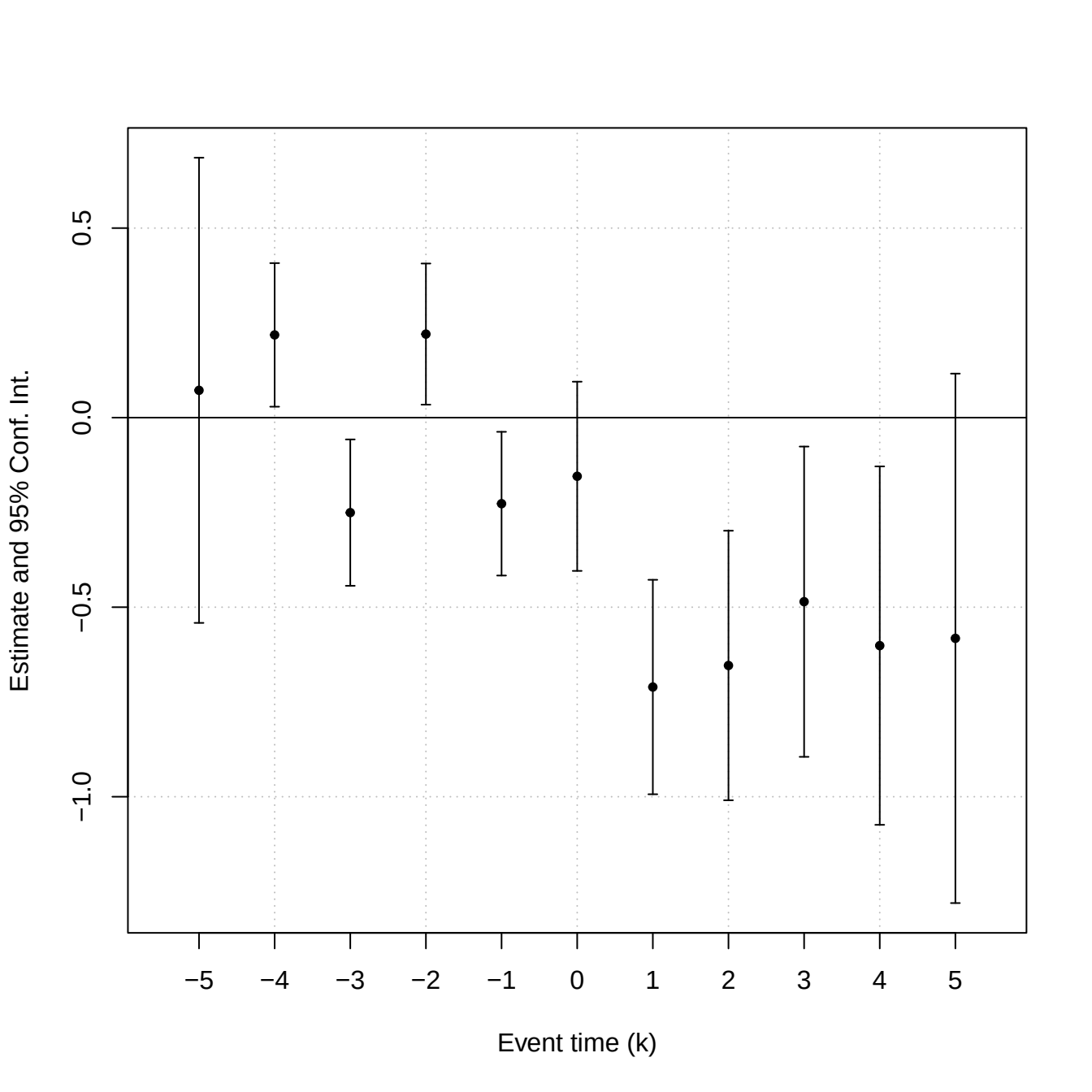

major_minor_release_count
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_merged_rate
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.429
Pretrend (Low) p−value: 0.345
Wald test p−value: 0.139
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

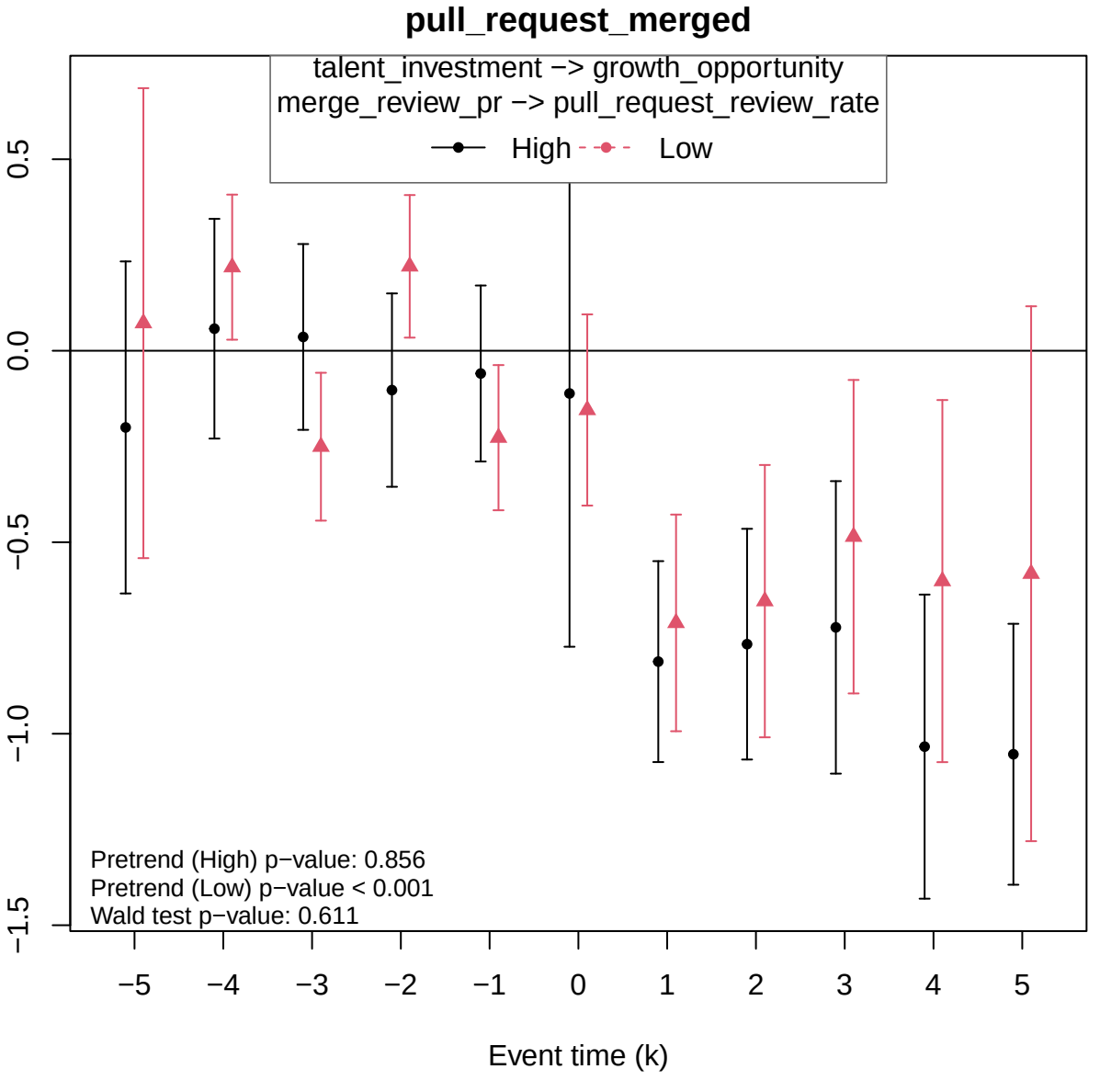

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

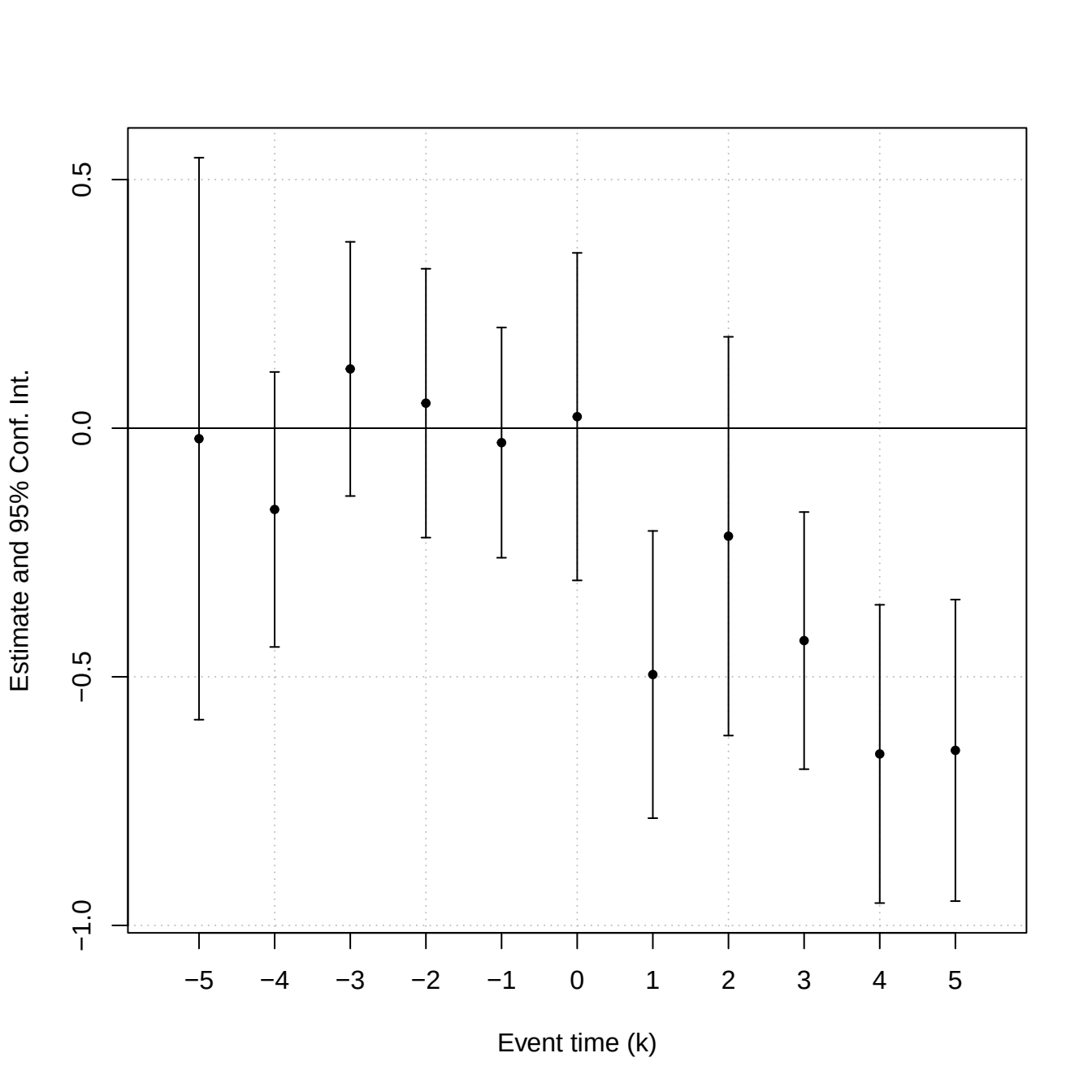

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

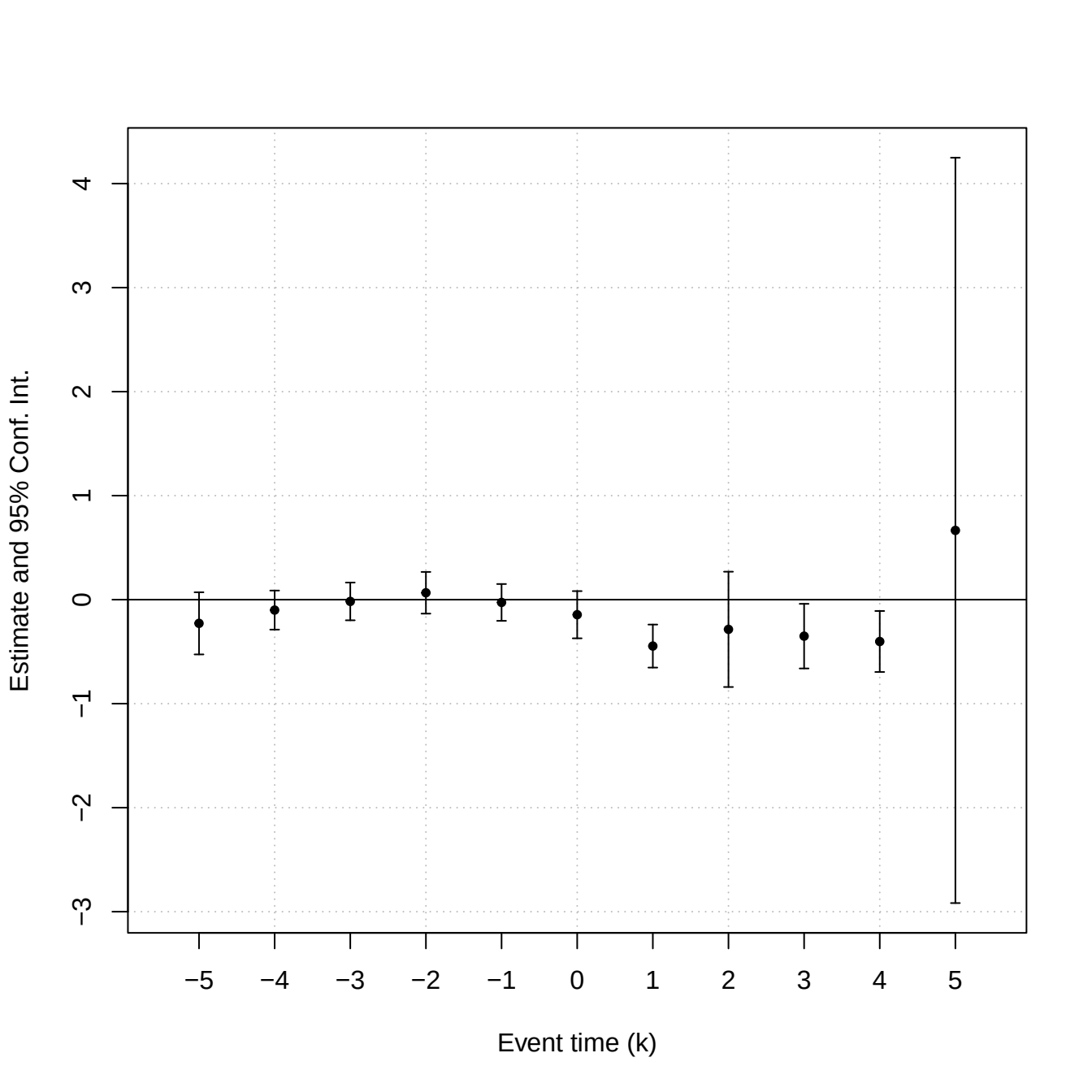

pull_request_opened
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_review_rate
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.962
Pretrend (Low) p−value: 0.003
Wald test p−value: 0.542
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

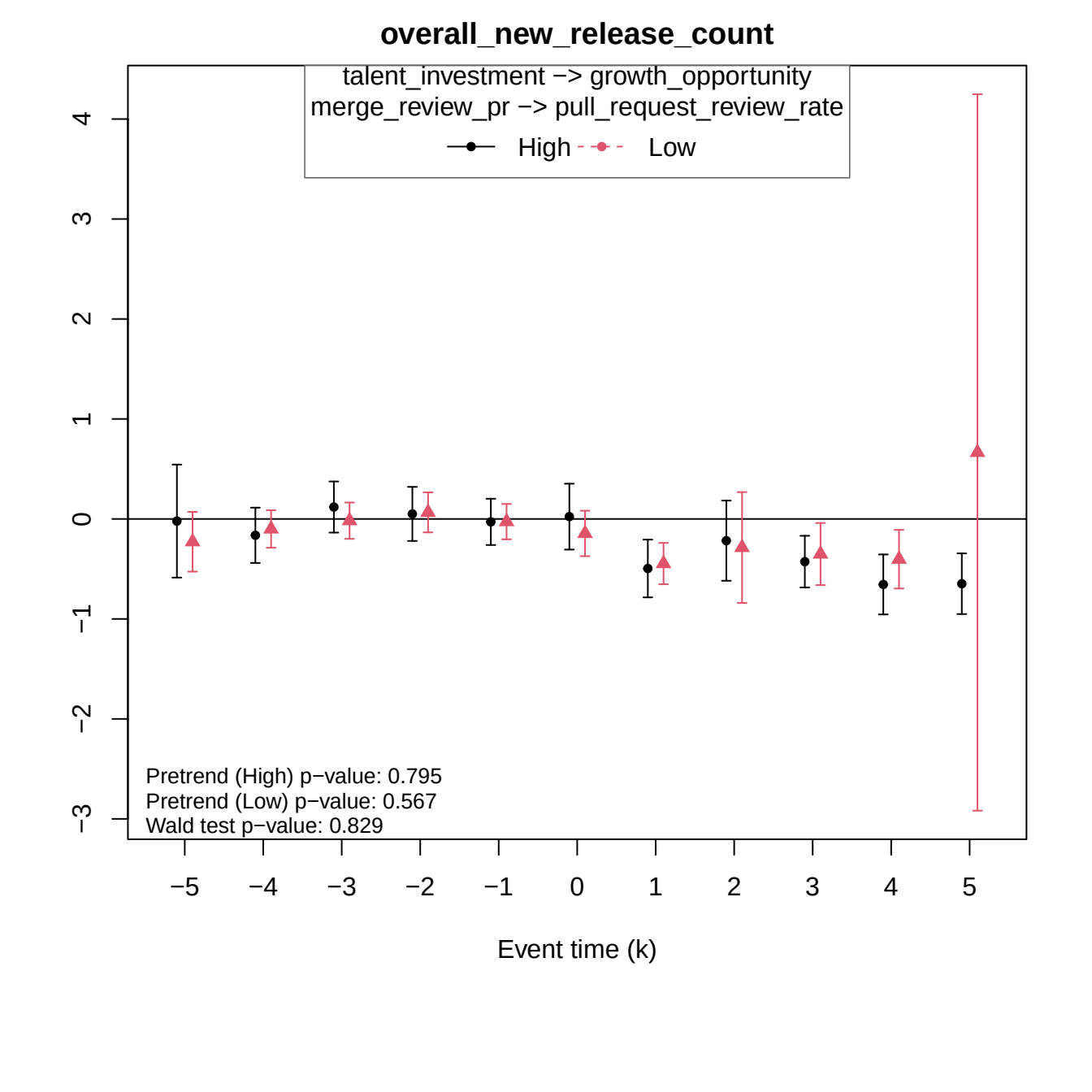

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

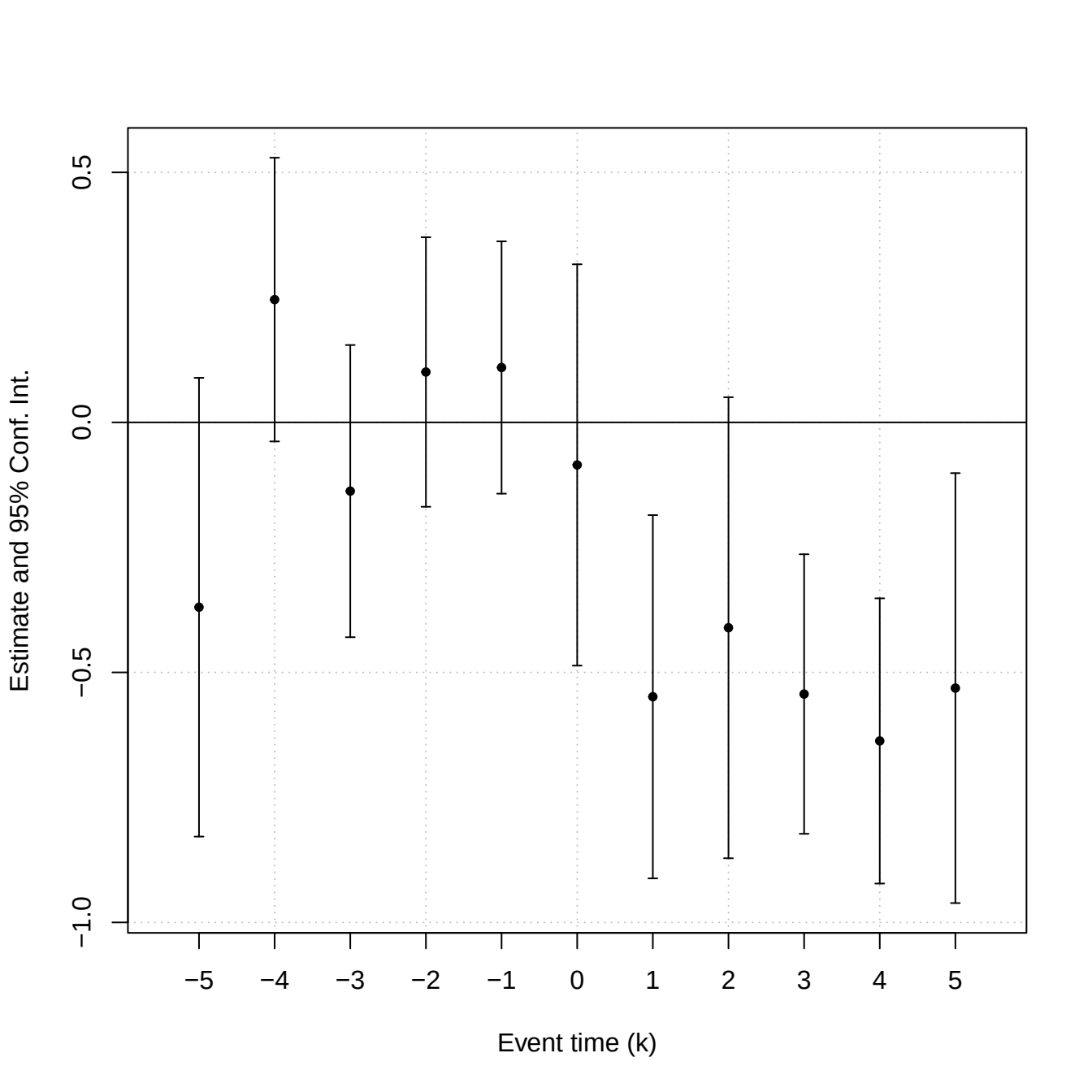

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

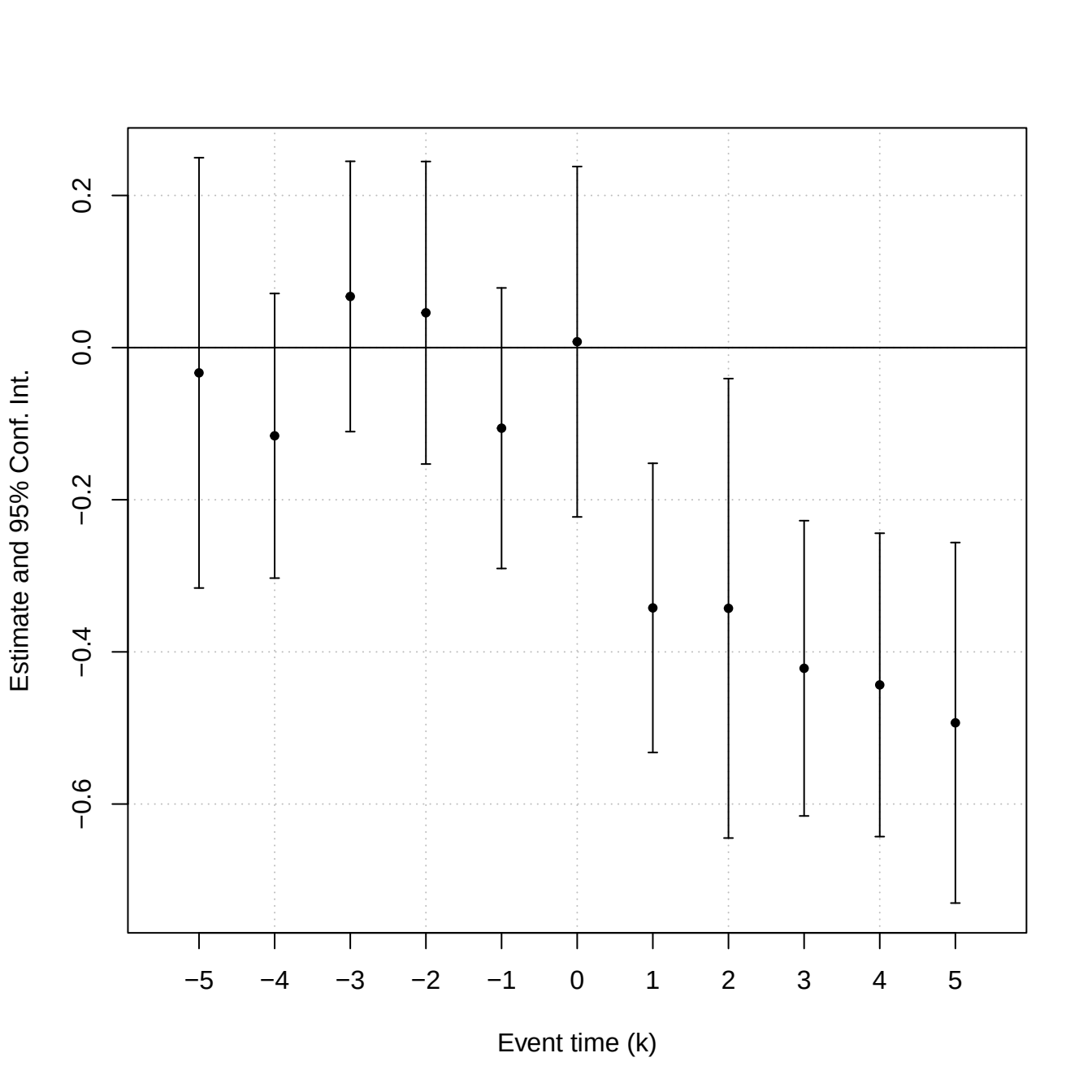

pull_request_merged
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_review_rate
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.856
Pretrend (Low) p−value < 0.001
Wald test p−value: 0.611
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

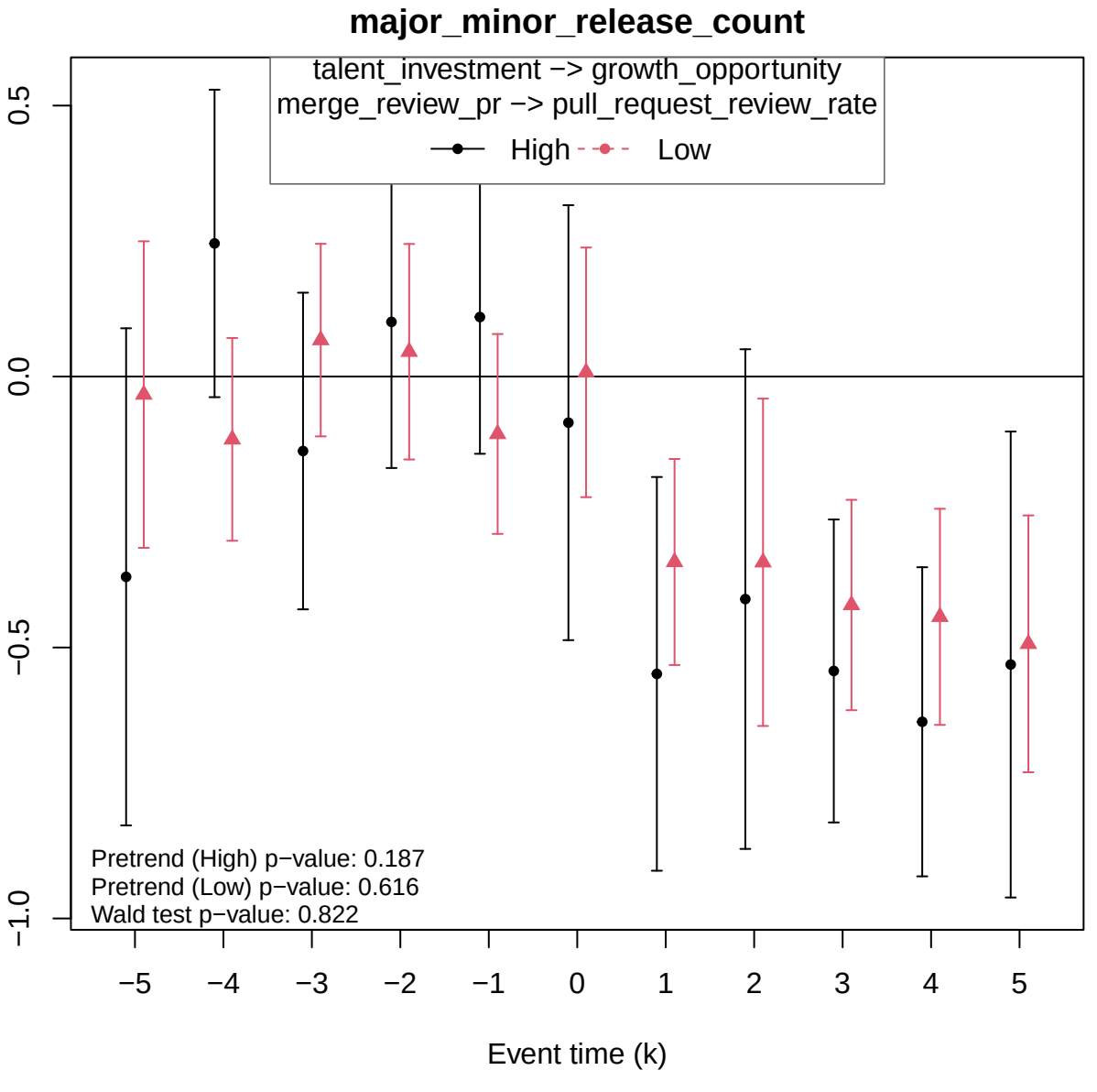

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

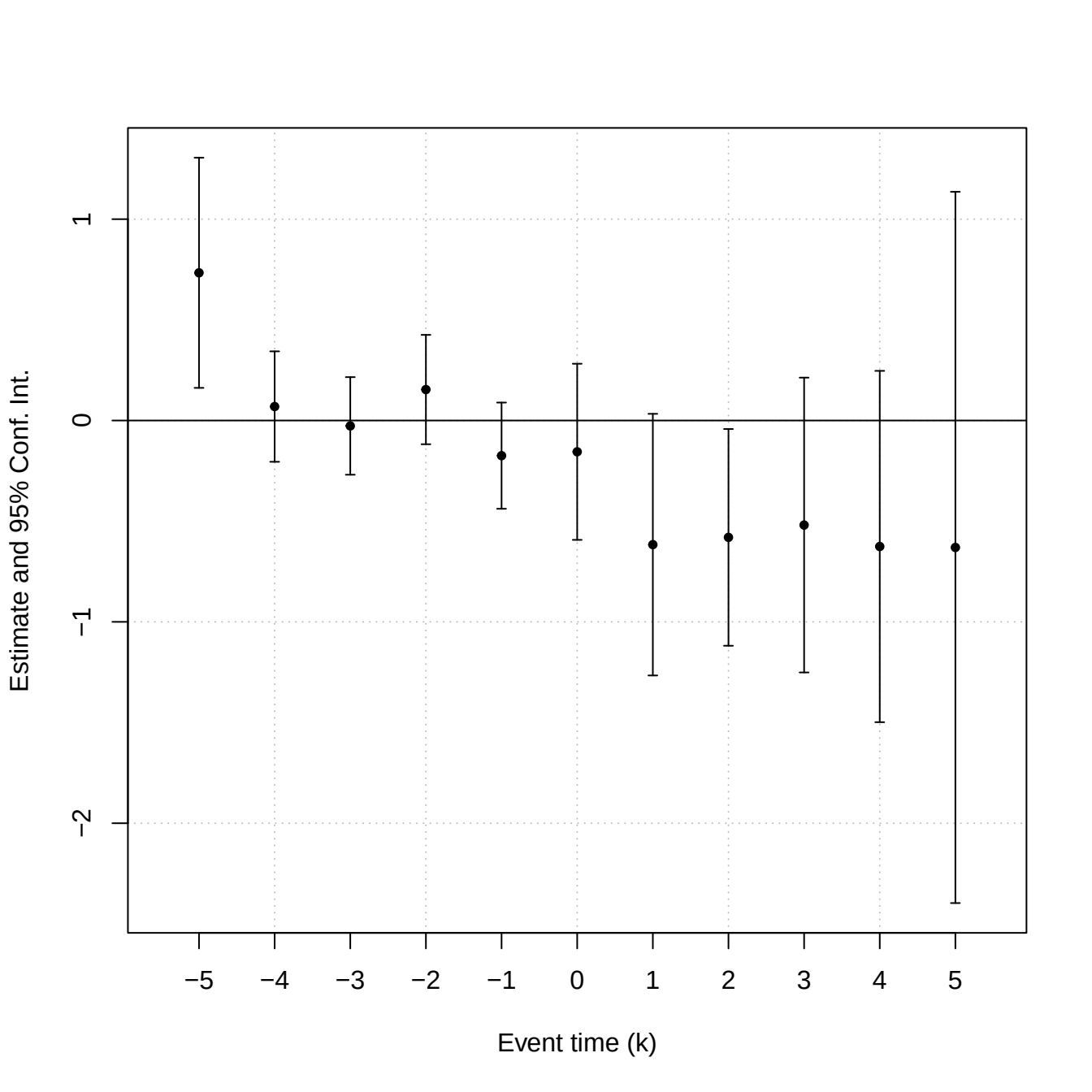

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

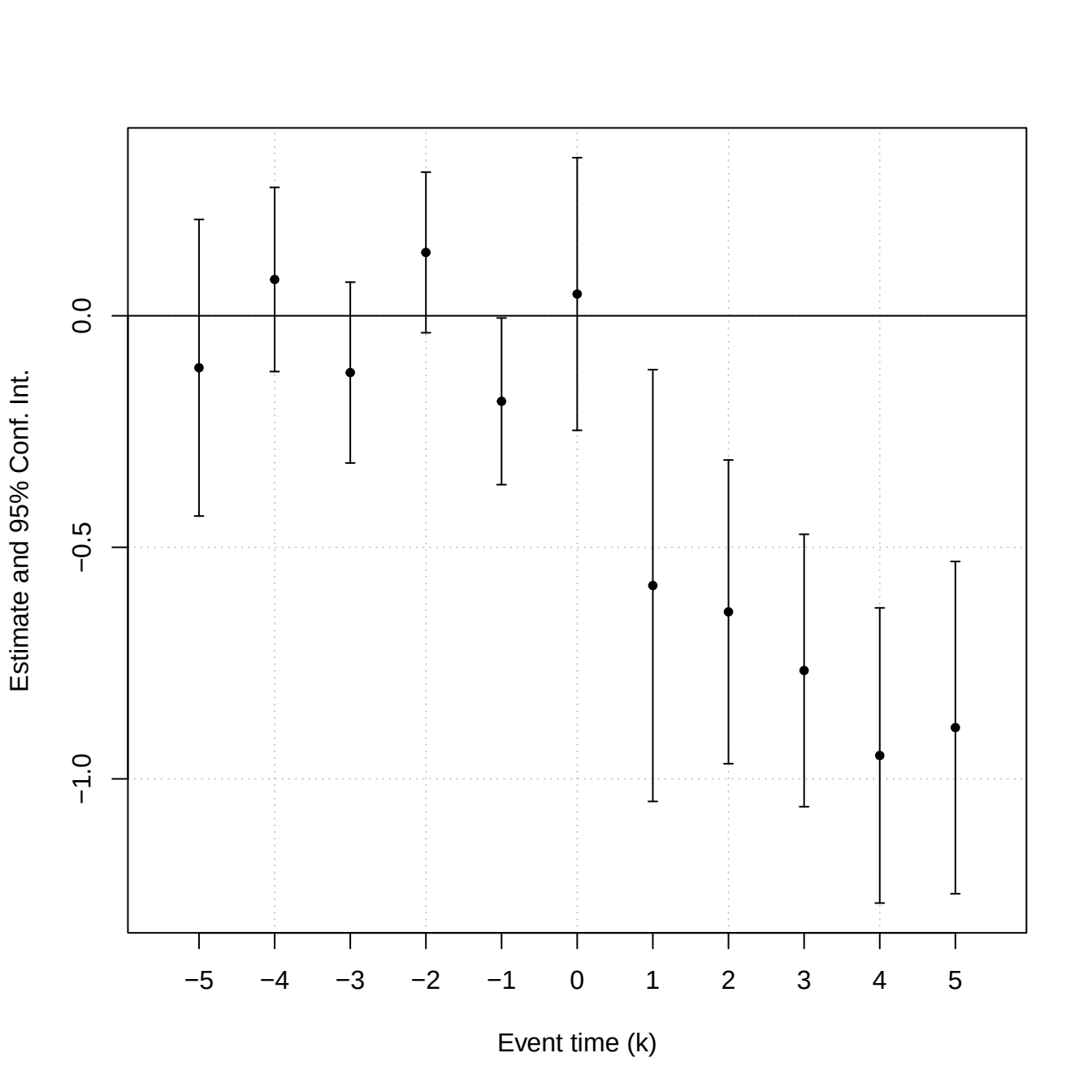

overall_new_release_count
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_review_rate
High
Low
Pretrend (High) p−value: 0.795
Pretrend (Low) p−value: 0.567
Wald test p−value: 0.829
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

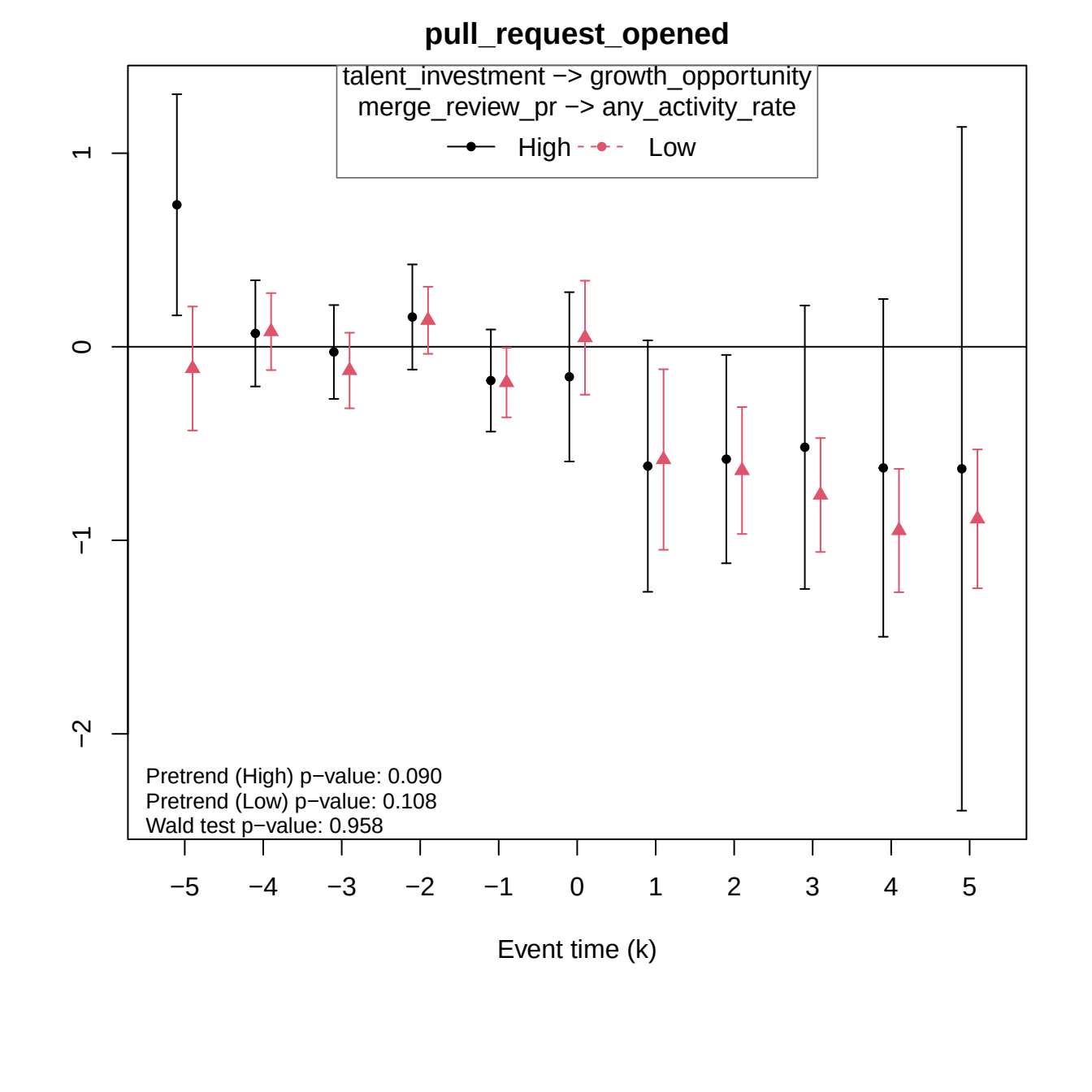

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

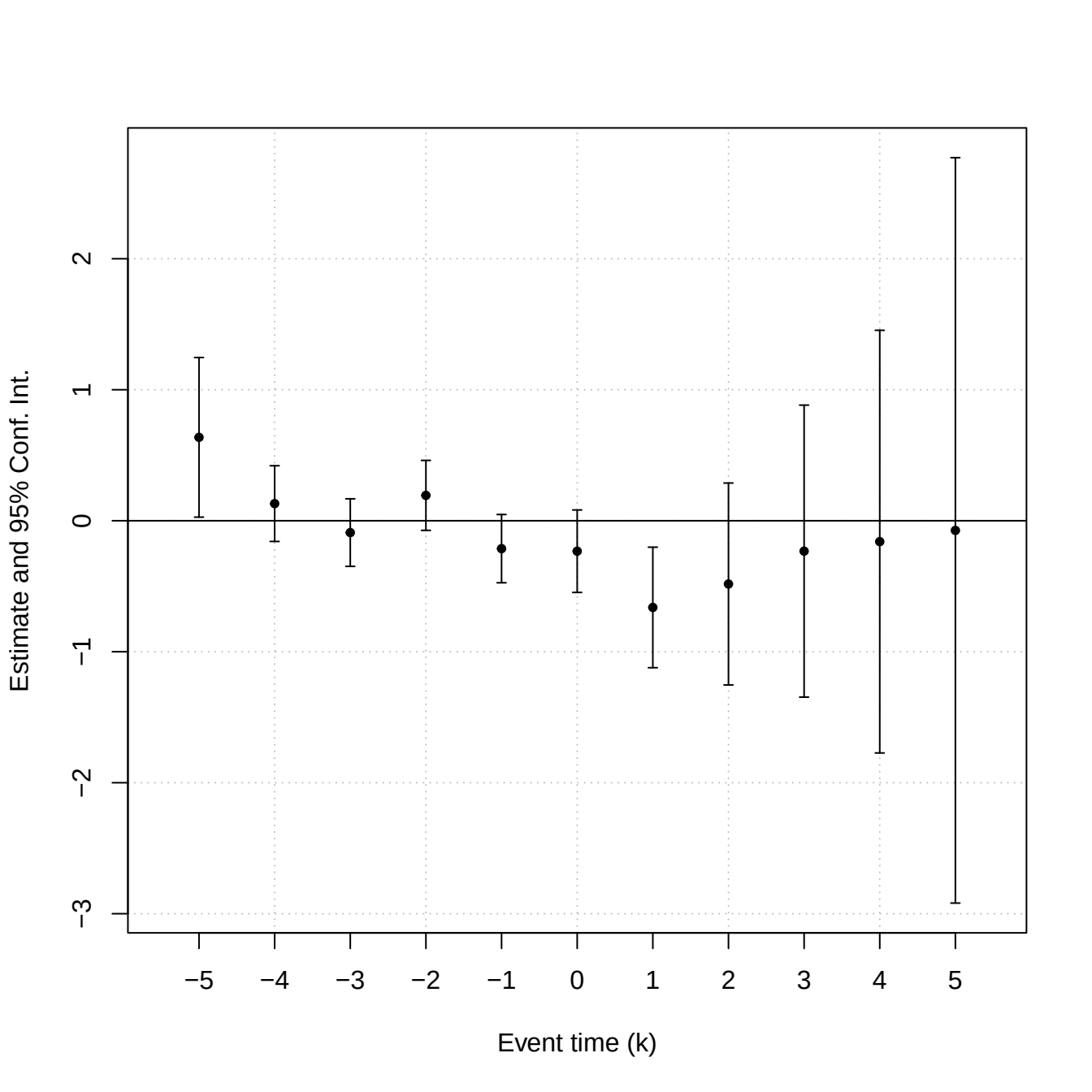

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

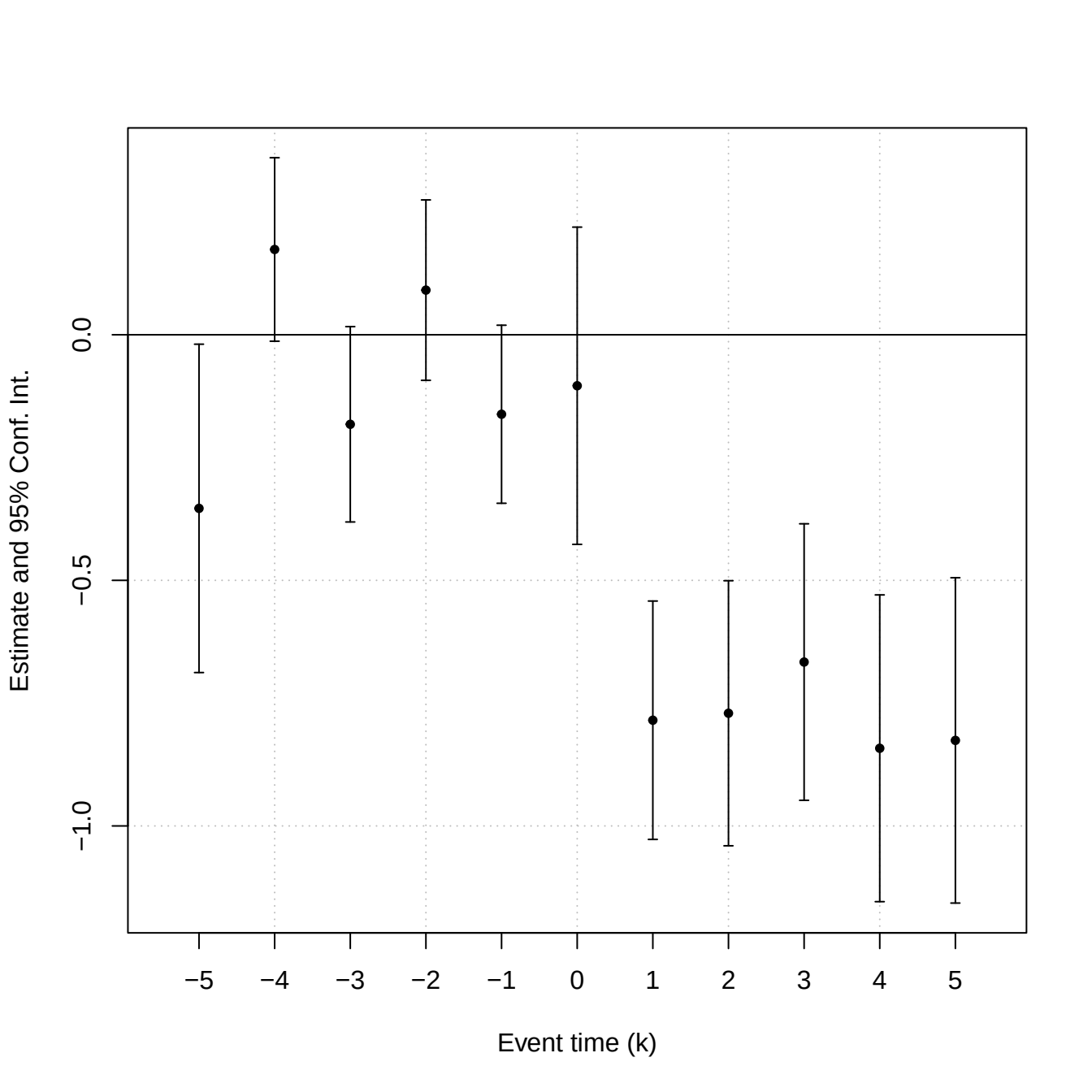

major_minor_release_count
talent_investment −> growth_opportunity
merge_review_pr −> pull_request_review_rate
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.187
Pretrend (Low) p−value: 0.616
Wald test p−value: 0.822
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

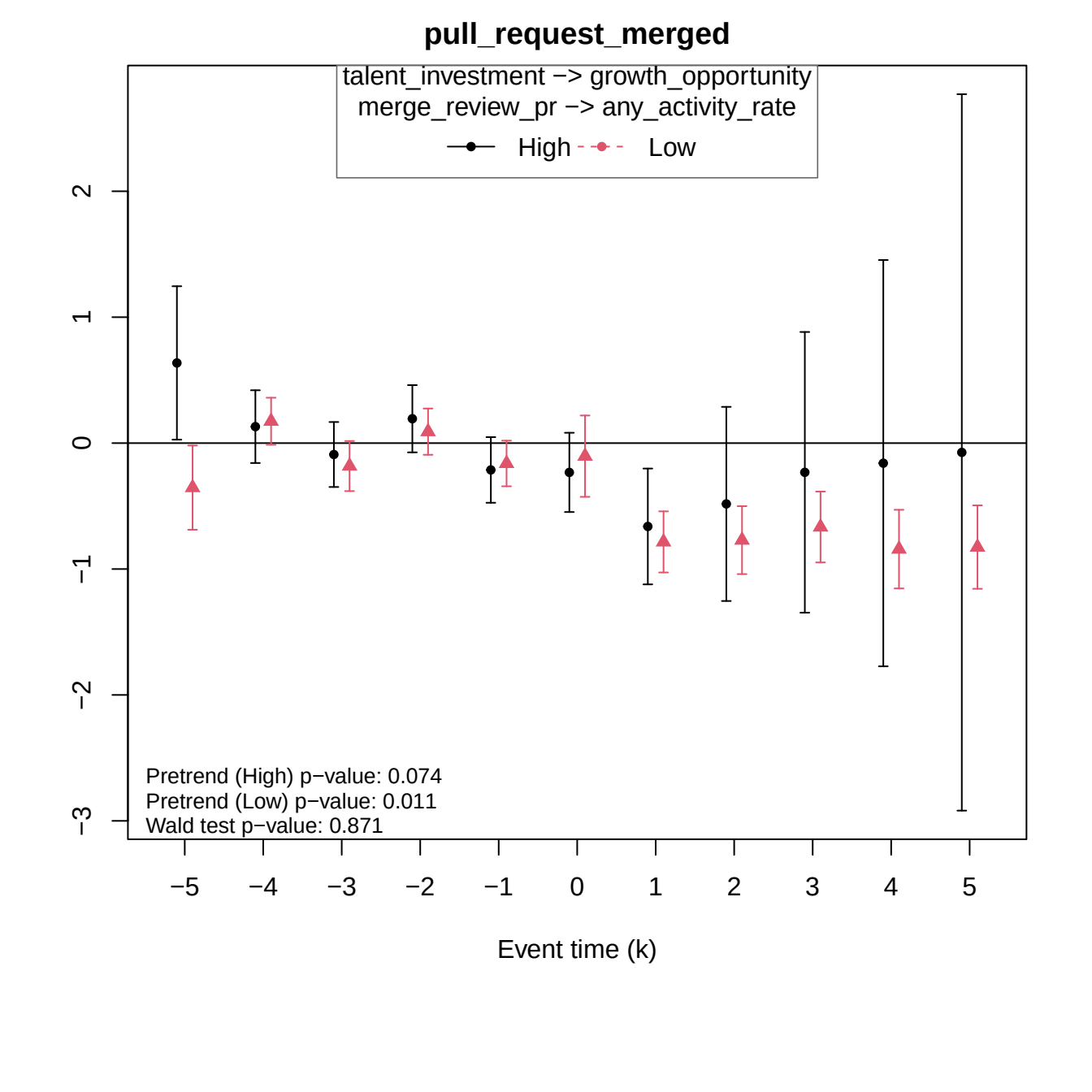

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

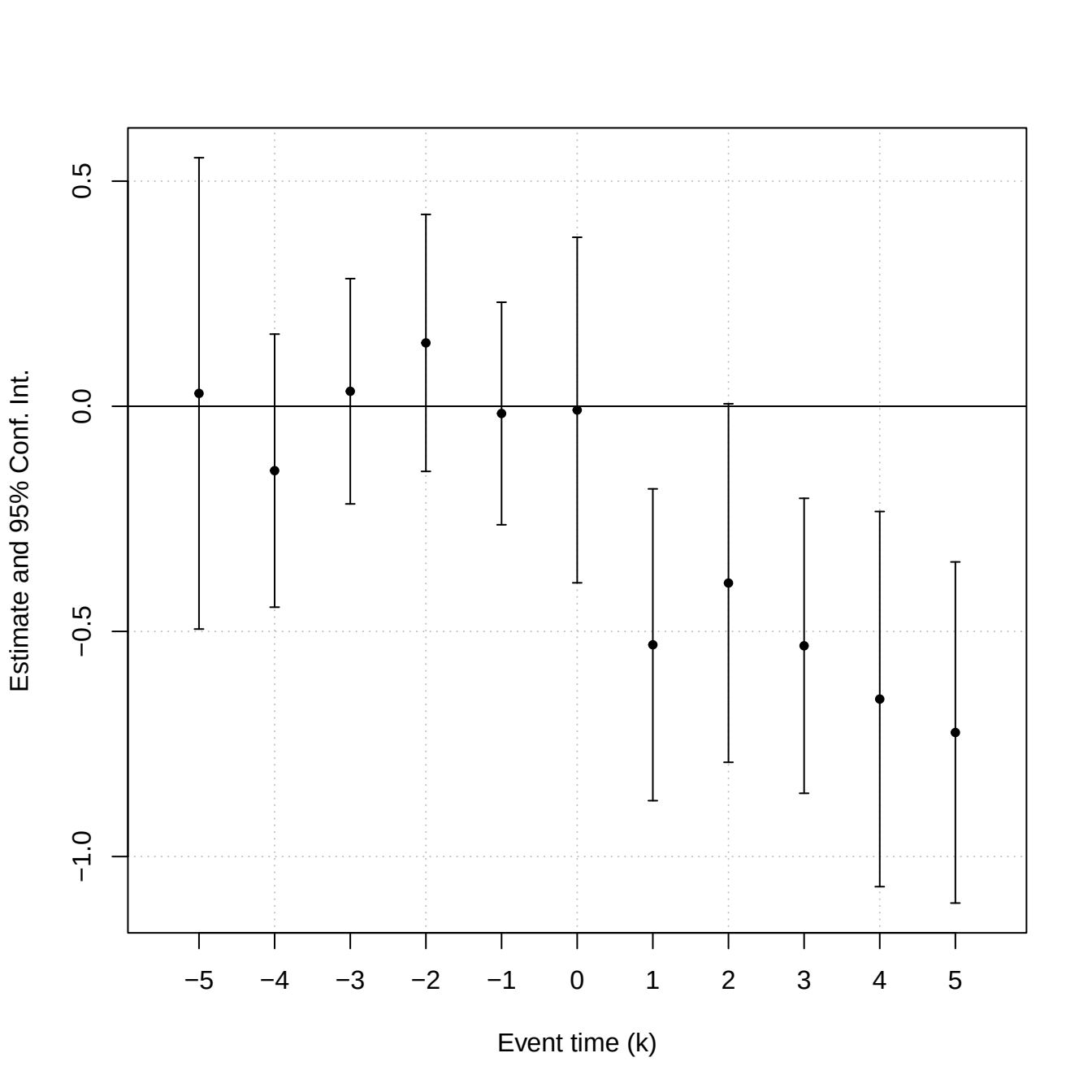

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

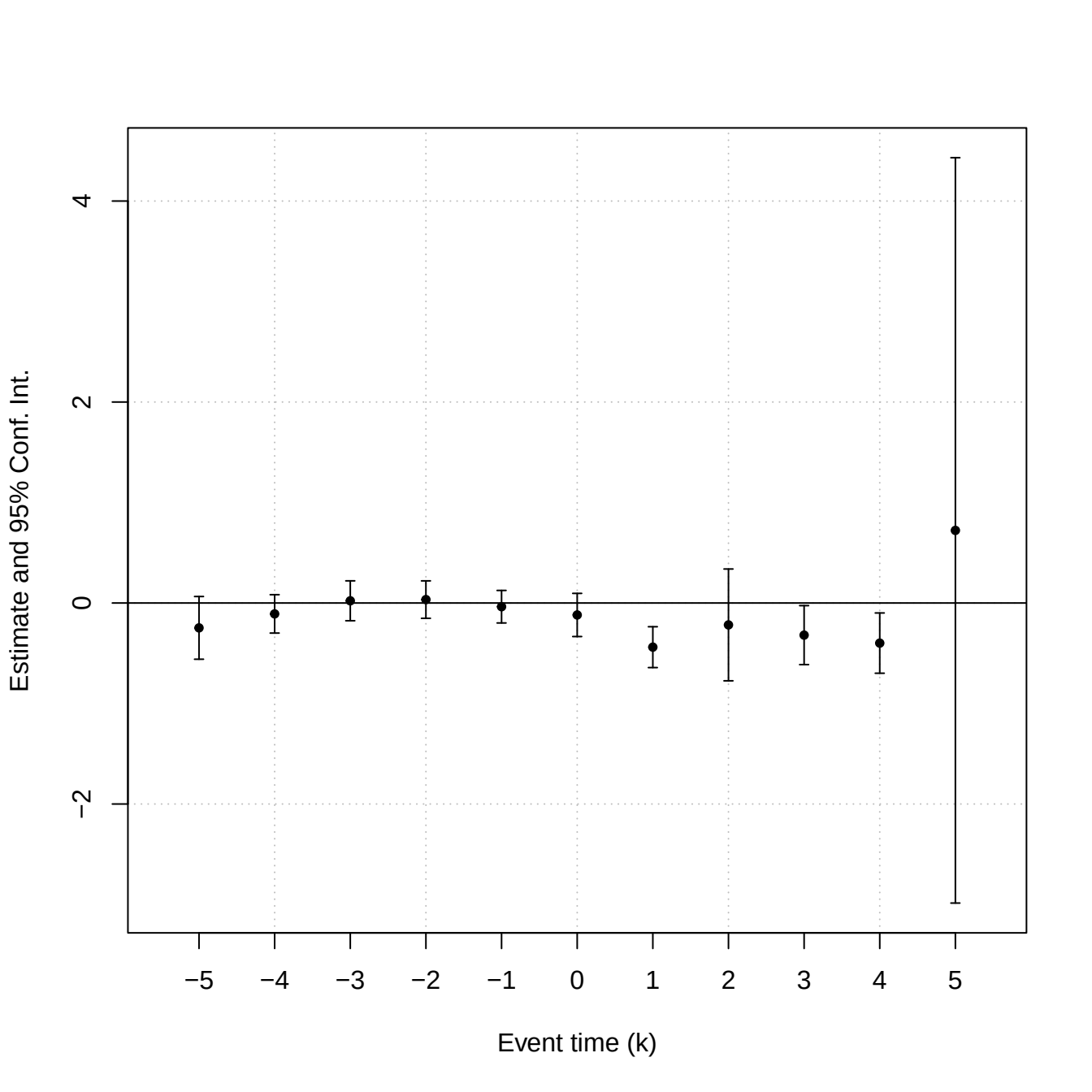

pull_request_opened
talent_investment −> growth_opportunity
merge_review_pr −> any_activity_rate
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.090
Pretrend (Low) p−value: 0.108
Wald test p−value: 0.958
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

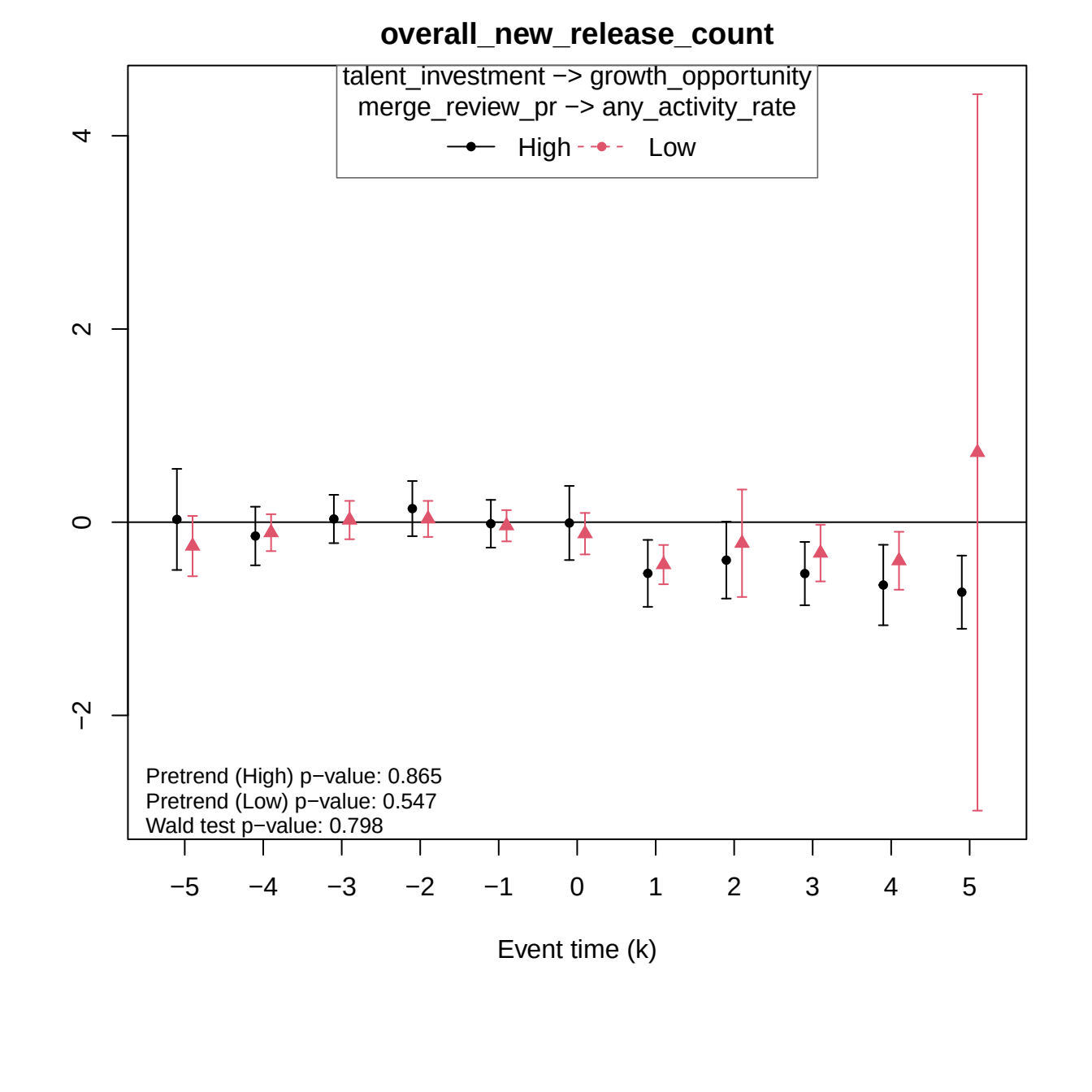

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

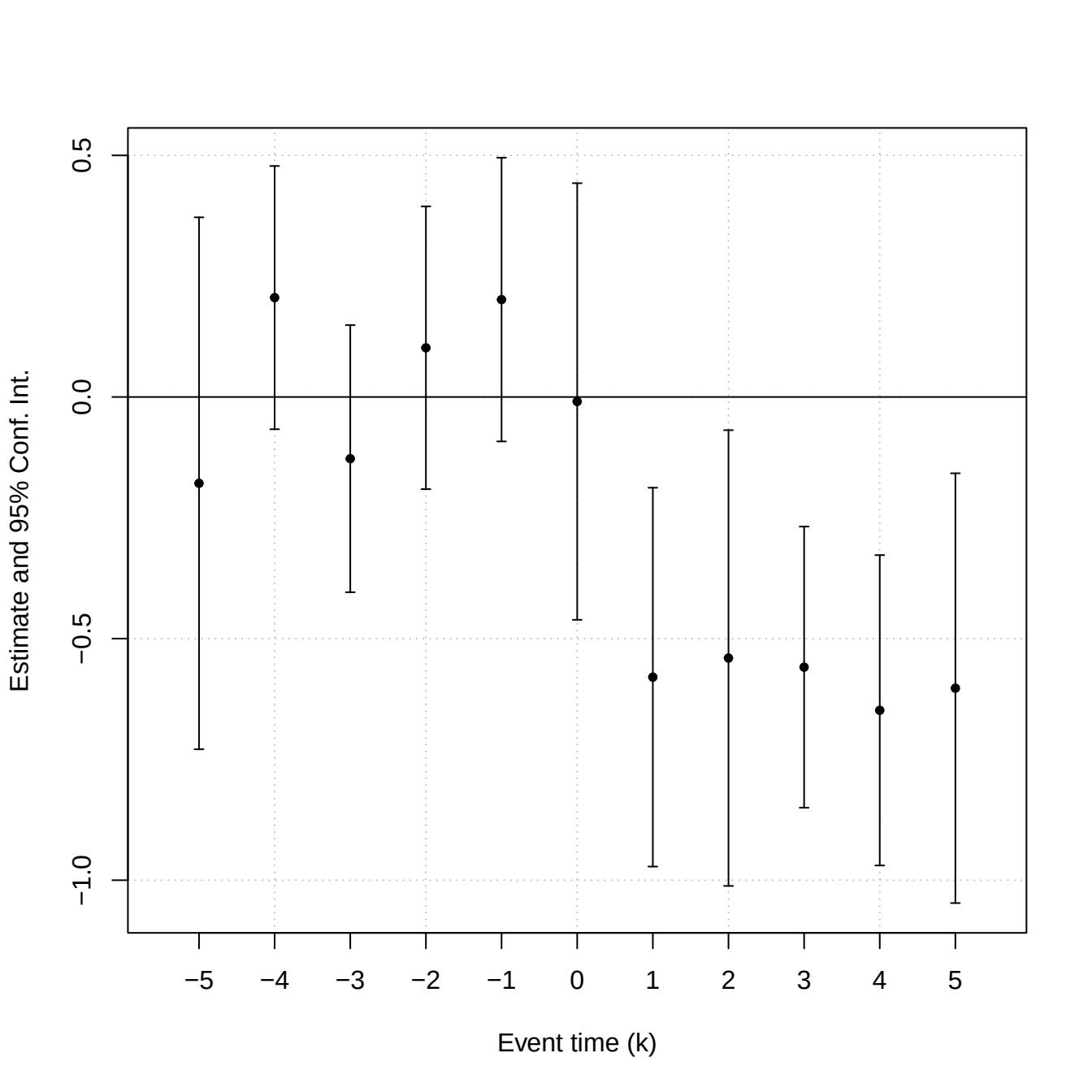

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

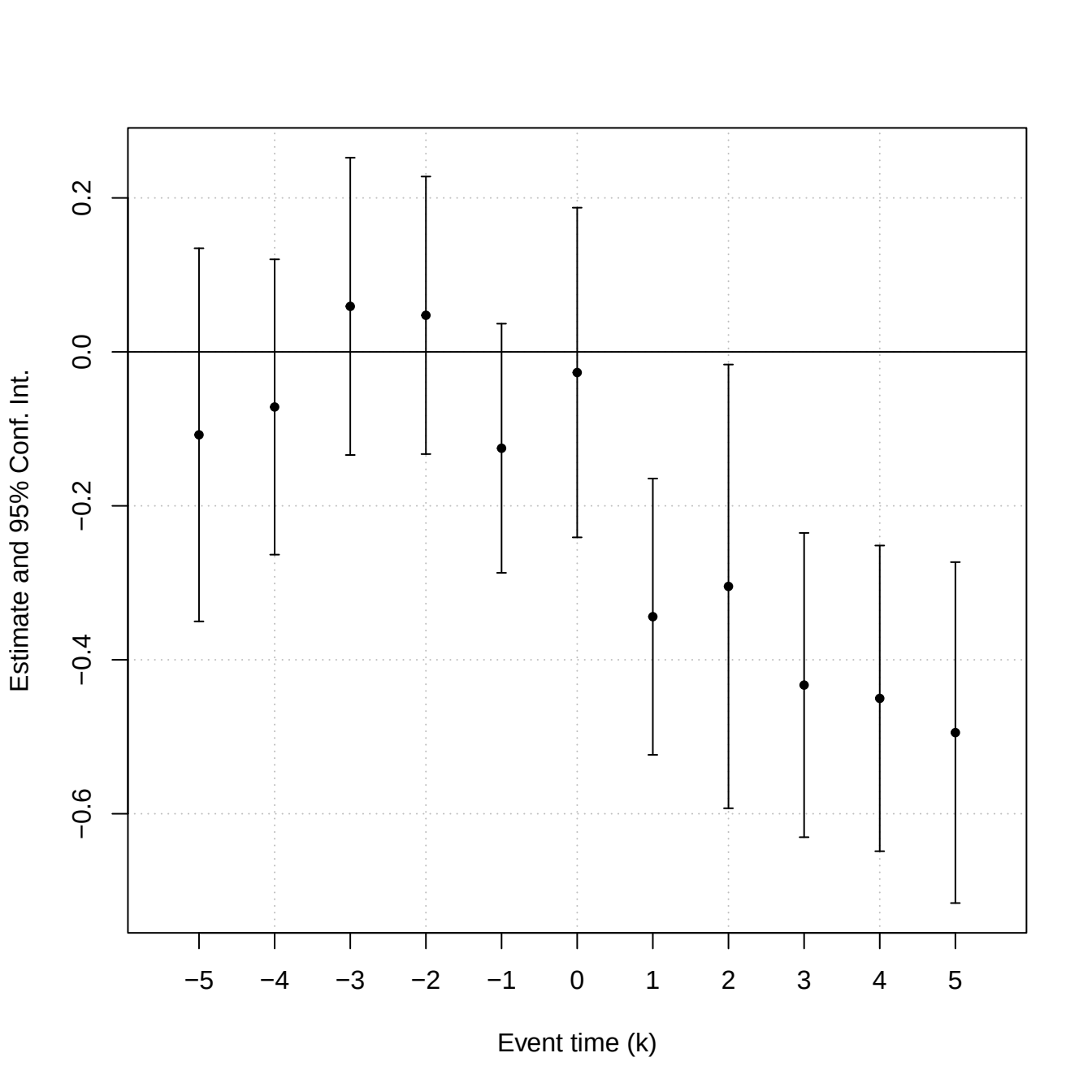

pull_request_merged
talent_investment −> growth_opportunity
merge_review_pr −> any_activity_rate
High
Low
Pretrend (High) p−value: 0.074
Pretrend (Low) p−value: 0.011
Wald test p−value: 0.871
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

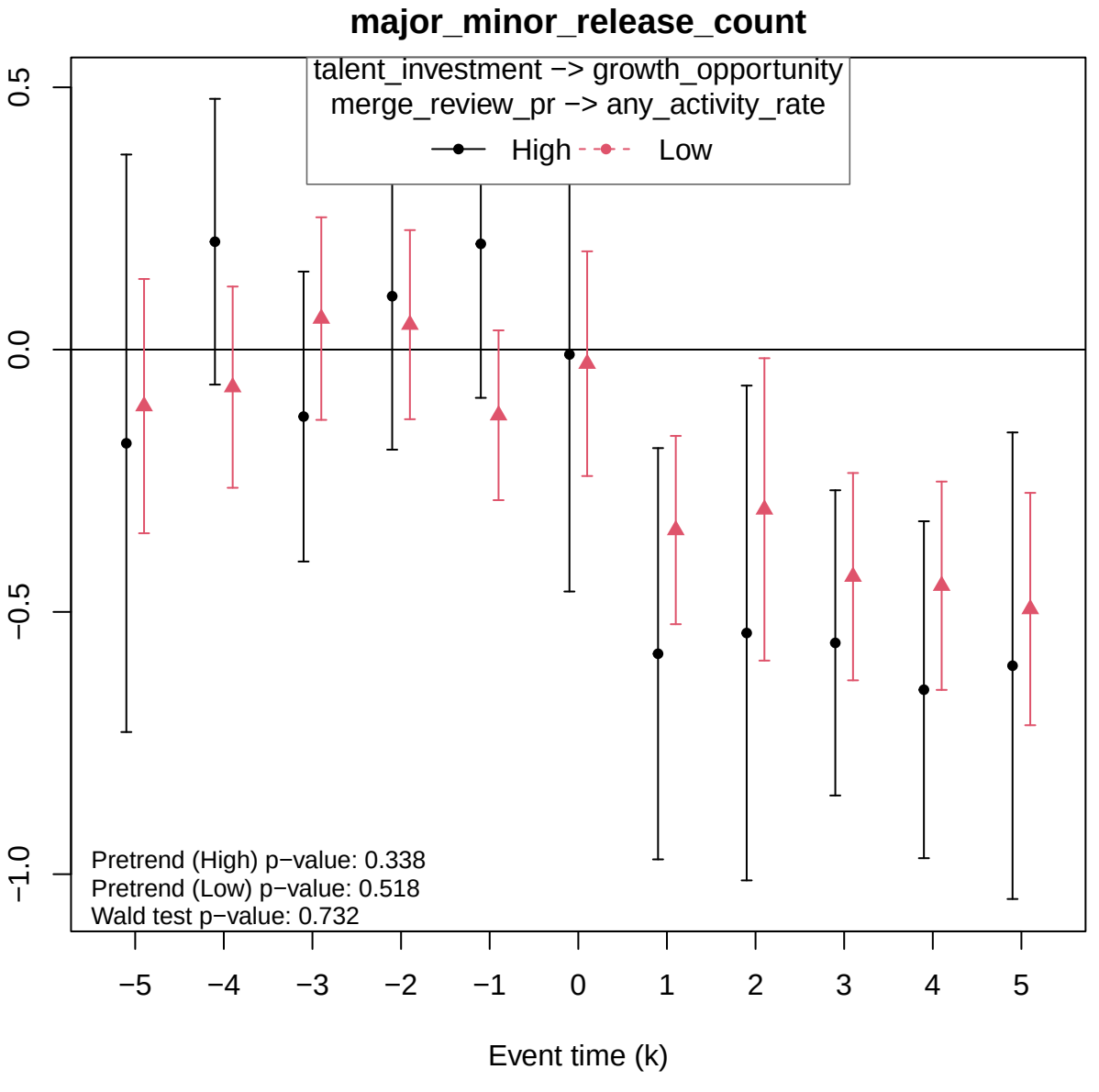

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

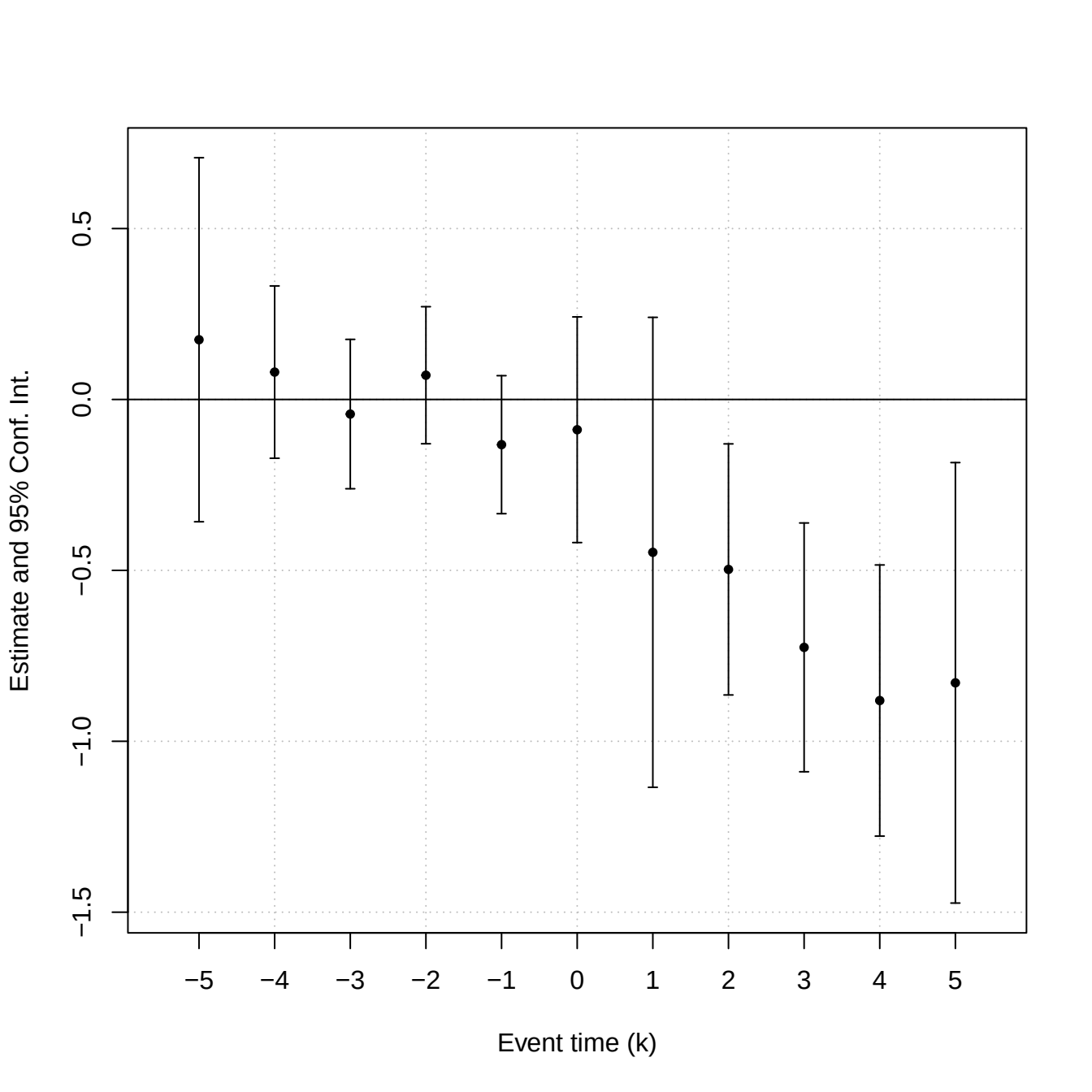

Estimate and 95% Conf. Int.
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

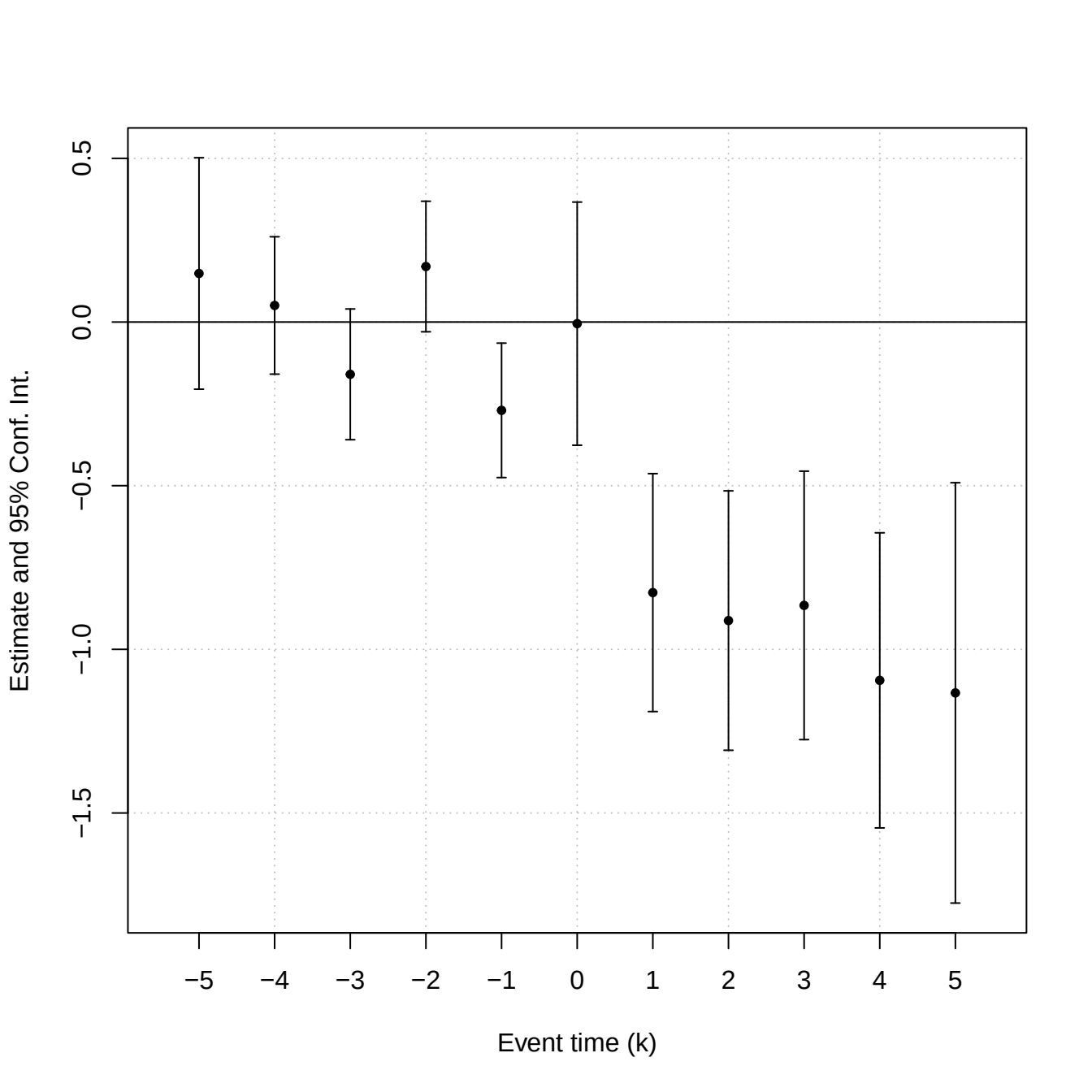

overall_new_release_count
talent_investment −> growth_opportunity
merge_review_pr −> any_activity_rate
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.865
Pretrend (Low) p−value: 0.547
Wald test p−value: 0.798
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

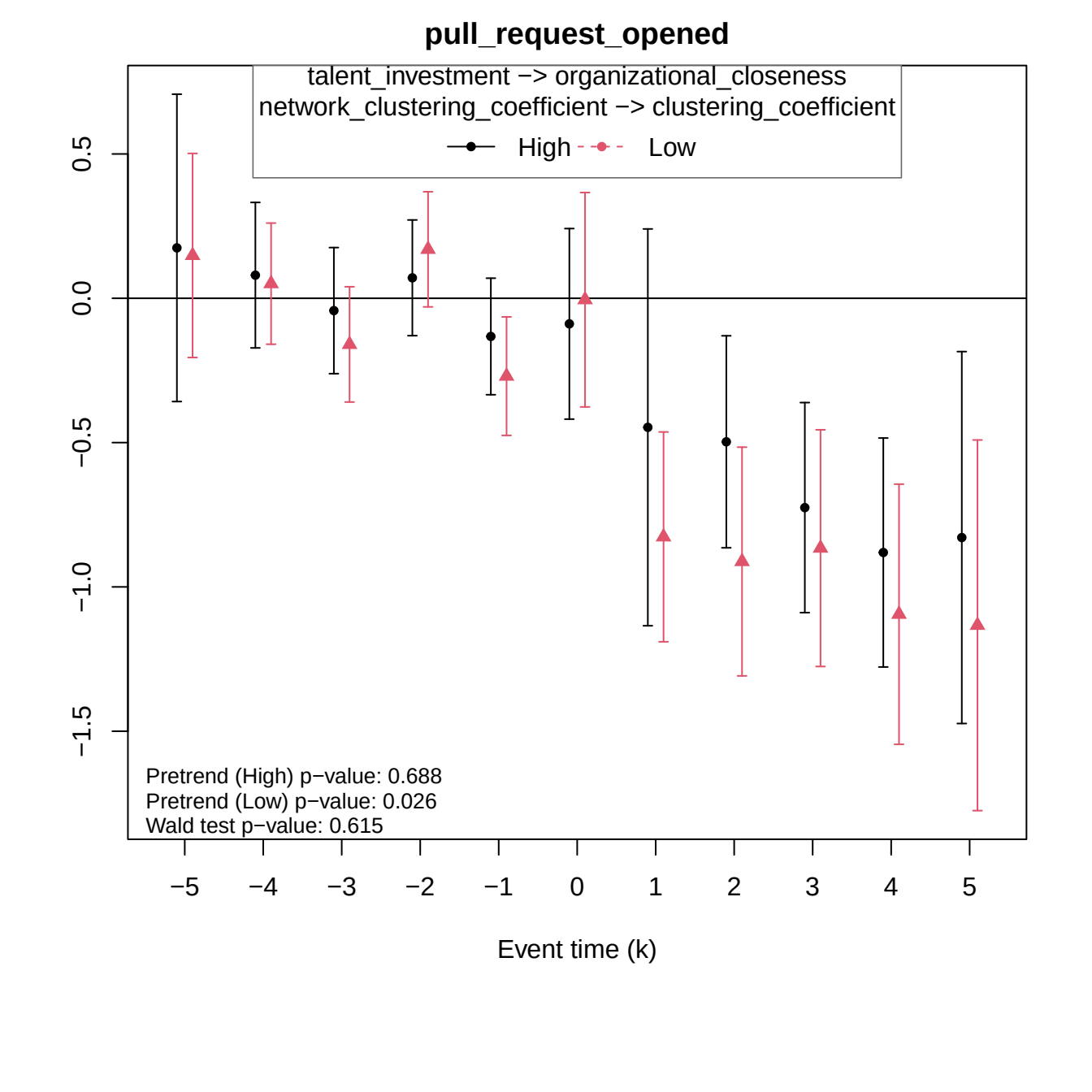

0.5
0.0
−0.5
−1.0
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

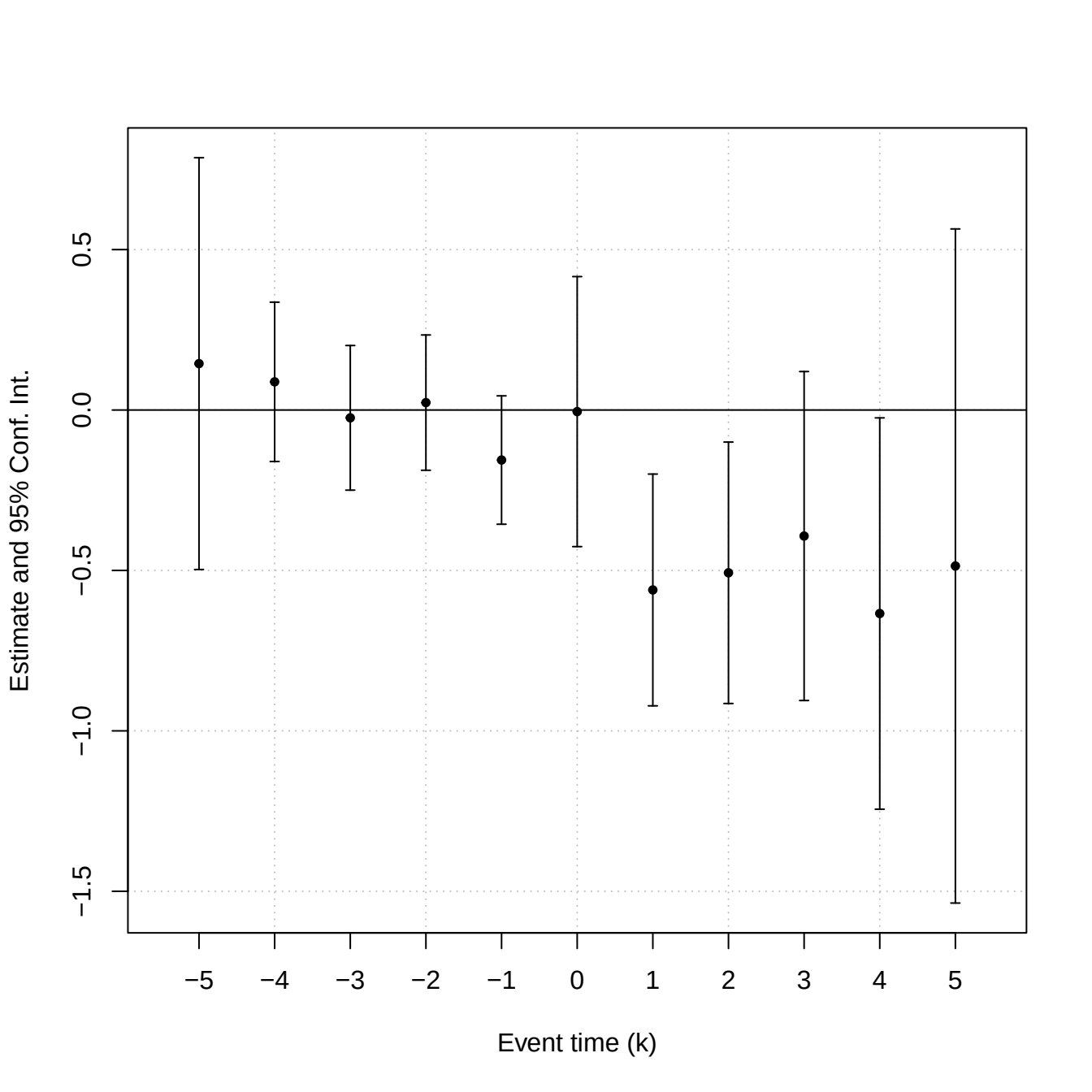

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

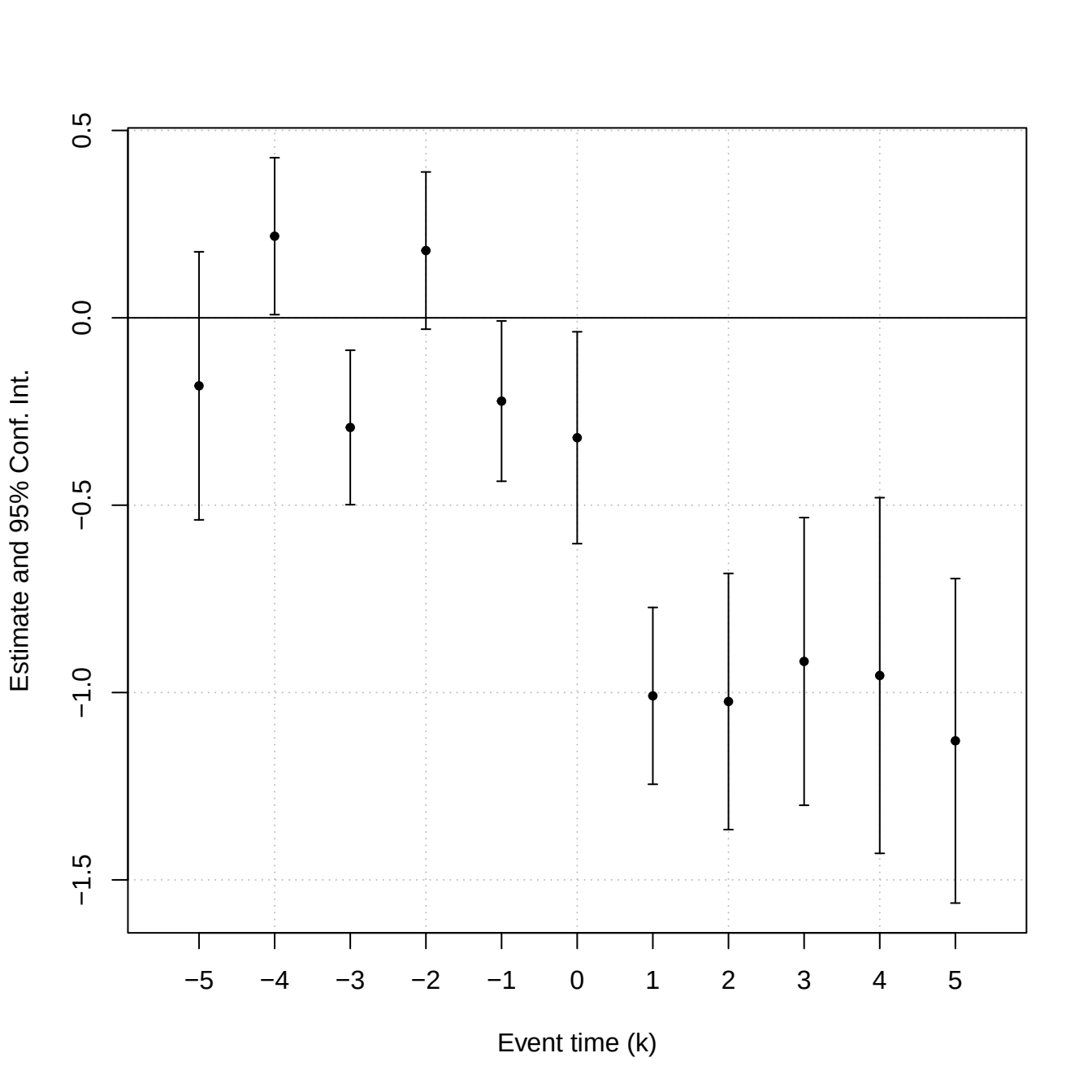

major_minor_release_count
talent_investment −> growth_opportunity
merge_review_pr −> any_activity_rate
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.338
Pretrend (Low) p−value: 0.518
Wald test p−value: 0.732
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

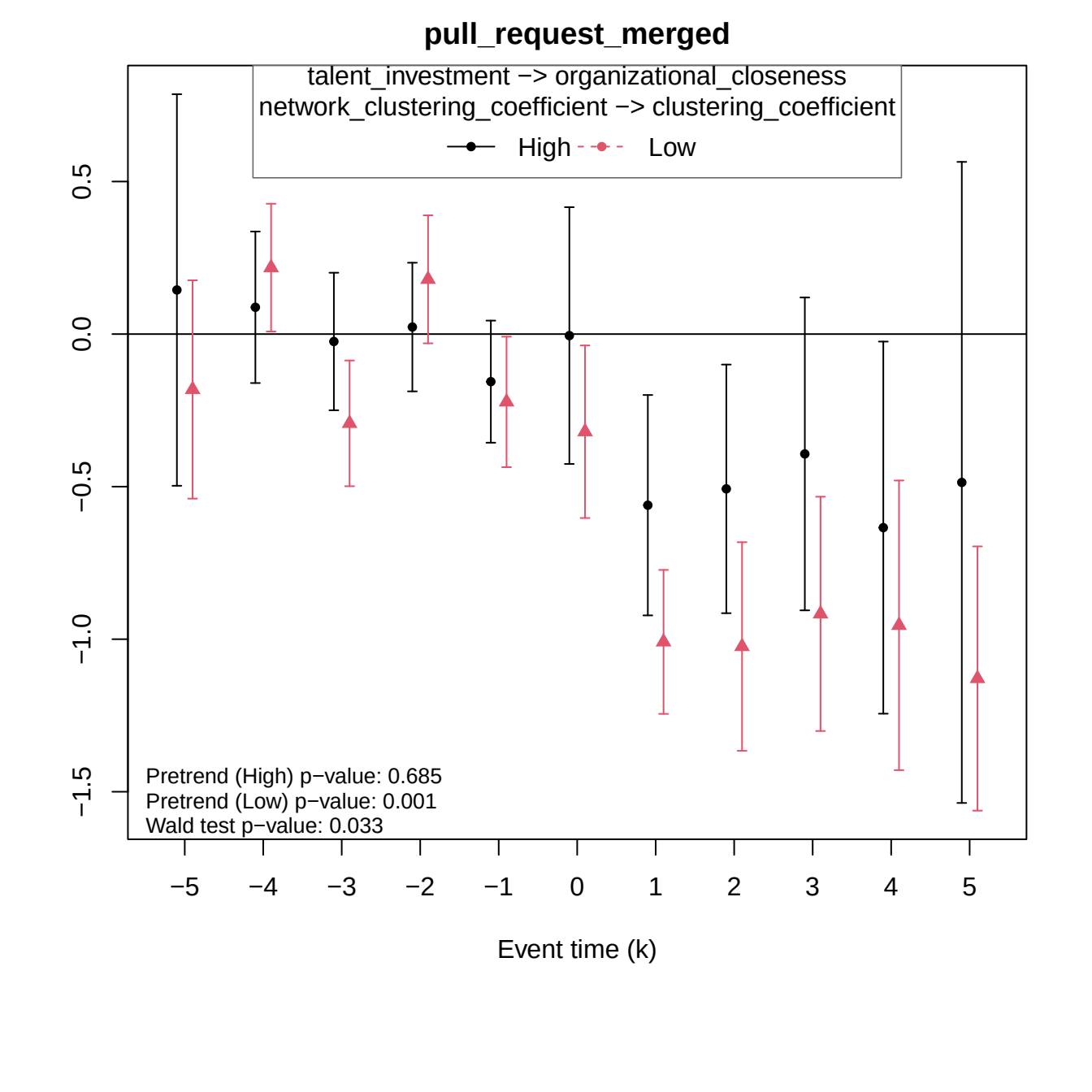

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

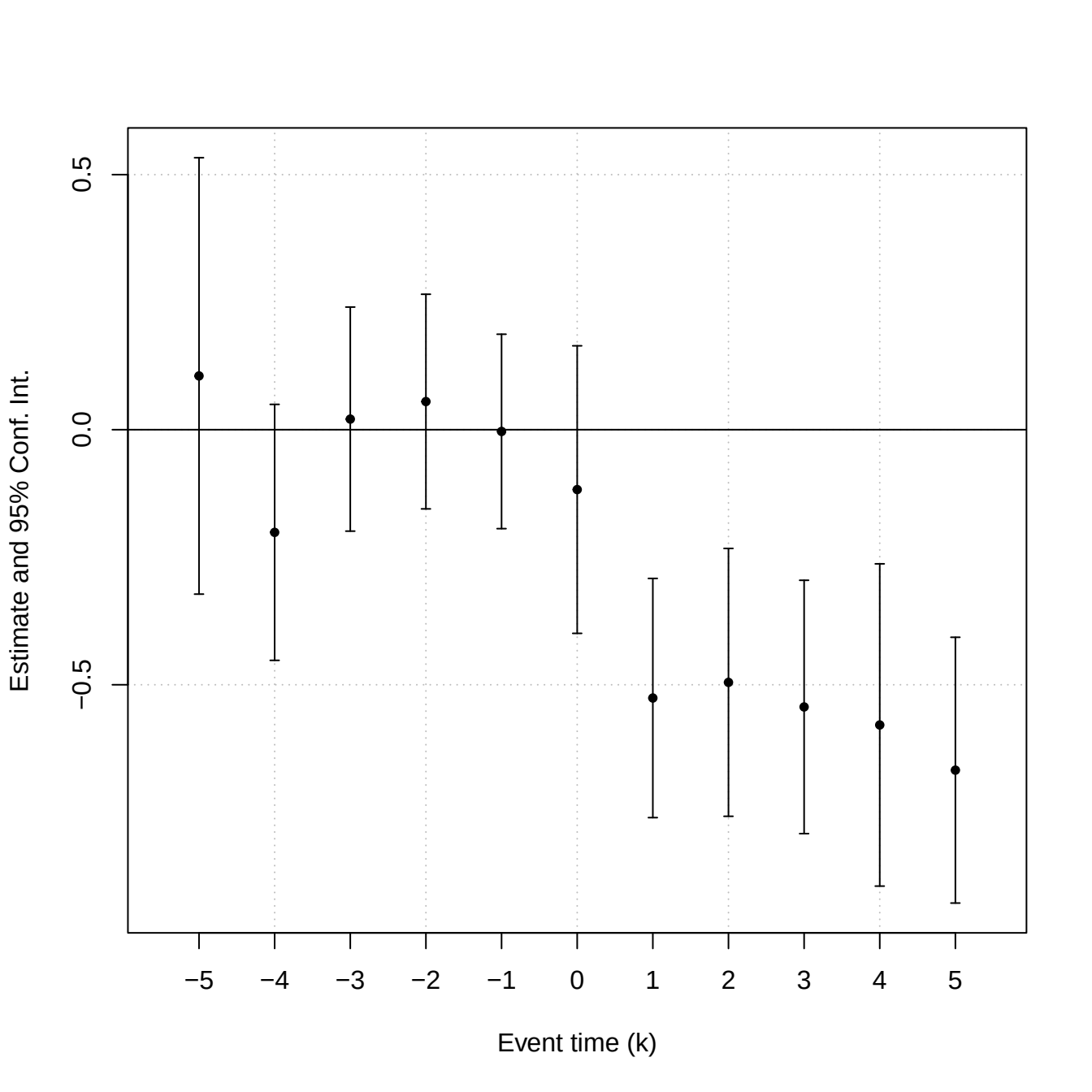

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

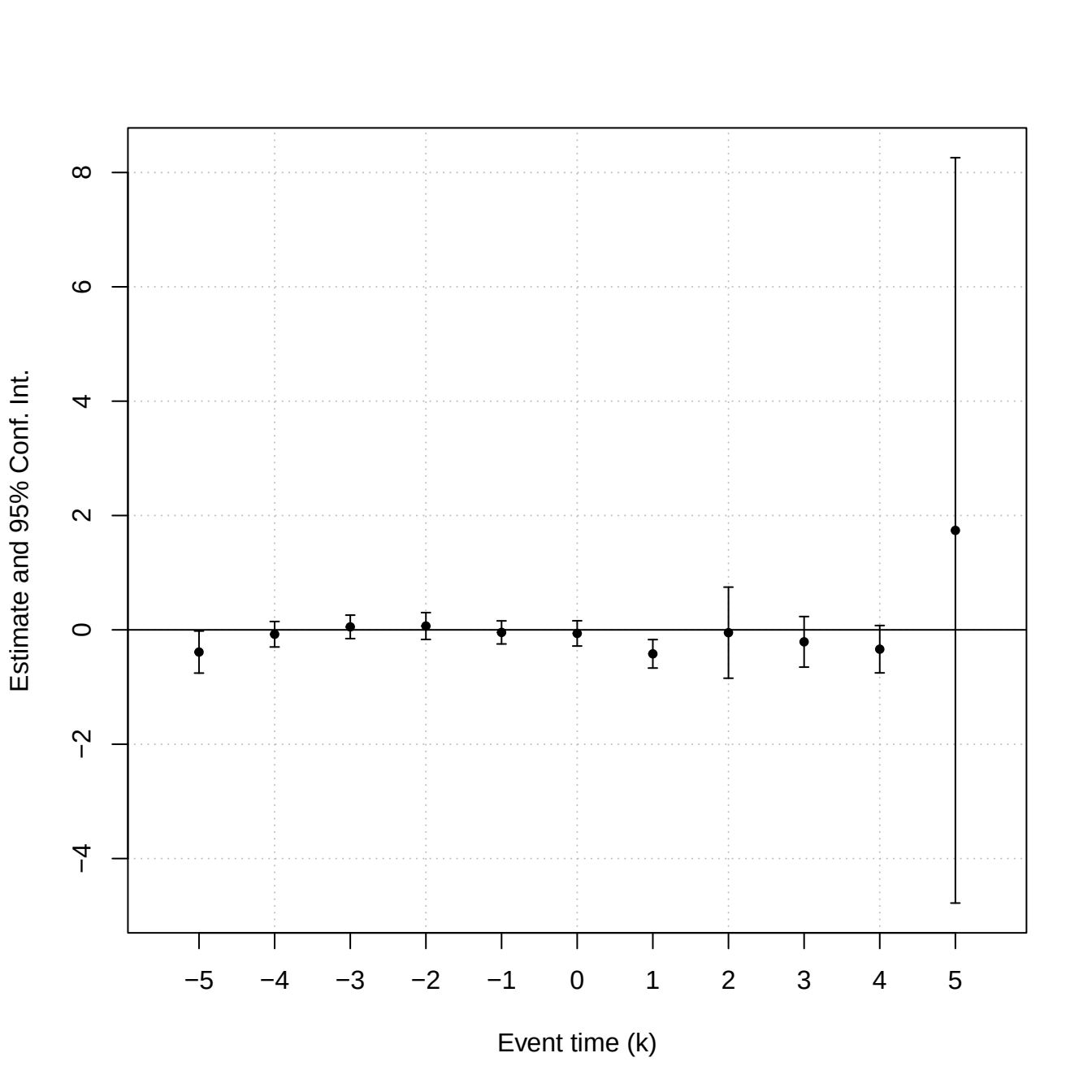

pull_request_opened
talent_investment −> organizational_closeness
network_clustering_coefficient −> clustering_coefficient
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.688
Pretrend (Low) p−value: 0.026
Wald test p−value: 0.615
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

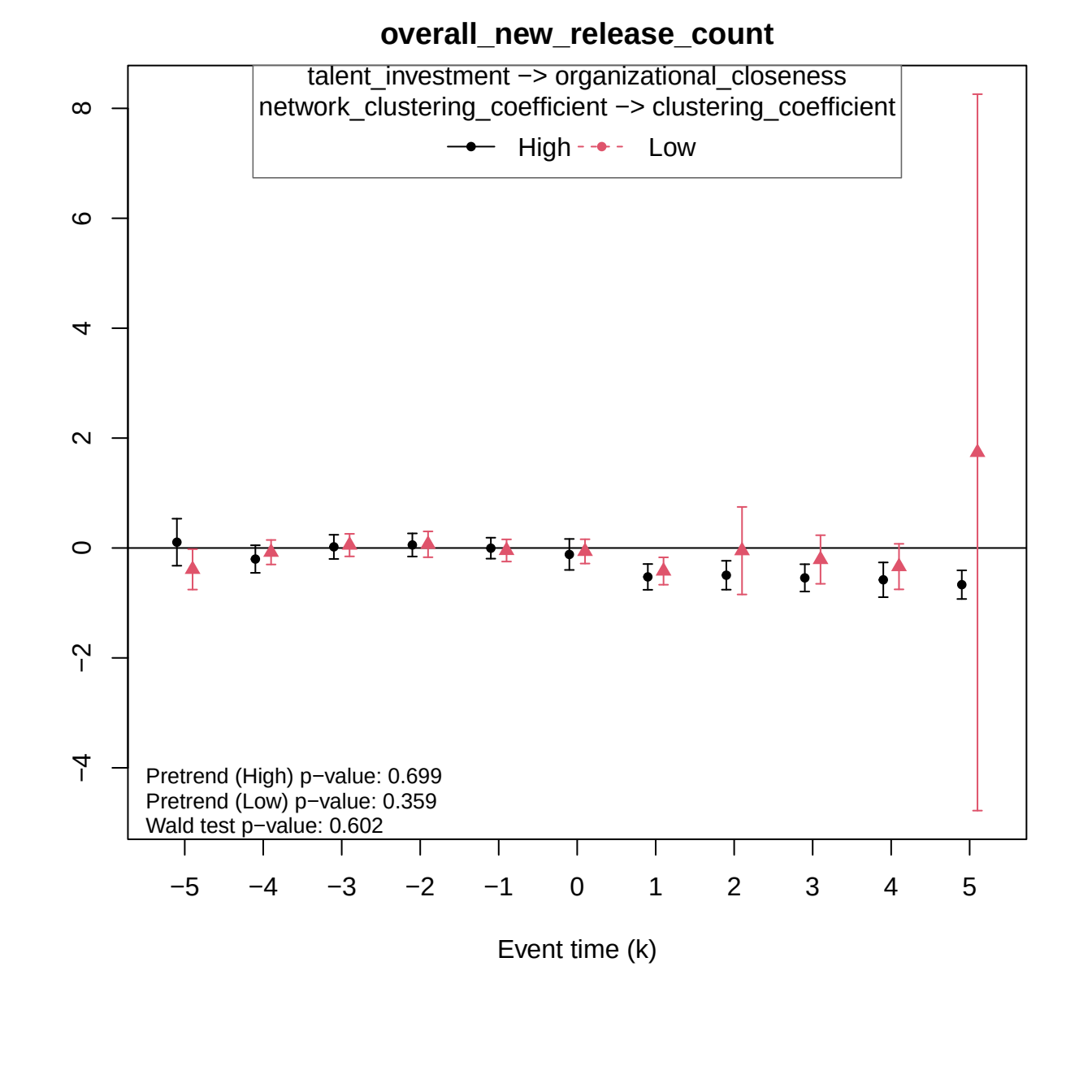

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

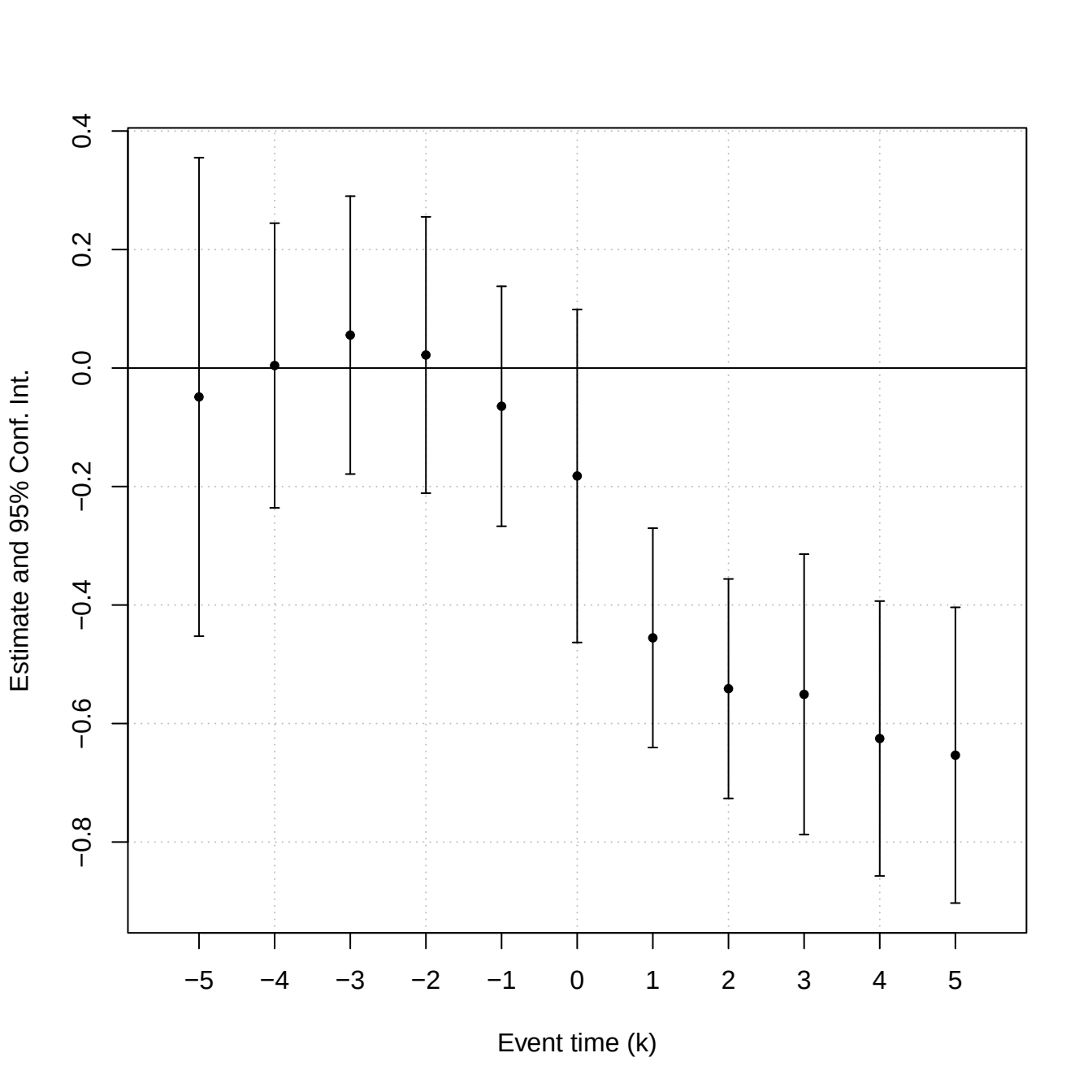

0.5
0.0
−0.5
−1.0
−1.5
Estimate and 95% Conf. Int.
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

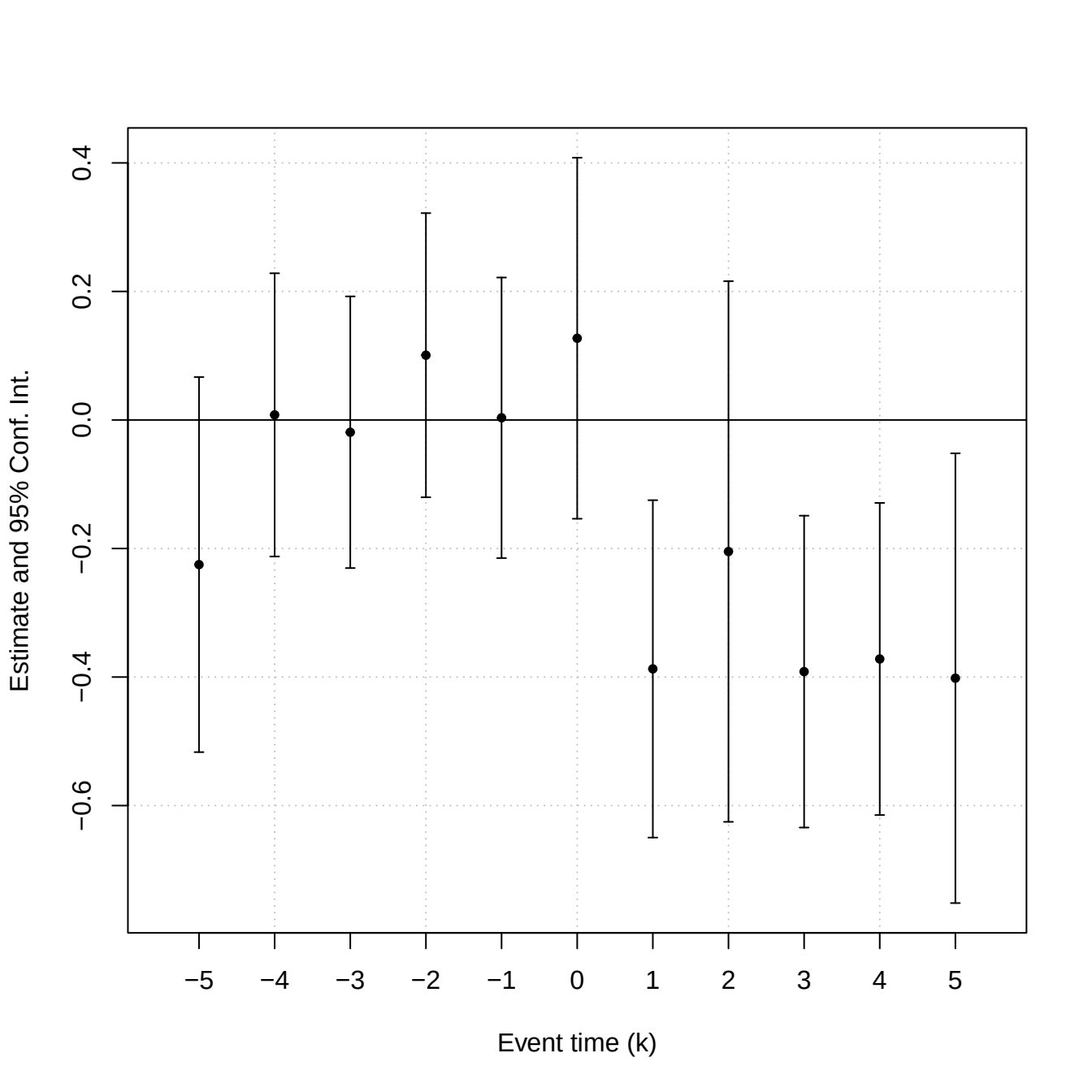

pull_request_merged
talent_investment −> organizational_closeness
network_clustering_coefficient −> clustering_coefficient
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.685
Pretrend (Low) p−value: 0.001
Wald test p−value: 0.033
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

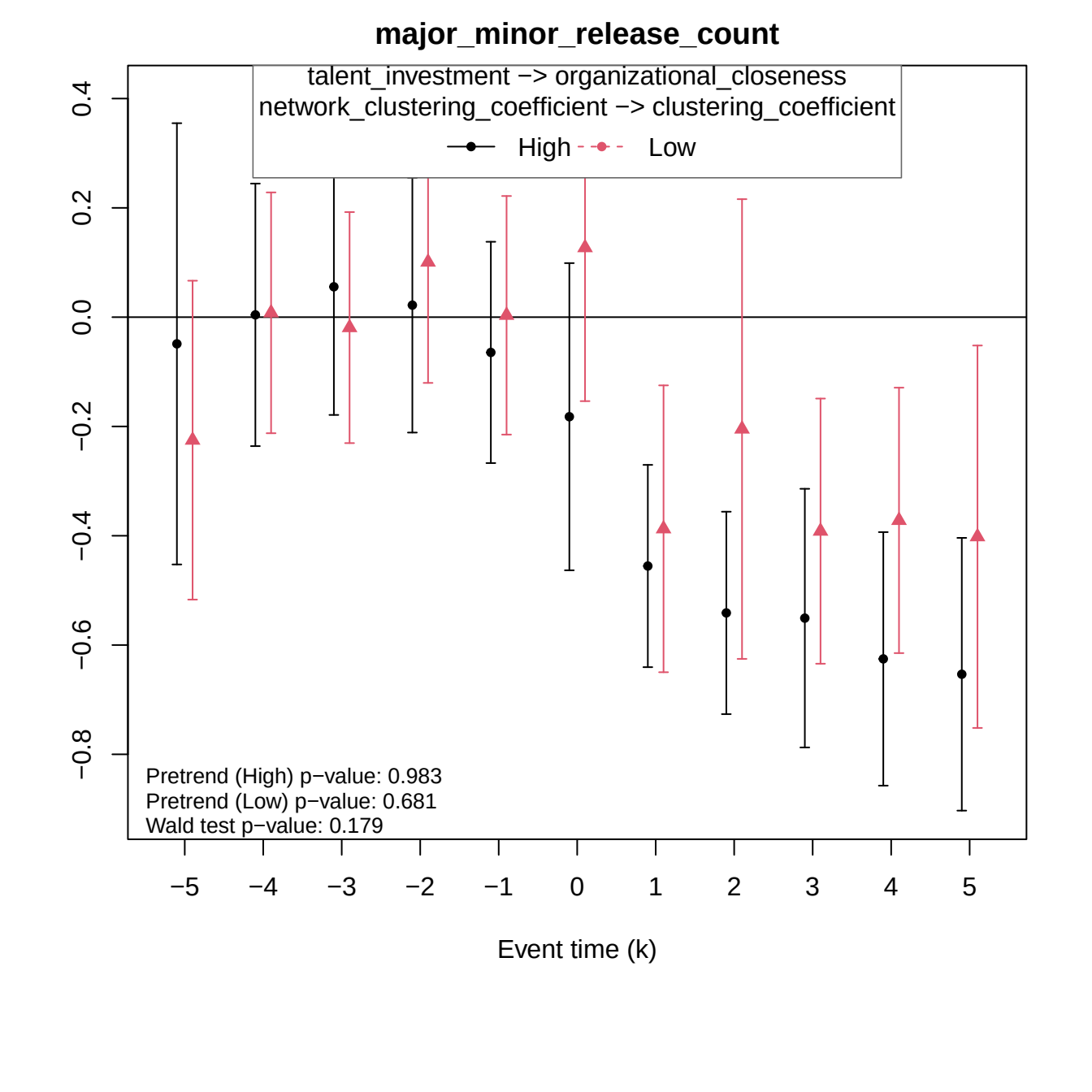

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

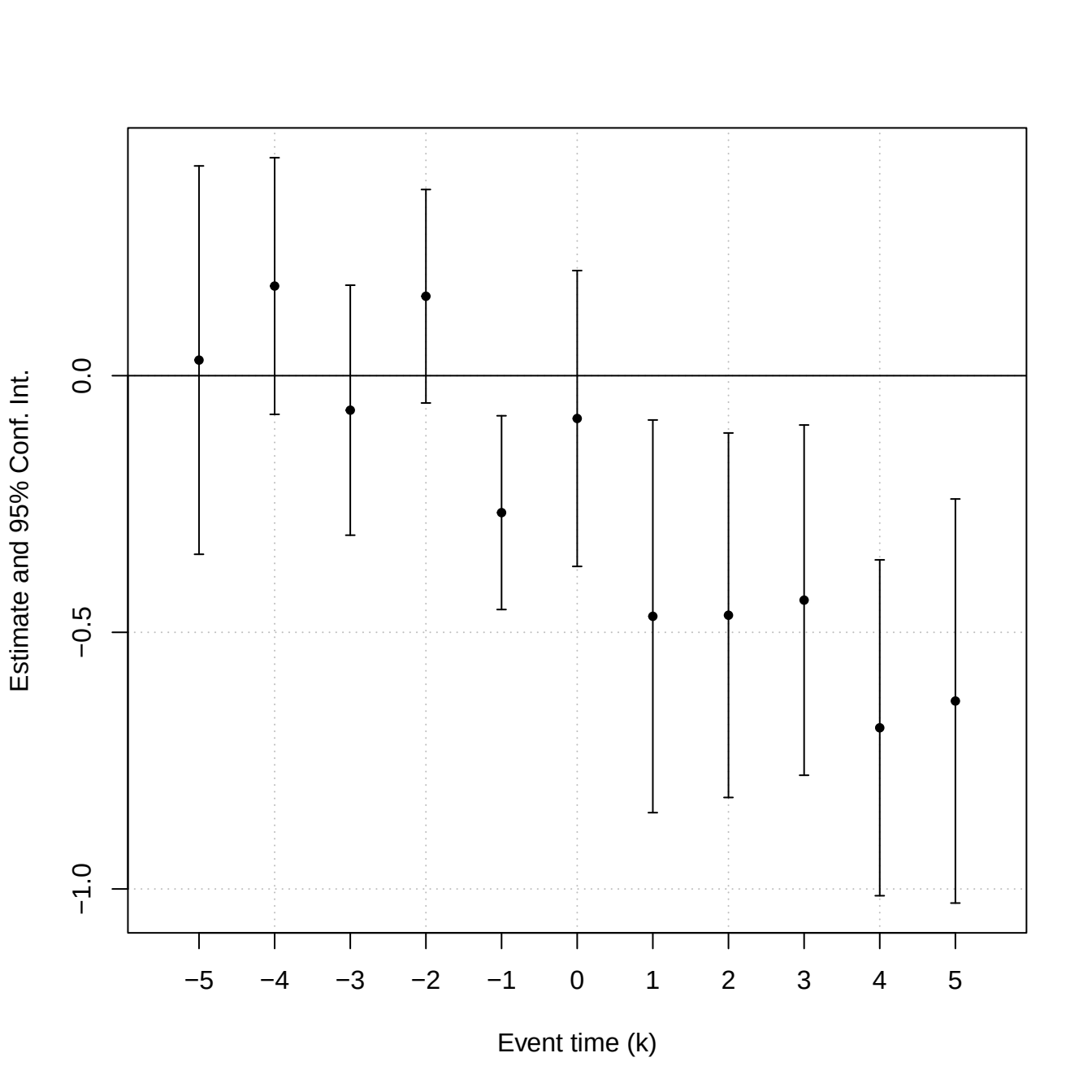

Estimate and 95% Conf. Int.
8
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

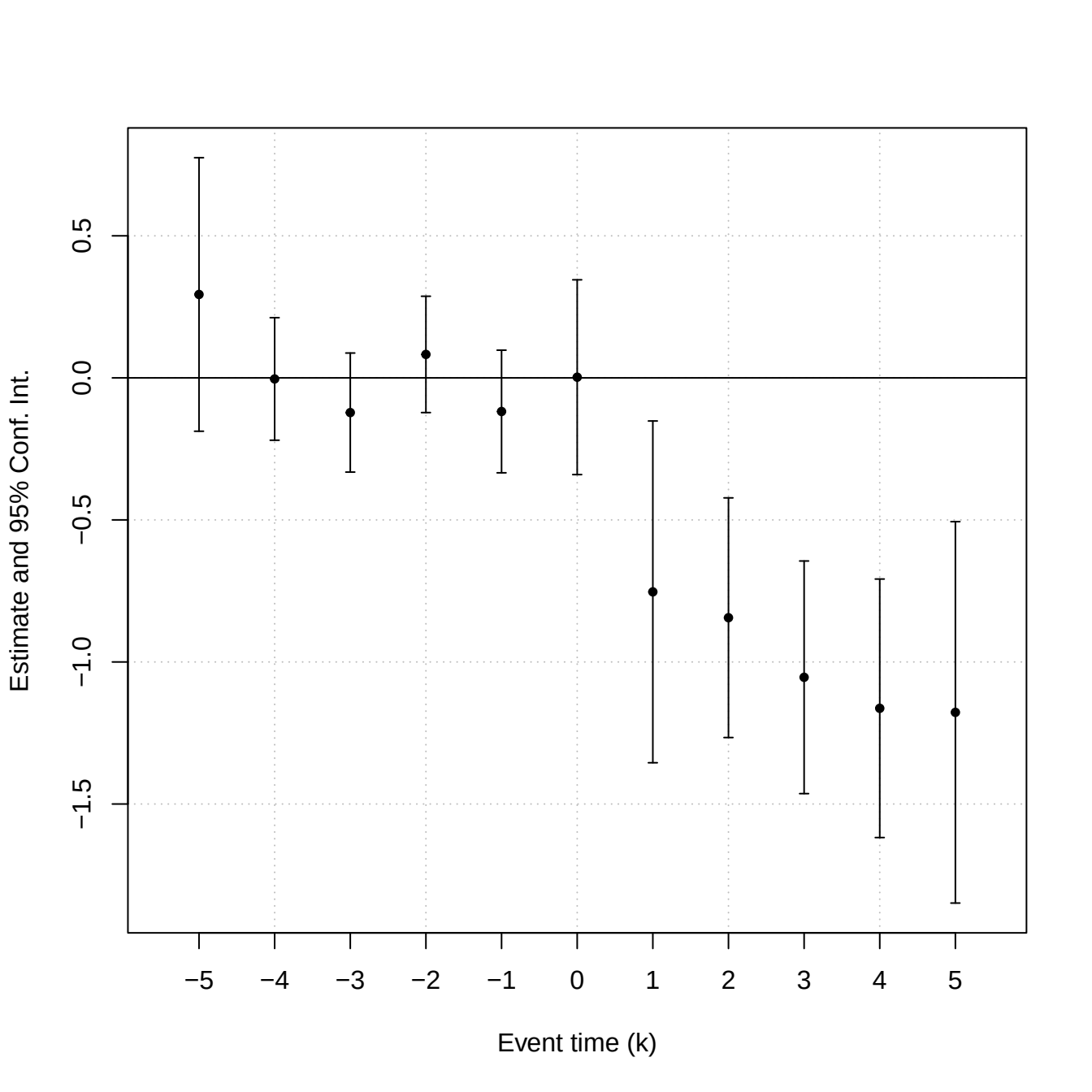

overall_new_release_count
talent_investment −> organizational_closeness
network_clustering_coefficient −> clustering_coefficient
High
Low
8
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.699
Pretrend (Low) p−value: 0.359
Wald test p−value: 0.602
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

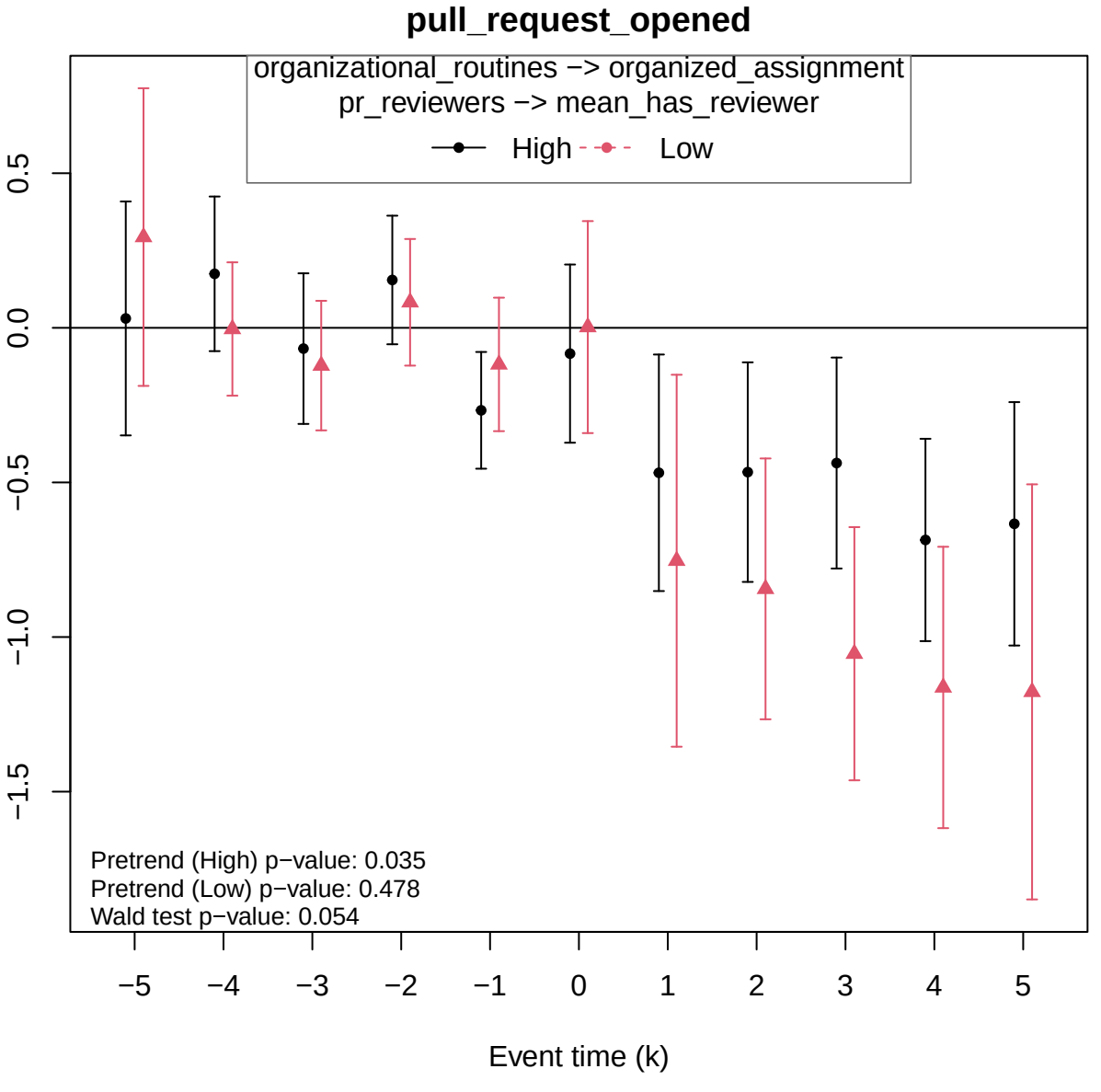

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

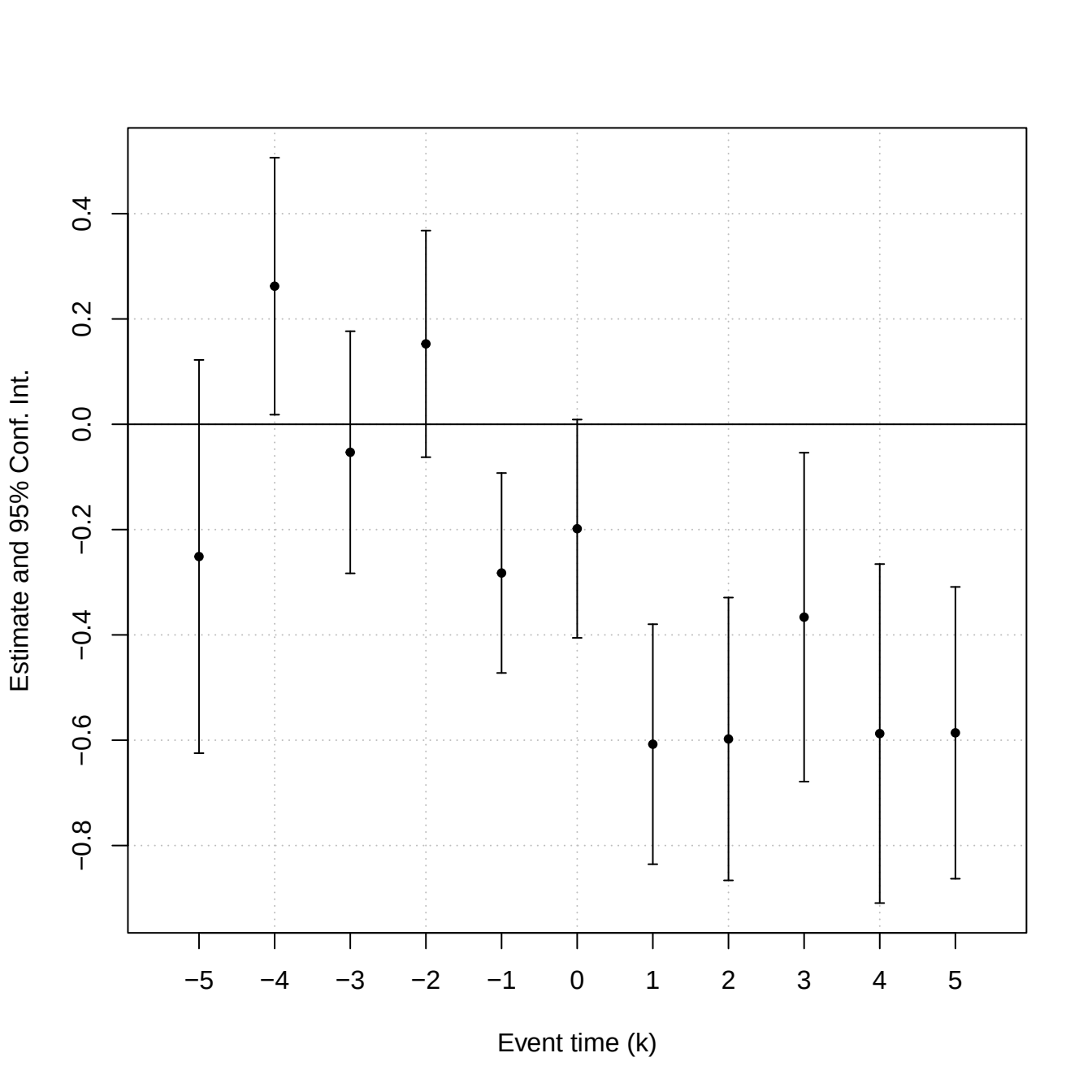

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

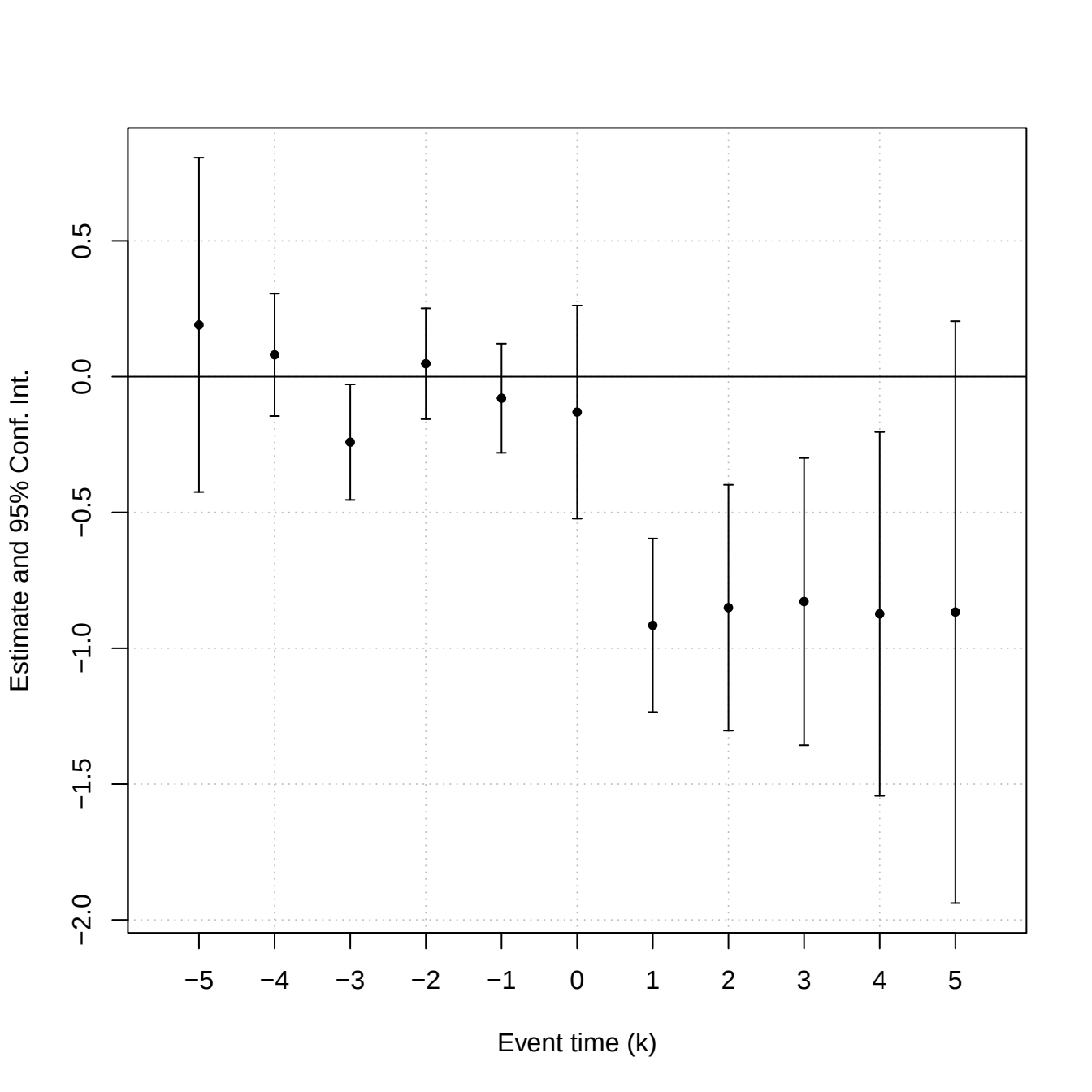

major_minor_release_count
talent_investment −> organizational_closeness
network_clustering_coefficient −> clustering_coefficient
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.983
Pretrend (Low) p−value: 0.681
Wald test p−value: 0.179
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

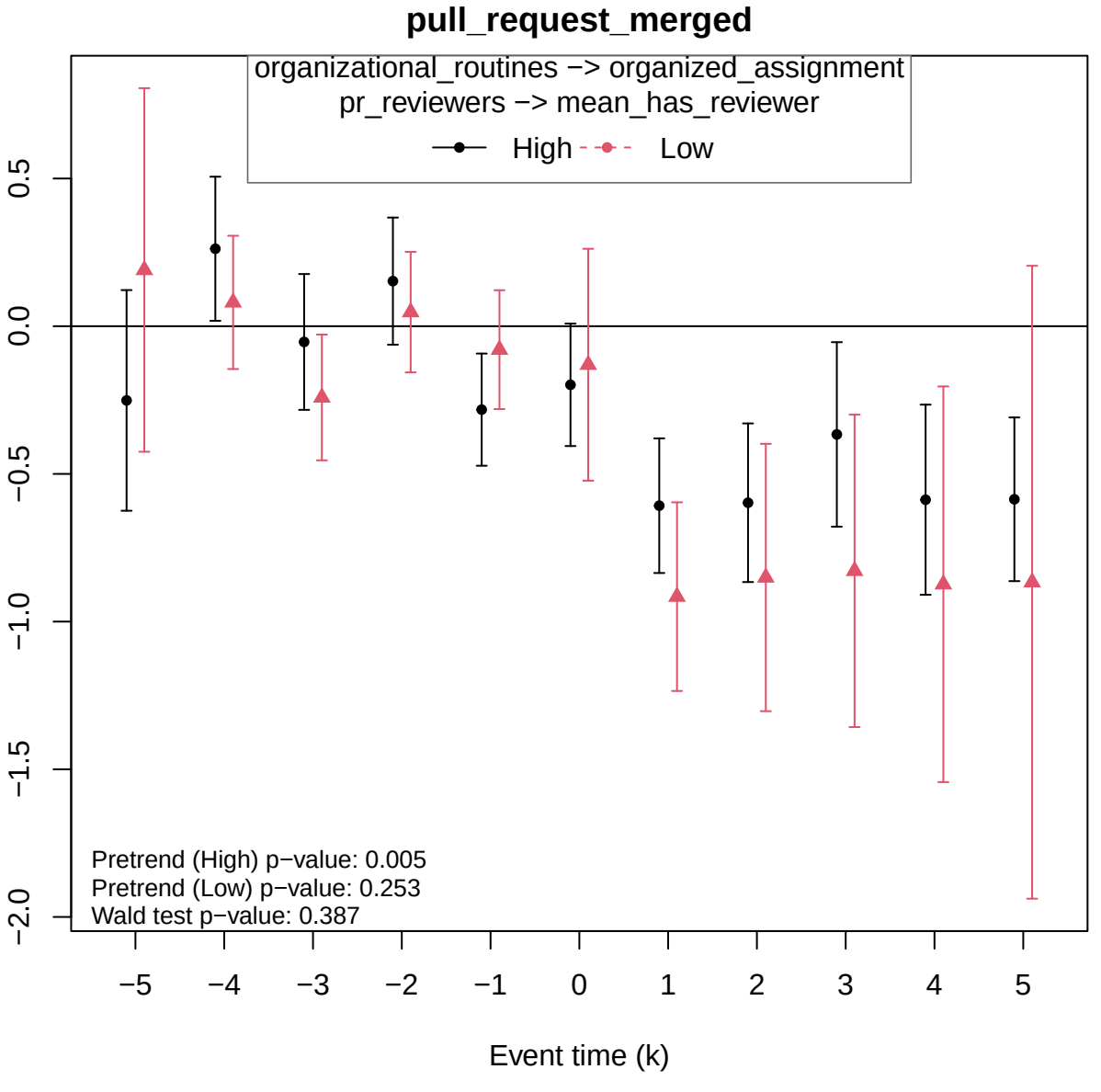

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

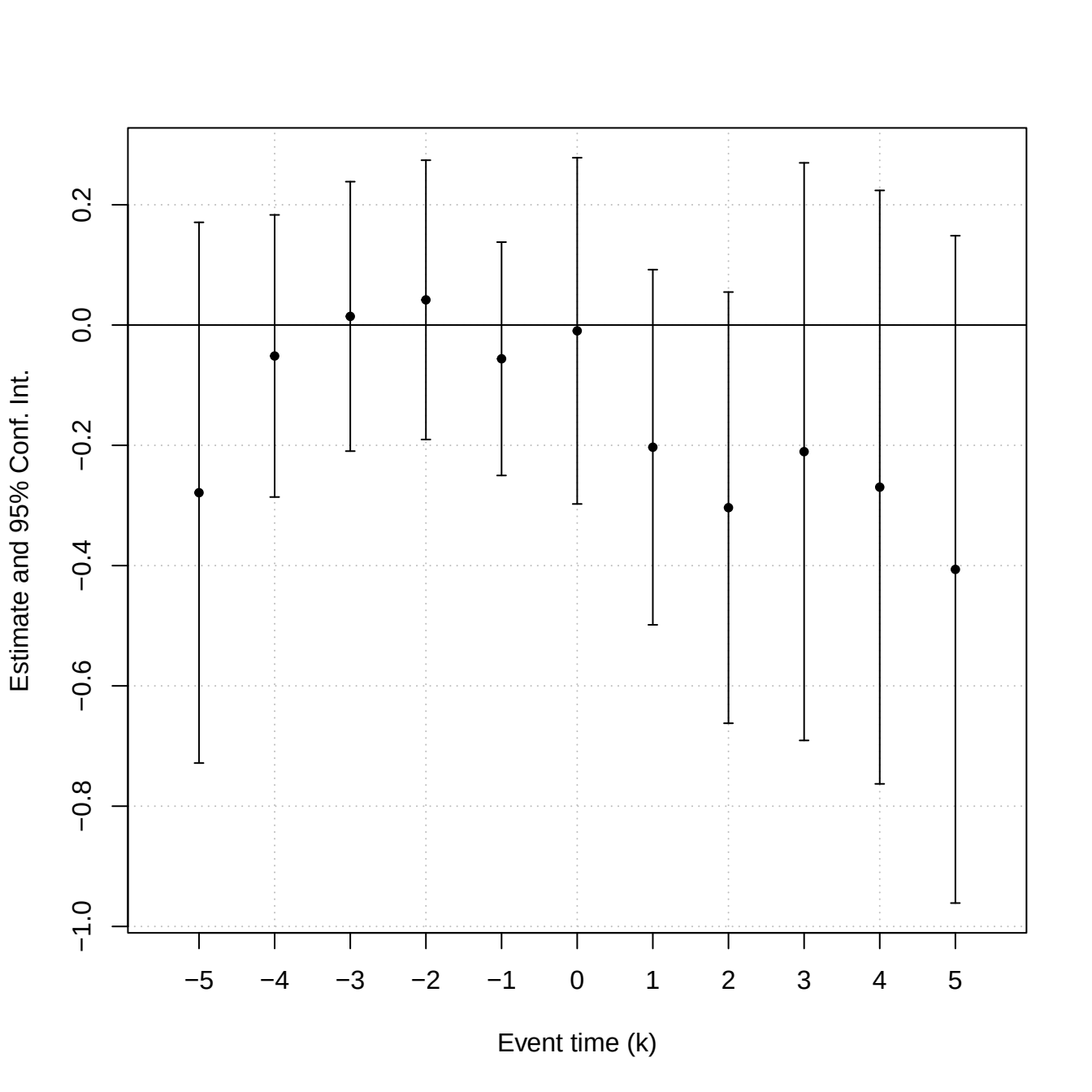

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

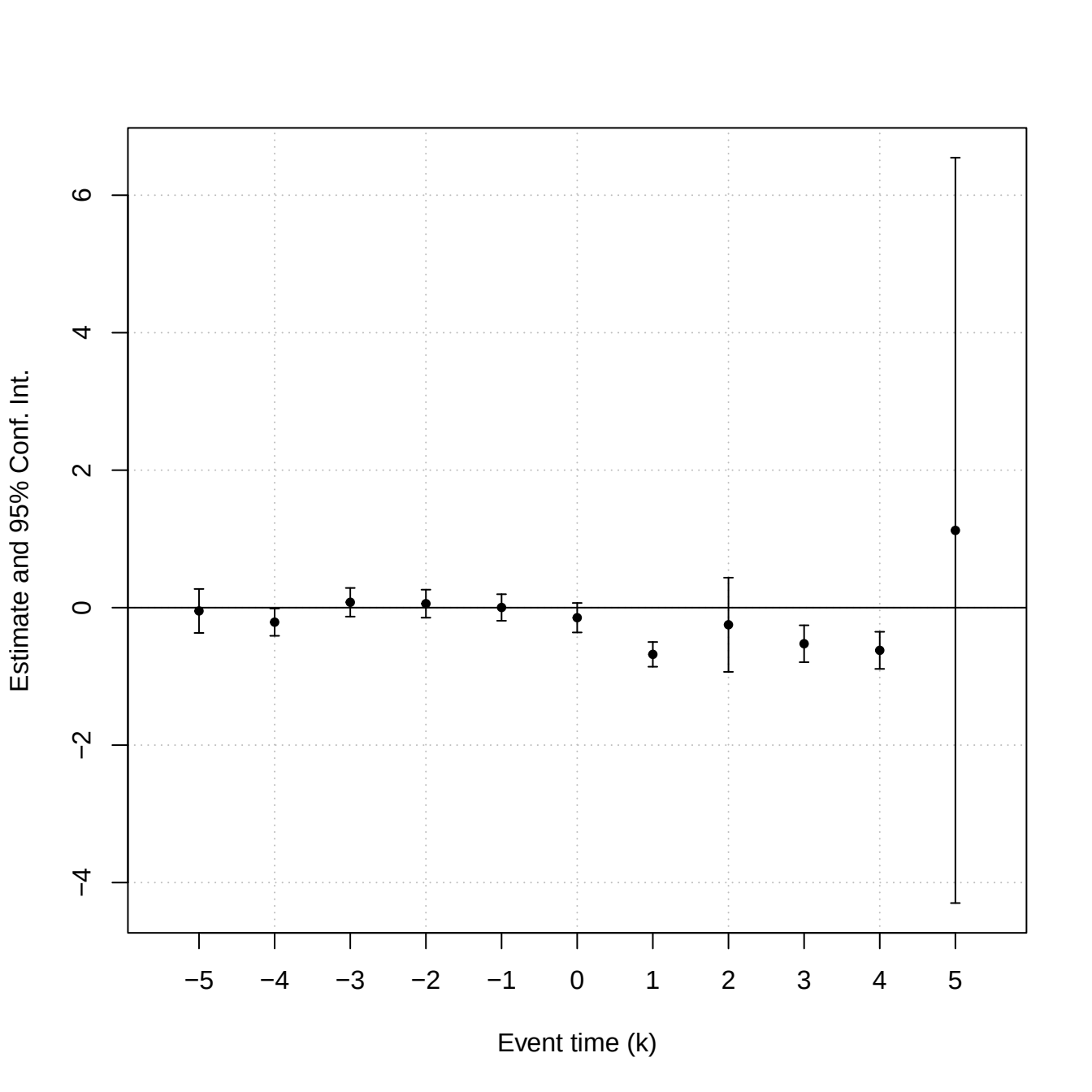

pull_request_opened
organizational_routines −> organized_assignment
pr_reviewers −> mean_has_reviewer
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.035
Pretrend (Low) p−value: 0.478
Wald test p−value: 0.054
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

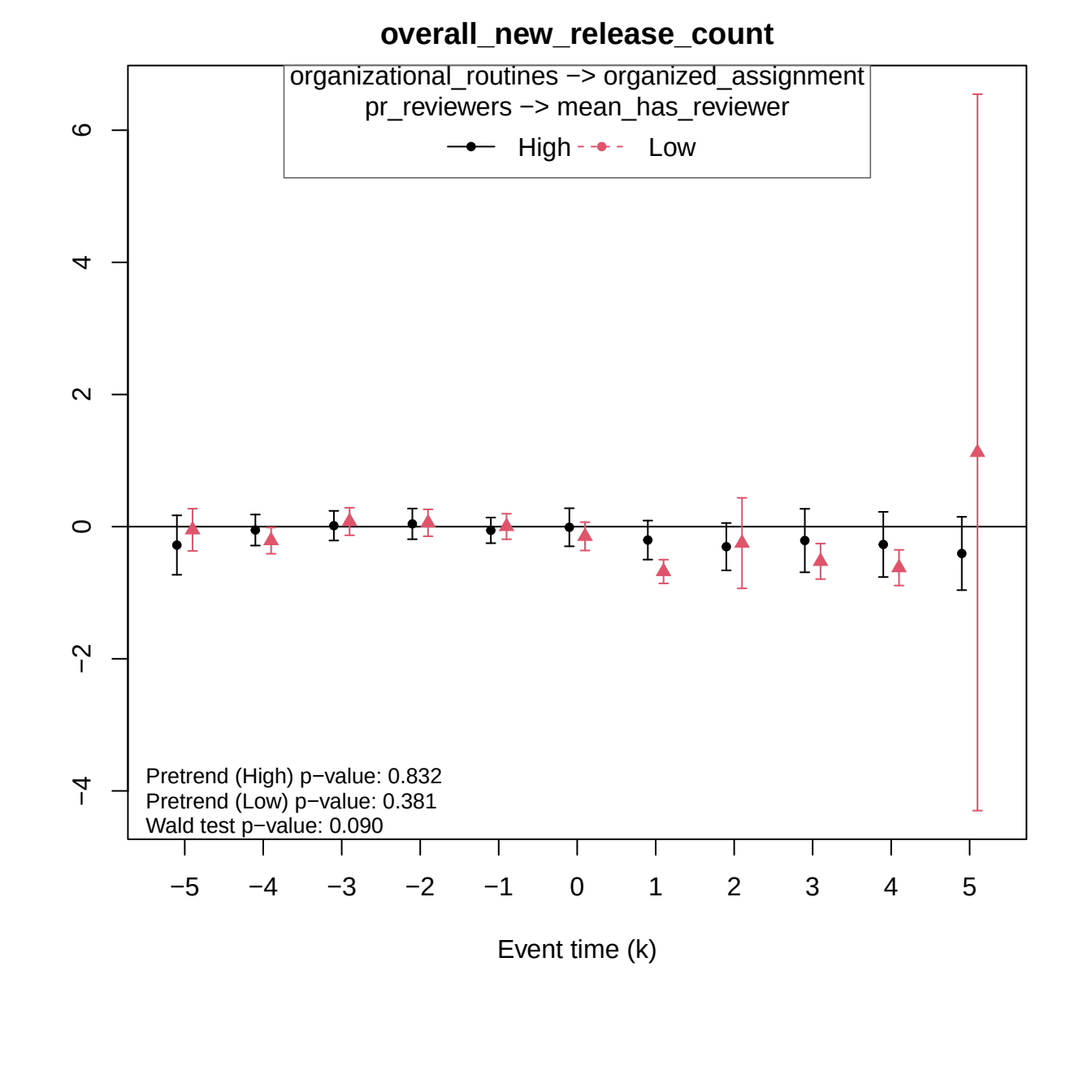

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

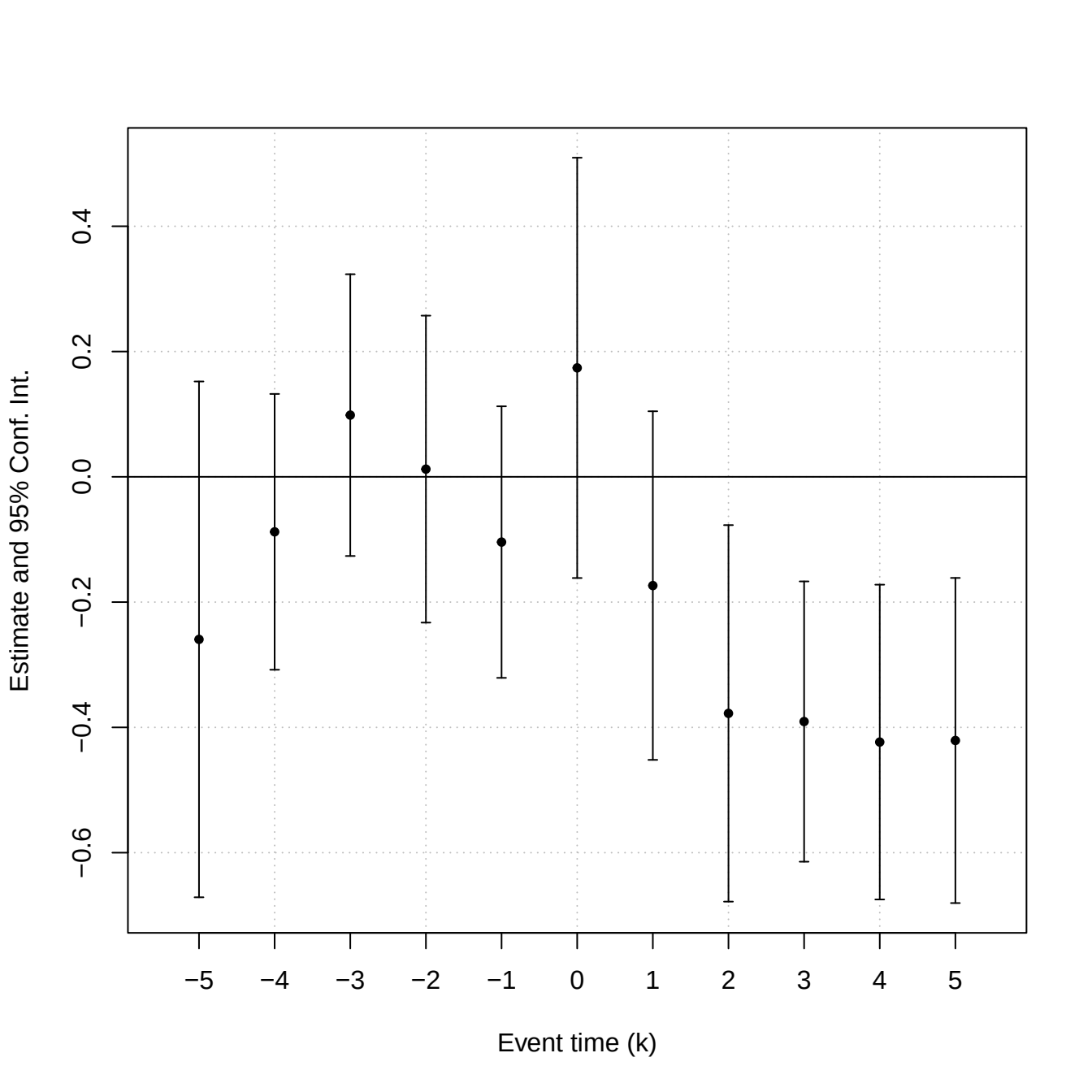

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

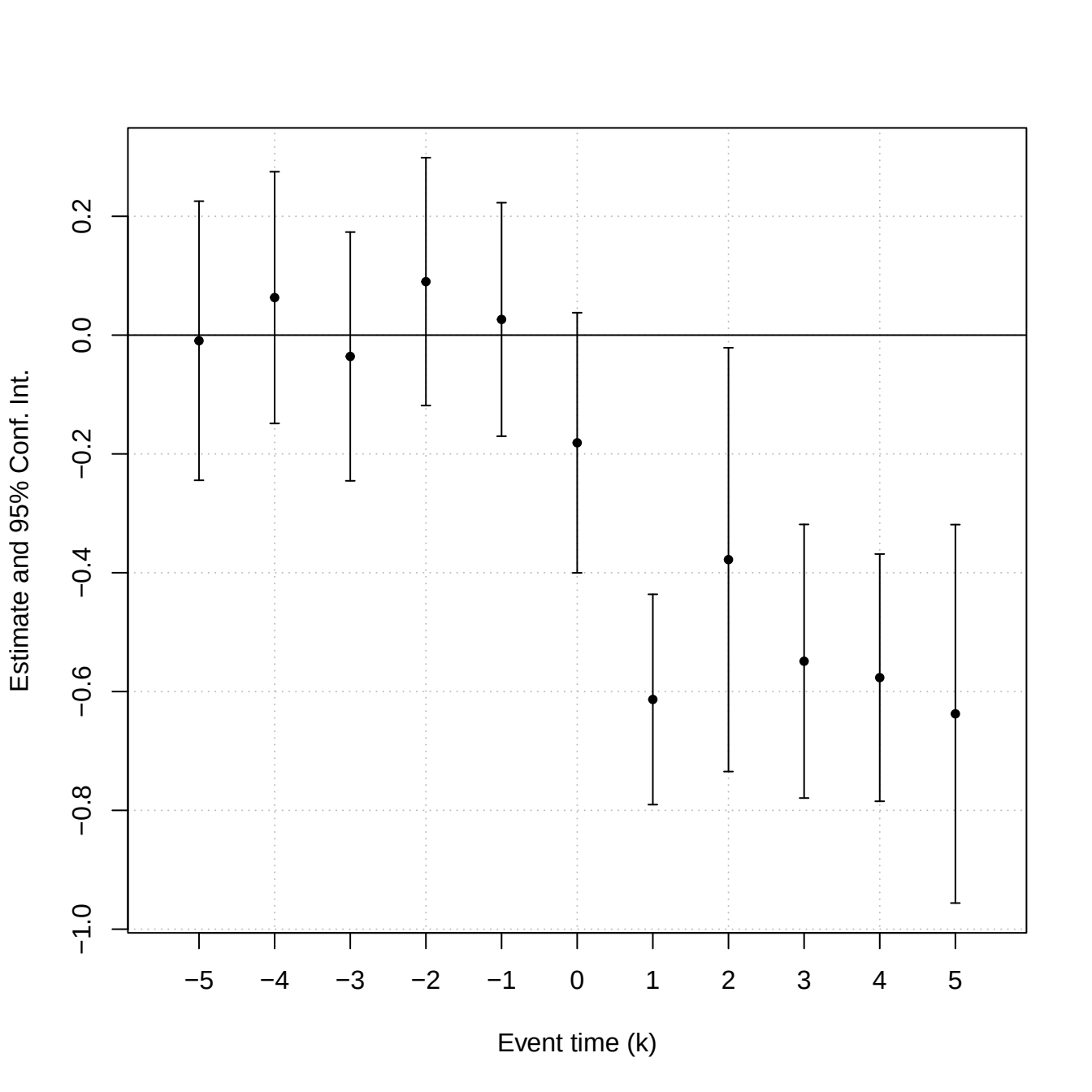

pull_request_merged
organizational_routines -> organized_assignment
pr_reviewers -> mean_has_reviewer
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.005
Pretrend (Low) p−value: 0.253
Wald test p−value: 0.387
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

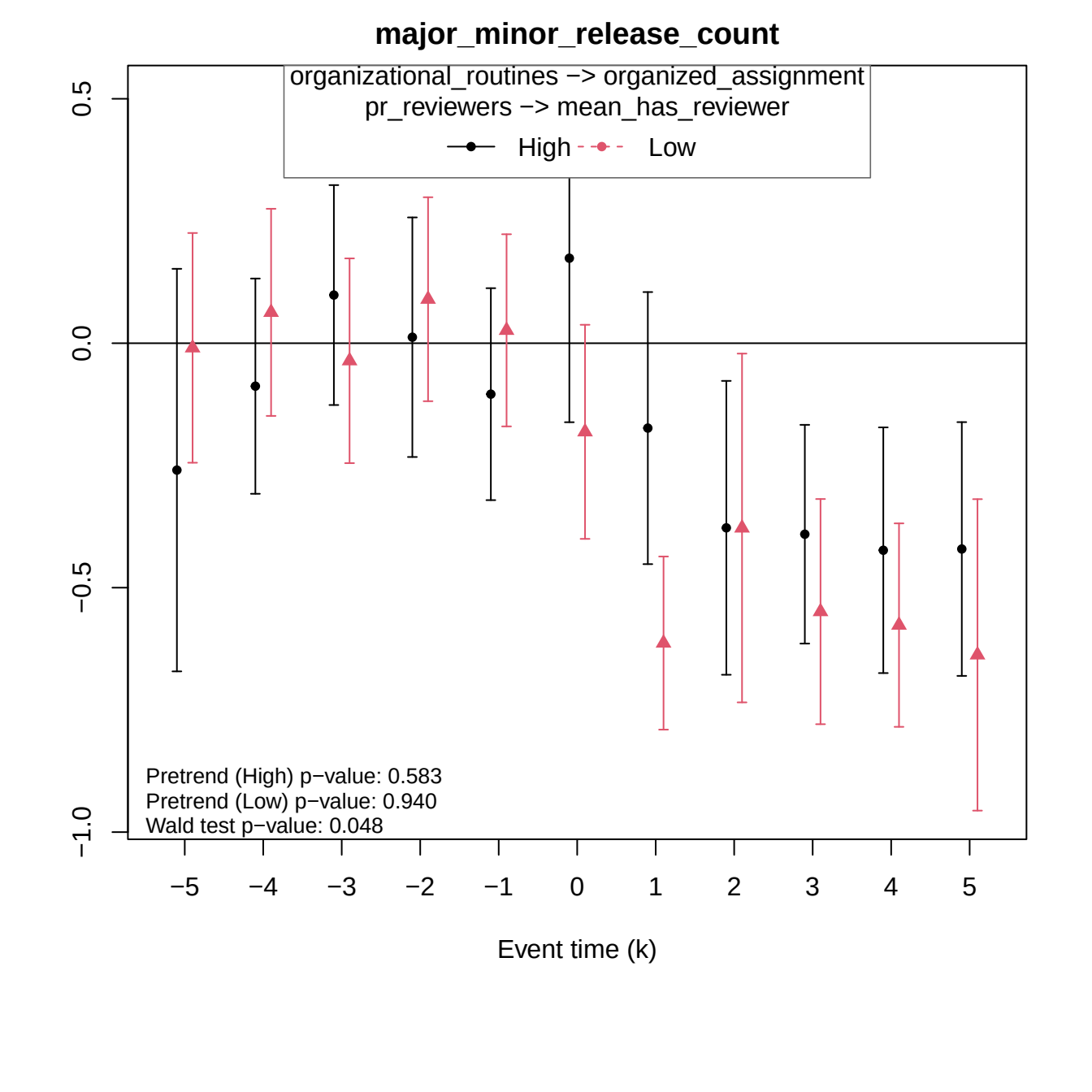

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

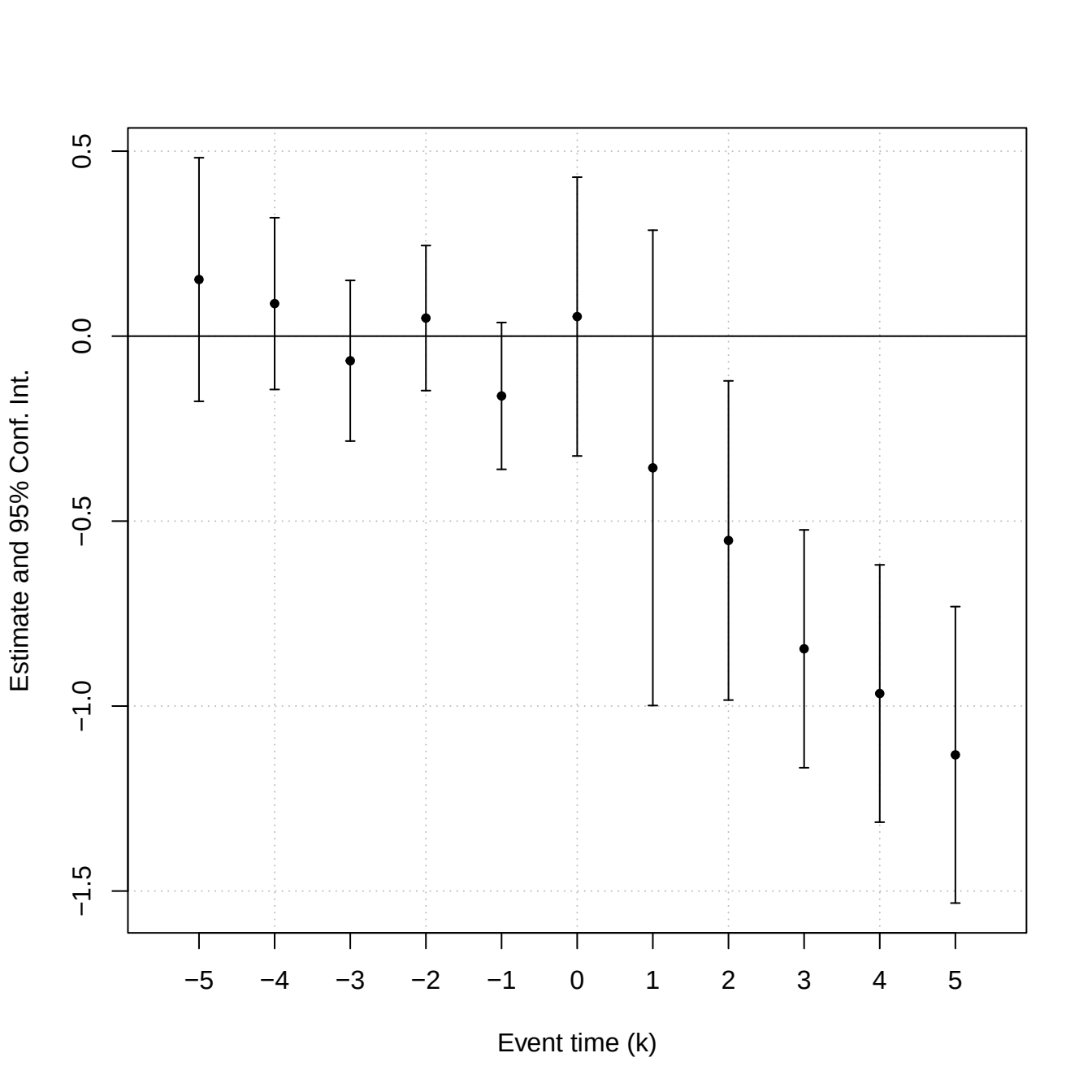

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

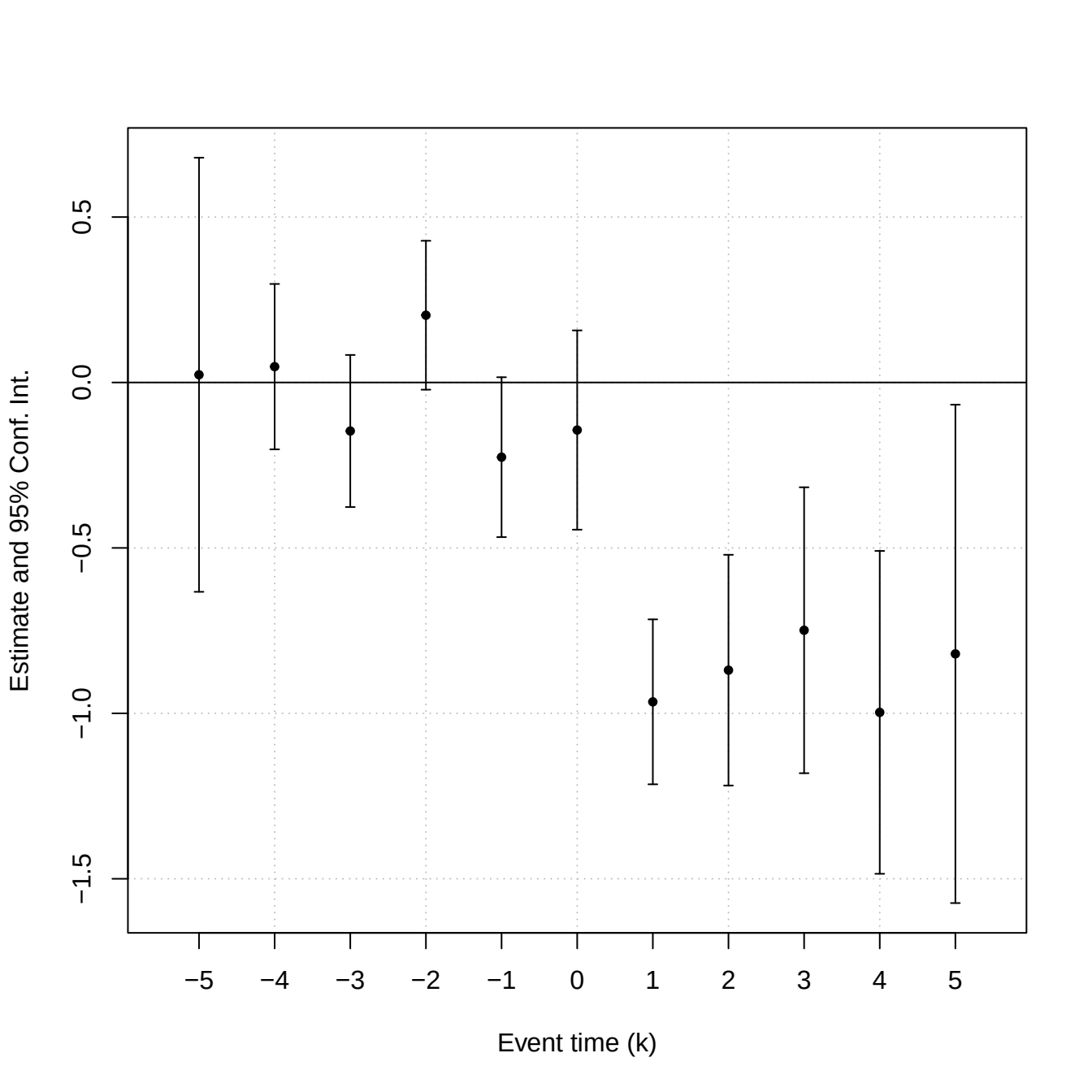

overall_new_release_count
organizational_routines −> organized_assignment
pr_reviewers −> mean_has_reviewer
High
Low
6
4
2
0
−2
−4
Pretrend (High) p−value: 0.832
Pretrend (Low) p−value: 0.381
Wald test p−value: 0.090
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

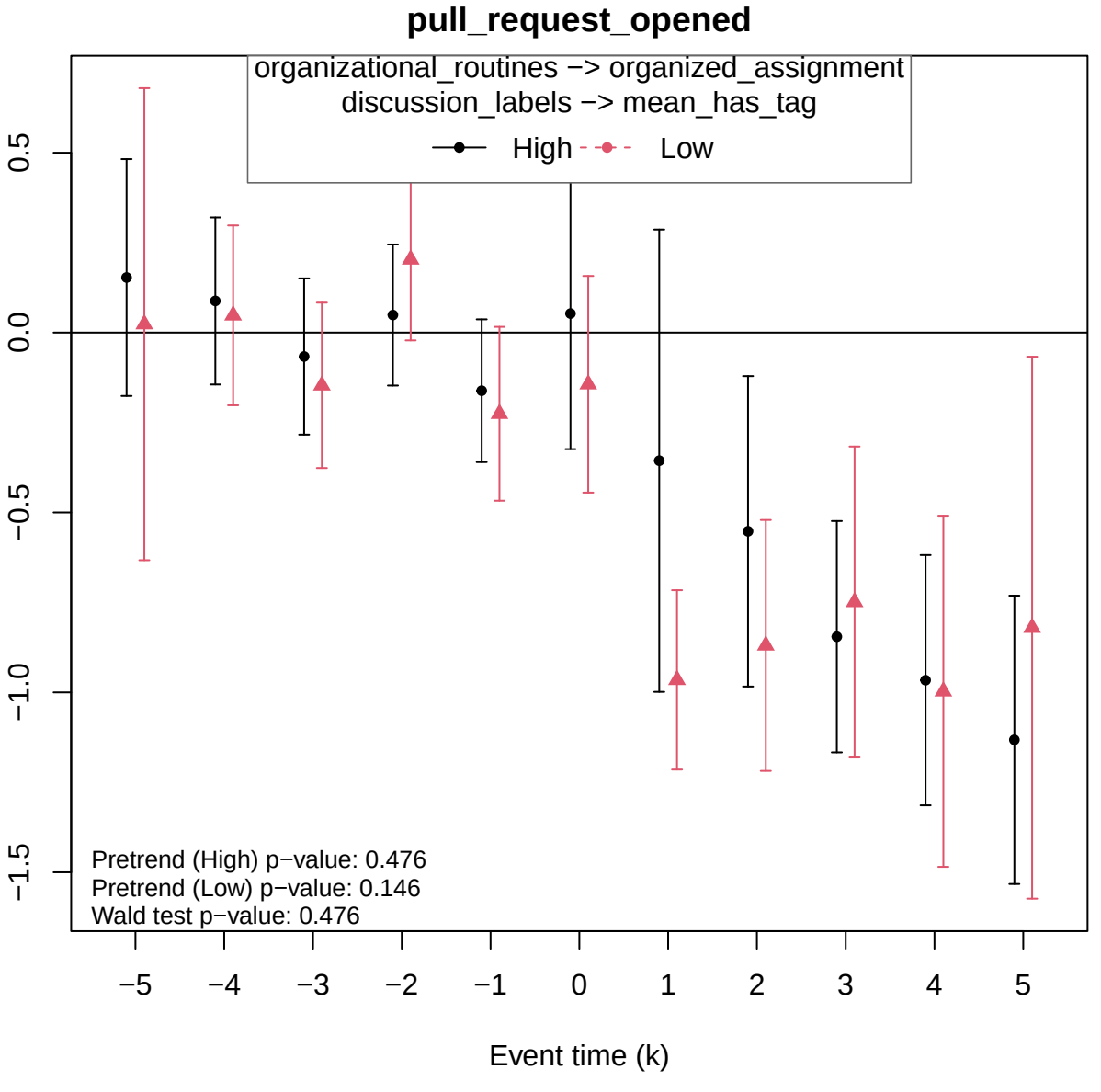

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

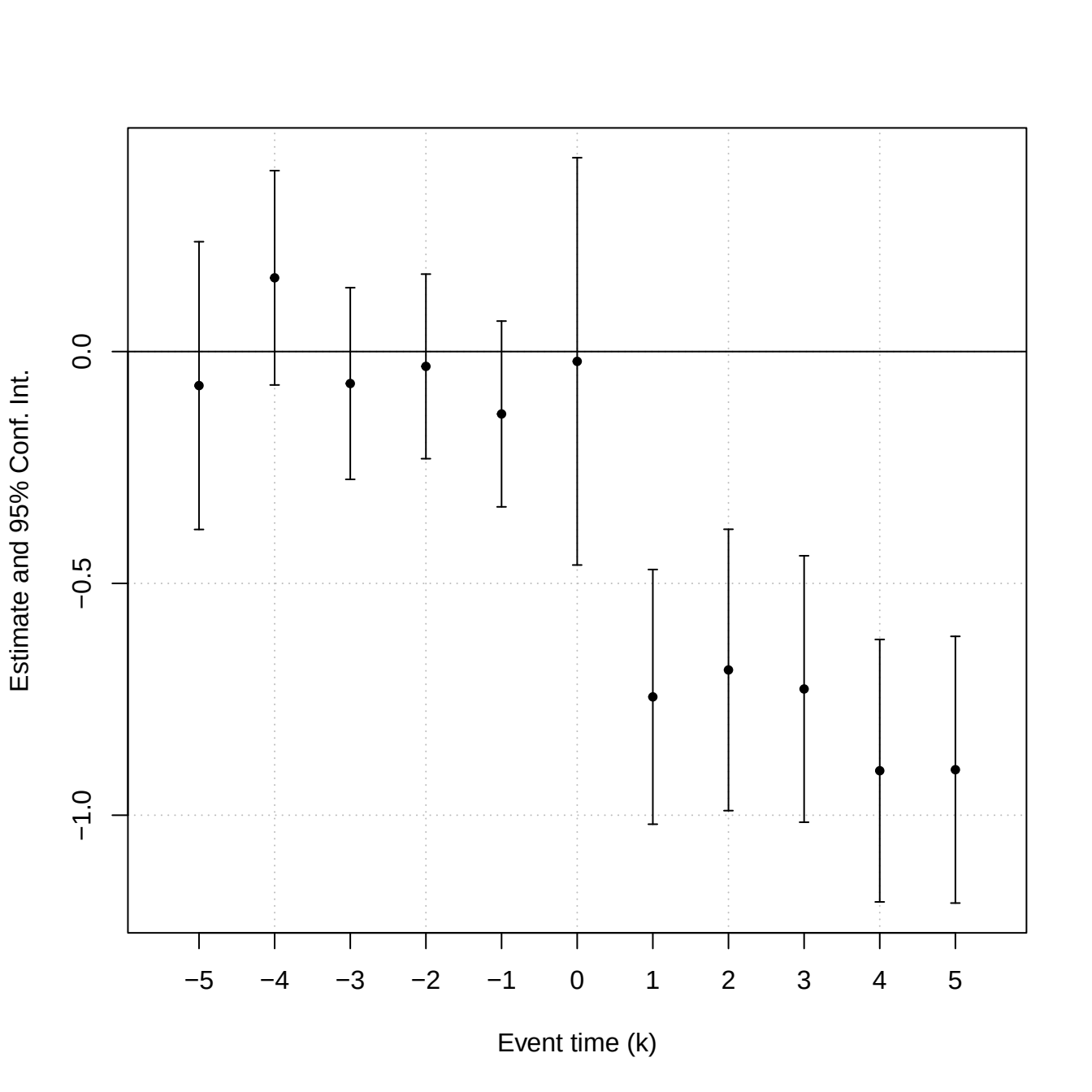

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

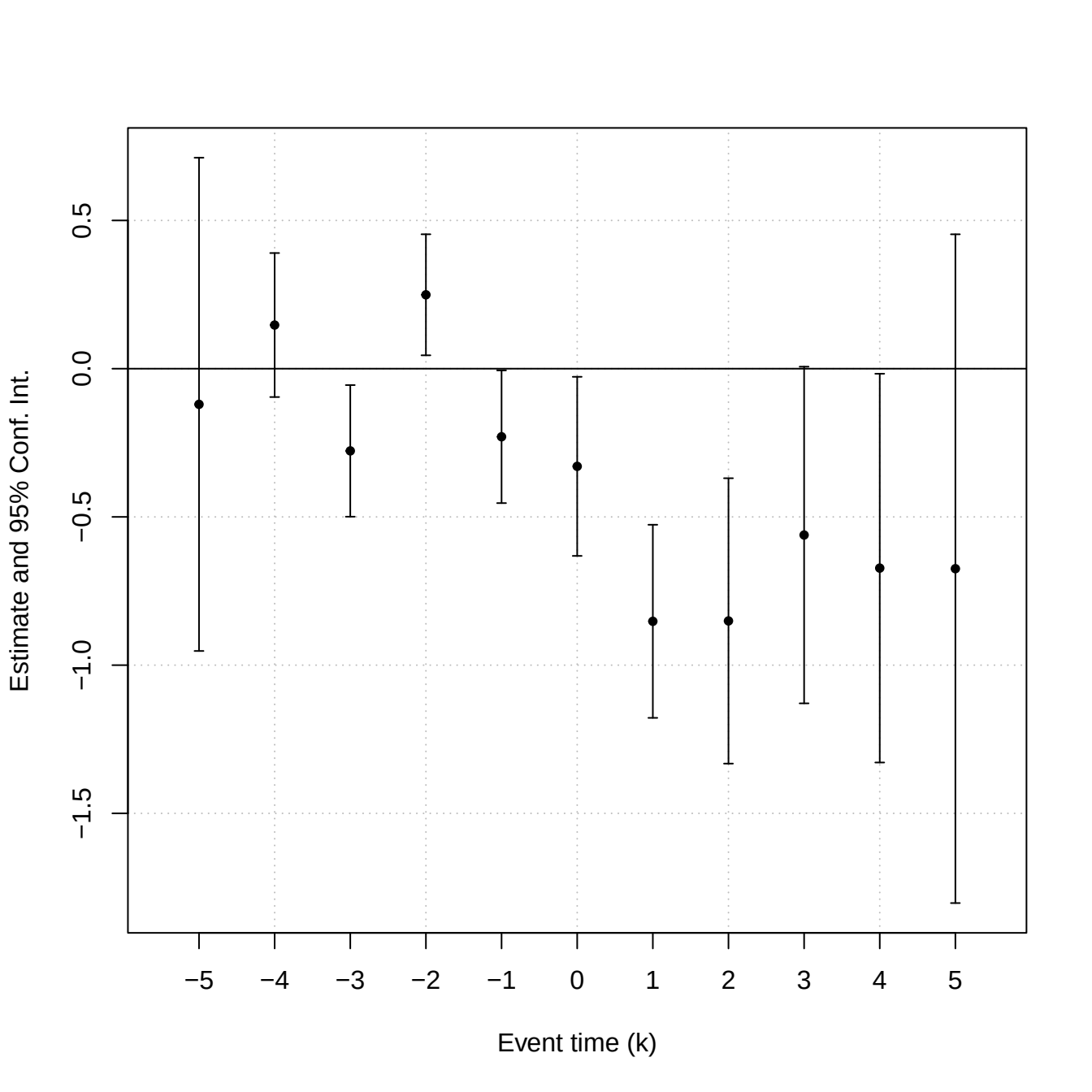

major_minor_release_count
organizational_routines −> organized_assignment
pr_reviewers −> mean_has_reviewer
High
Low
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.583
Pretrend (Low) p−value: 0.940
Wald test p−value: 0.048
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

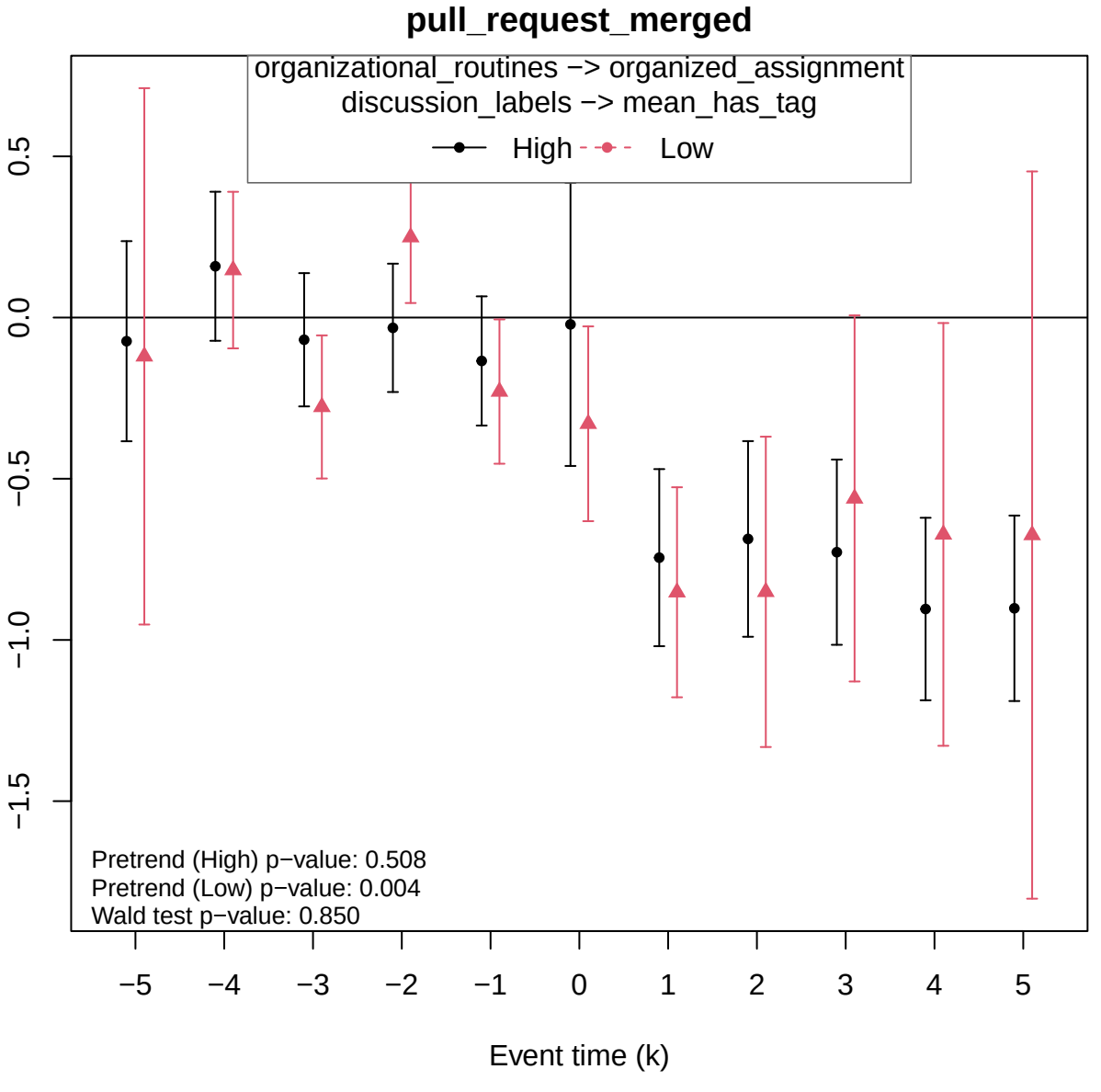

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

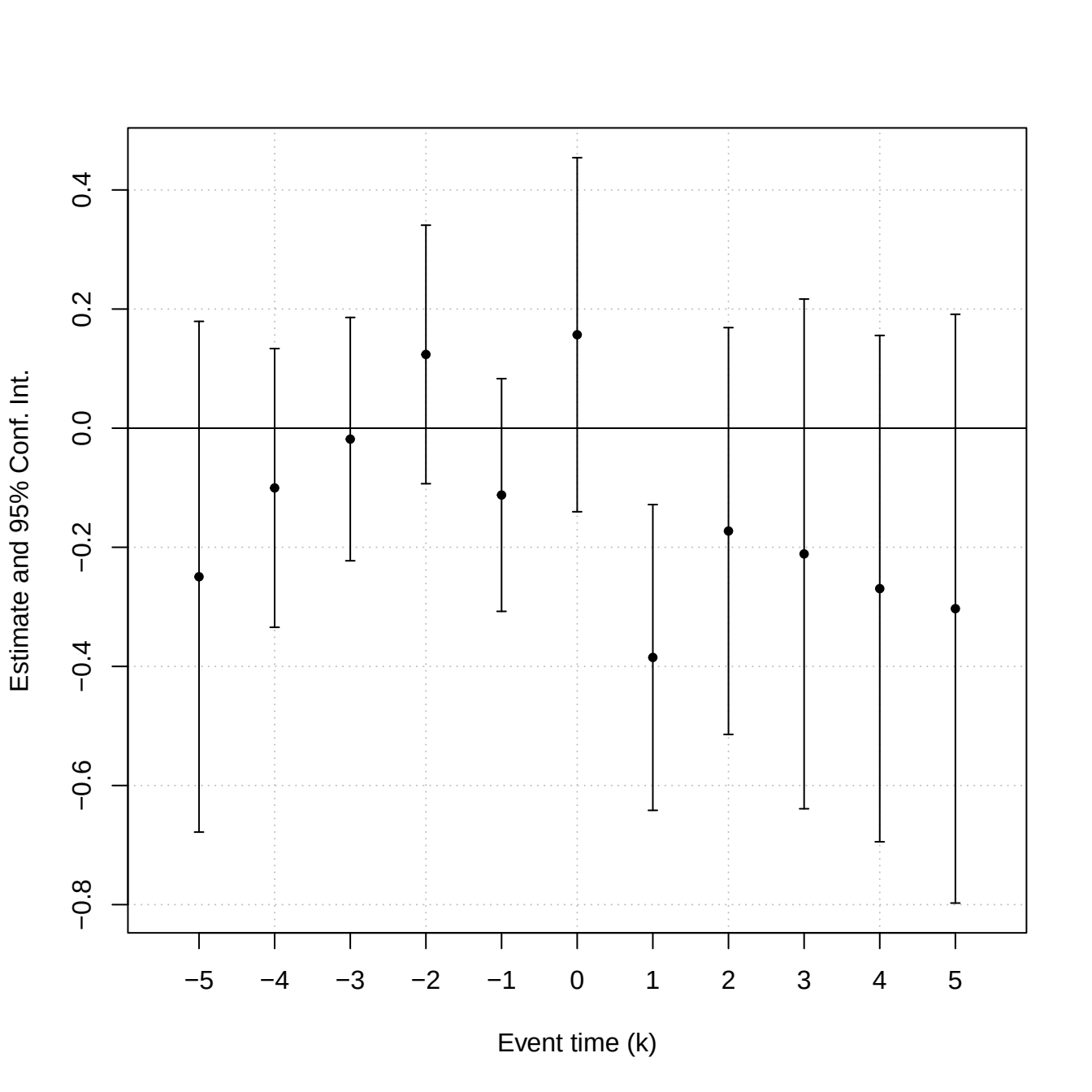

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

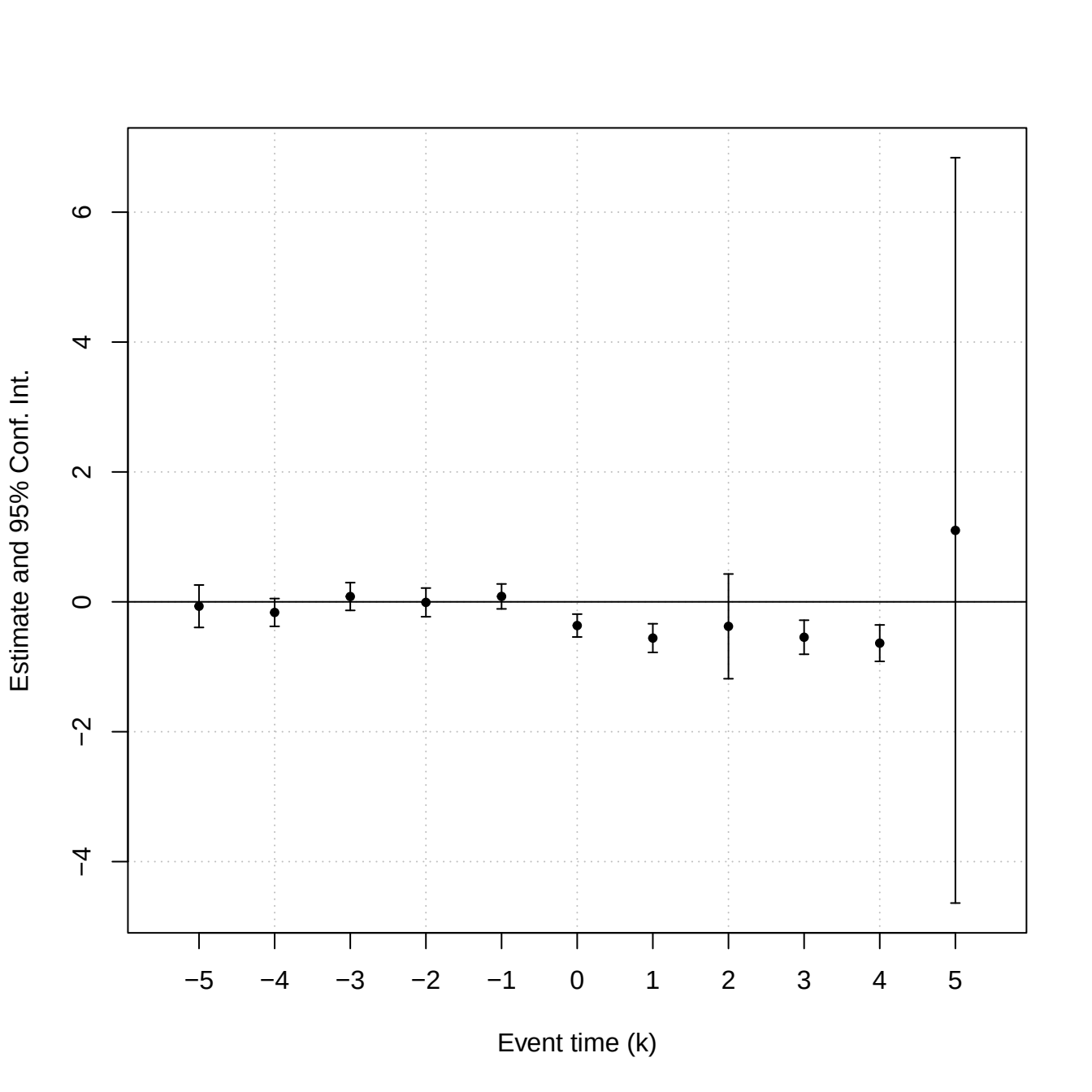

pull_request_opened
organizational_routines −> organized_assignment
discussion_labels −> mean_has_tag
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.476
Pretrend (Low) p−value: 0.146
Wald test p−value: 0.476
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

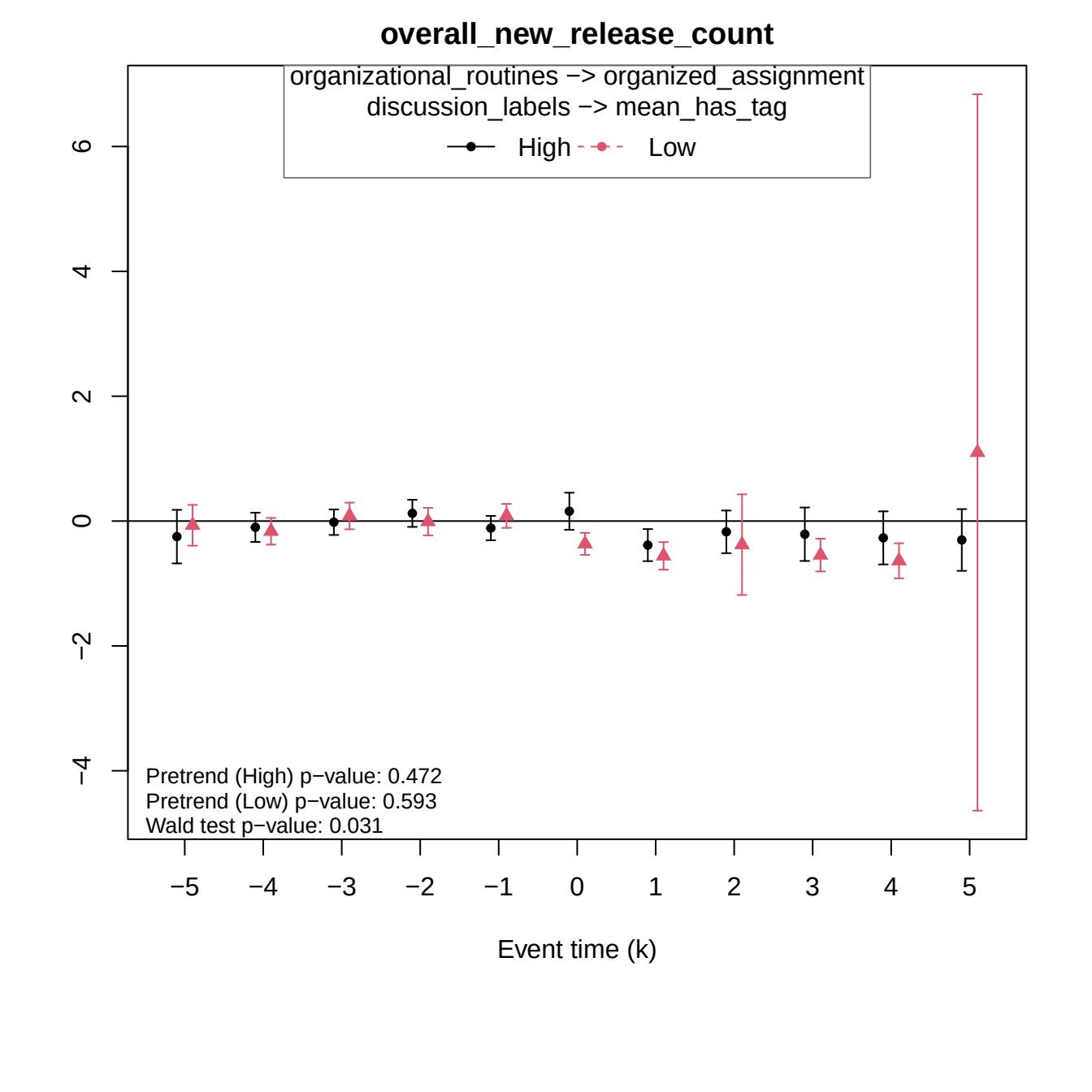

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

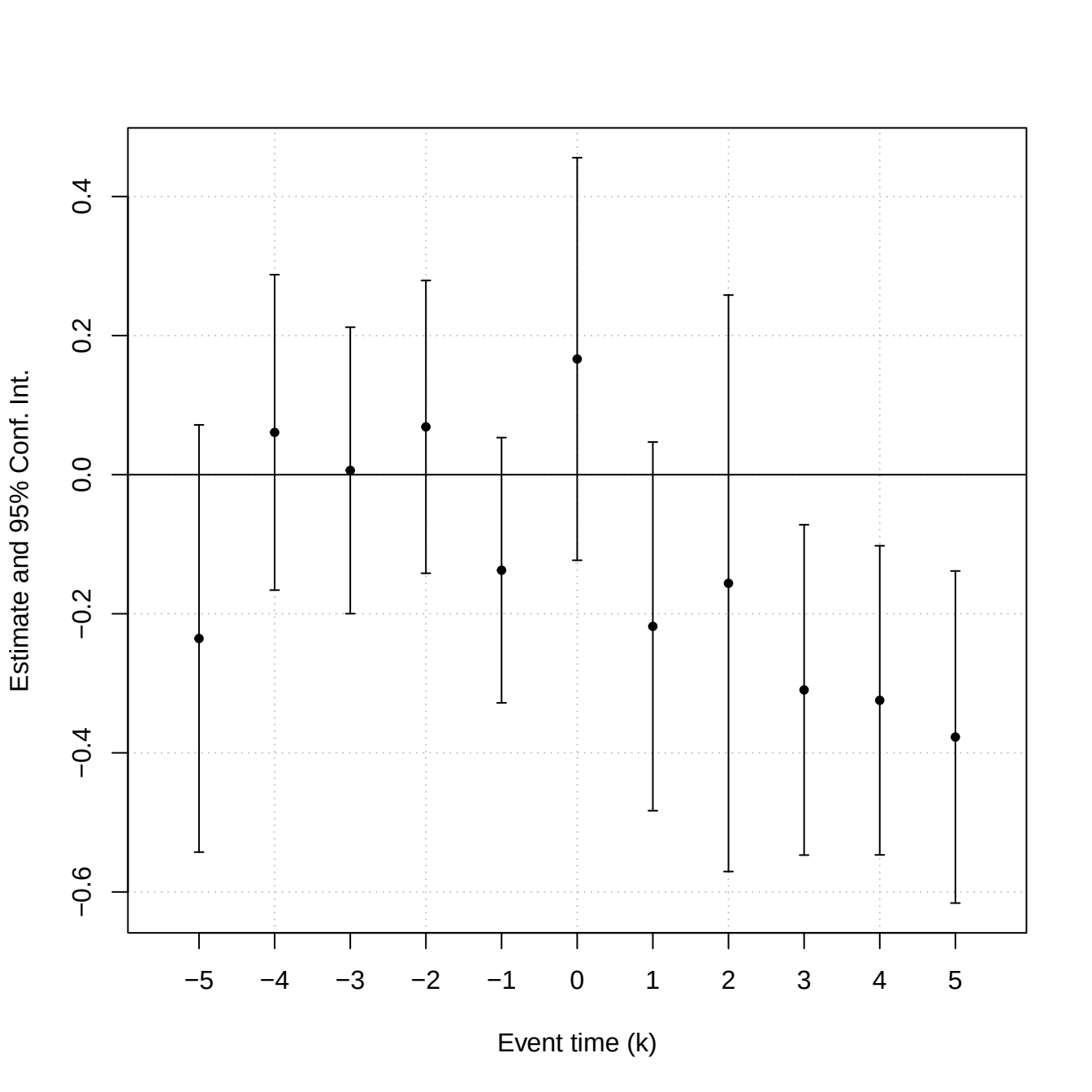

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

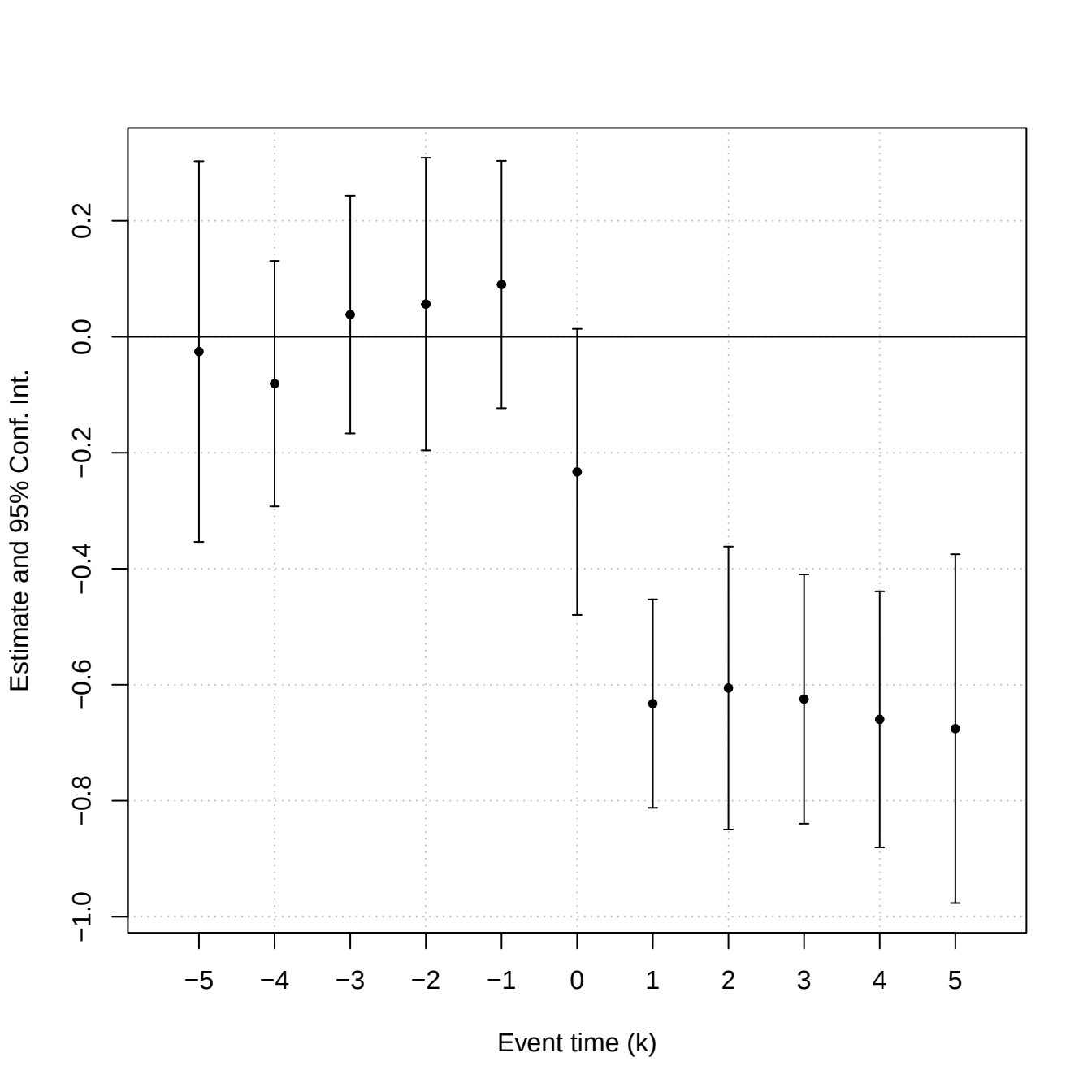

pull_request_merged
organizational_routines −> organized_assignment
discussion_labels −> mean_has_tag
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.508
Pretrend (Low) p−value: 0.004
Wald test p−value: 0.850
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

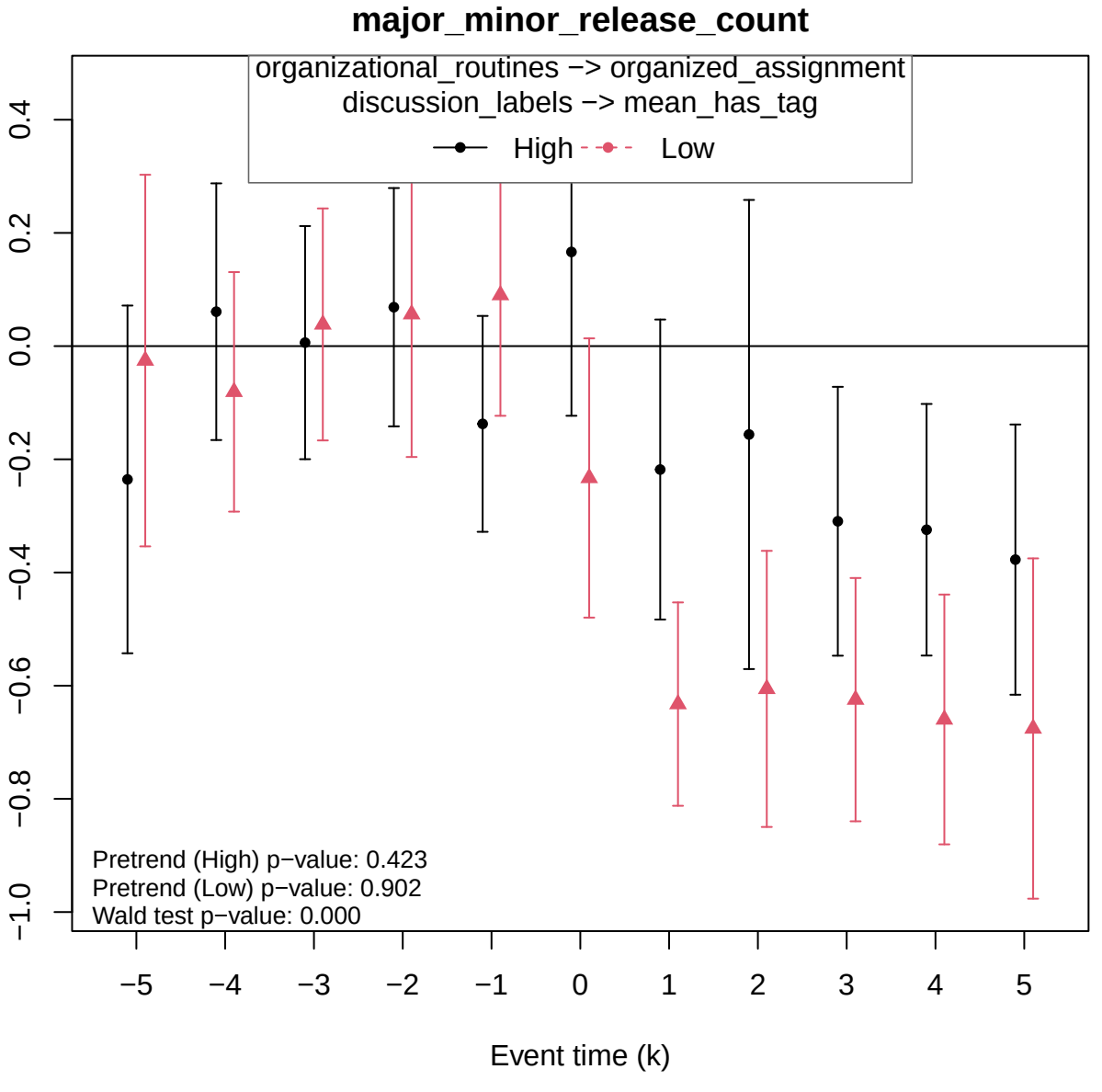

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

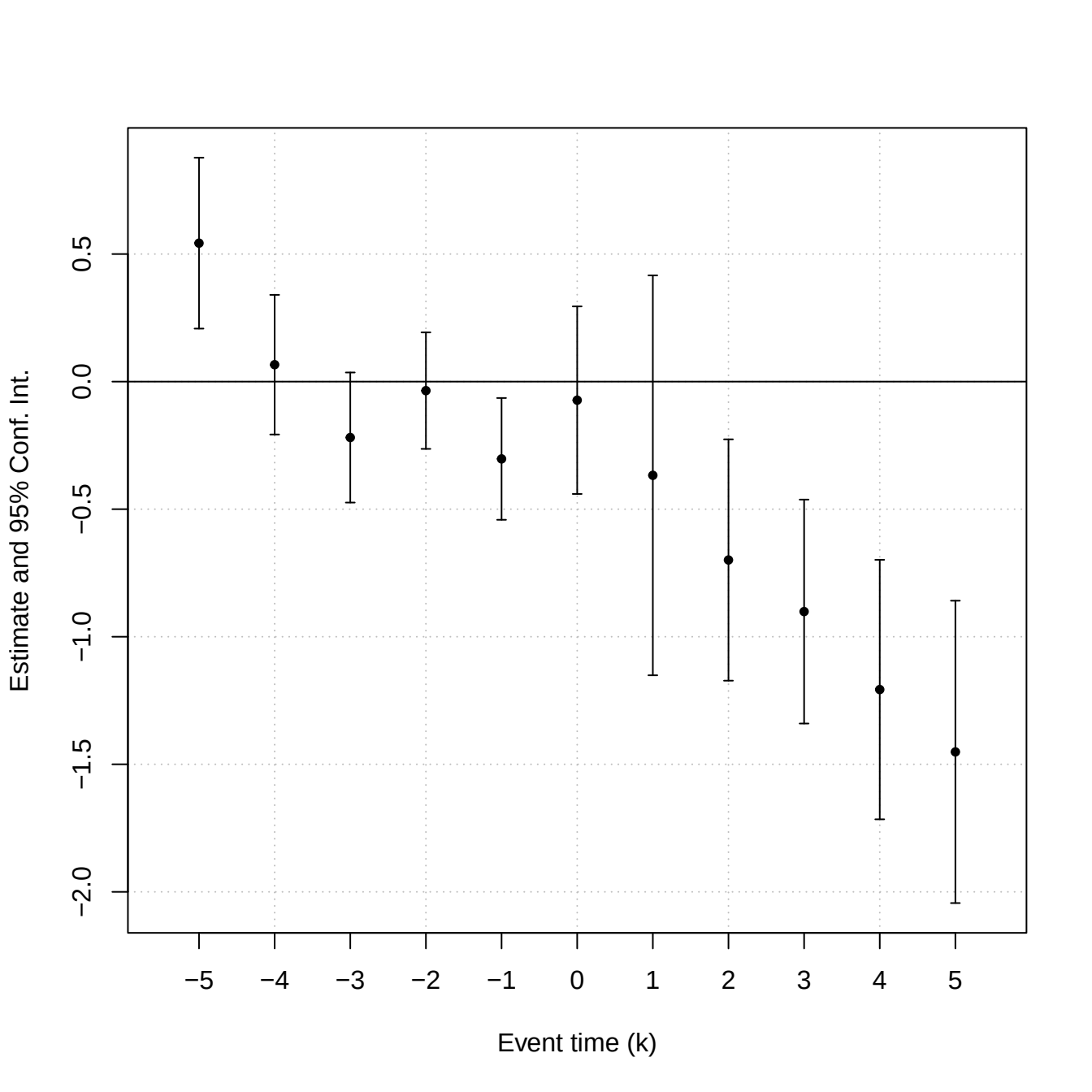

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

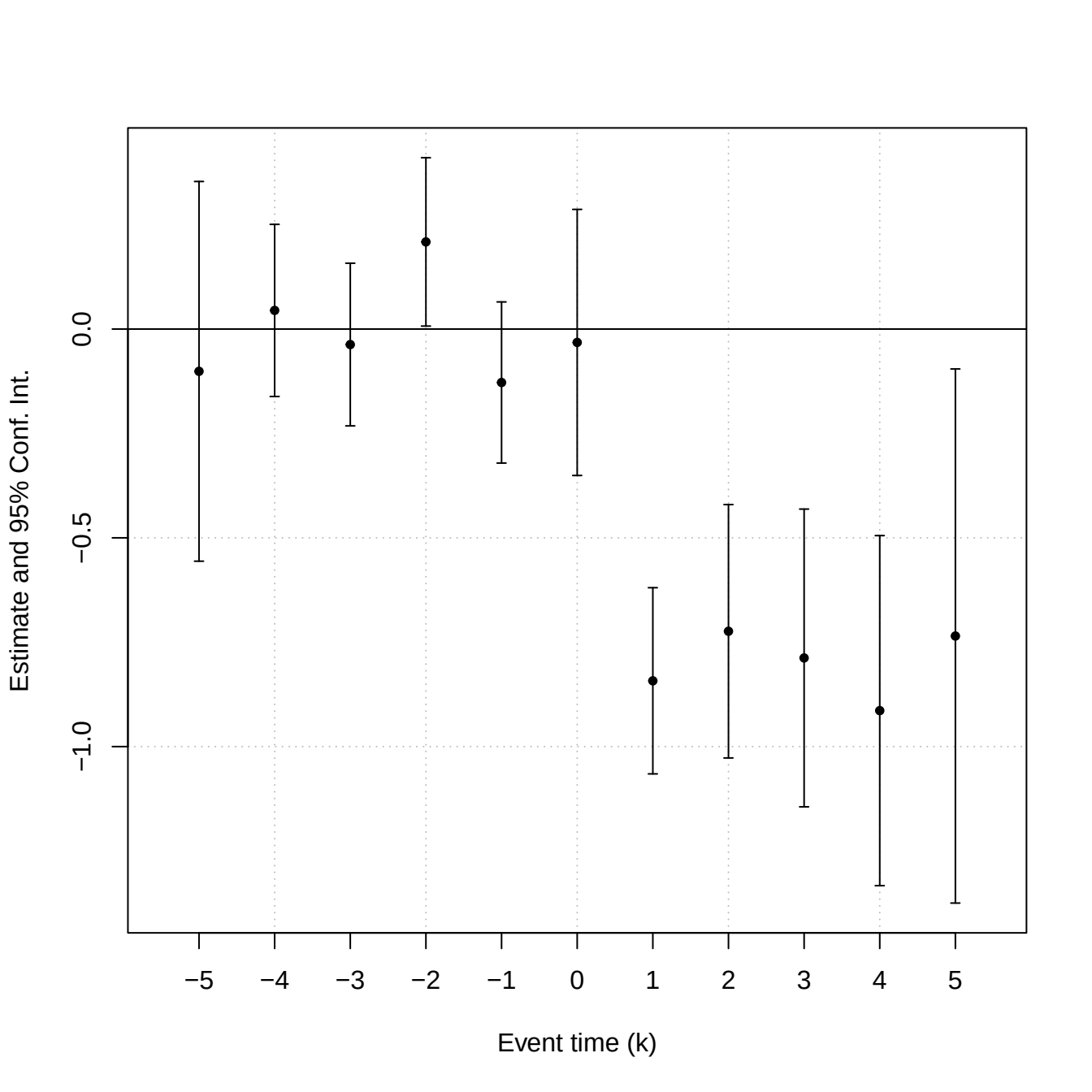

overall_new_release_count
organizational_routines −> organized_assignment
discussion_labels −> mean_has_tag
High
Low
Pretrend (High) p−value: 0.472
Pretrend (Low) p−value: 0.593
Wald test p−value: 0.031
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

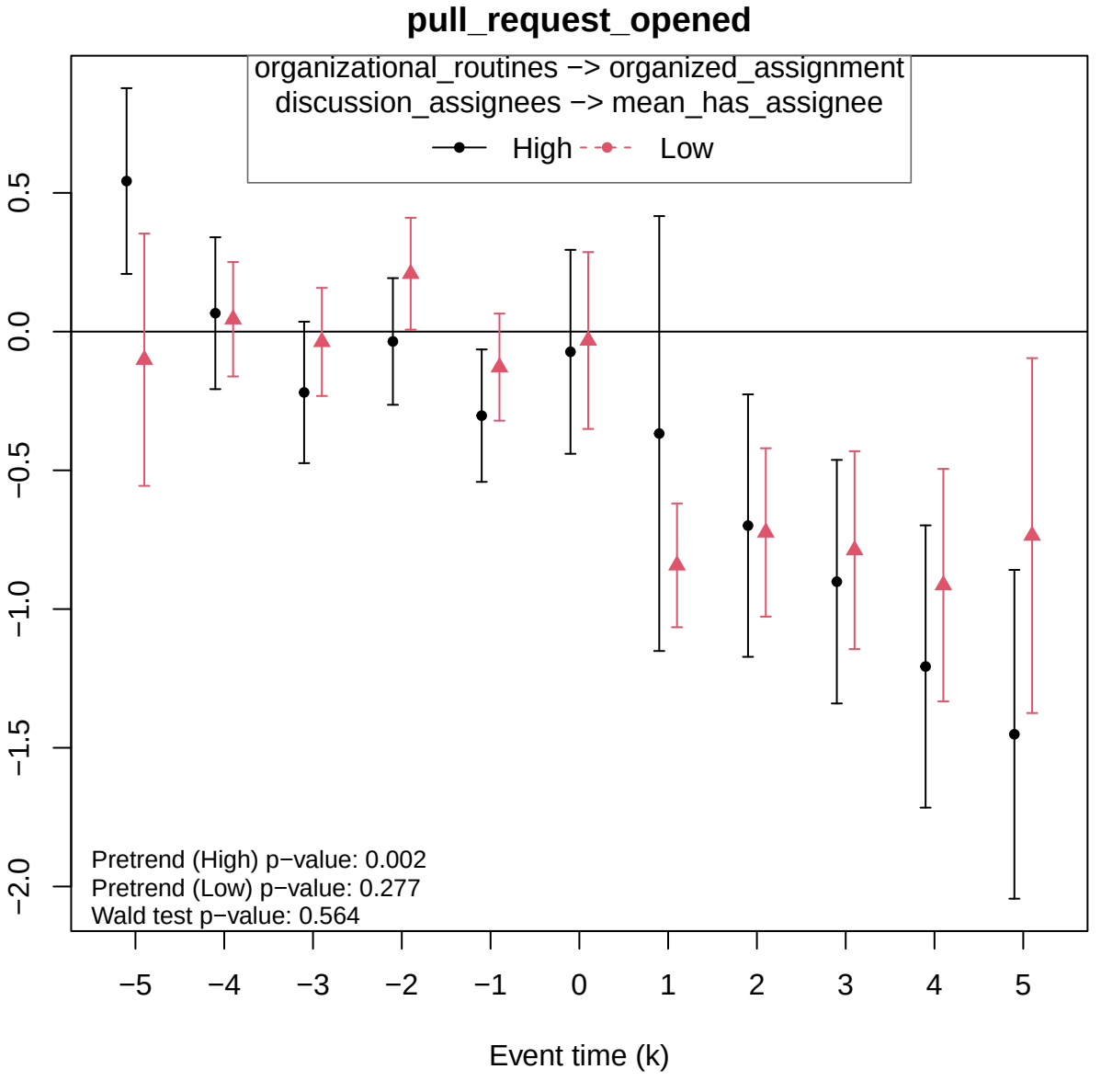

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

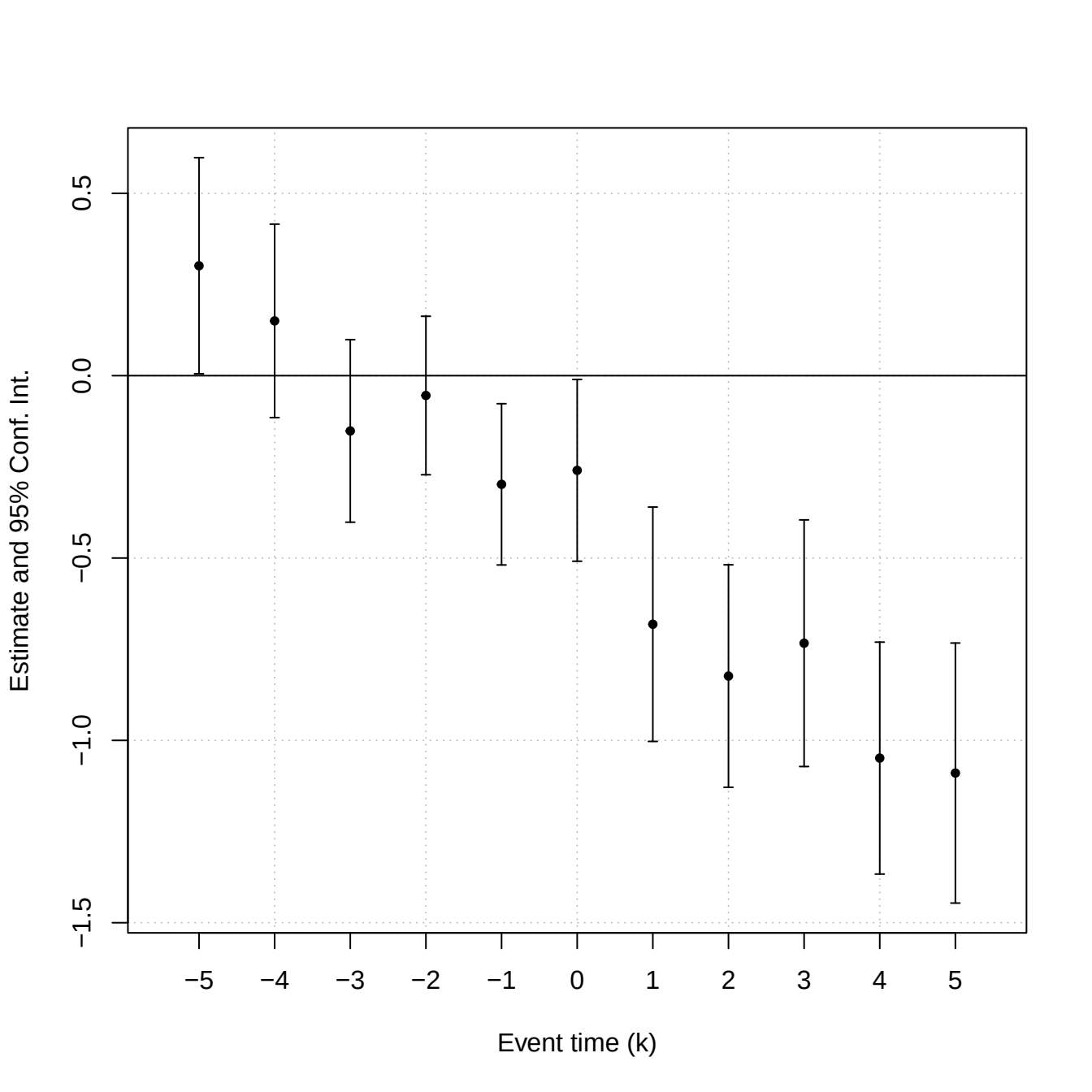

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

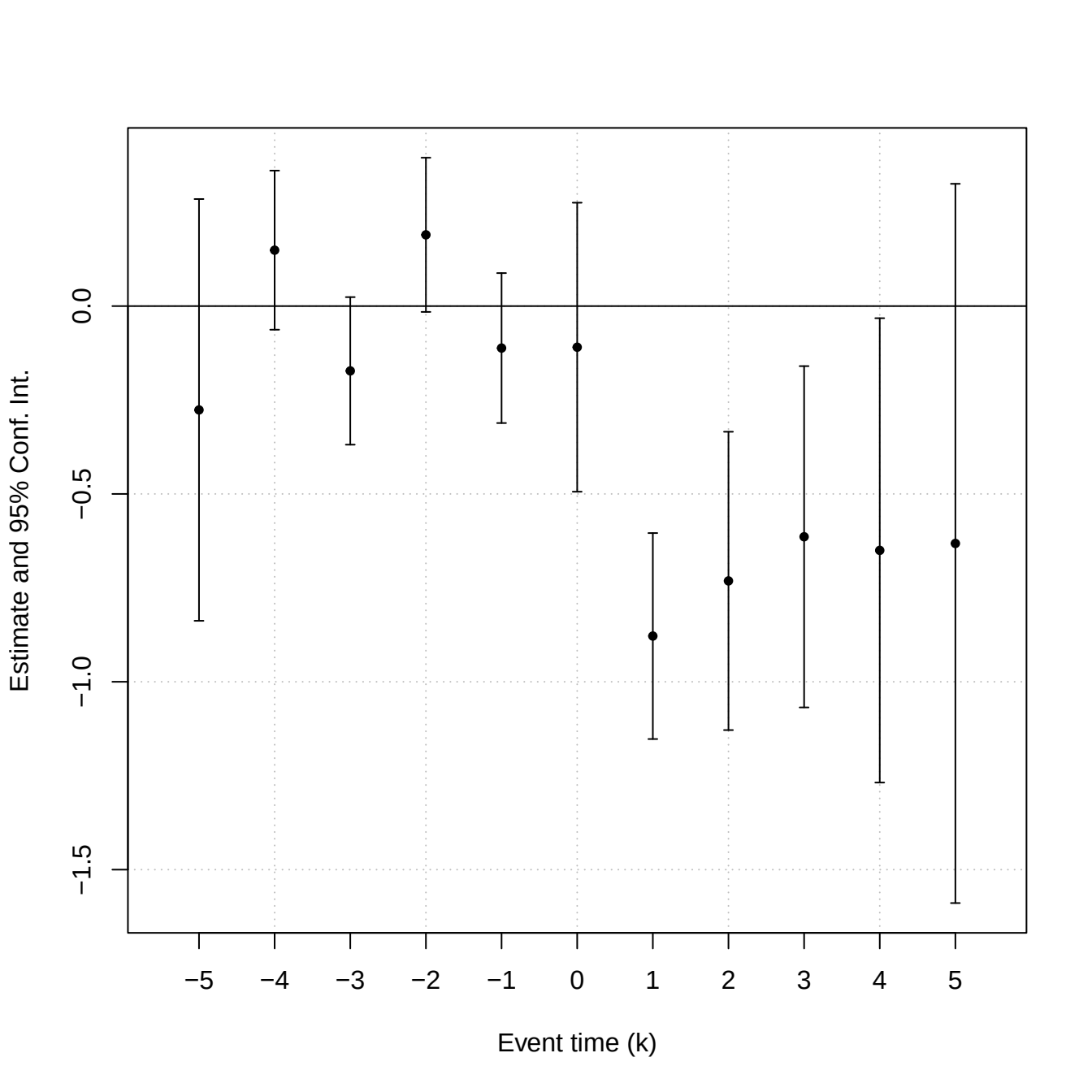

major_minor_release_count
organizational_routines −> organized_assignment
discussion_labels −> mean_has_tag
High
Low
Pretrend (High) p−value: 0.423
Pretrend (Low) p−value: 0.902
Wald test p−value: 0.000
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

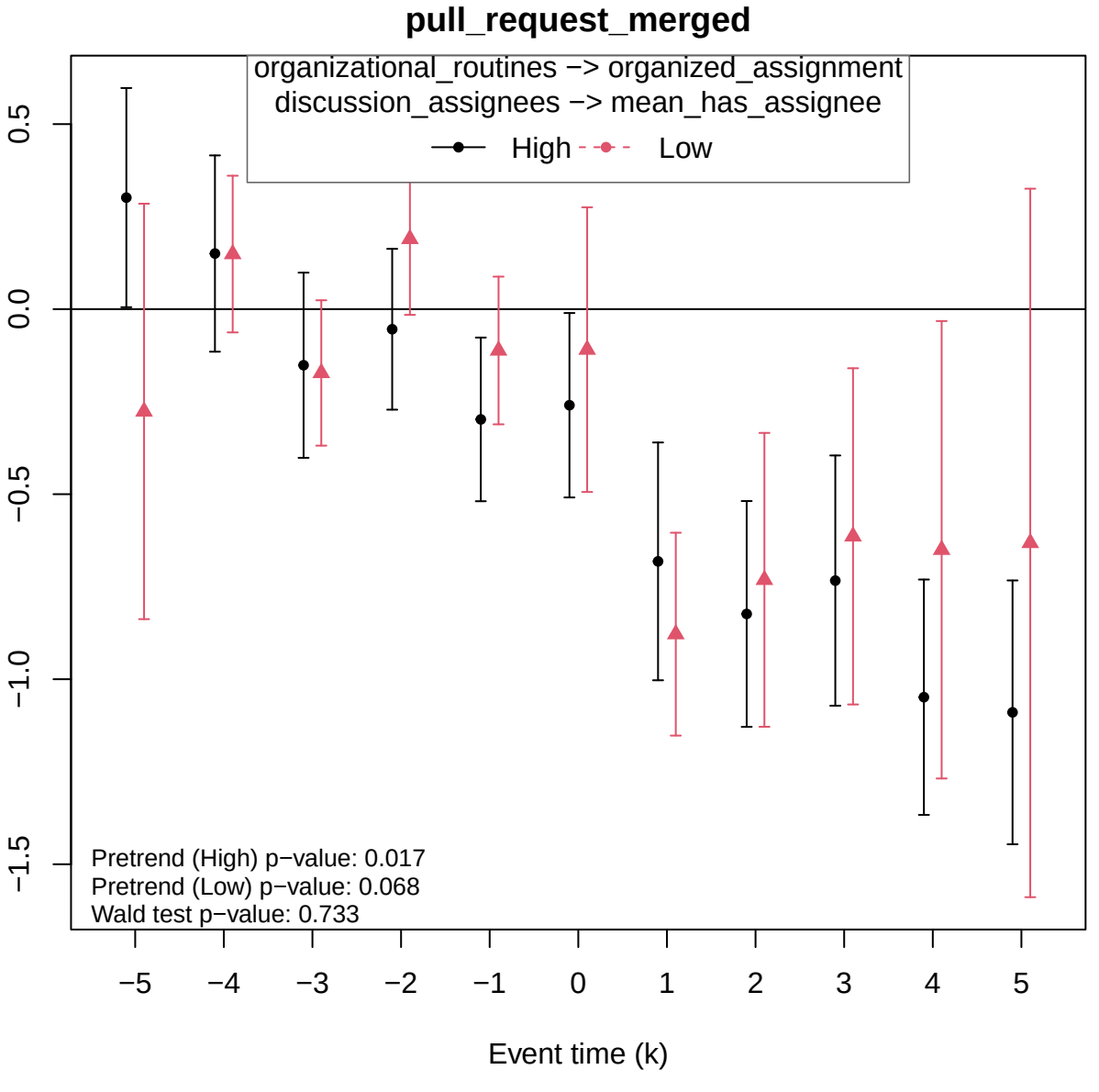

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

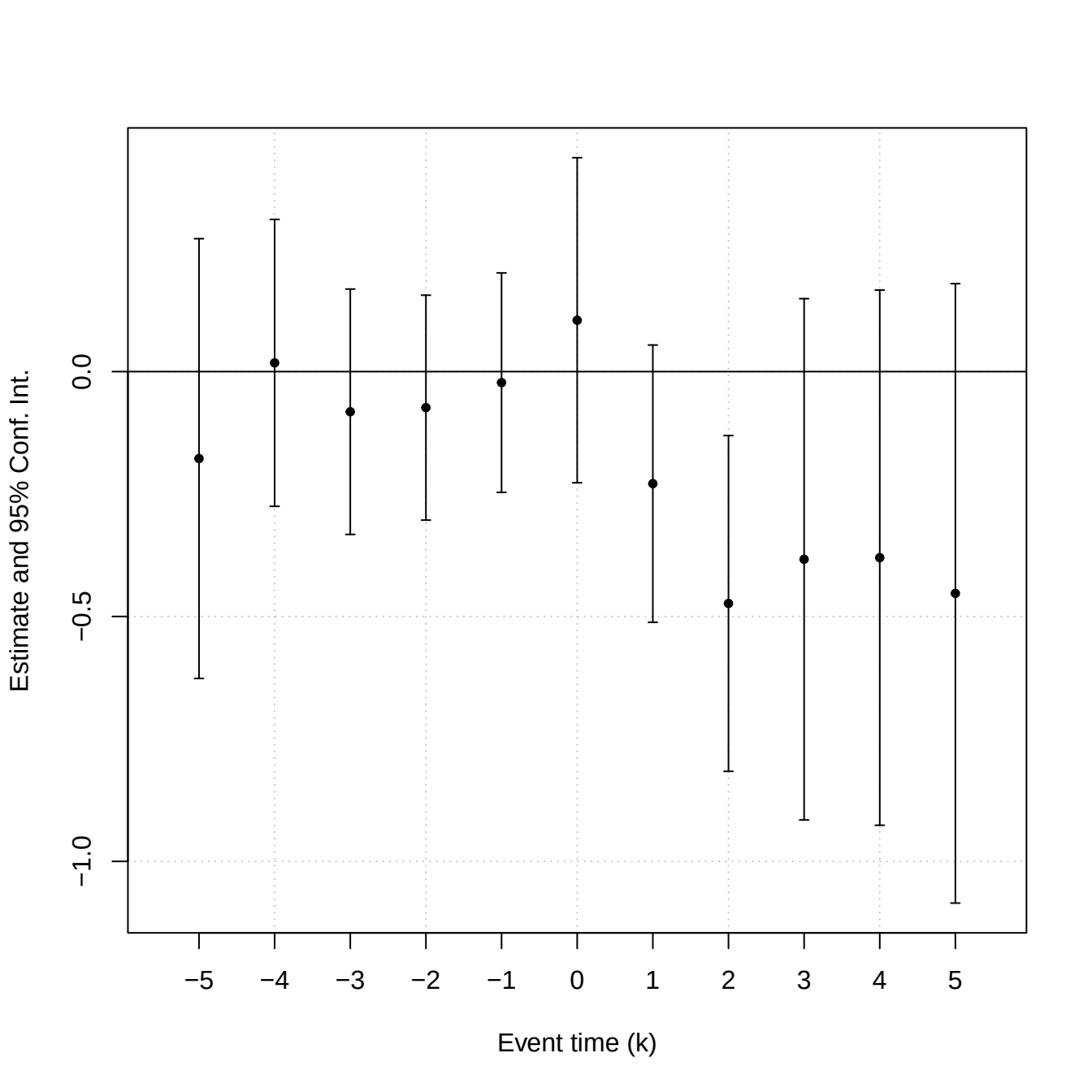

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

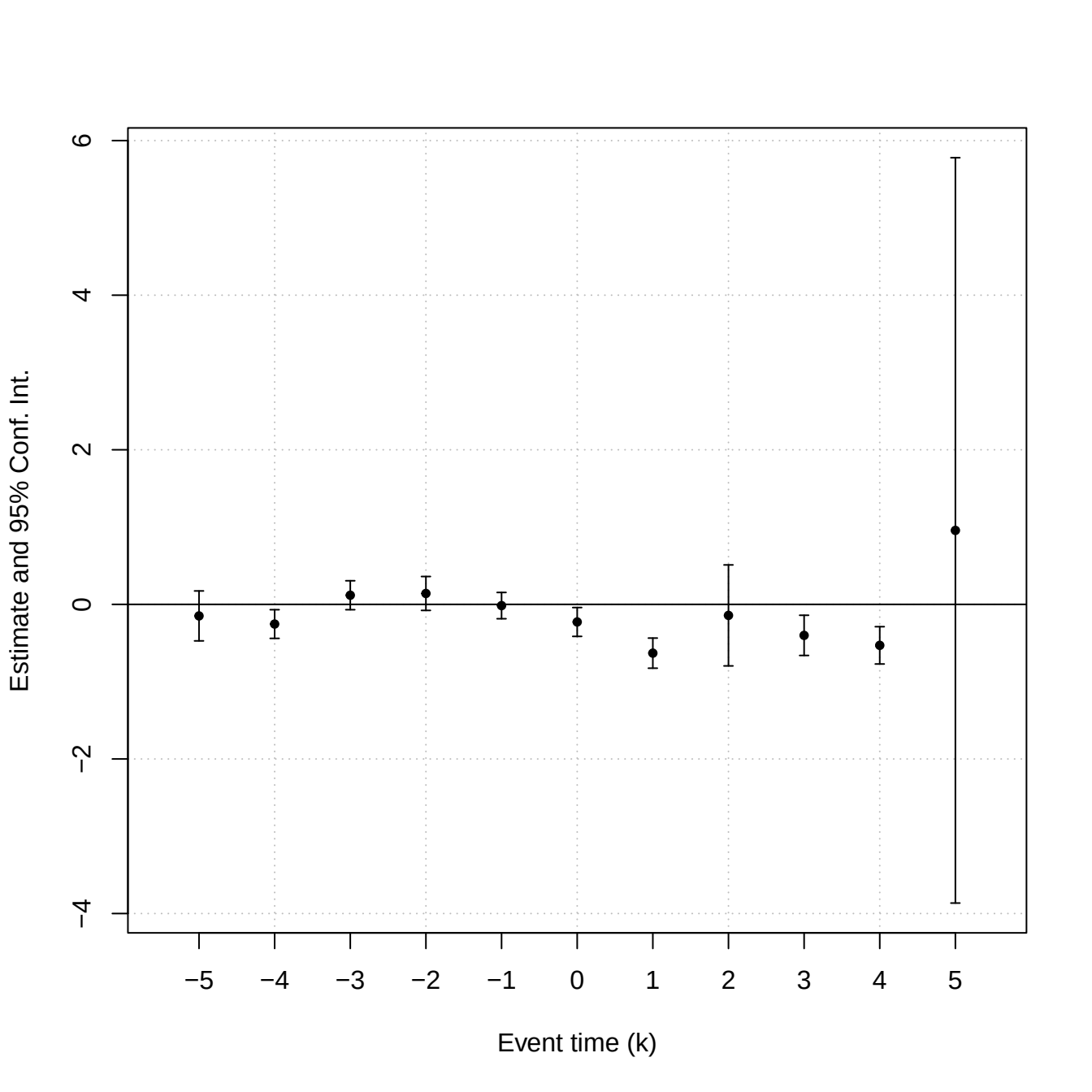

pull_request_opened
organizational_routines −> organized_assignment
discussion_assignees −> mean_has_assignee
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.002
Pretrend (Low) p−value: 0.277
Wald test p−value: 0.564
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

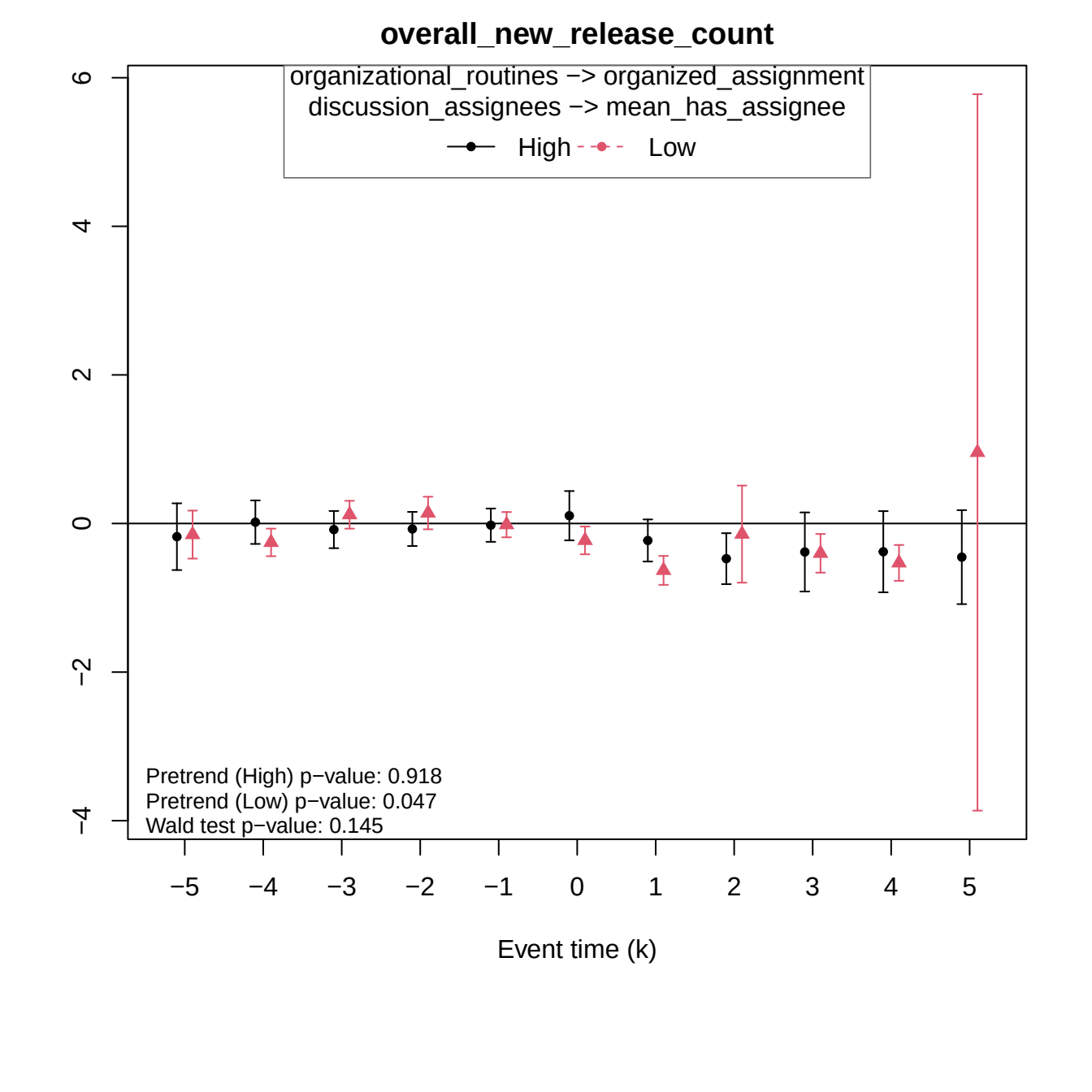

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

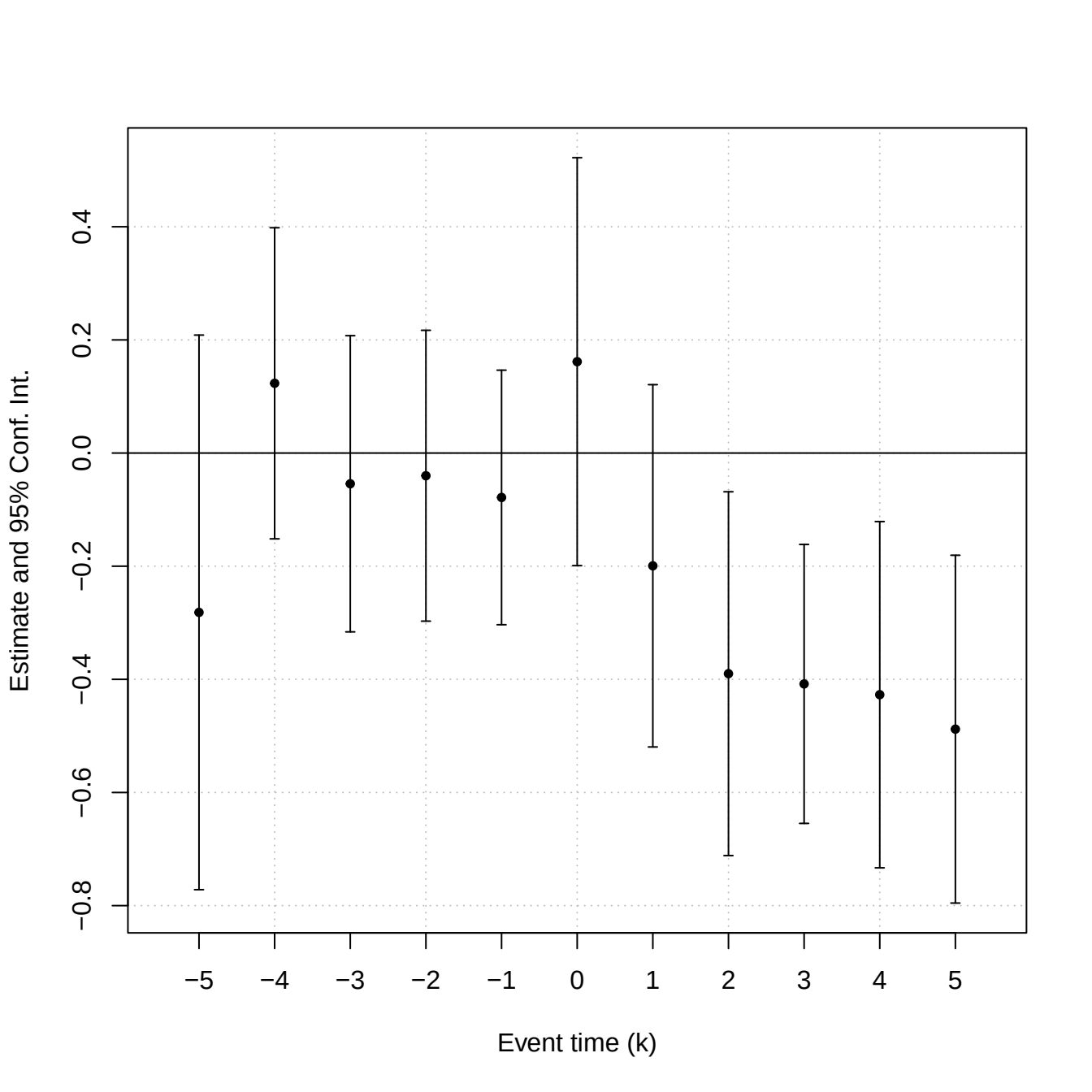

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

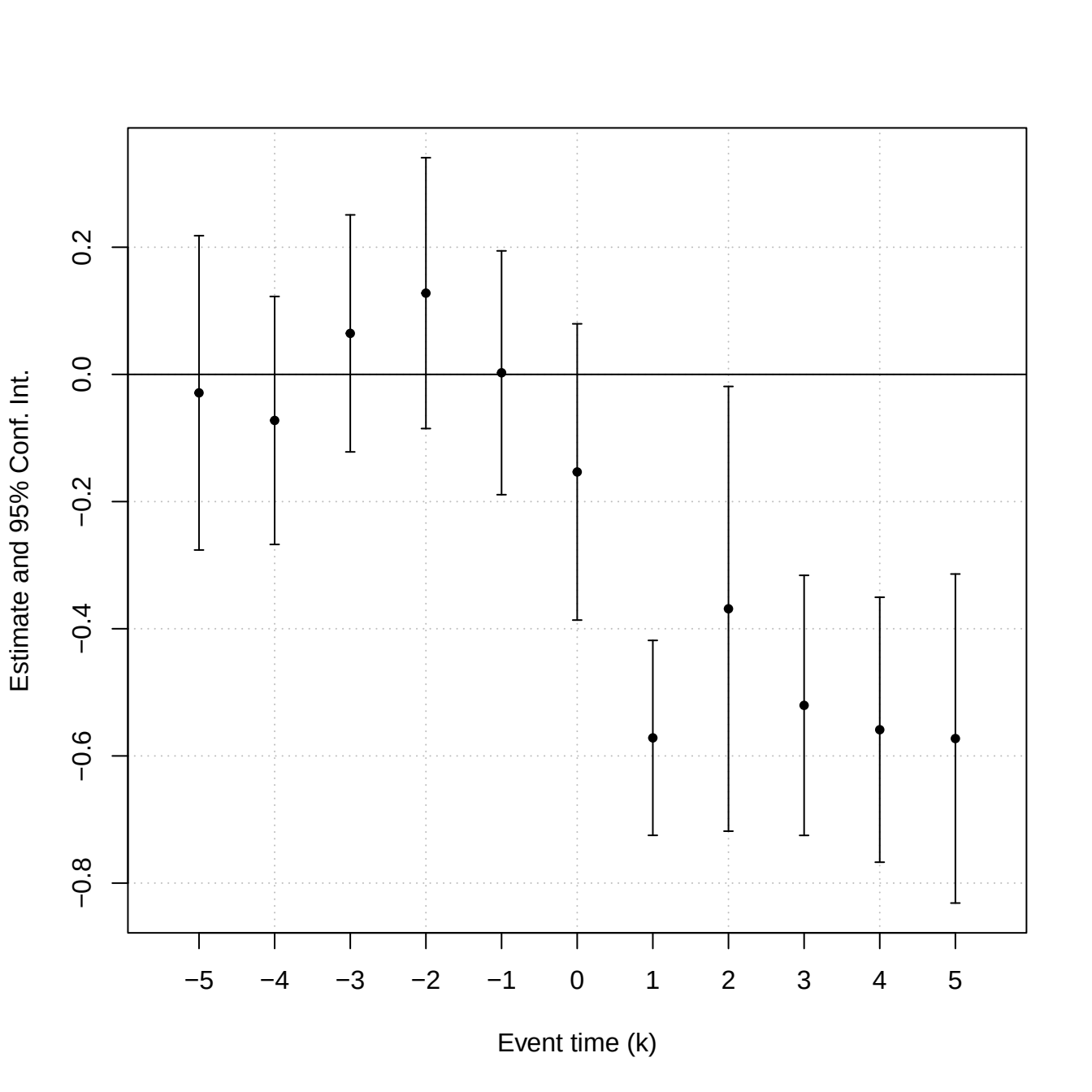

pull_request_merged
organizational_routines -> organized_assignment
discussion_assignees -> mean_has_assignee
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.017
Pretrend (Low) p−value: 0.068
Wald test p−value: 0.733
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

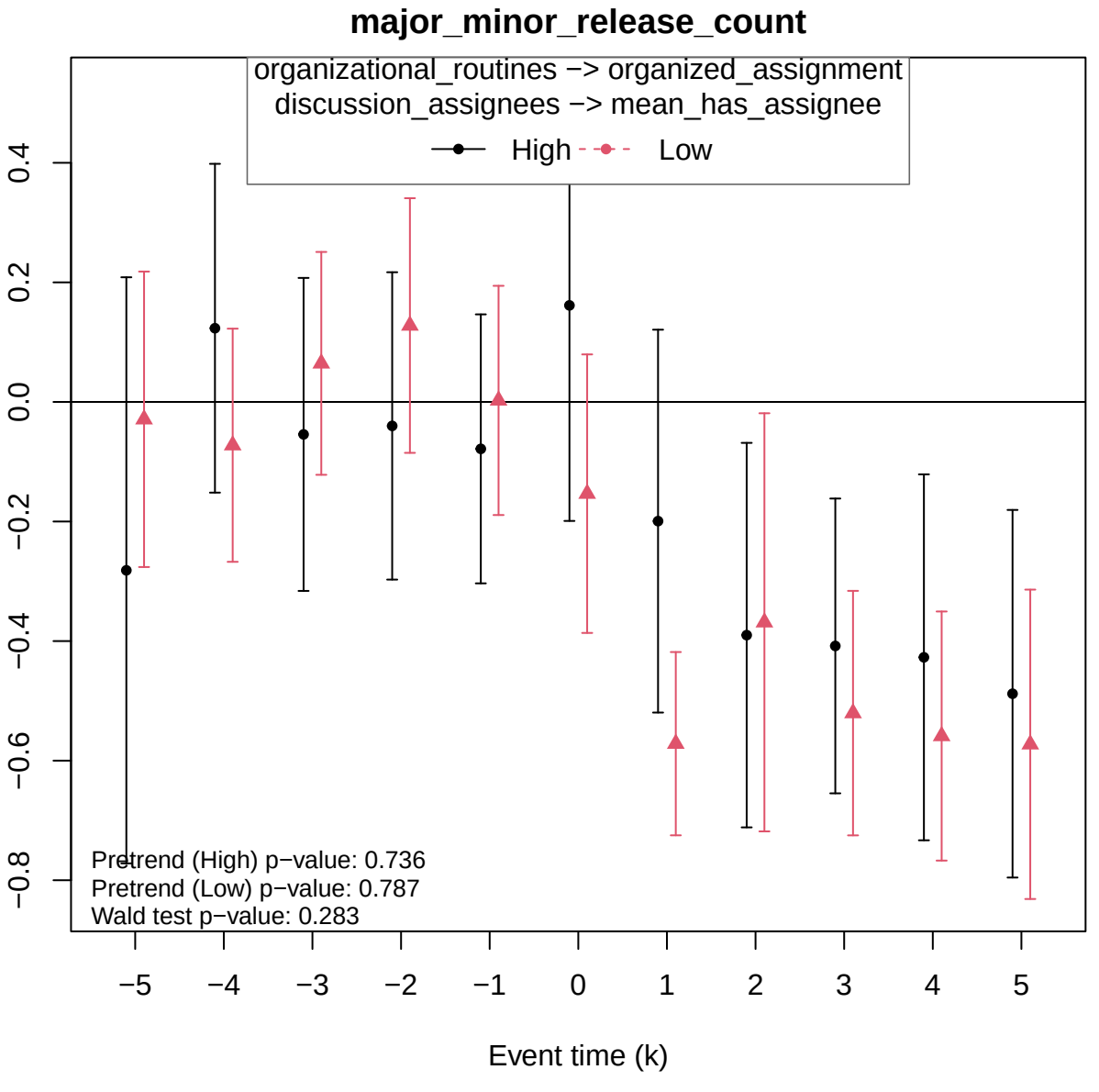

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

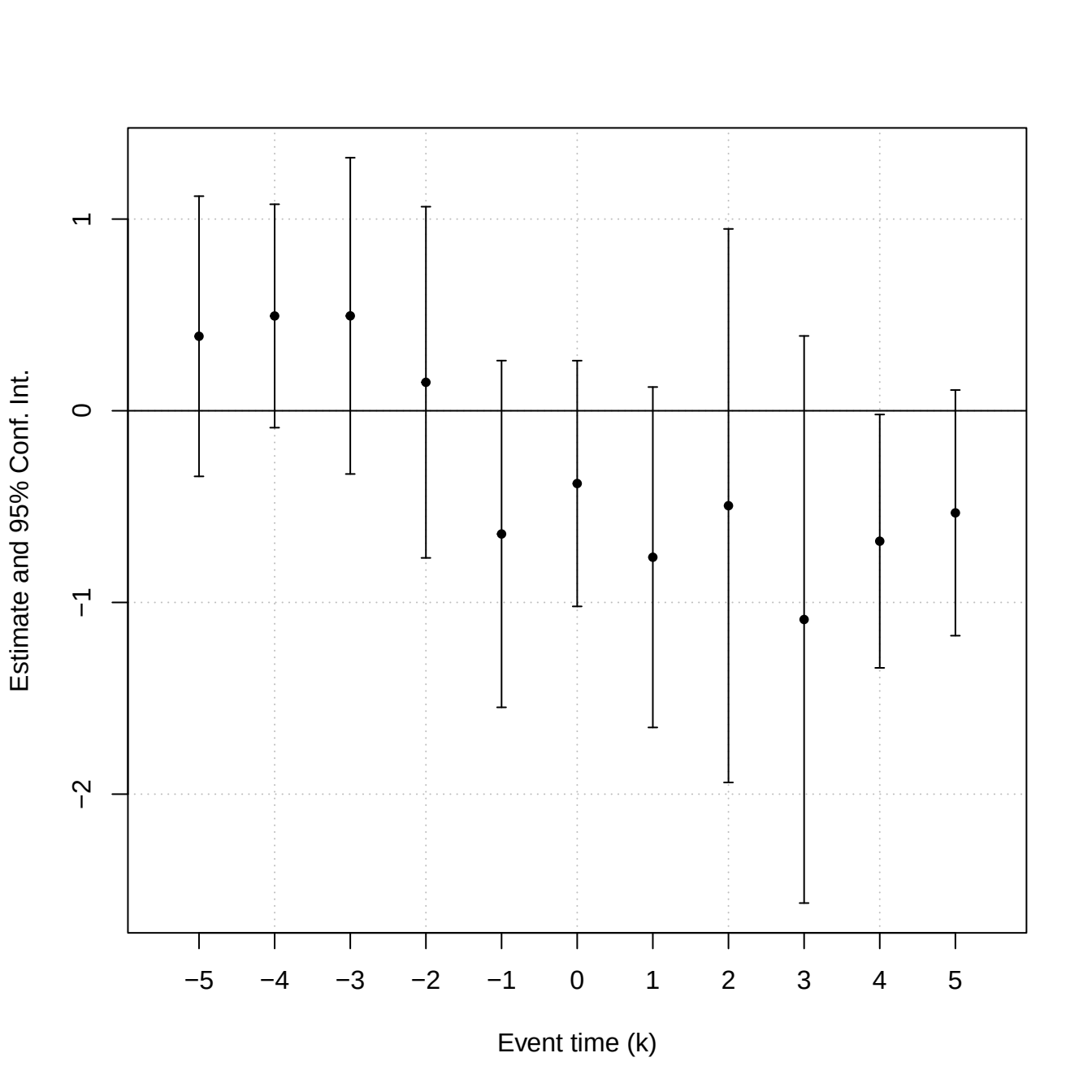

Estimate and 95% Conf. Int.
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

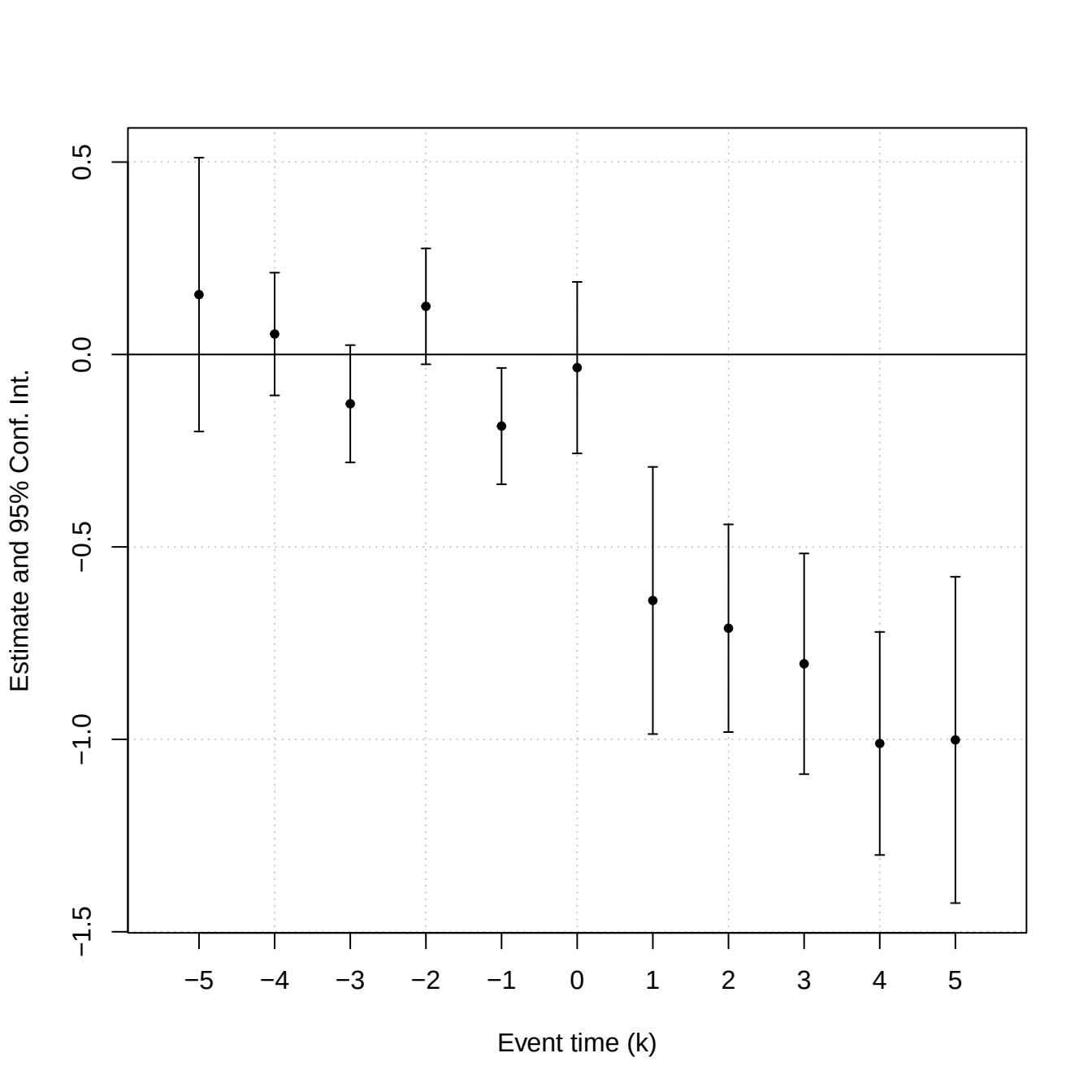

overall_new_release_count
organizational_routines −> organized_assignment
discussion_assignees −> mean_has_assignee
High
Low
Pretrend (High) p−value: 0.918
Pretrend (Low) p−value: 0.047
Wald test p−value: 0.145
6
4
2
0
−2
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

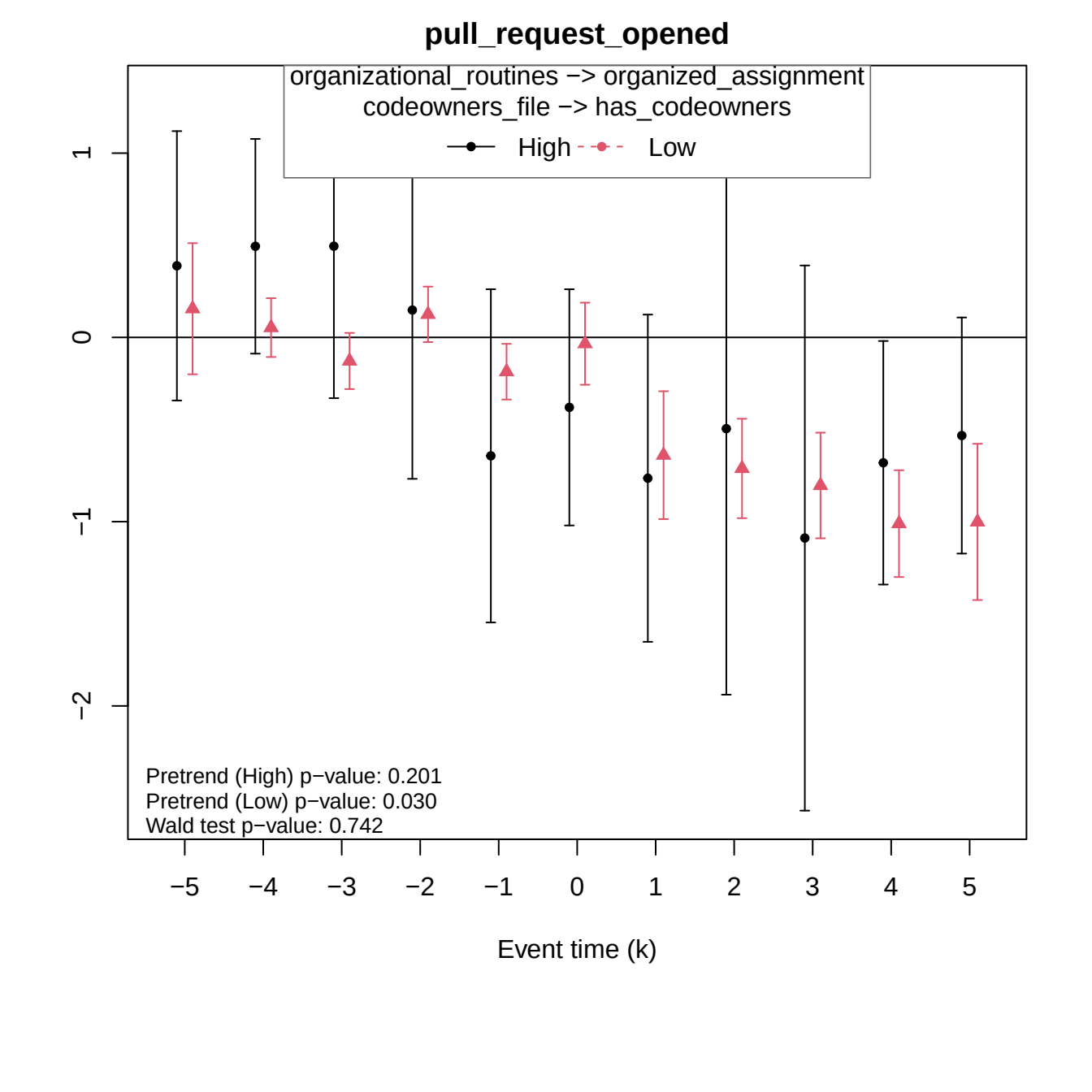

Estimate and 95% Conf. Int.
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

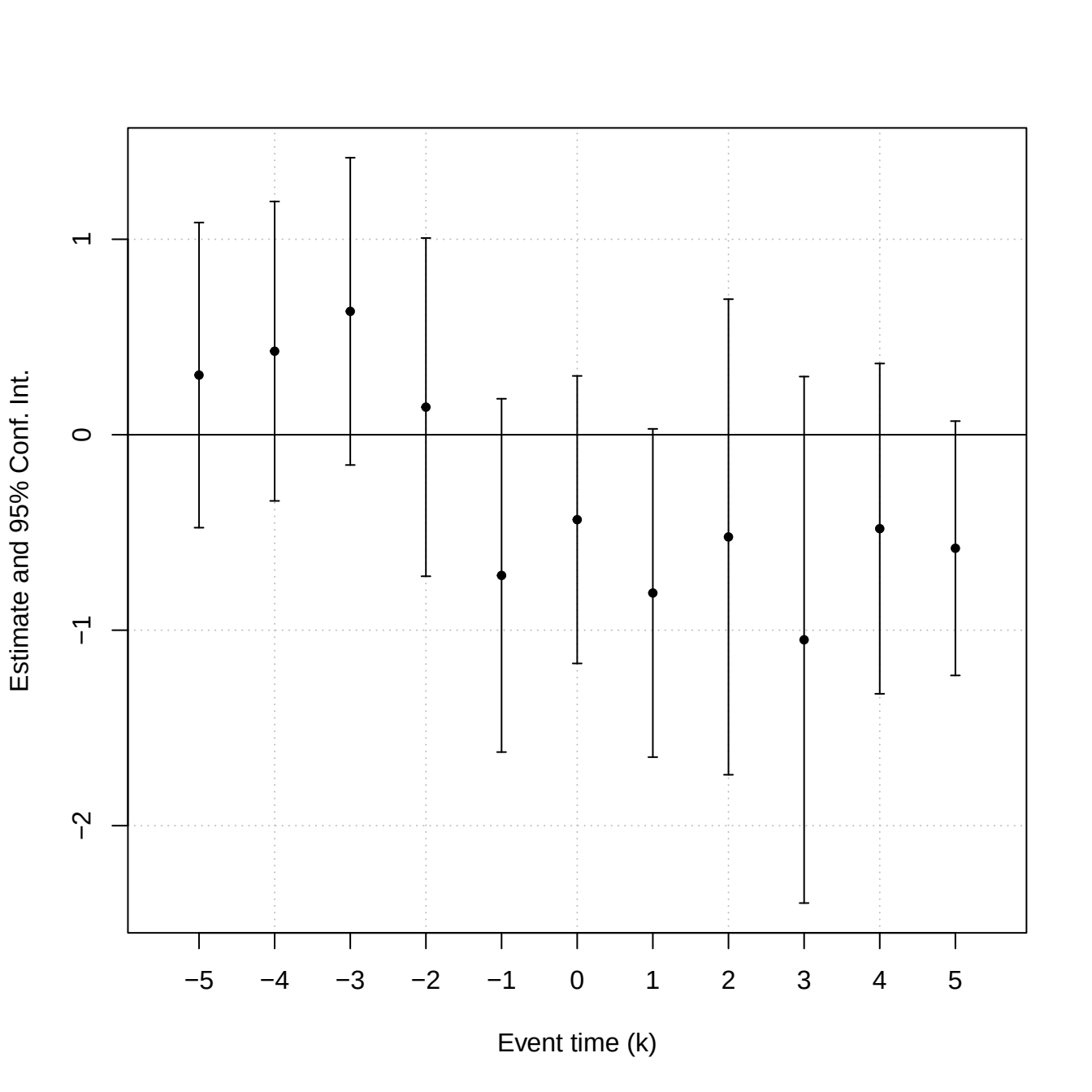

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

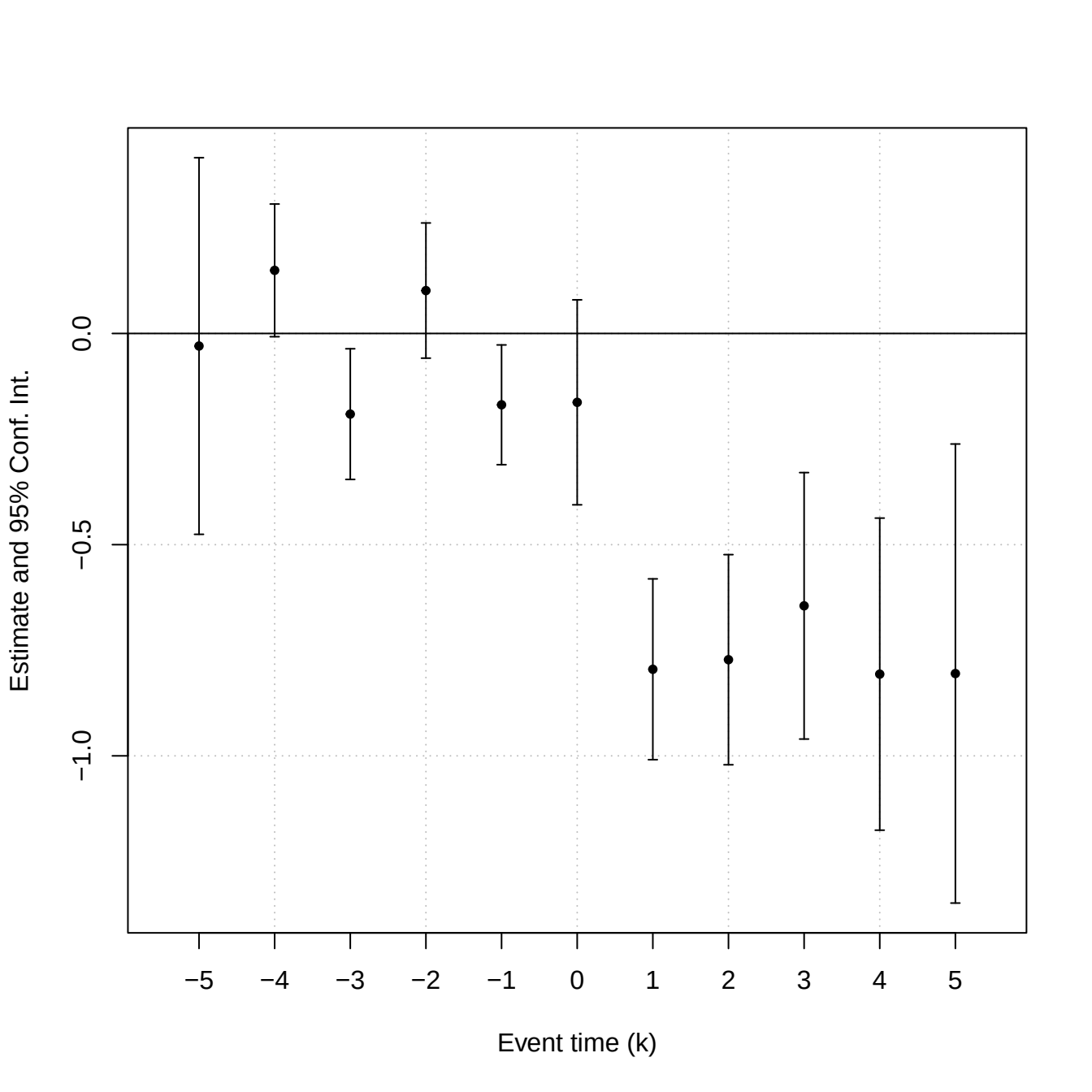

major_minor_release_count
organizational_routines −> organized_assignment
discussion_assignees −> mean_has_assignee
High
Low
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
Pretrend (High) p−value: 0.736
Pretrend (Low) p−value: 0.787
Wald test p−value: 0.283
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

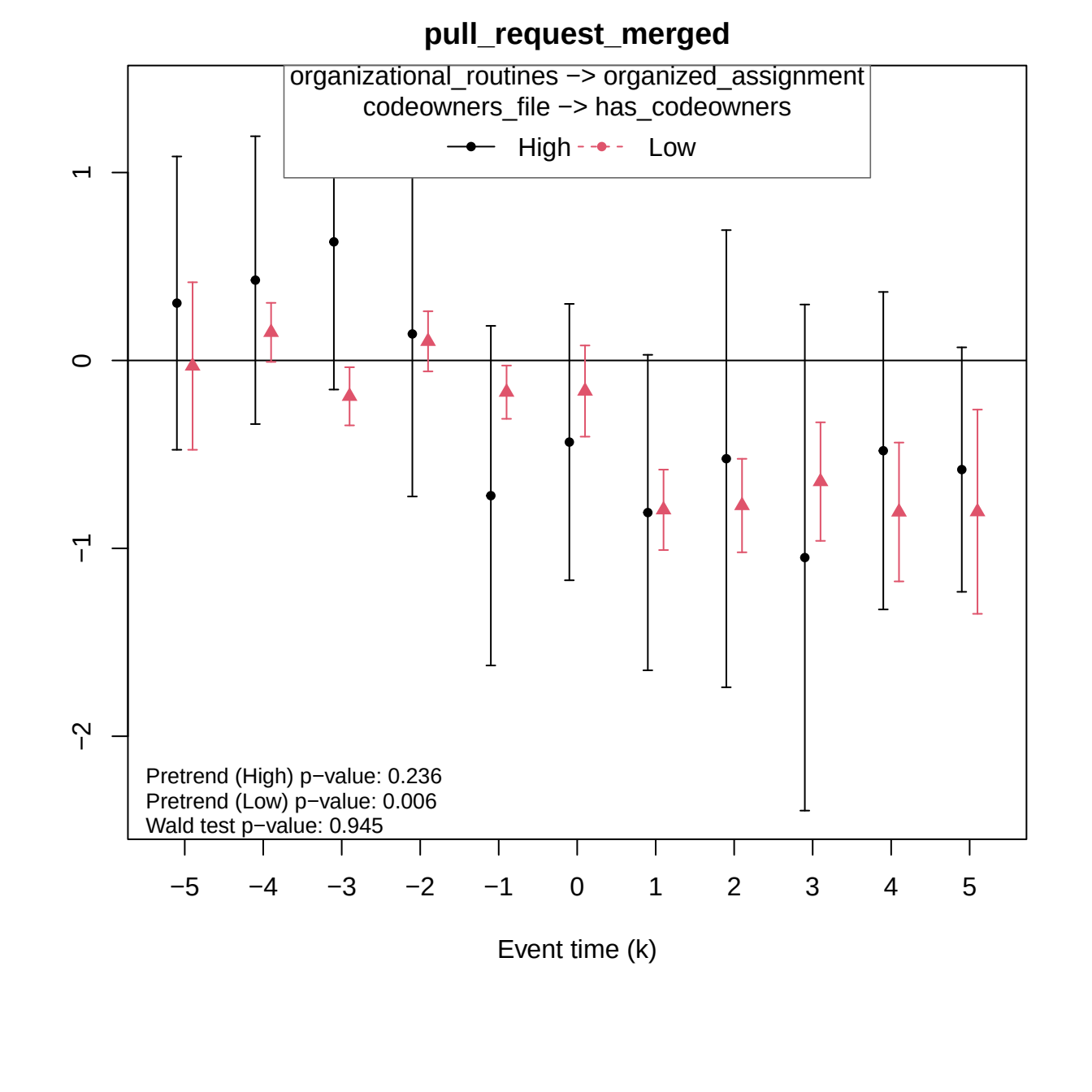

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

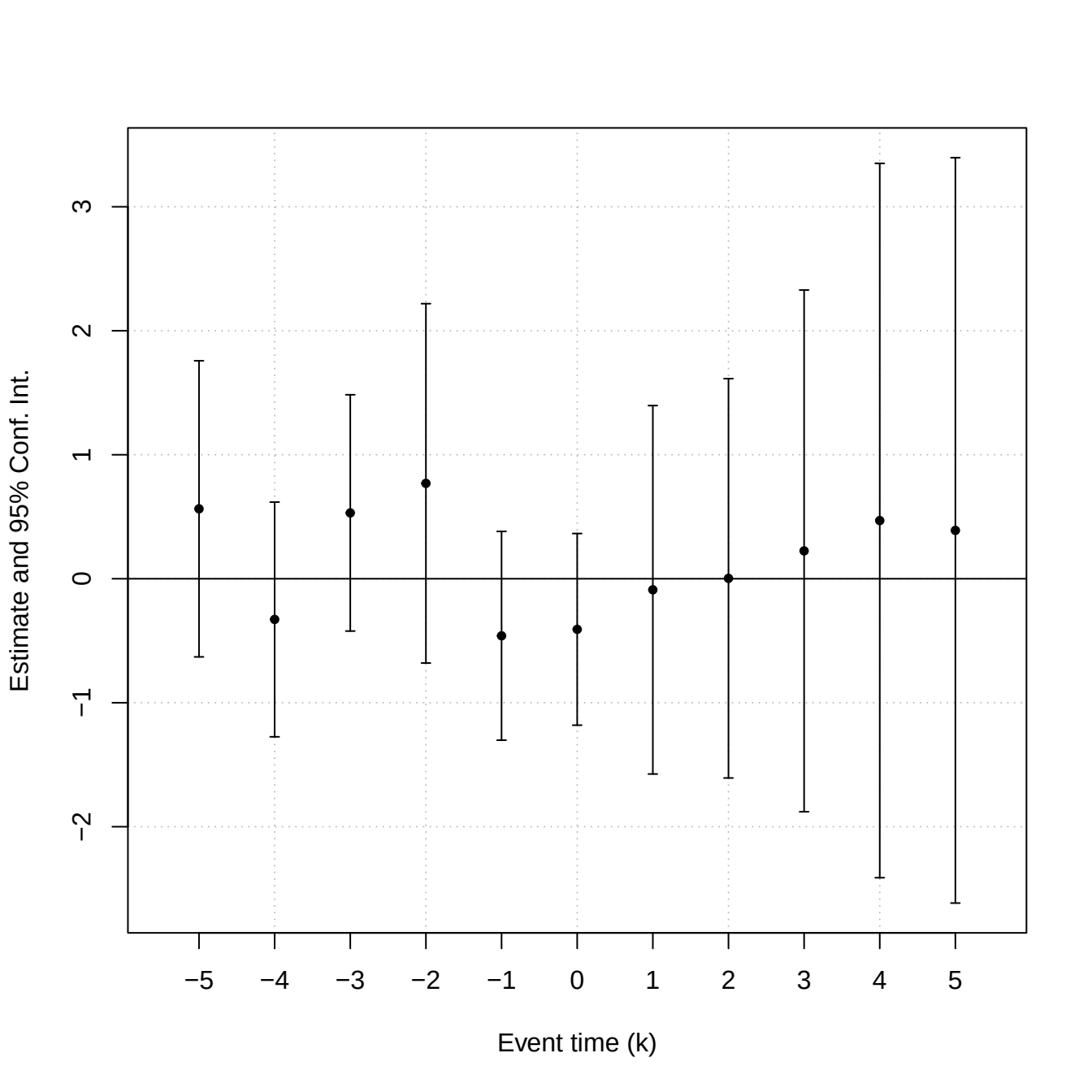

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

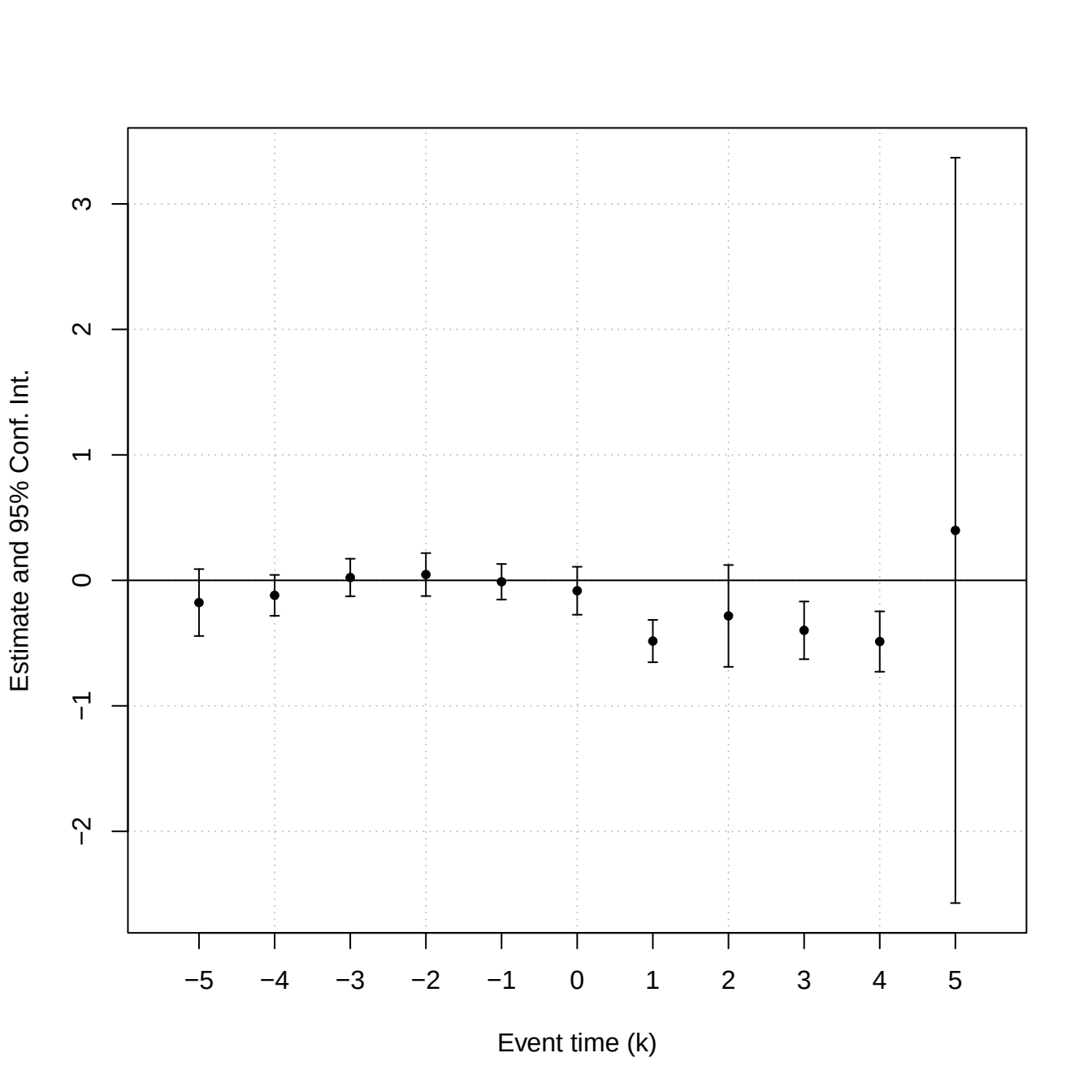

pull_request_opened
organizational_routines −> organized_assignment
codeowners_file −> has_codeowners
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.201
Pretrend (Low) p−value: 0.030
Wald test p−value: 0.742
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

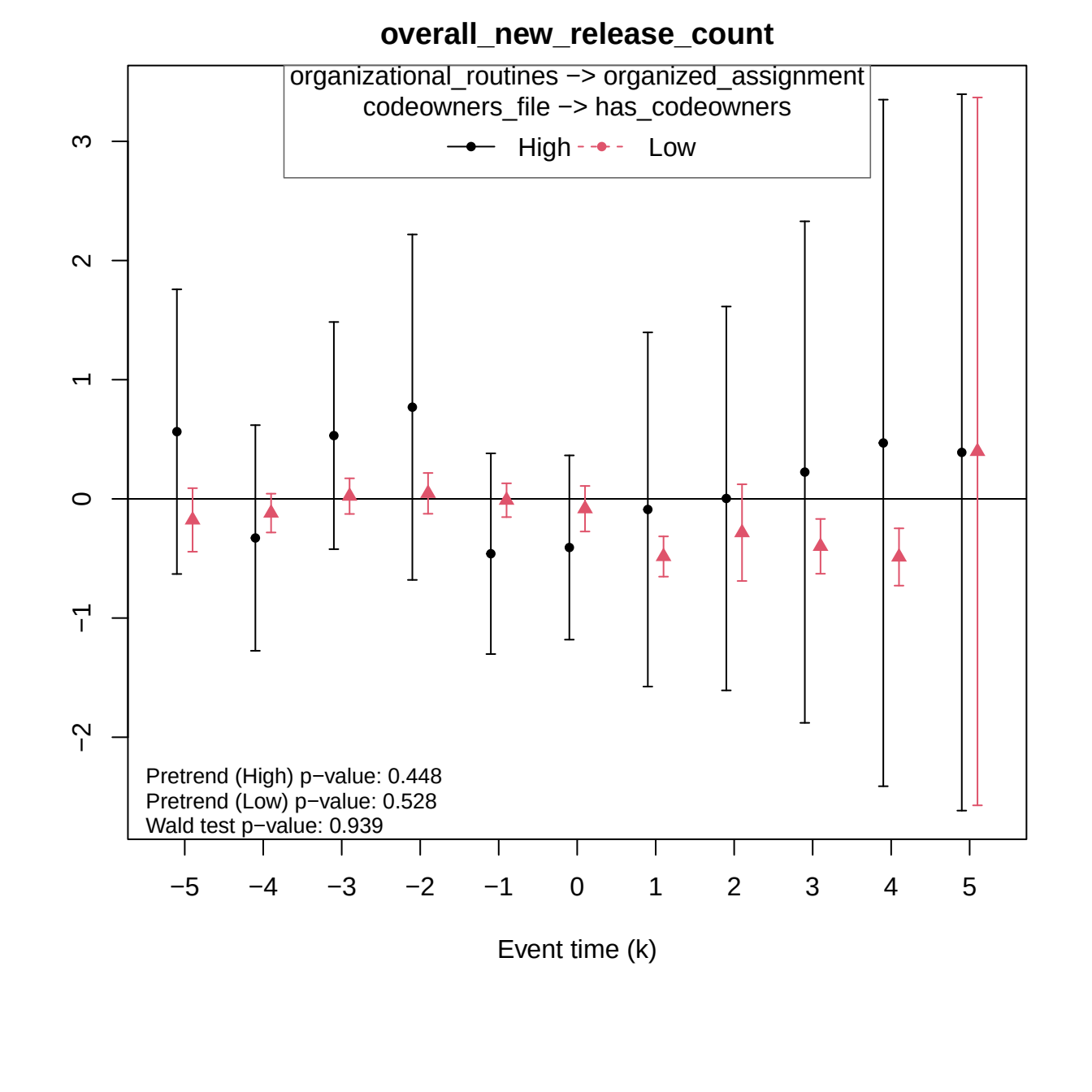

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

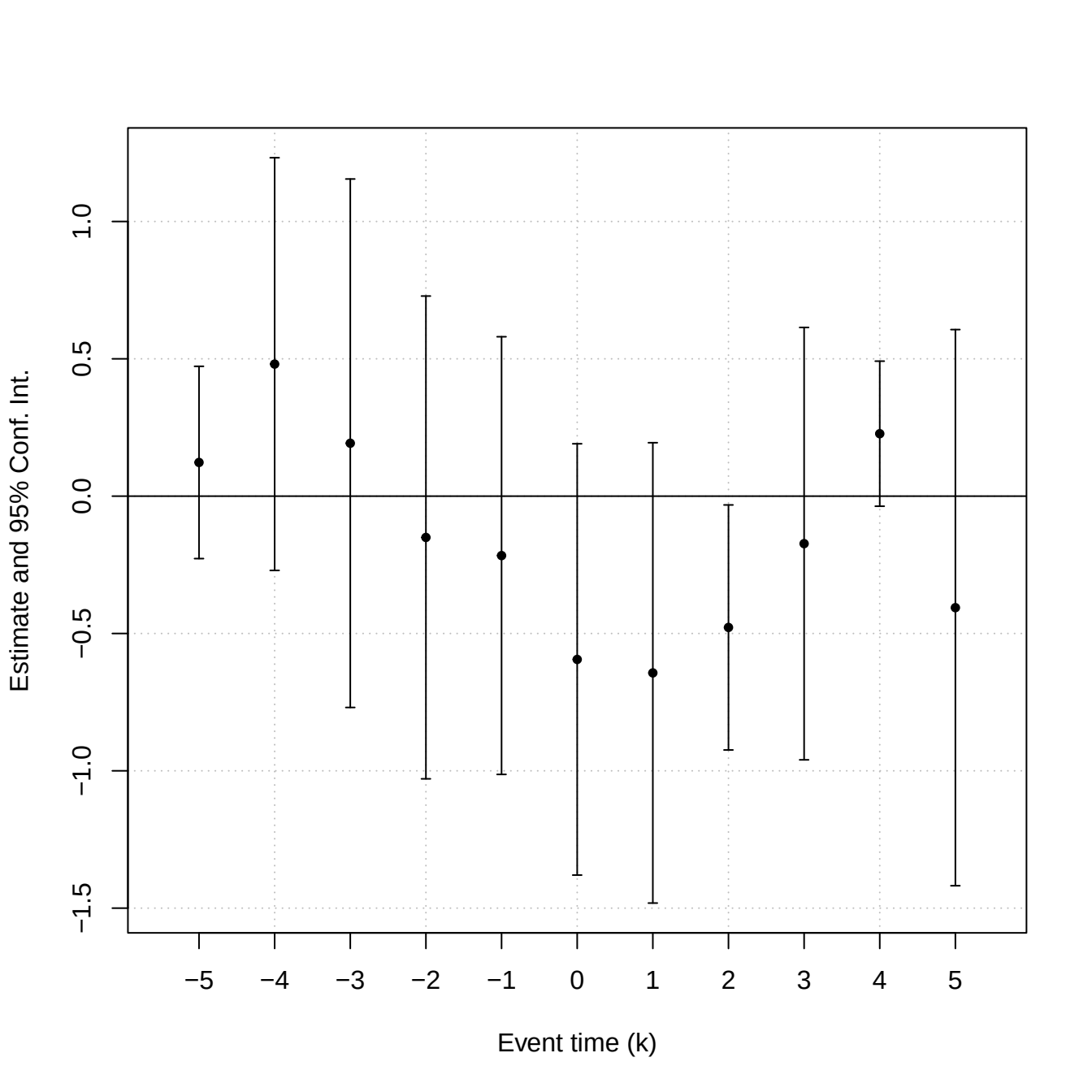

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

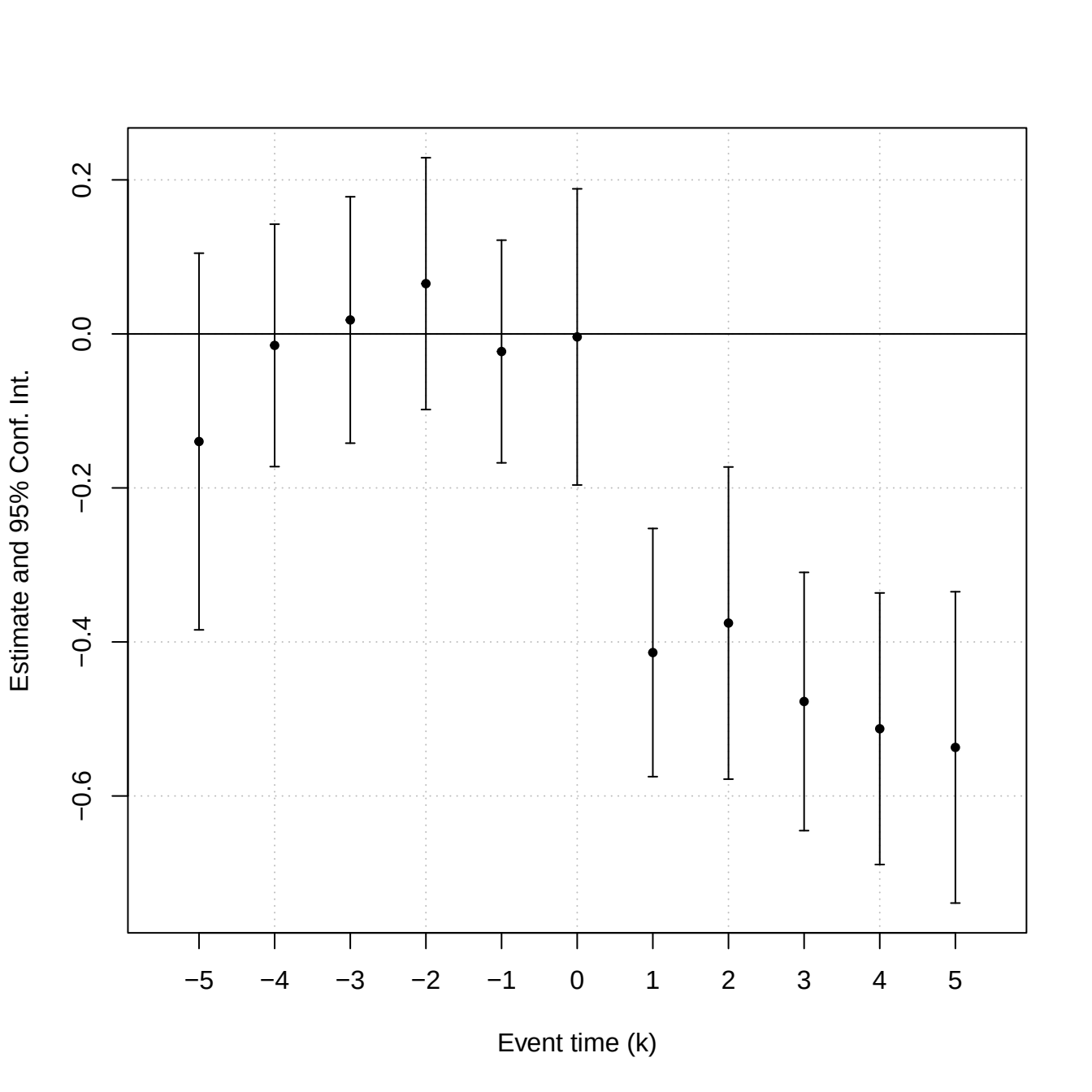

pull_request_merged
organizational_routines −> organized_assignment
codeowners_file −> has_codeowners
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.236
Pretrend (Low) p−value: 0.006
Wald test p−value: 0.945
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

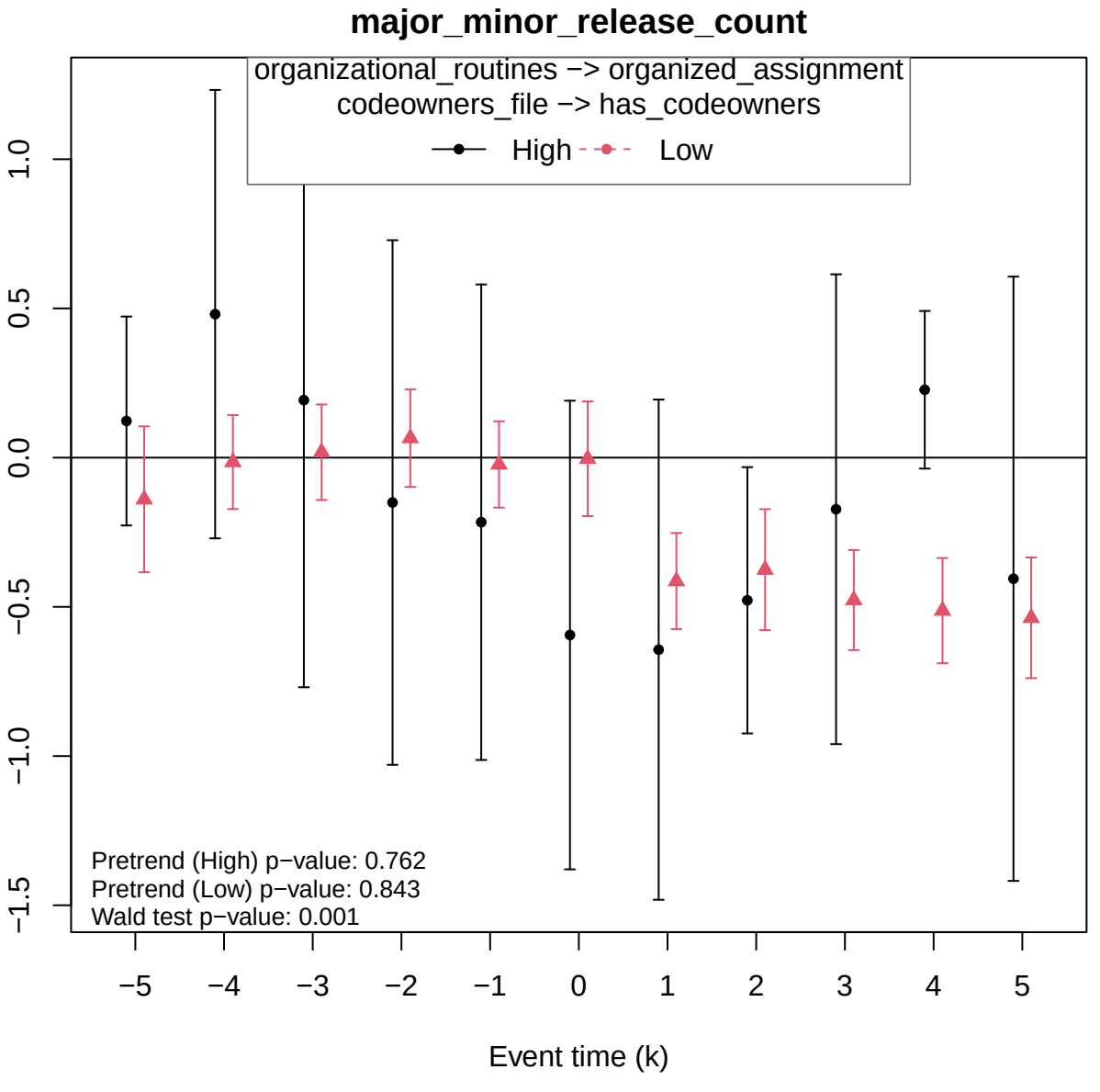

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

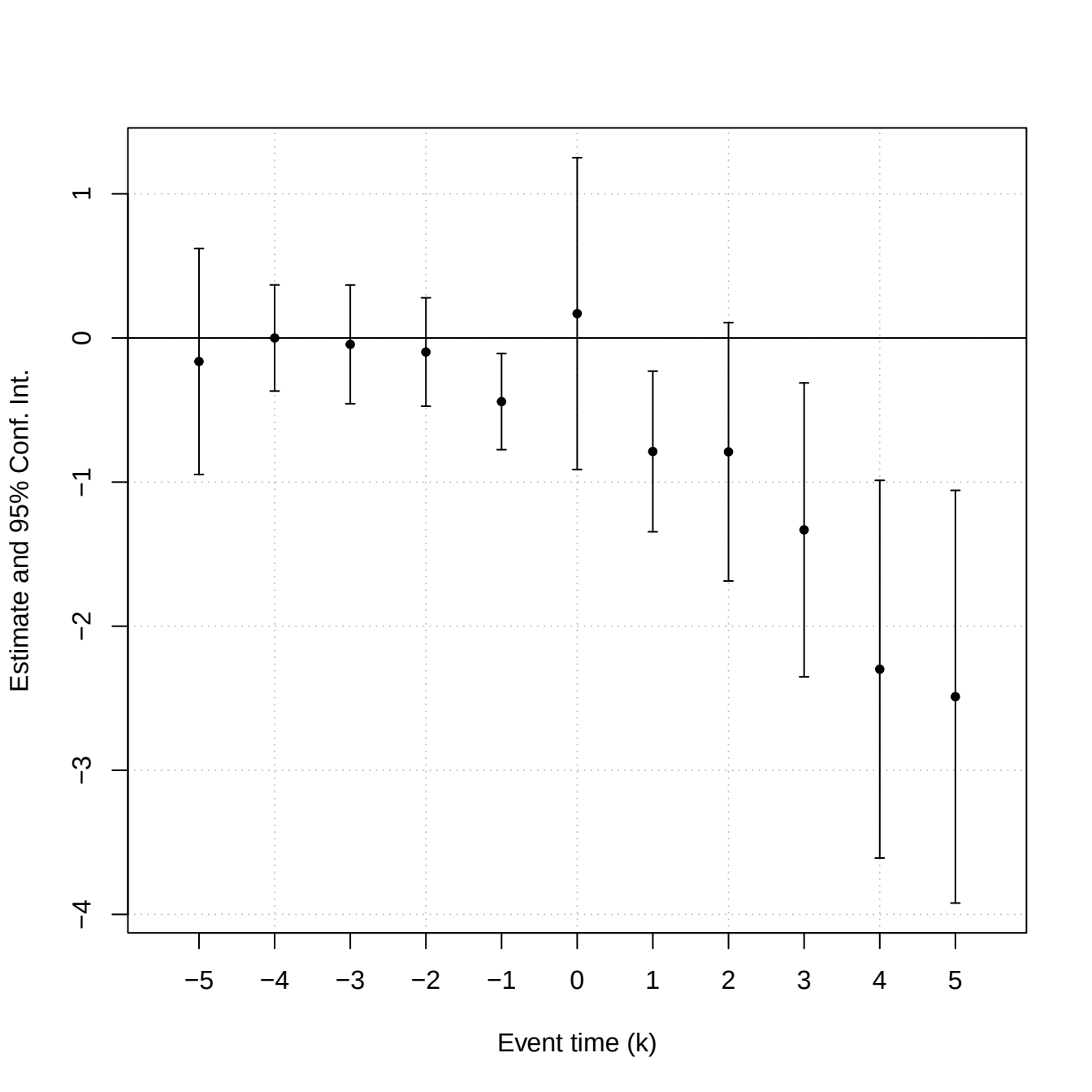

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

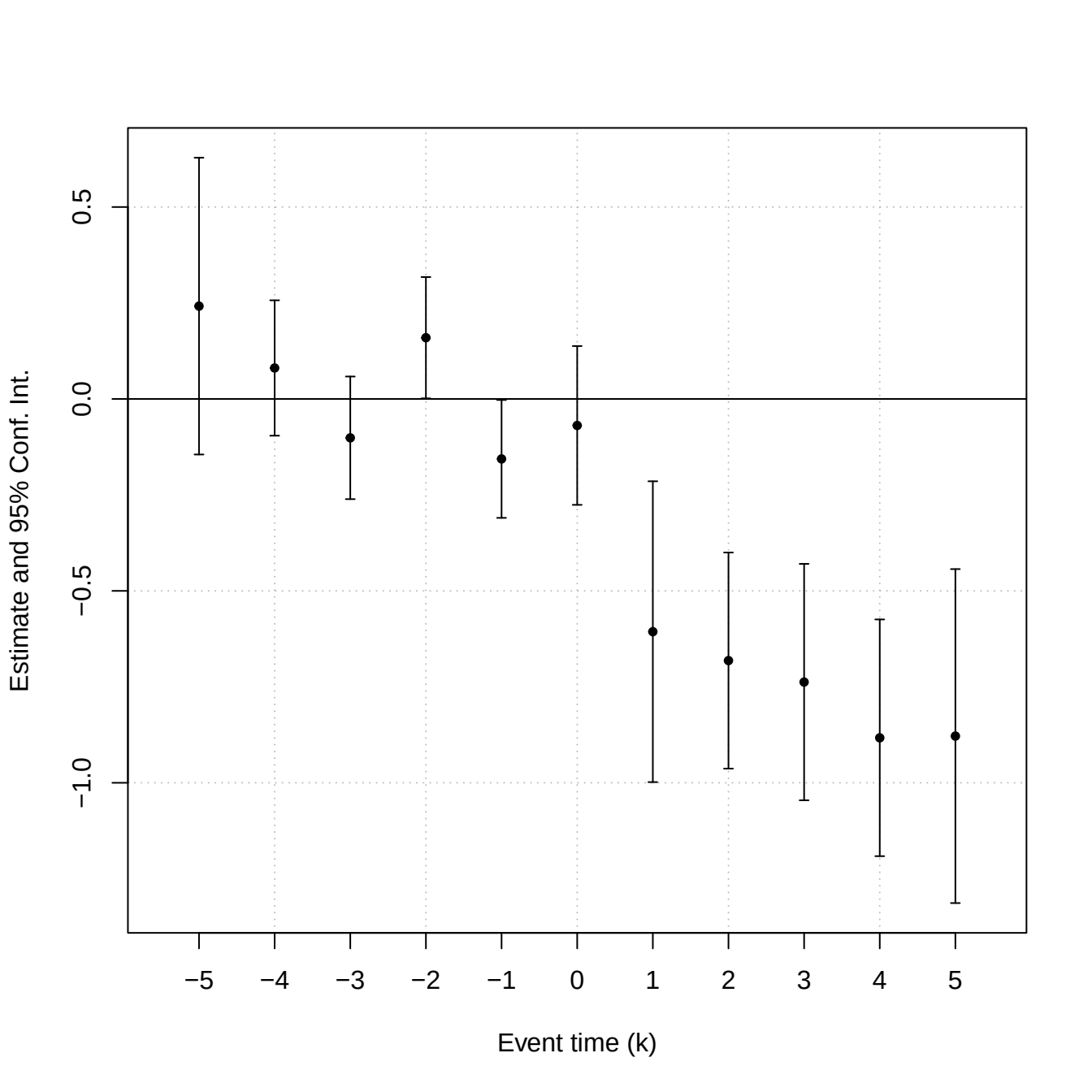

overall_new_release_count
organizational_routines −> organized_assignment
codeowners_file −> has_codeowners
High
Low
Pretrend (High) p−value: 0.448
Pretrend (Low) p−value: 0.528
Wald test p−value: 0.939
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

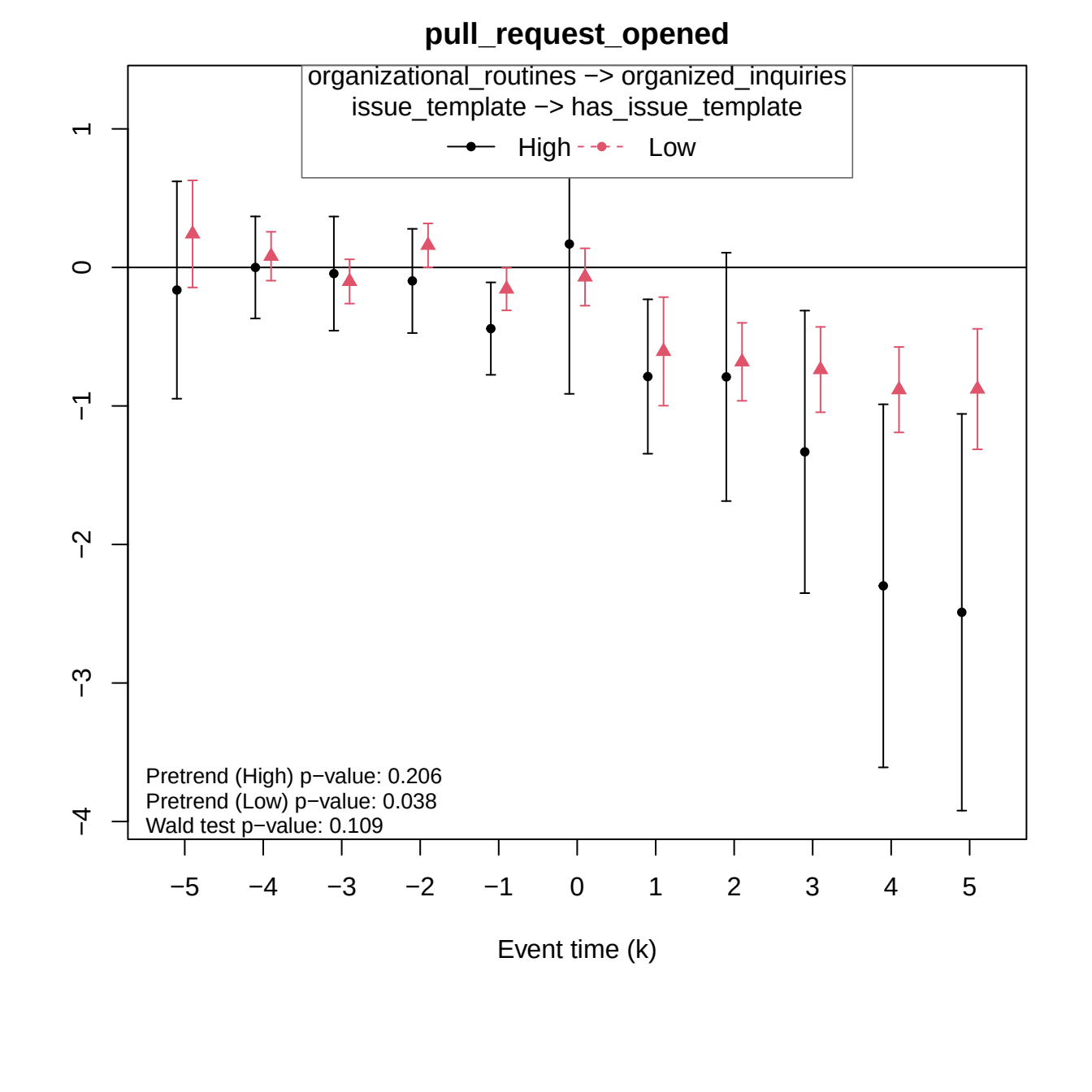

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

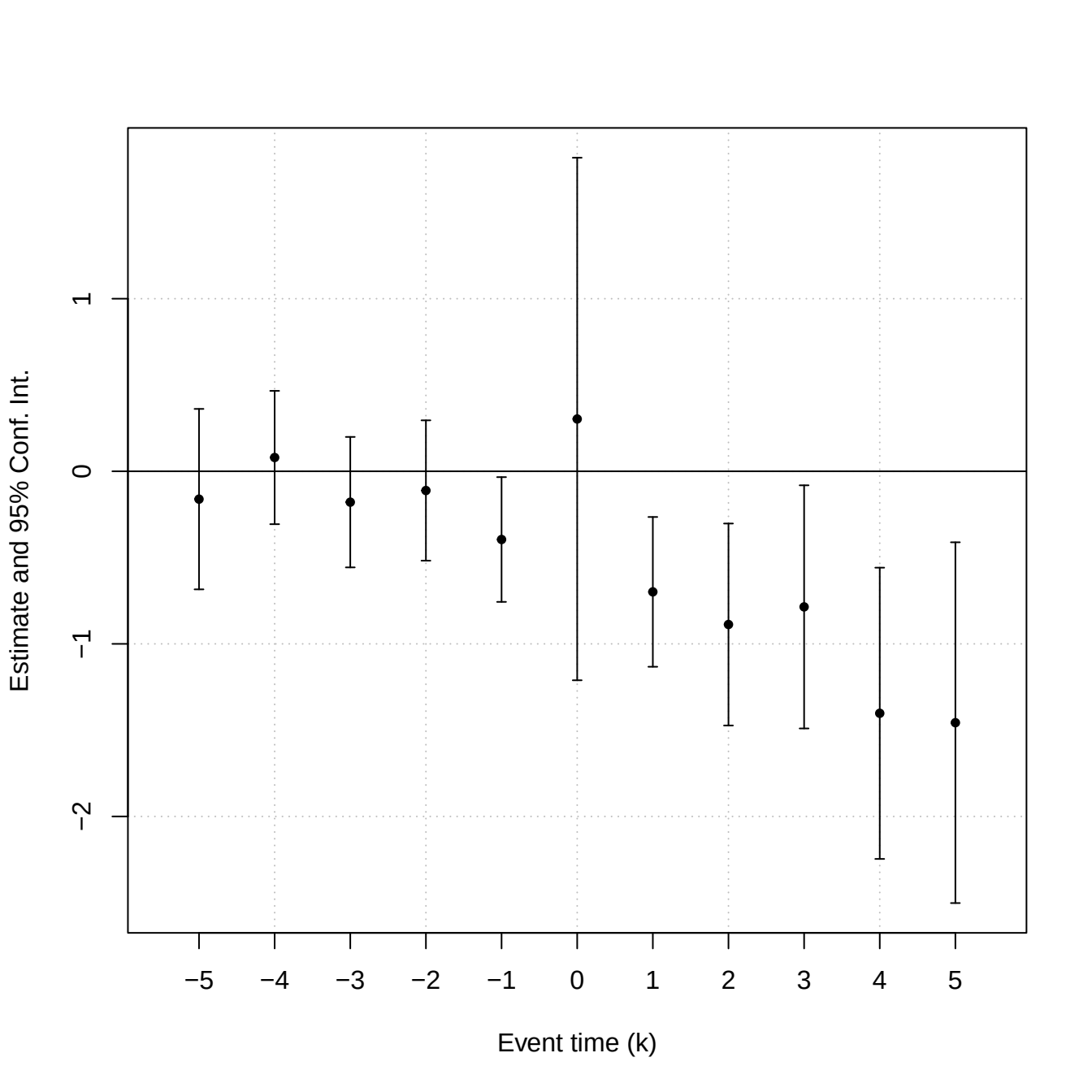

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

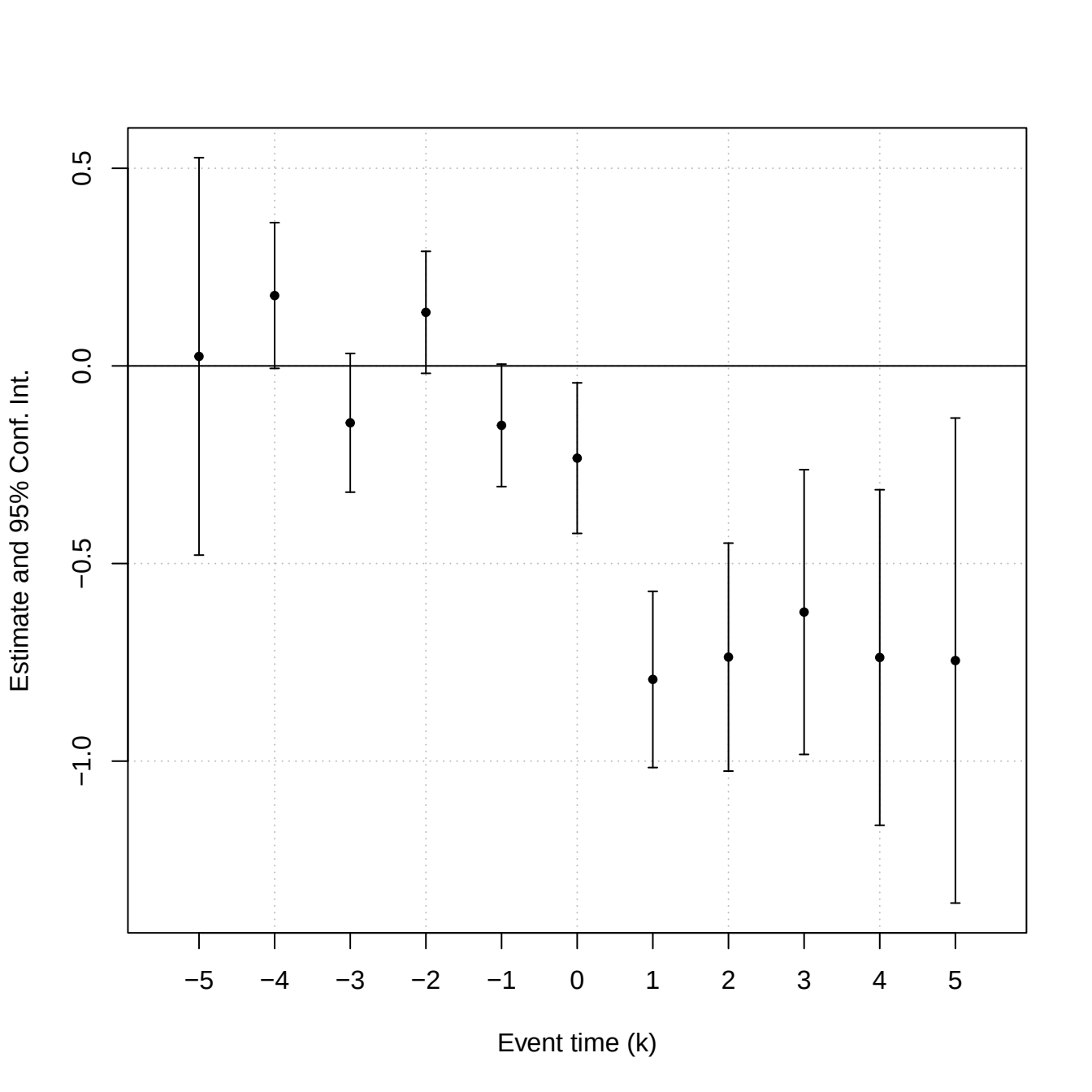

major_minor_release_count
organizational_routines −> organized_assignment
codeowners_file −> has_codeowners
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.762
Pretrend (Low) p−value: 0.843
Wald test p−value: 0.001
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

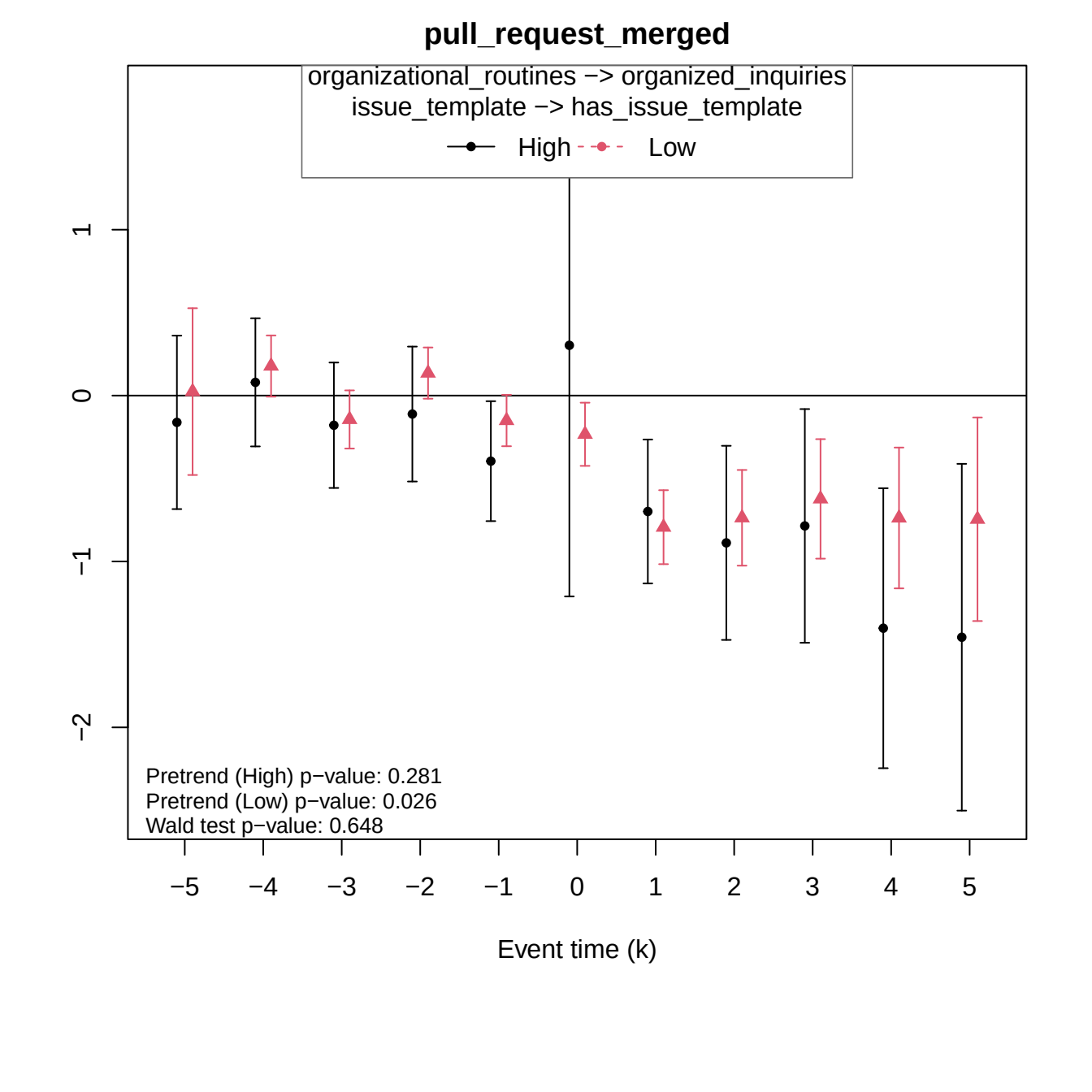

Estimate and 95% Conf. Int.
1
0
−1
−2
−3
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

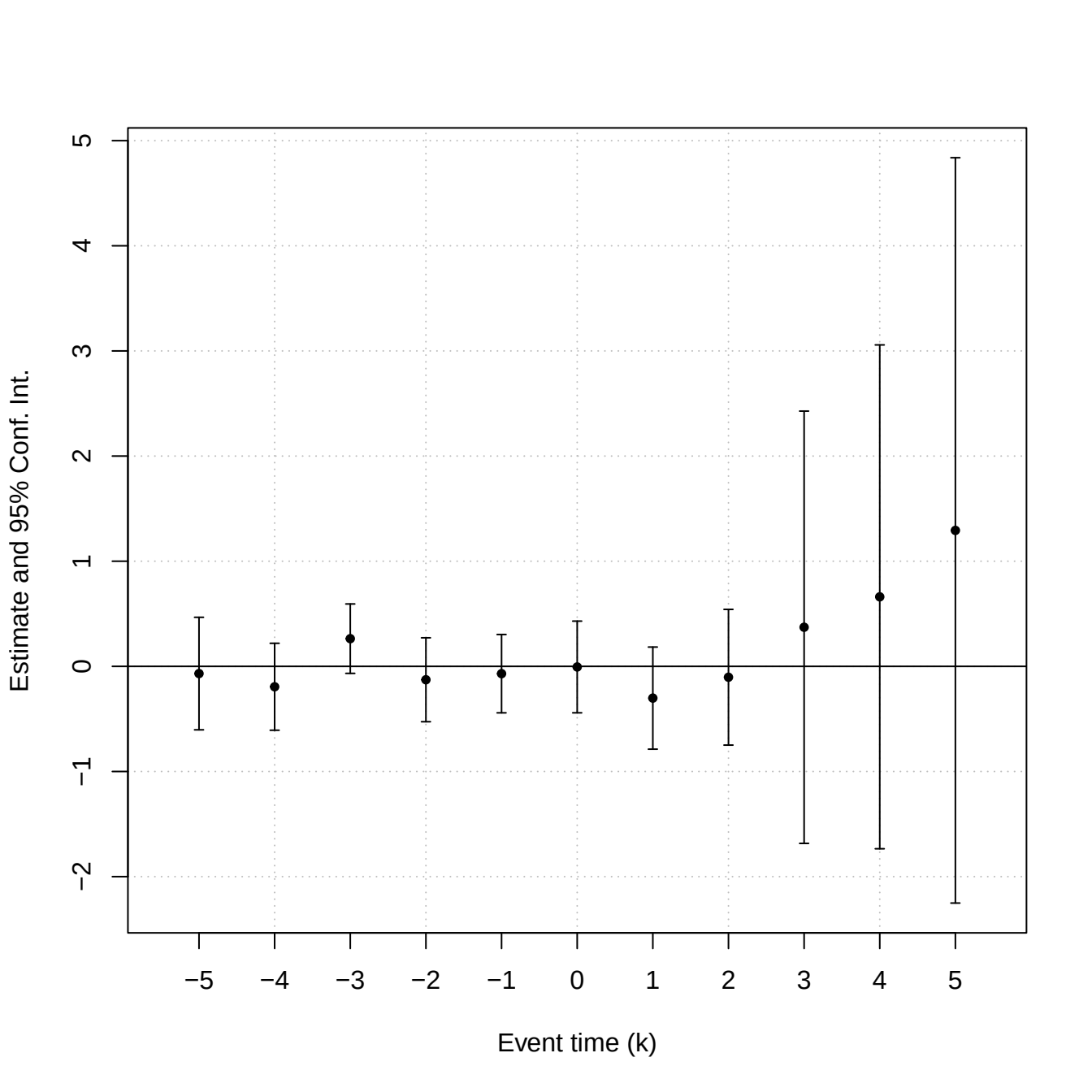

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

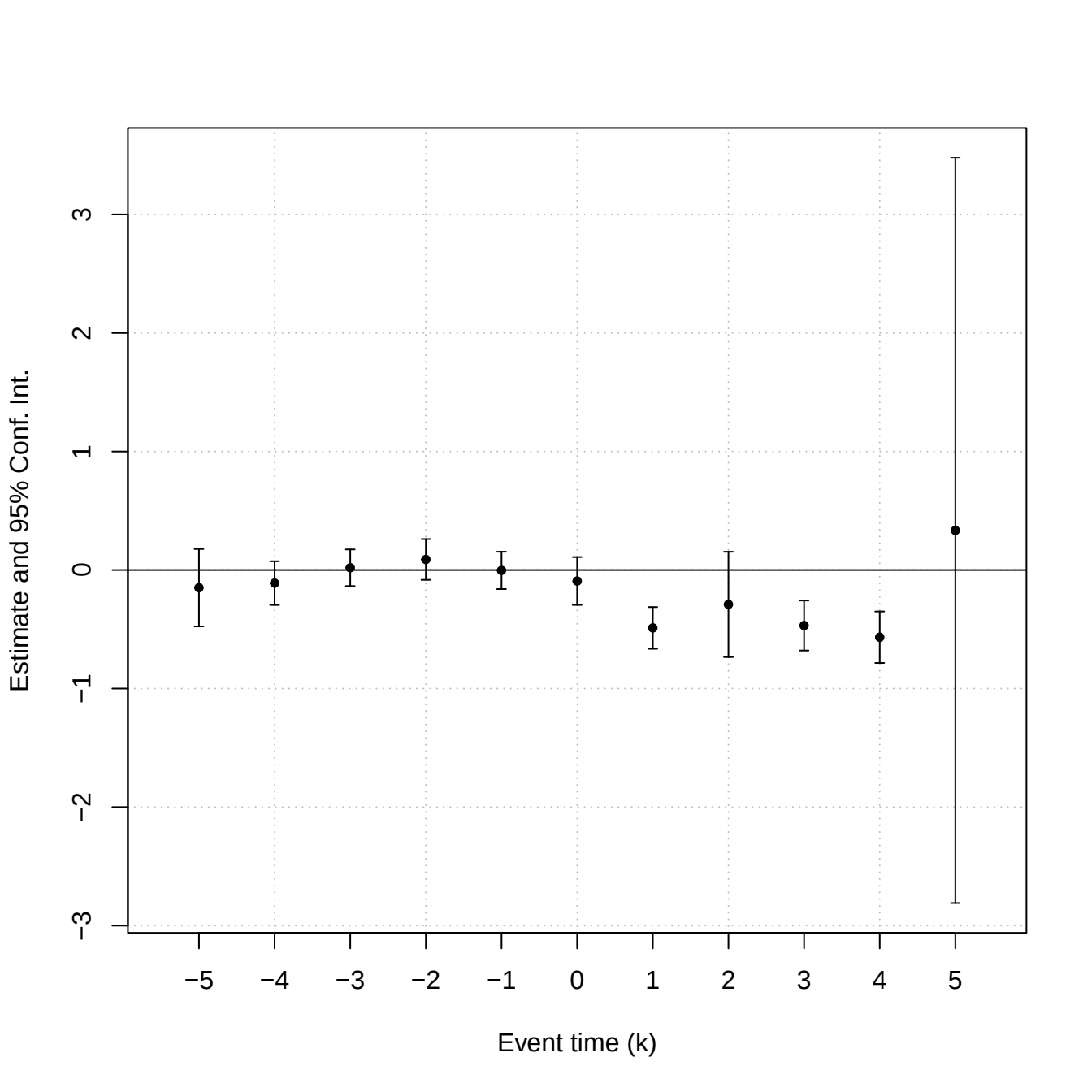

pull_request_opened
organizational_routines −> organized_inquiries
issue_template −> has_issue_template
High
Low
Pretrend (High) p−value: 0.206
Pretrend (Low) p−value: 0.038
Wald test p−value: 0.109
1
0
−1
−2
−3
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

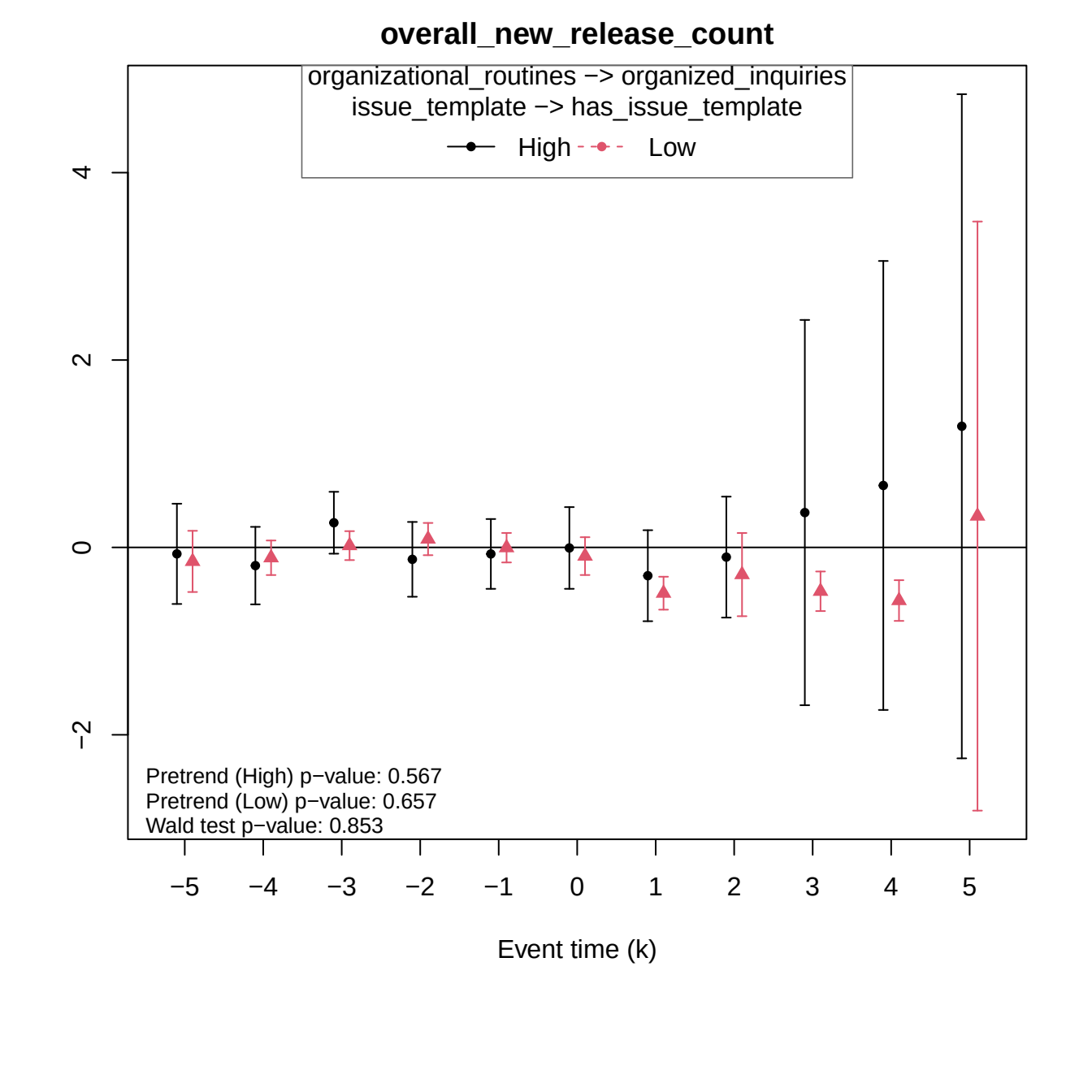

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

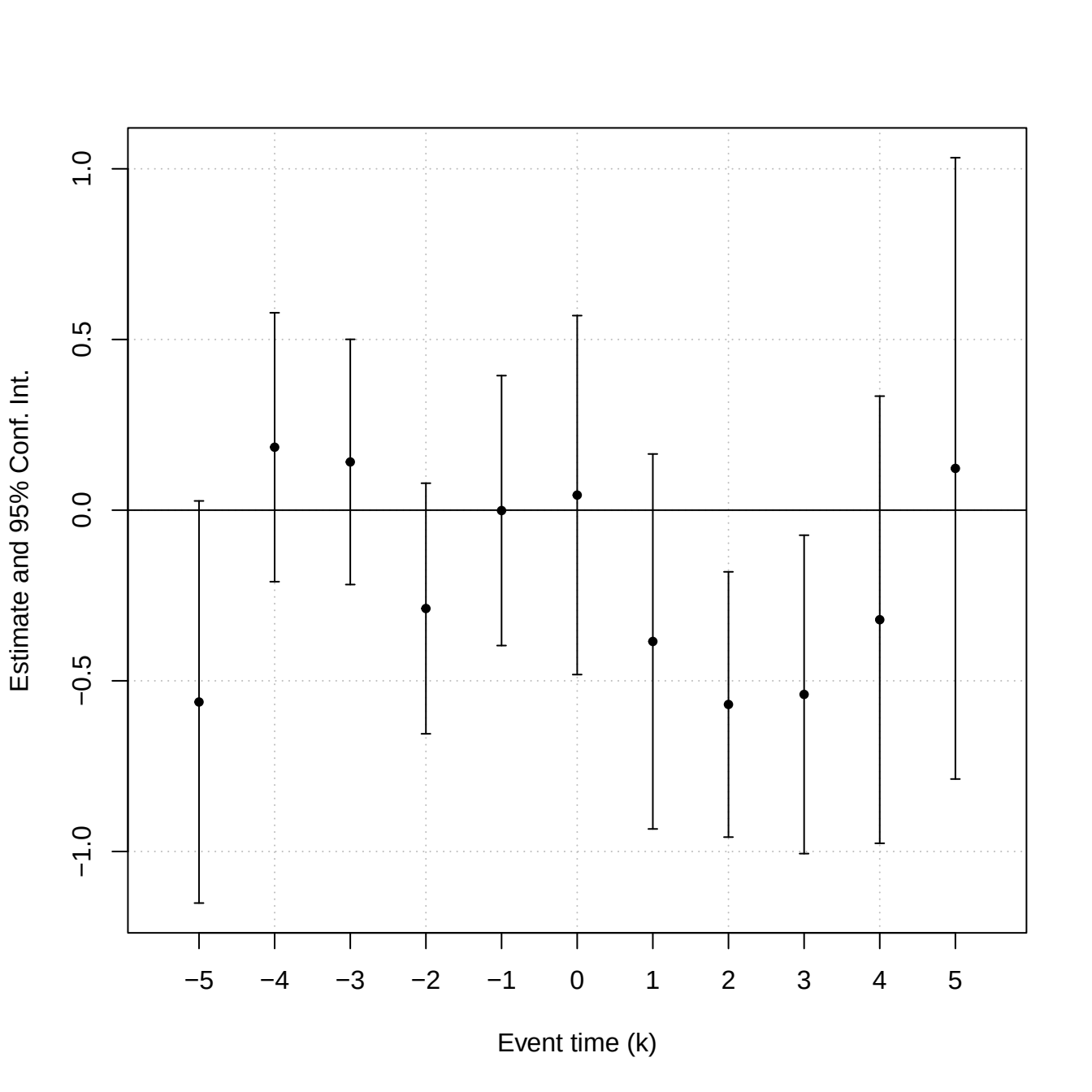

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

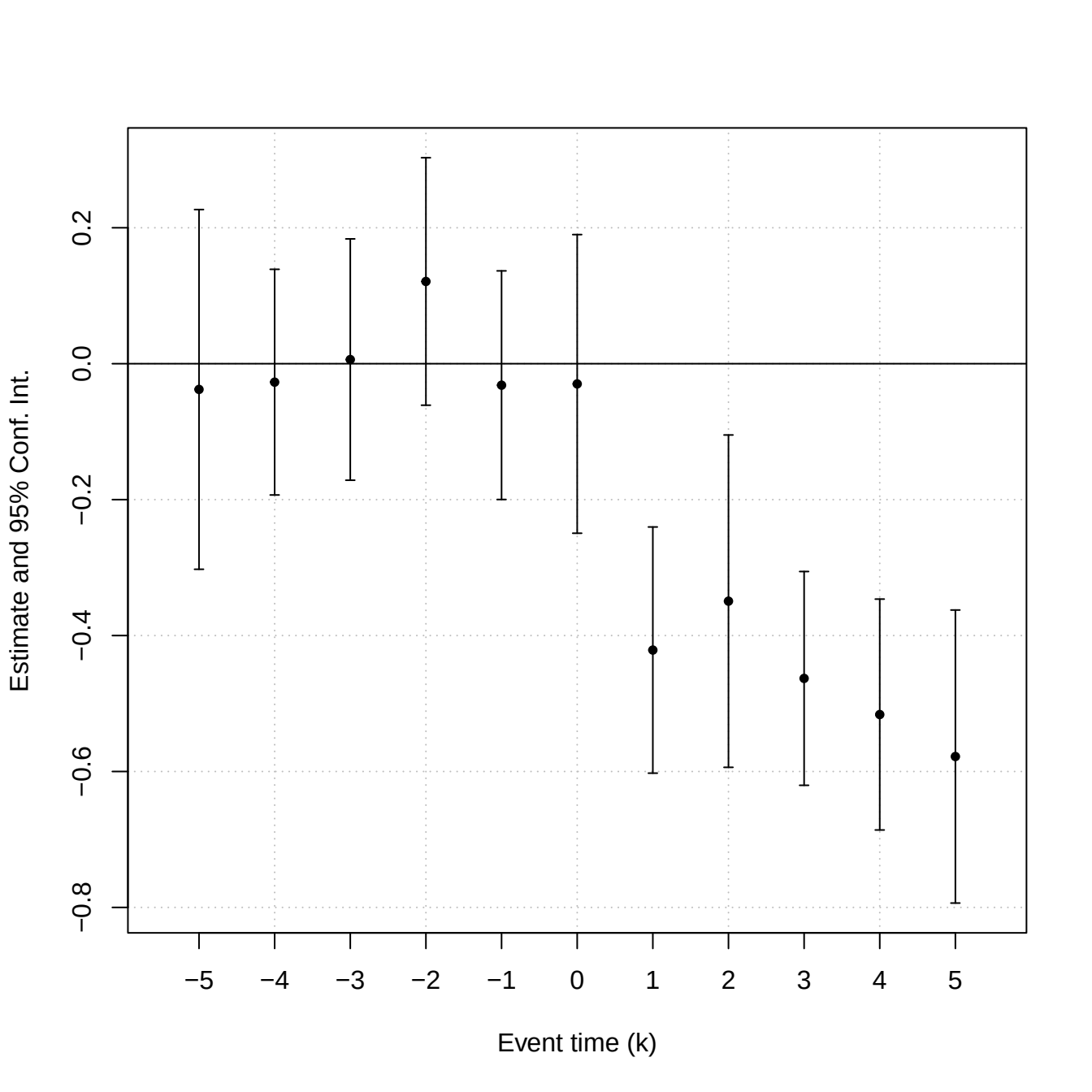

pull_request_merged
organizational_routines −> organized_inquiries
issue_template −> has_issue_template
High
Low
1
0
−1
−2
Pretrend (High) p−value: 0.281
Pretrend (Low) p−value: 0.026
Wald test p−value: 0.648
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

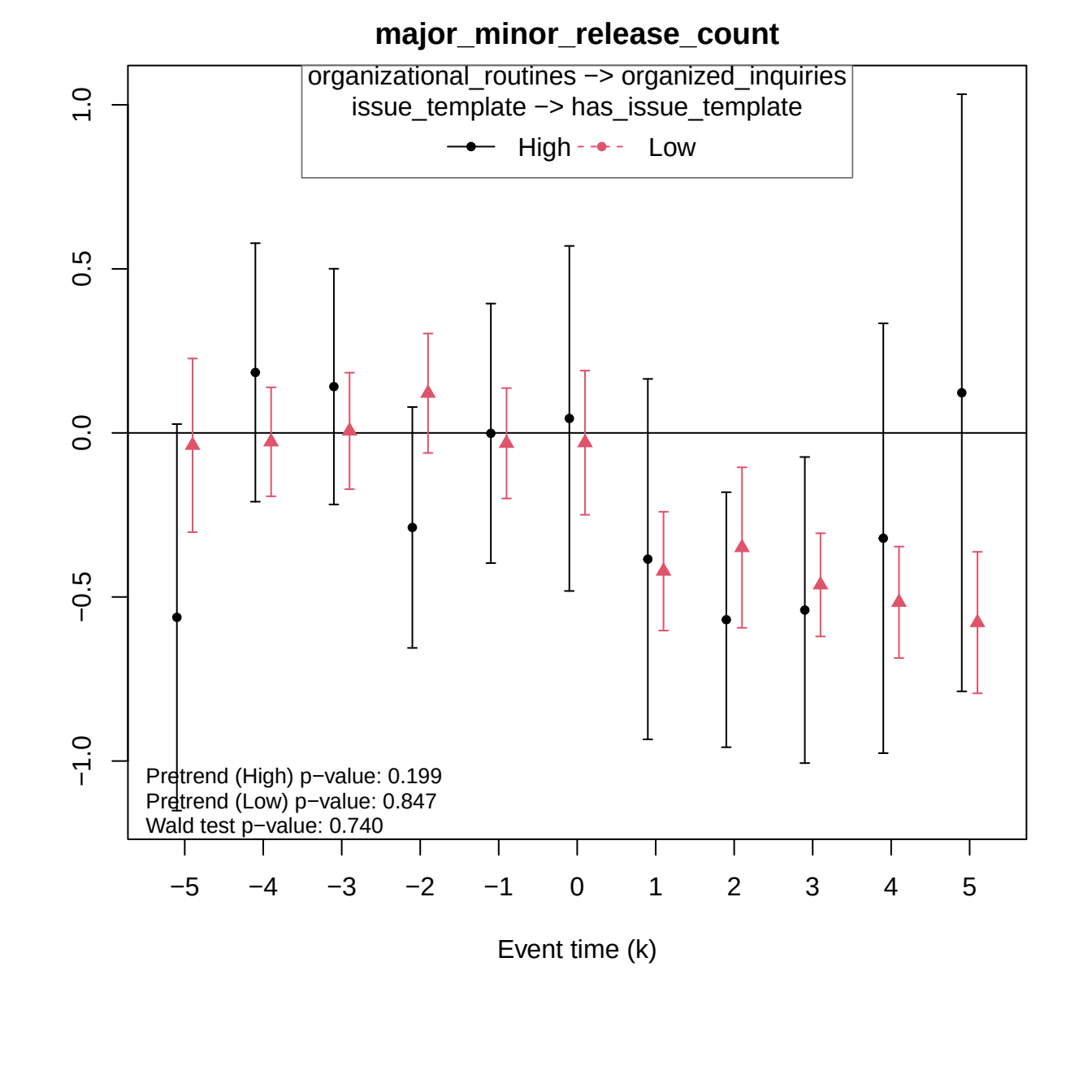

Estimate and 95% Conf. Int.
5
4
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

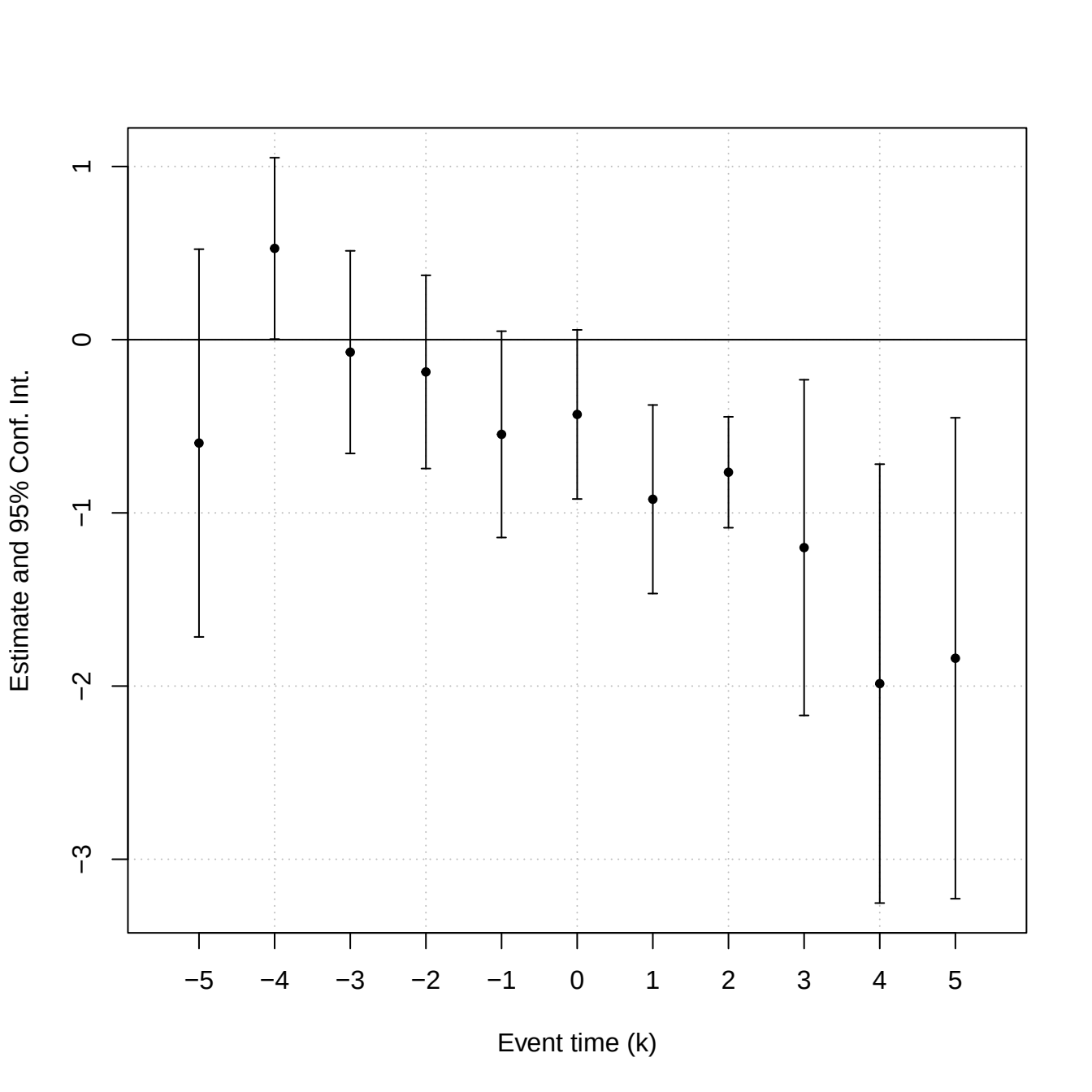

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

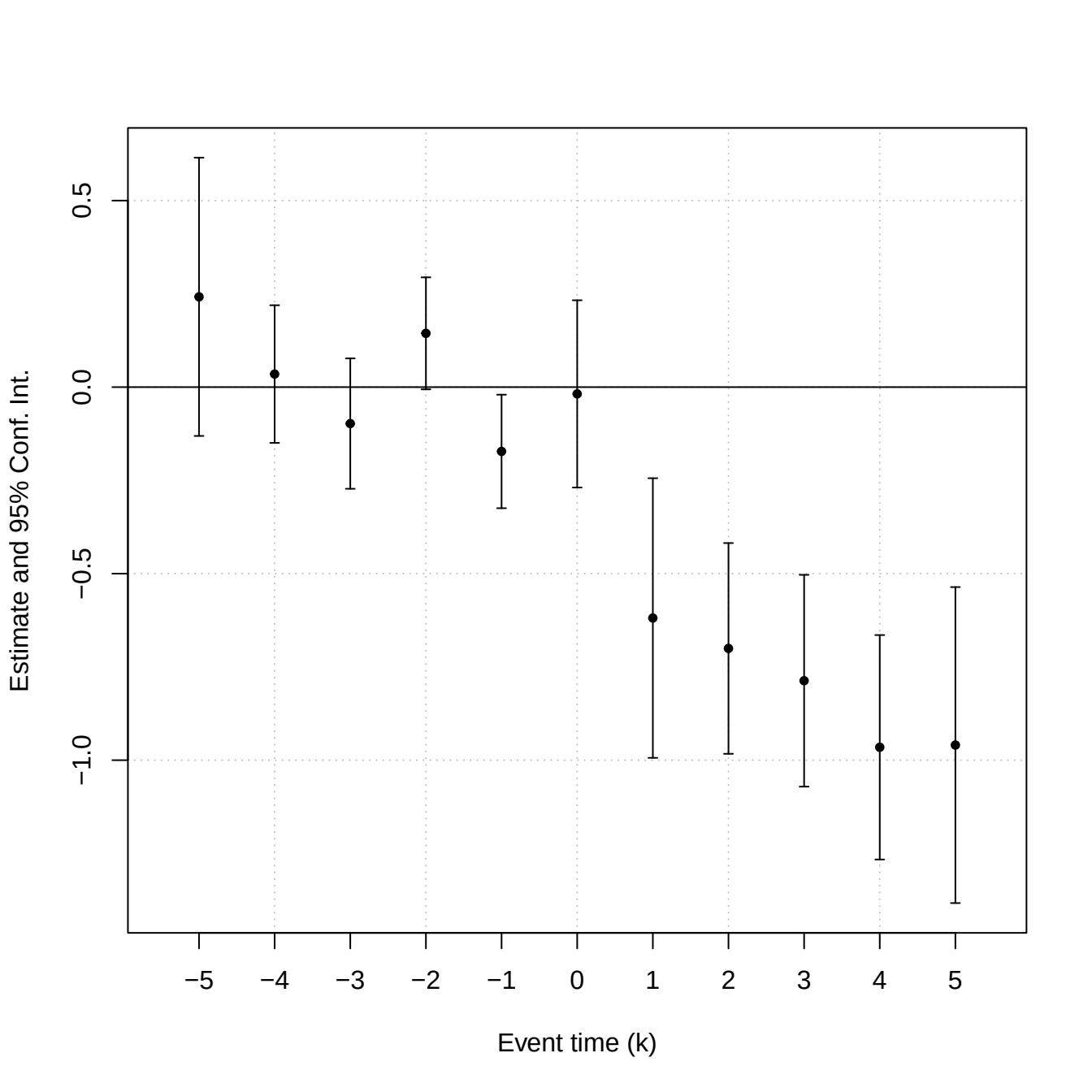

overall_new_release_count
organizational_routines −> organized_inquiries
issue_template −> has_issue_template
High
Low
4
2
0
−2
Pretrend (High) p−value: 0.567
Pretrend (Low) p−value: 0.657
Wald test p−value: 0.853
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

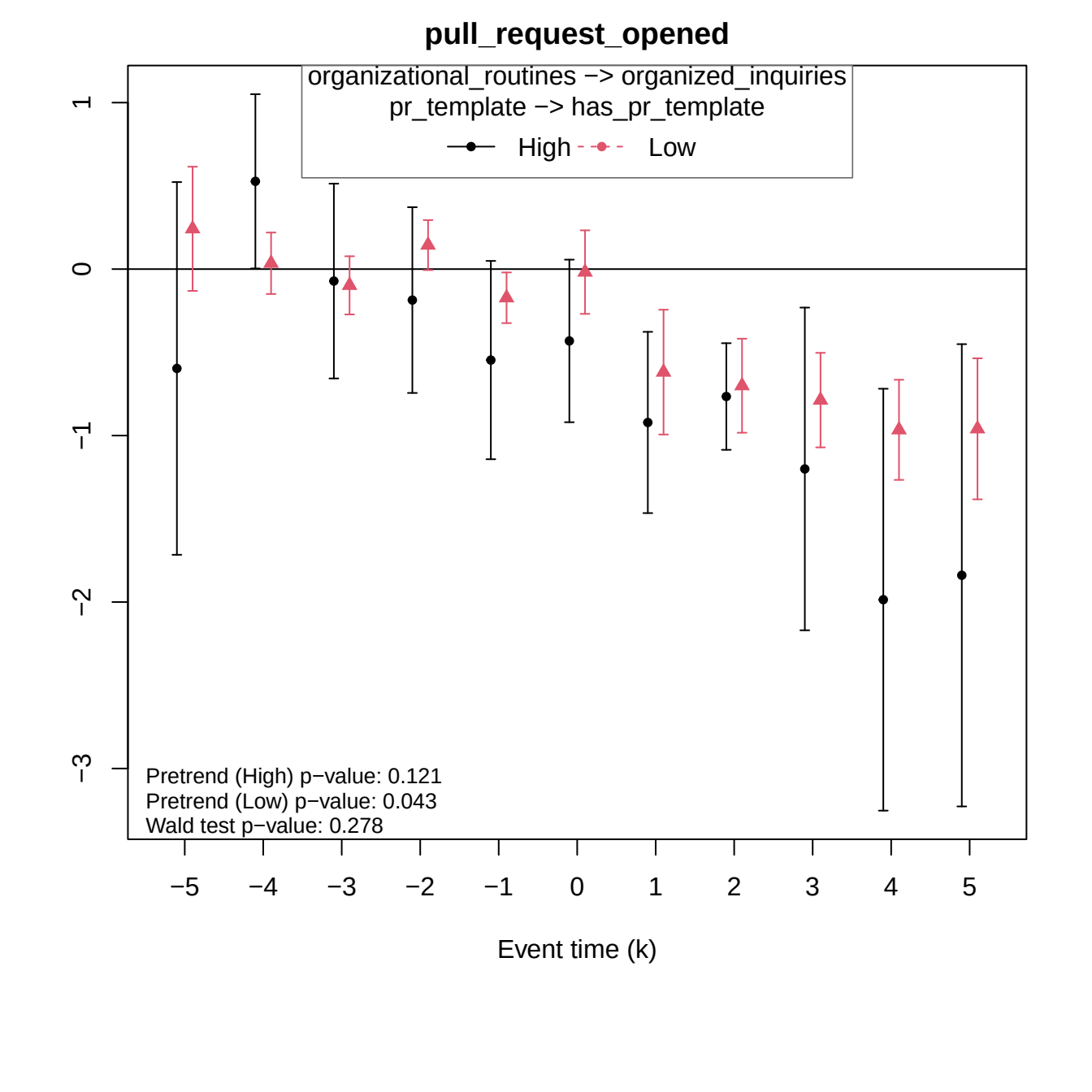

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

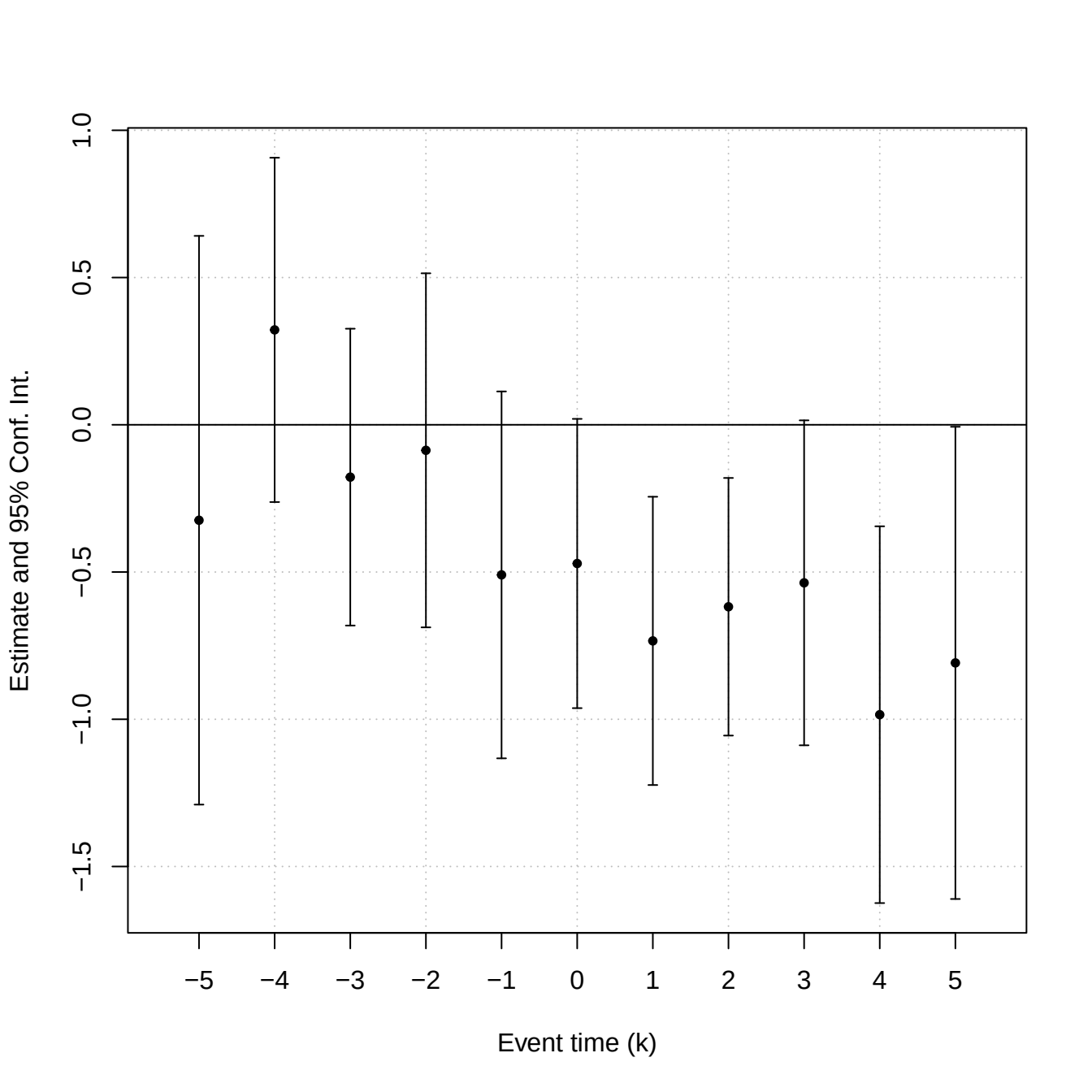

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

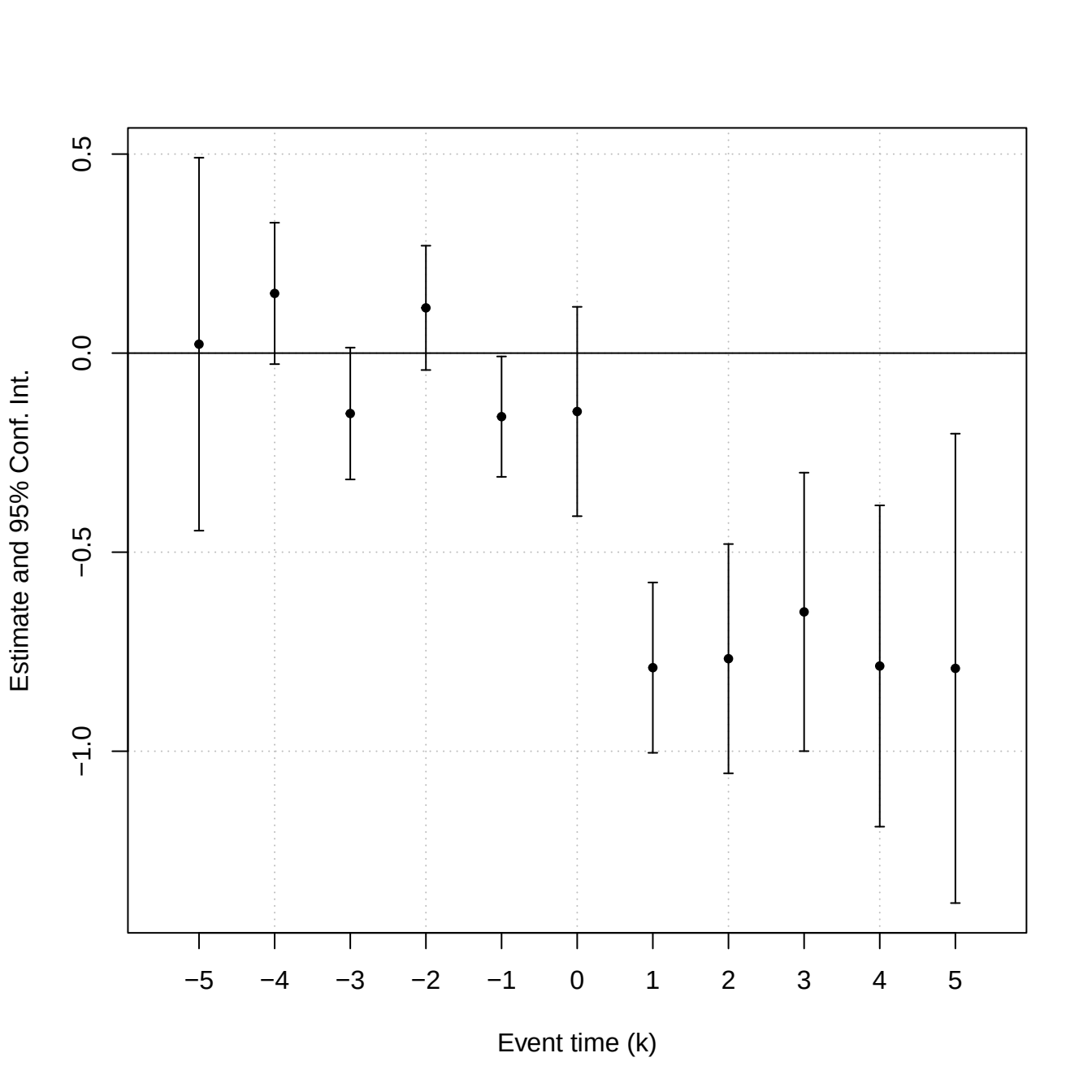

major_minor_release_count
organizational_routines −> organized_inquiries
issue_template −> has_issue_template
High
Low
1.0
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.199
Pretrend (Low) p−value: 0.847
Wald test p−value: 0.740
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

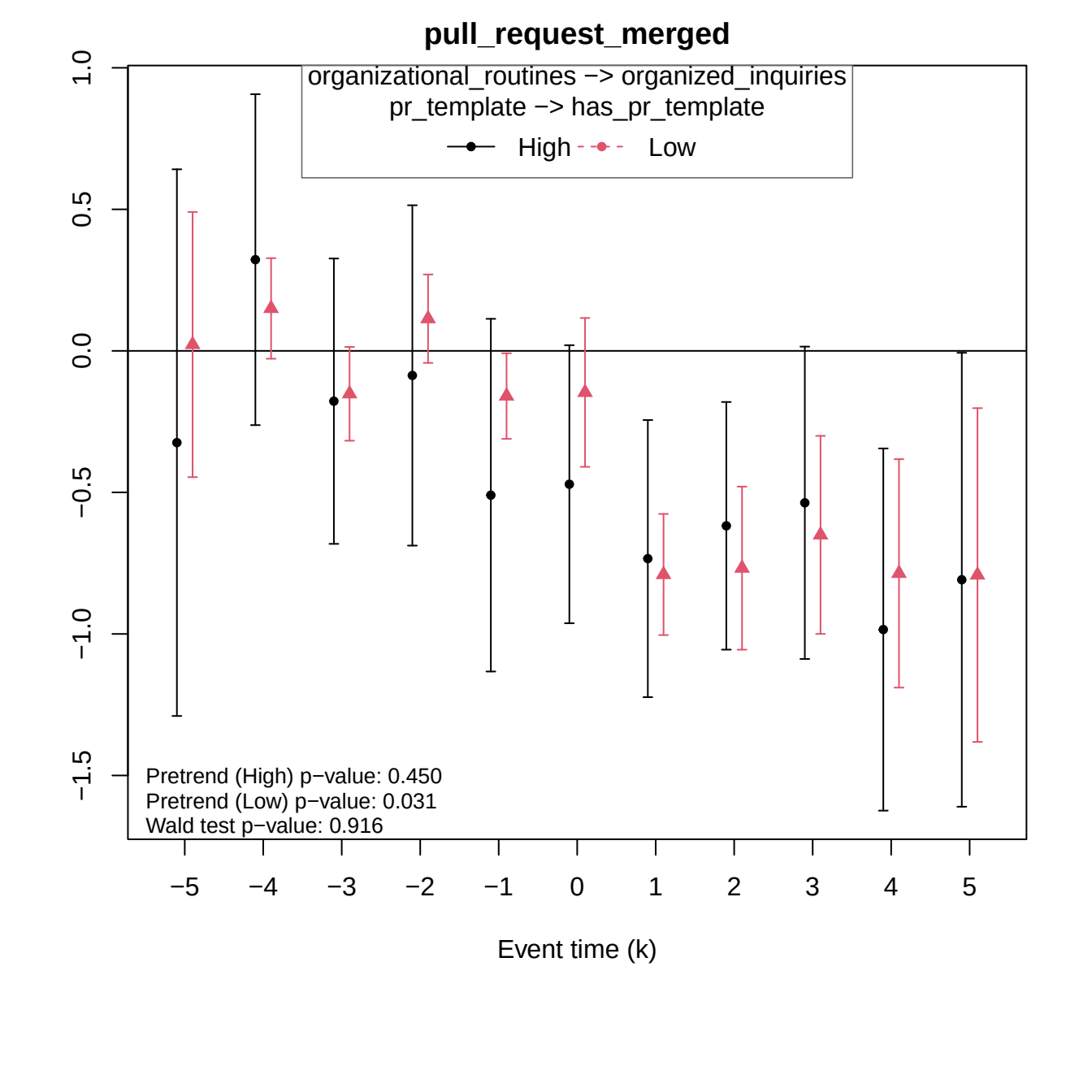

Estimate and 95% Conf. Int.
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

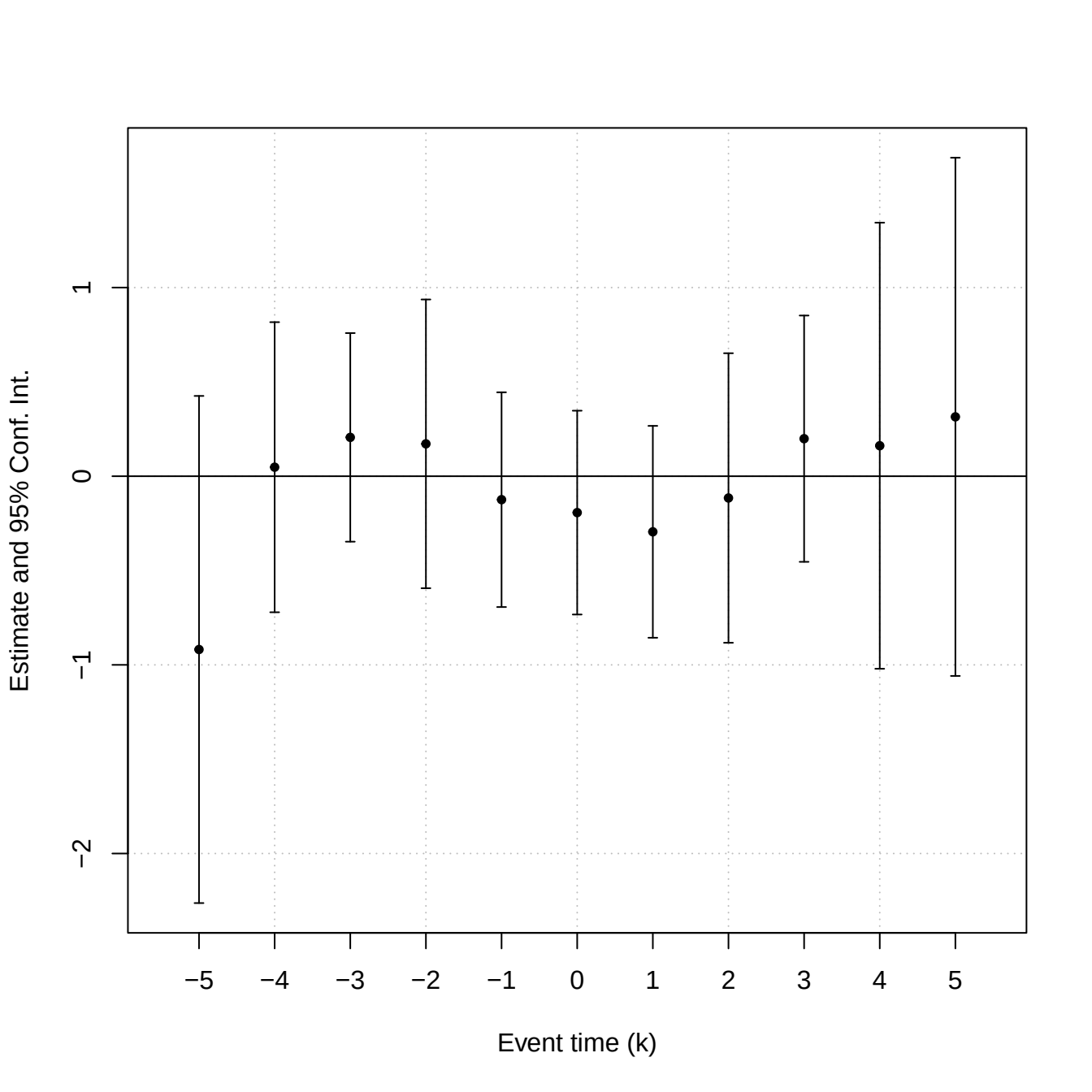

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

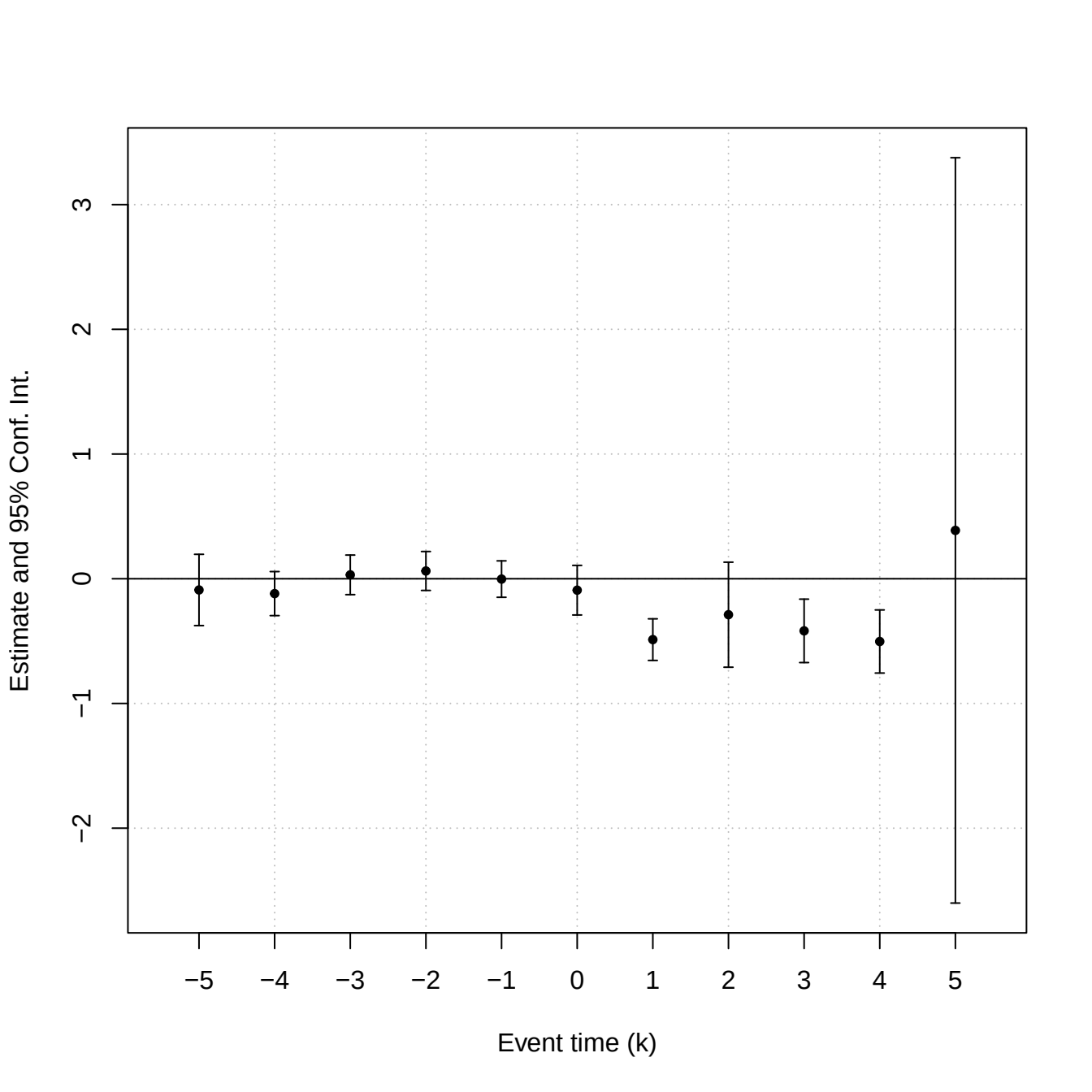

pull_request_opened
organizational_routines −> organized_inquiries
pr_template −> has_pr_template
High
Low
1
0
−1
−2
−3
Pretrend (High) p−value: 0.121
Pretrend (Low) p−value: 0.043
Wald test p−value: 0.278
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

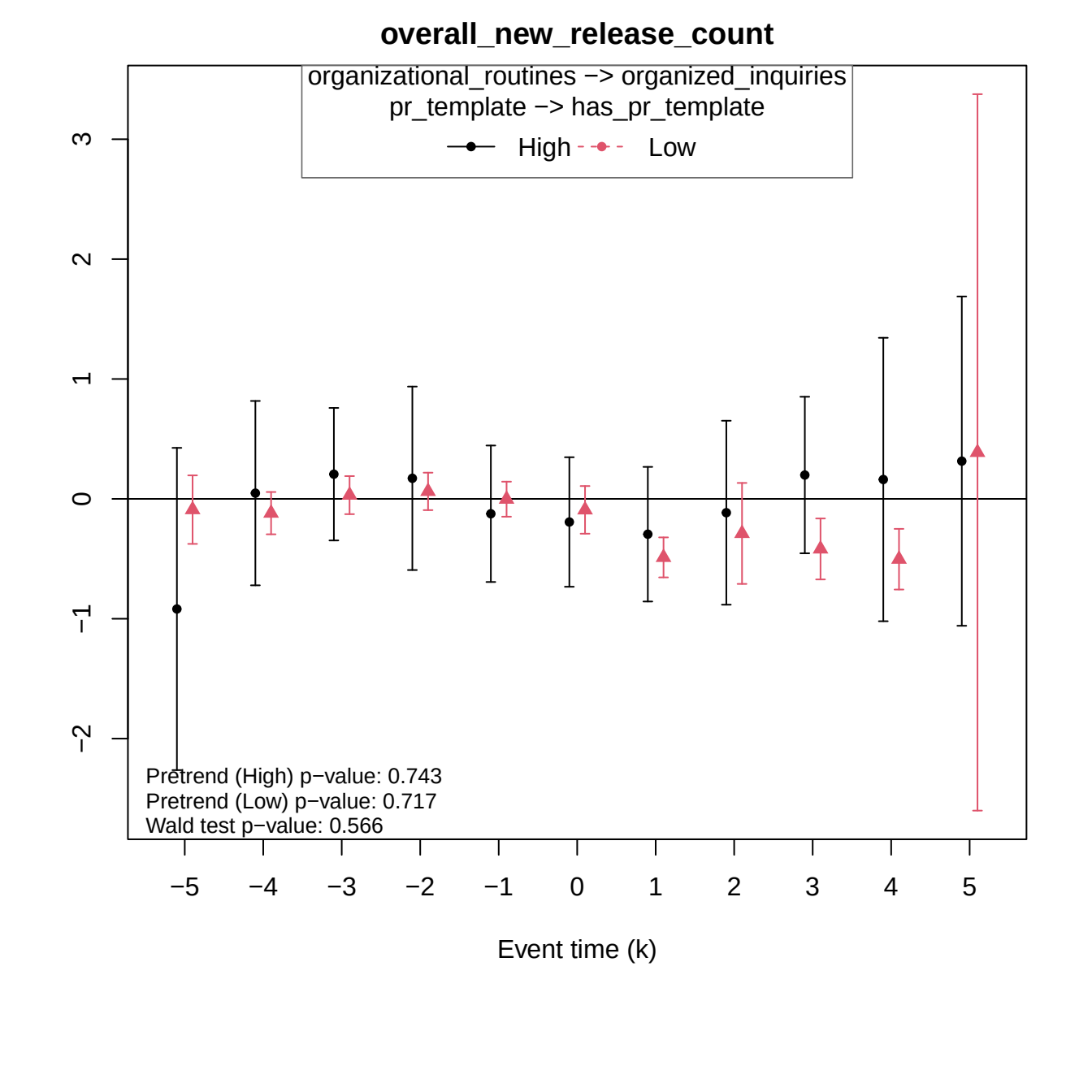

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

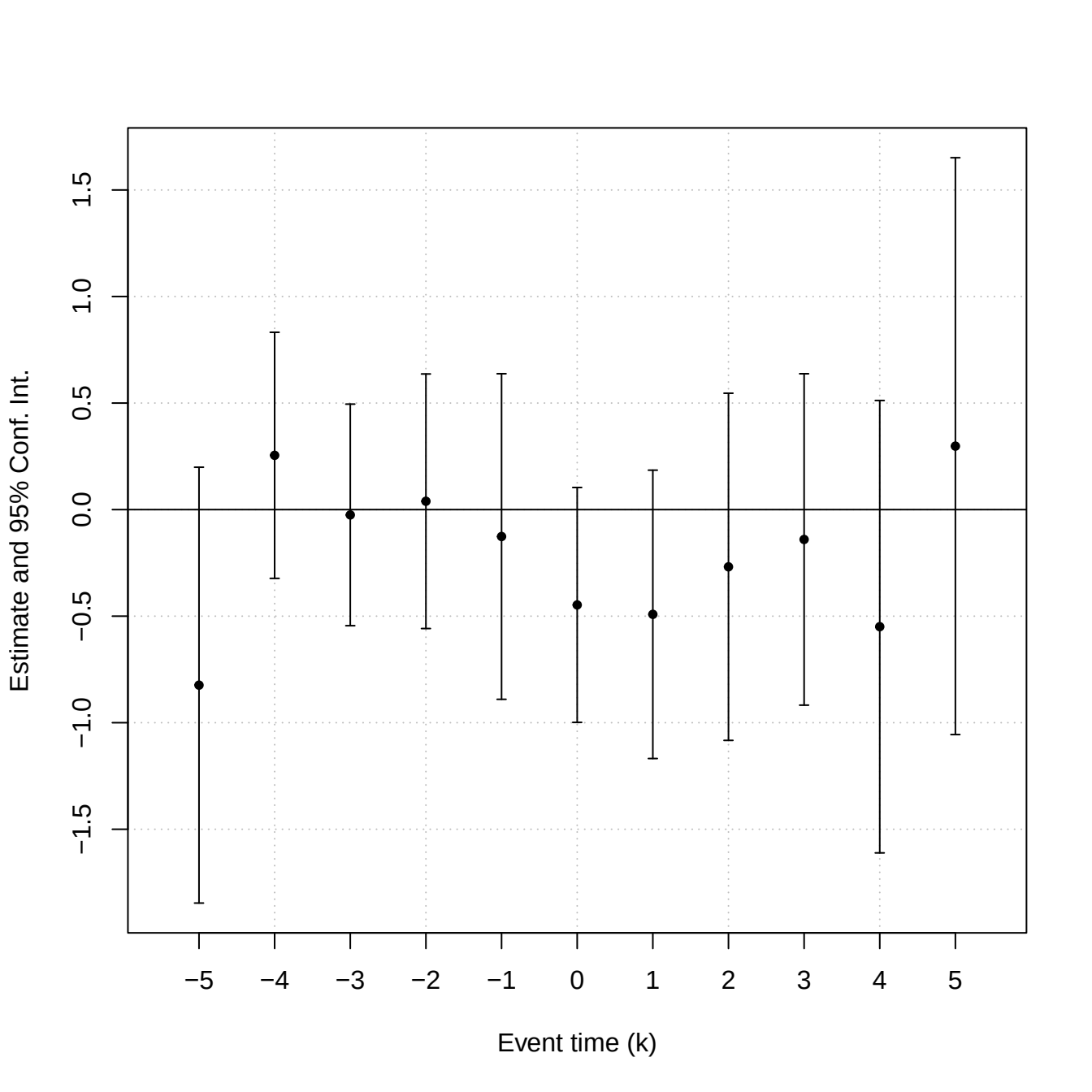

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

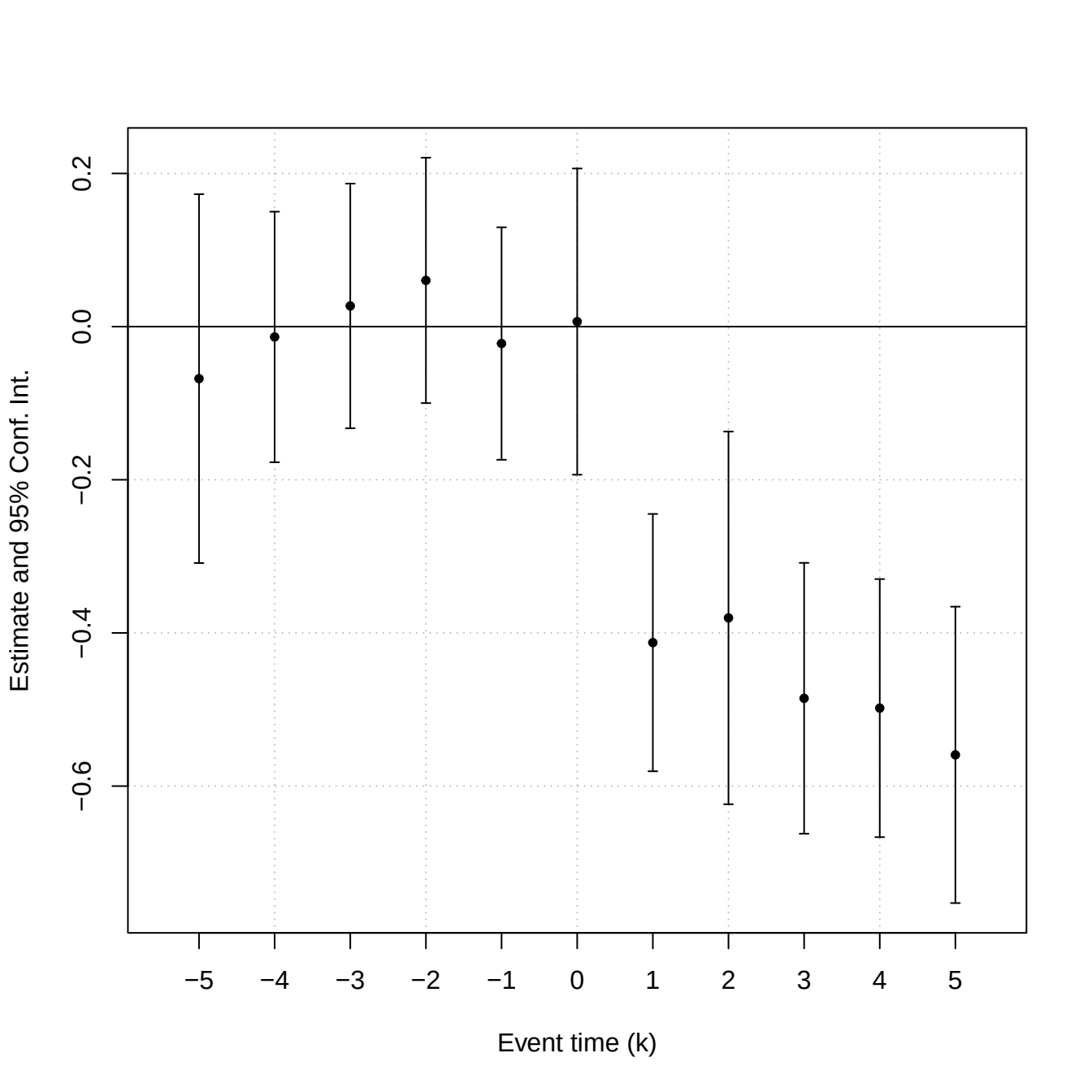

pull_request_merged
organizational_routines −> organized_inquiries
pr_template −> has_pr_template
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.450
Pretrend (Low) p−value: 0.031
Wald test p−value: 0.916
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

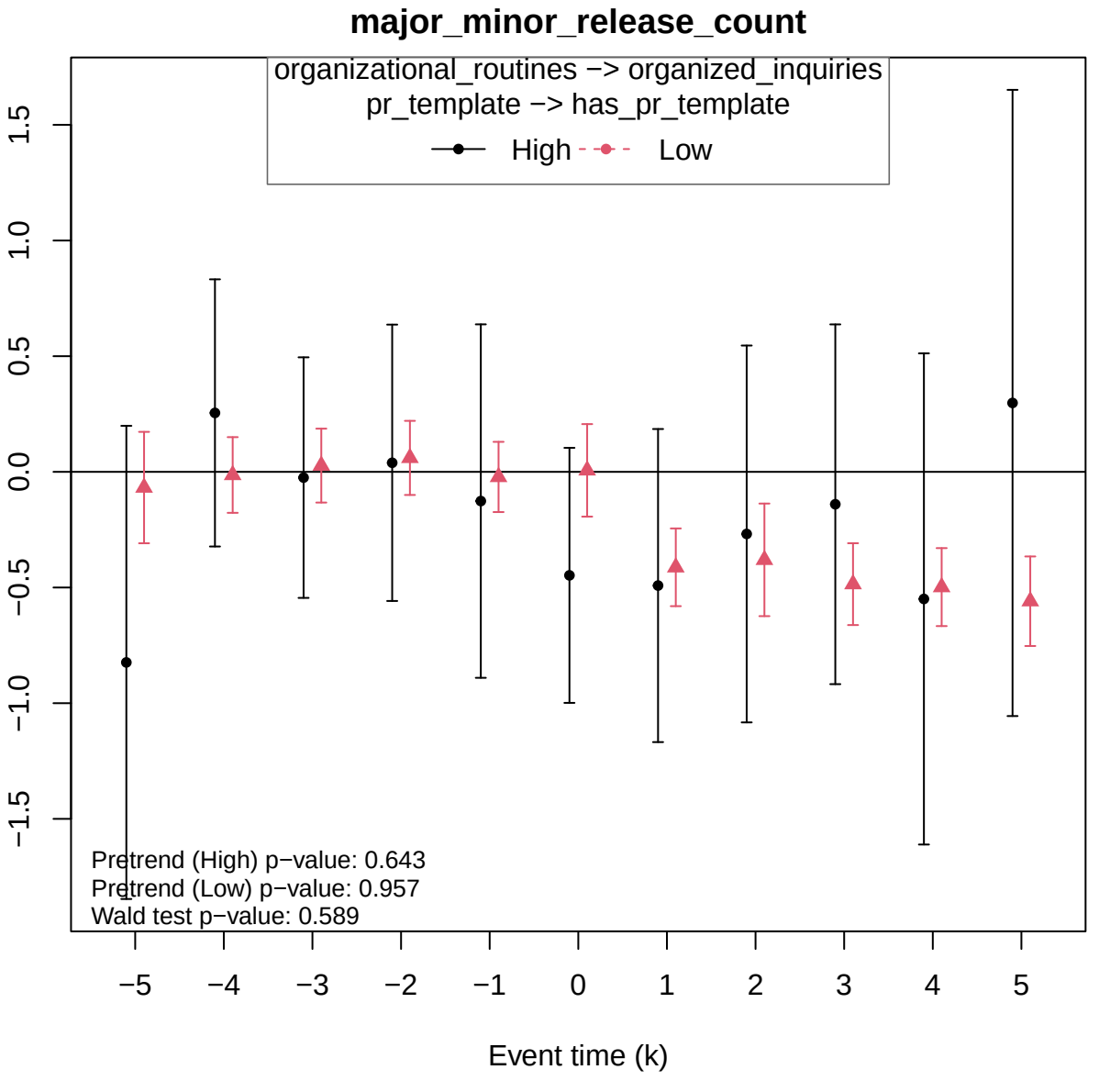

Estimate and 95% Conf. Int.
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

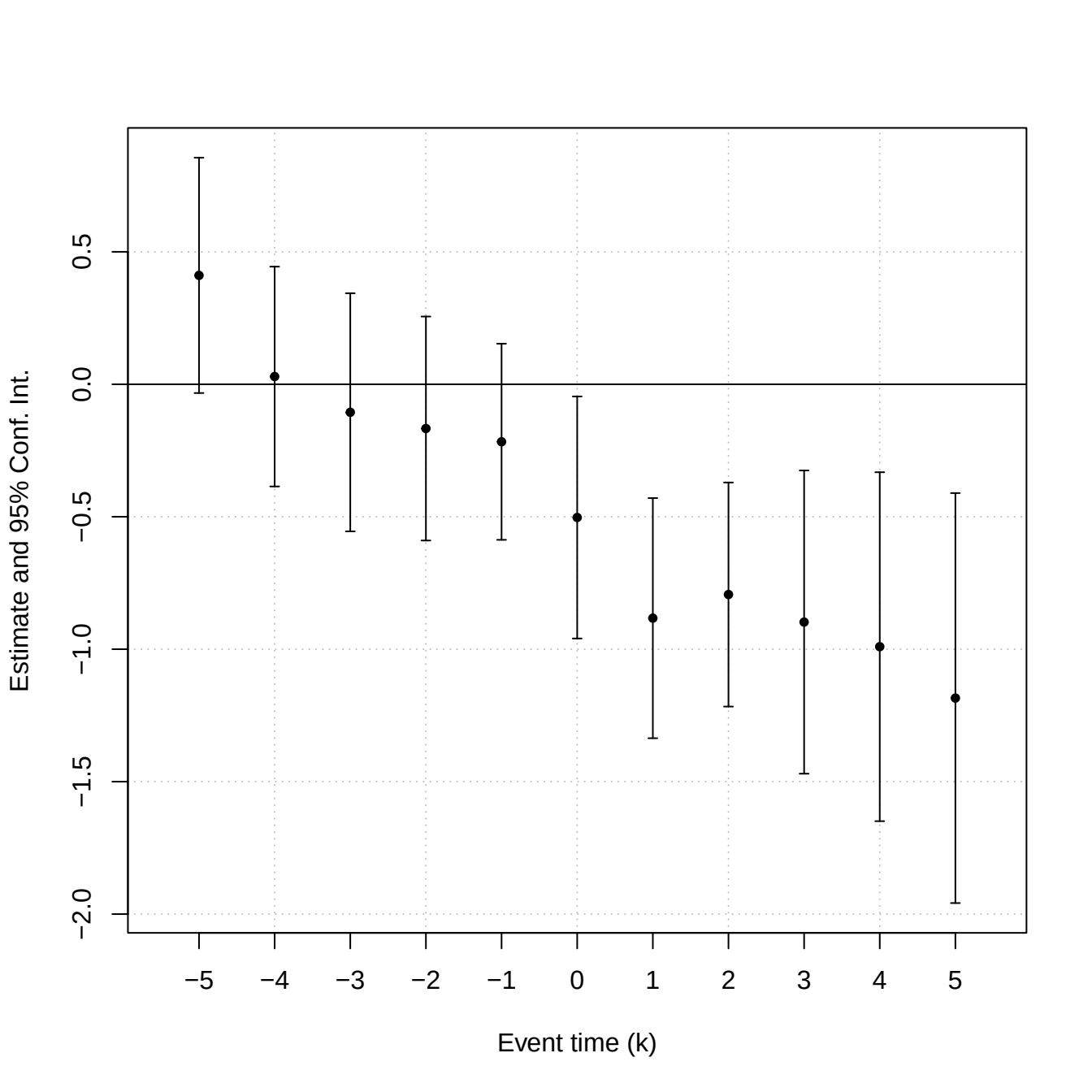

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

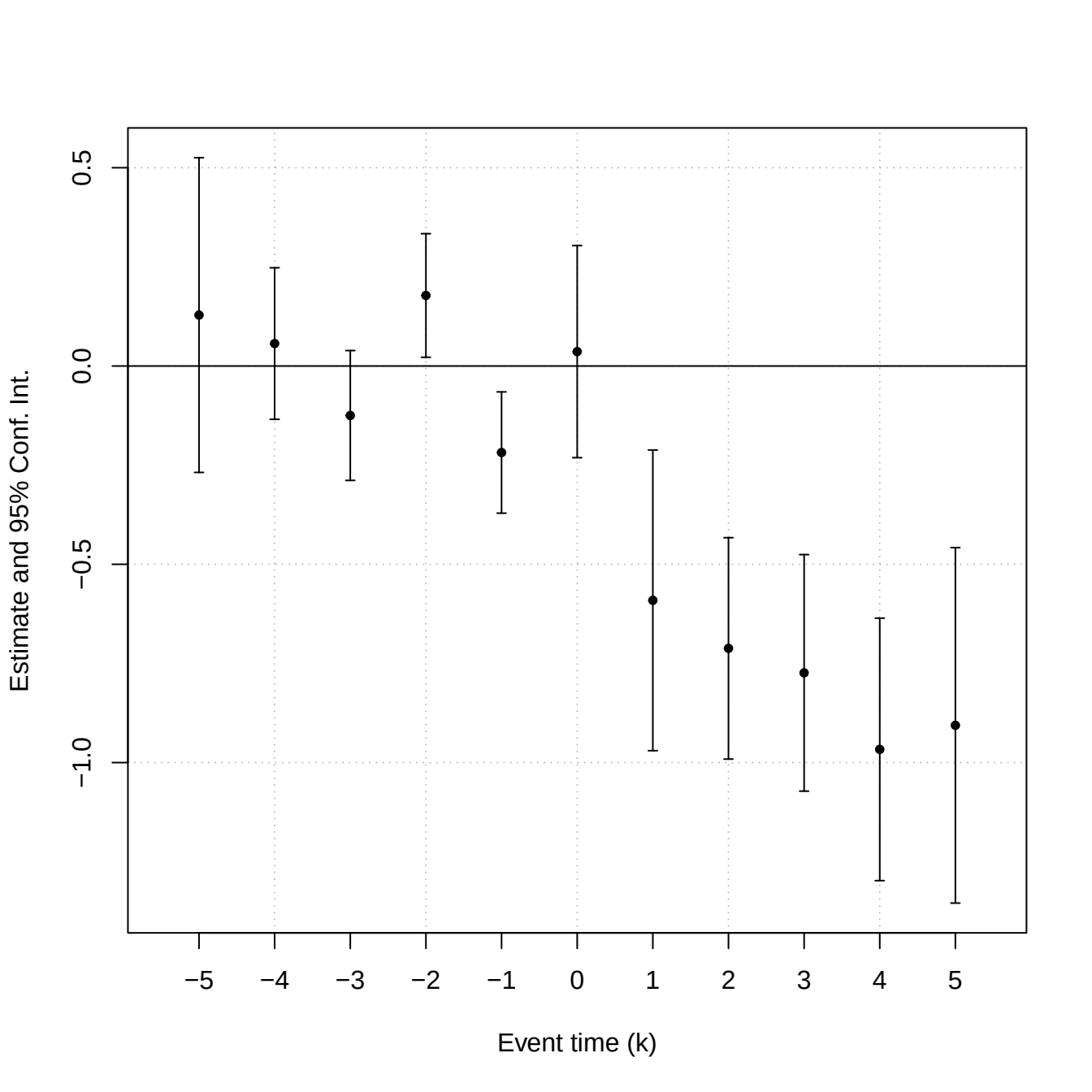

overall_new_release_count
organizational_routines −> organized_inquiries
pr_template −> has_pr_template
High
Low
3
2
1
0
−1
−2
Pretrend (High) p−value: 0.743
Pretrend (Low) p−value: 0.717
Wald test p−value: 0.566
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

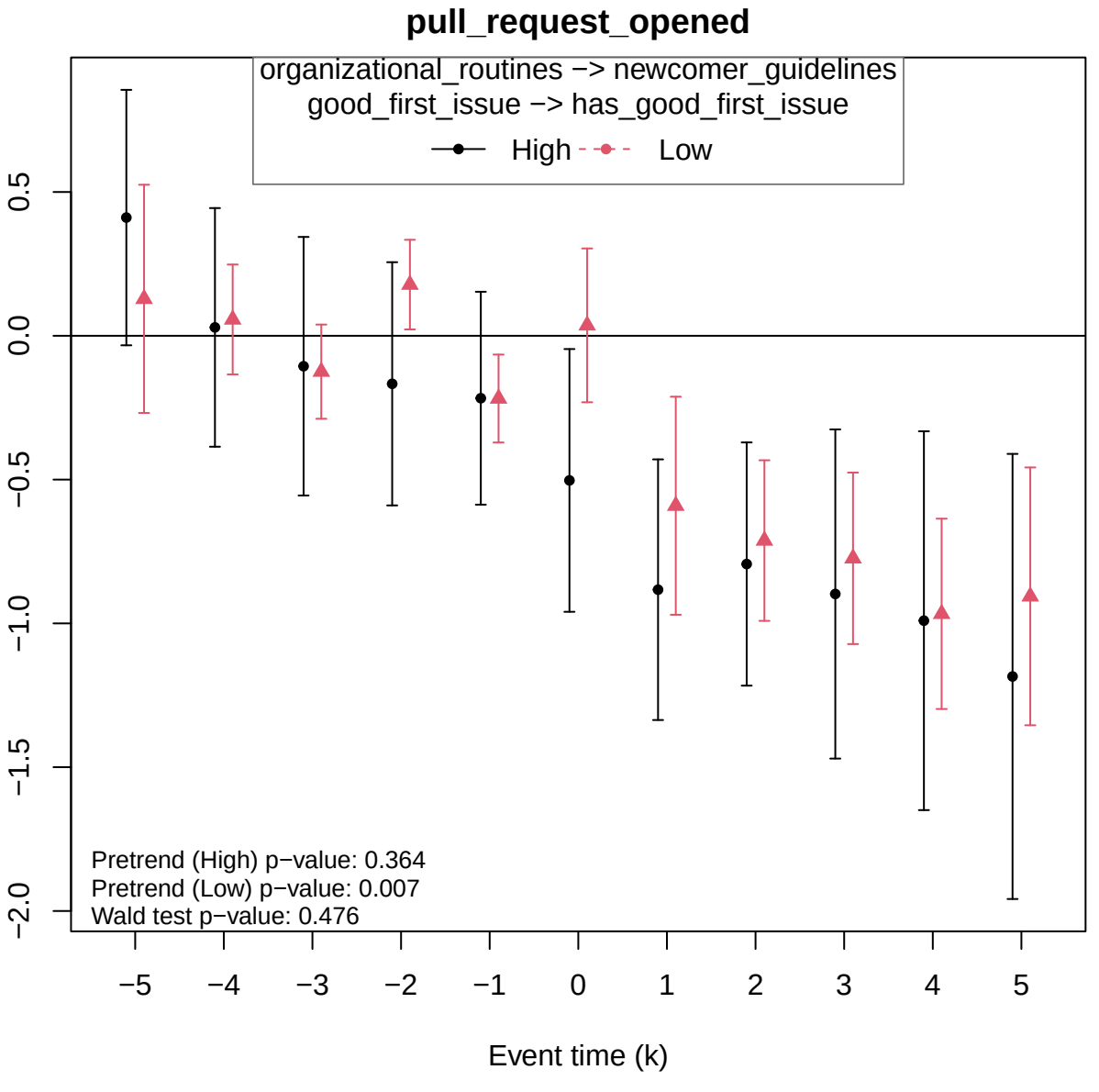

Estimate and 95% Conf. Int.
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

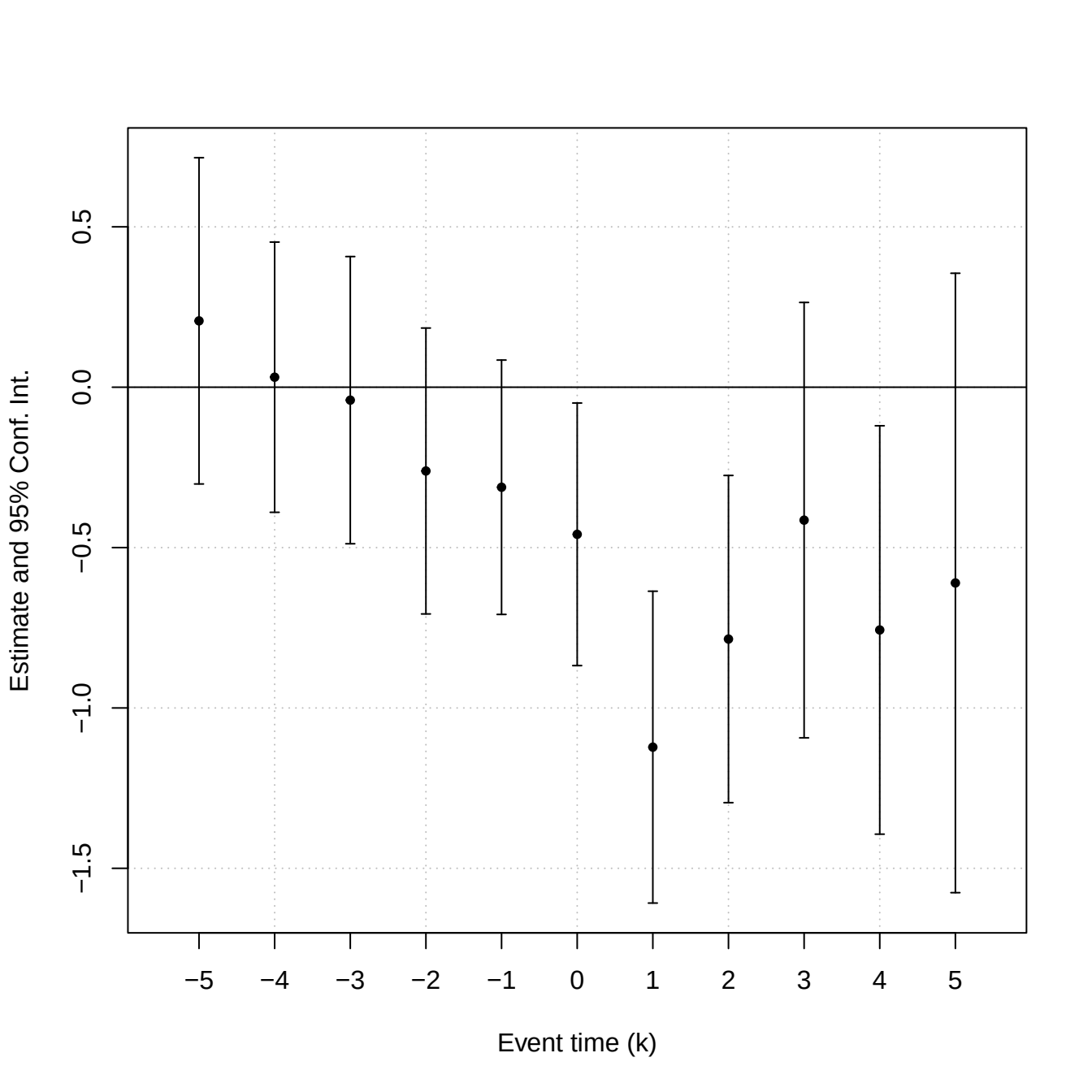

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

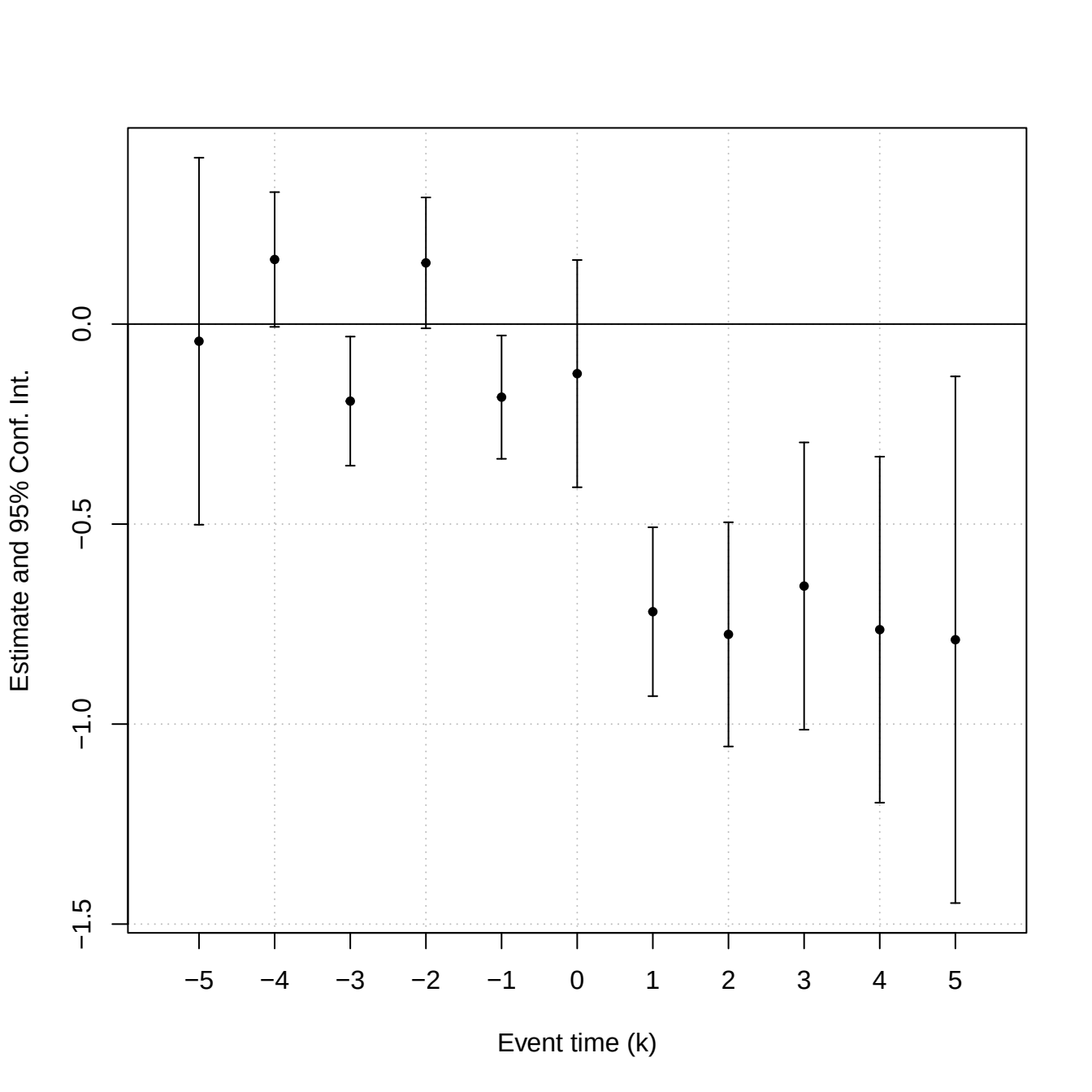

major_minor_release_count
organizational_routines −> organized_inquiries
pr_template −> has_pr_template
High
Low
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.643
Pretrend (Low) p−value: 0.957
Wald test p−value: 0.589
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

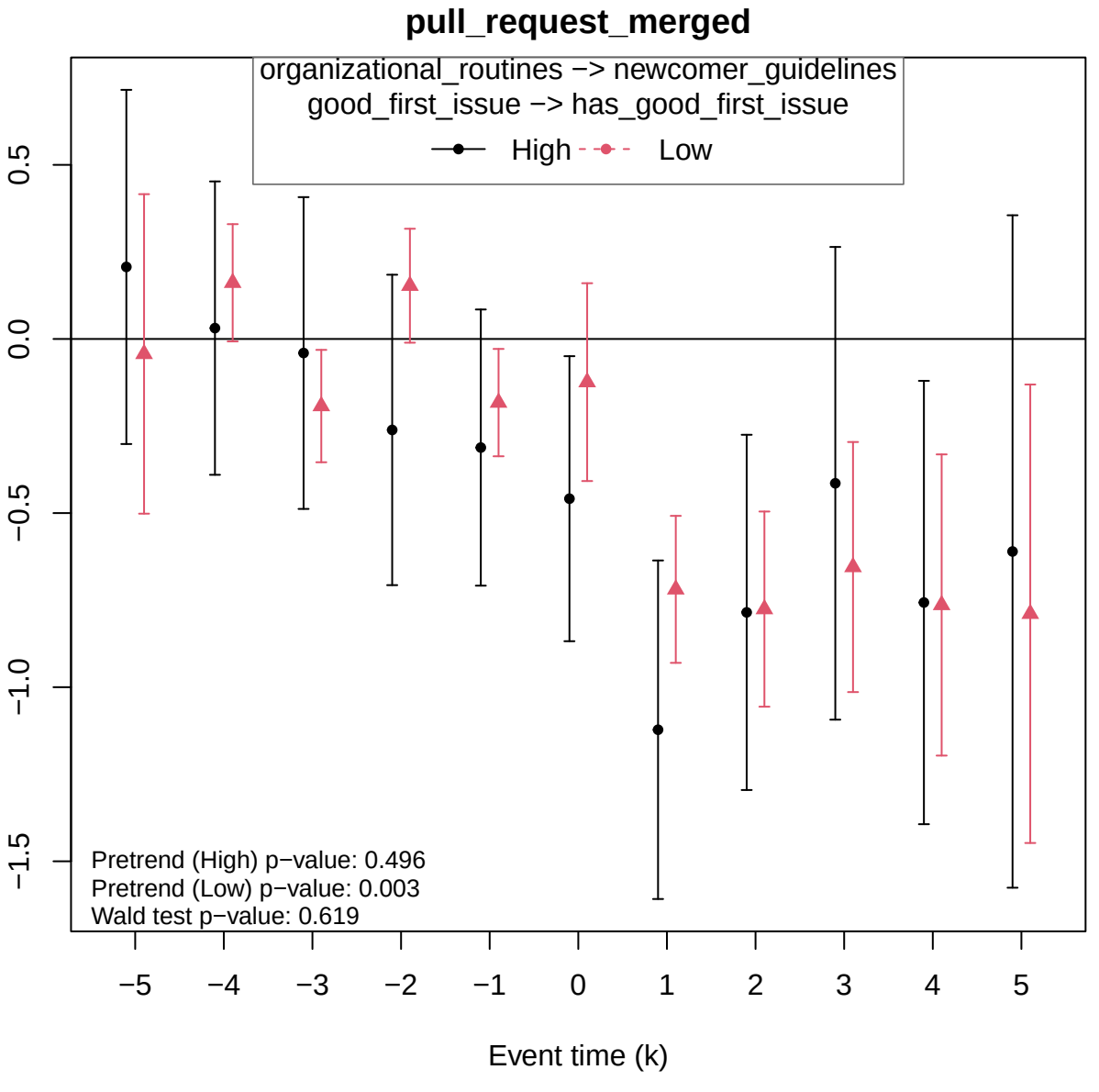

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

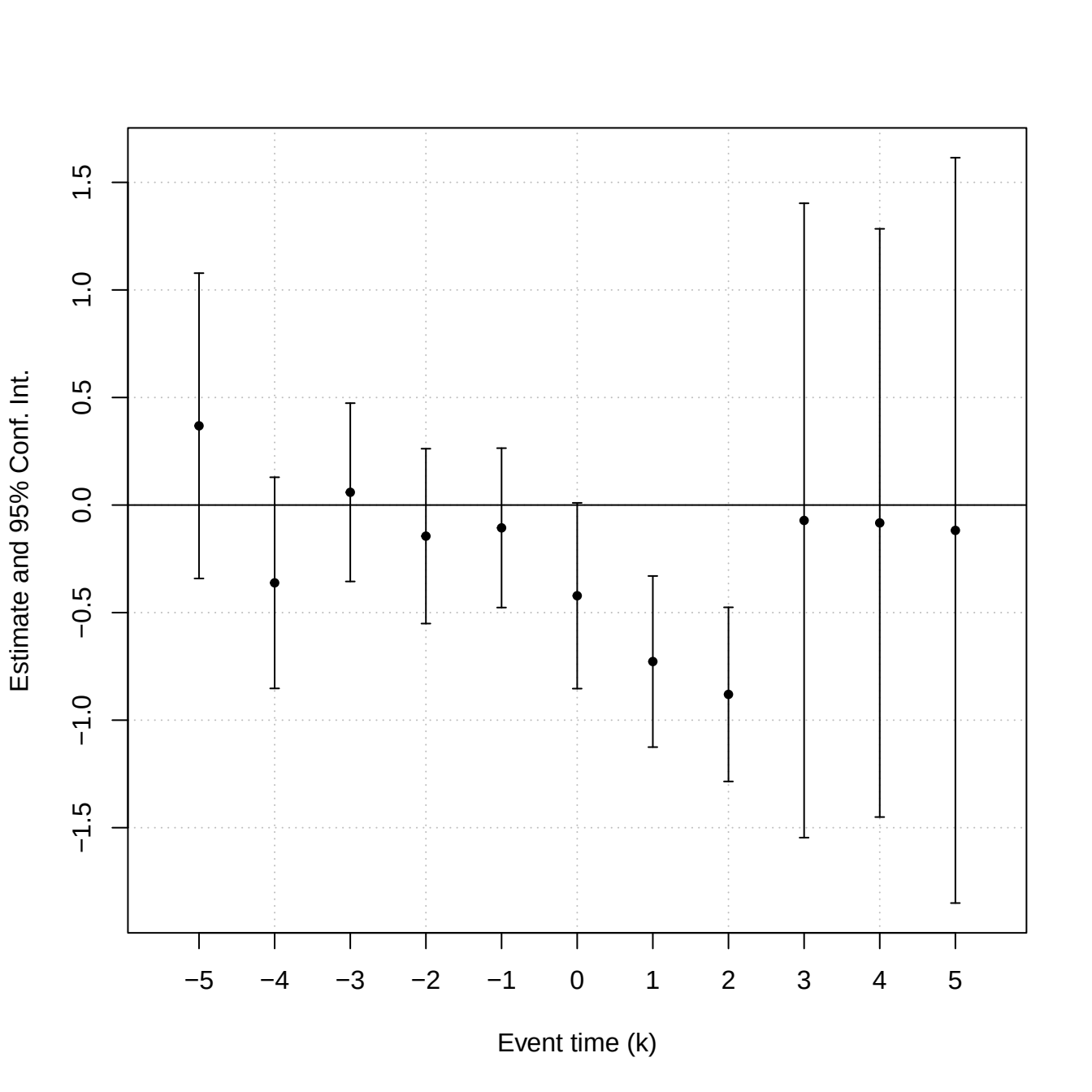

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

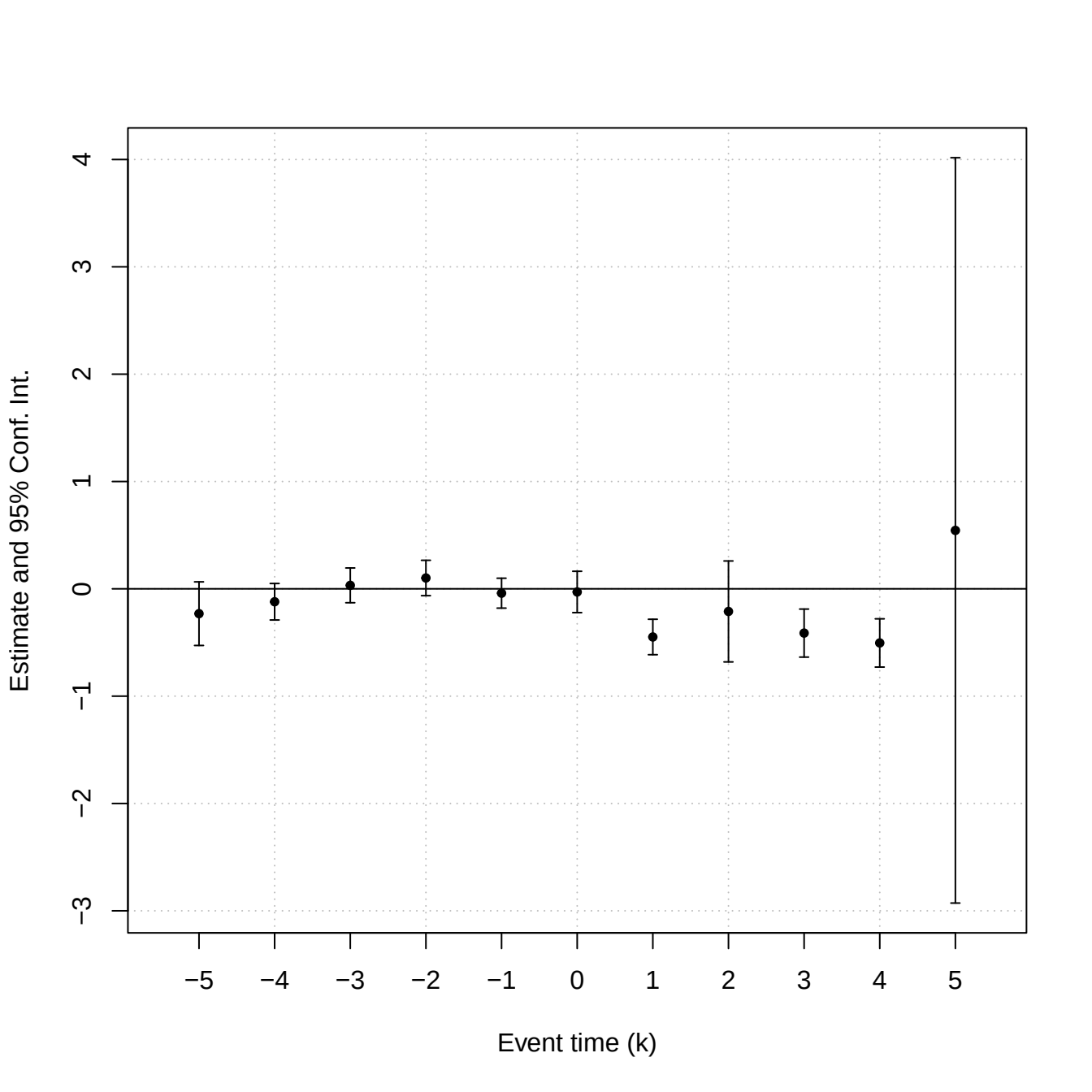

pull_request_opened
organizational_routines −> newcomer_guidelines
good_first_issue −> has_good_first_issue
High
Low
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.364
Pretrend (Low) p−value: 0.007
Wald test p−value: 0.476
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

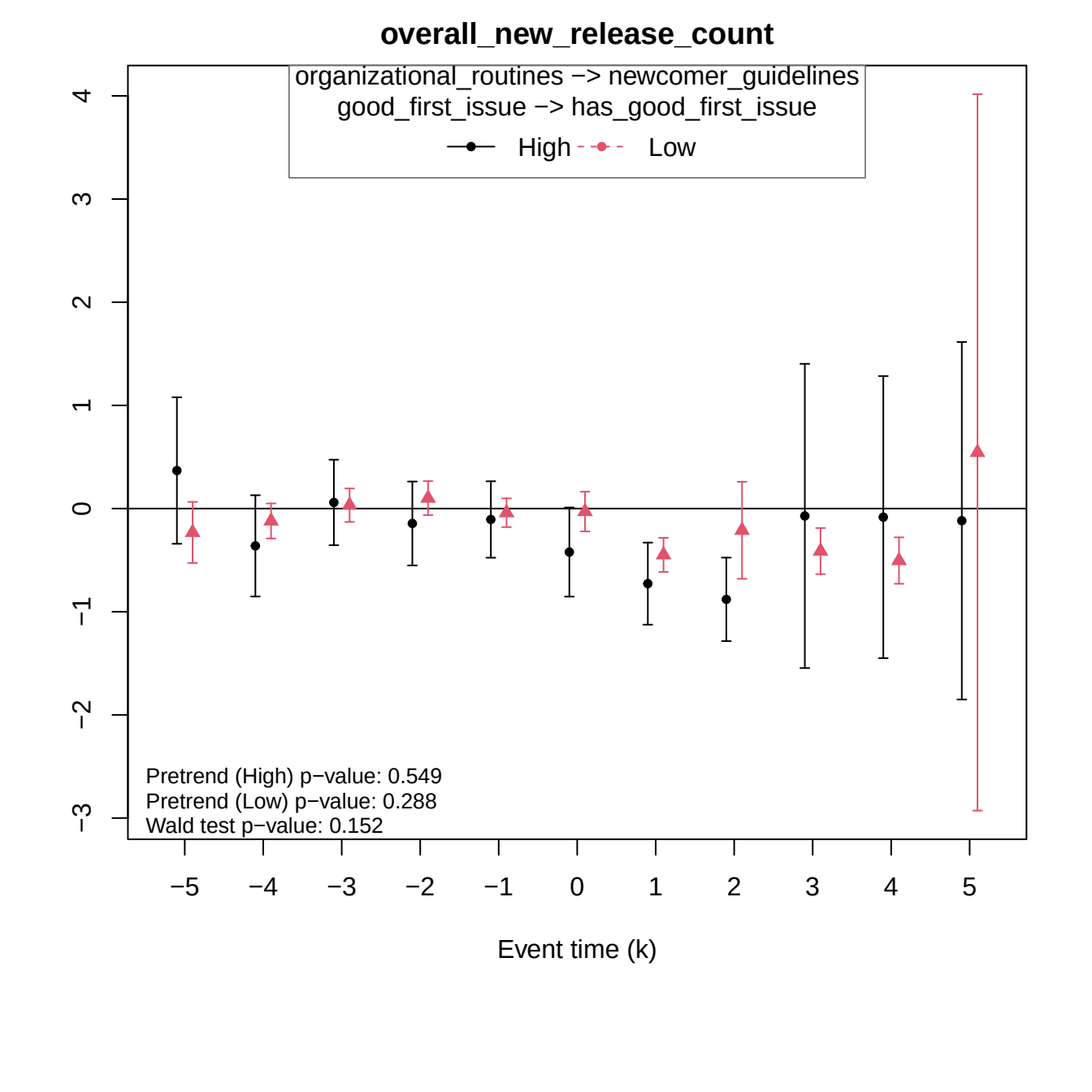

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

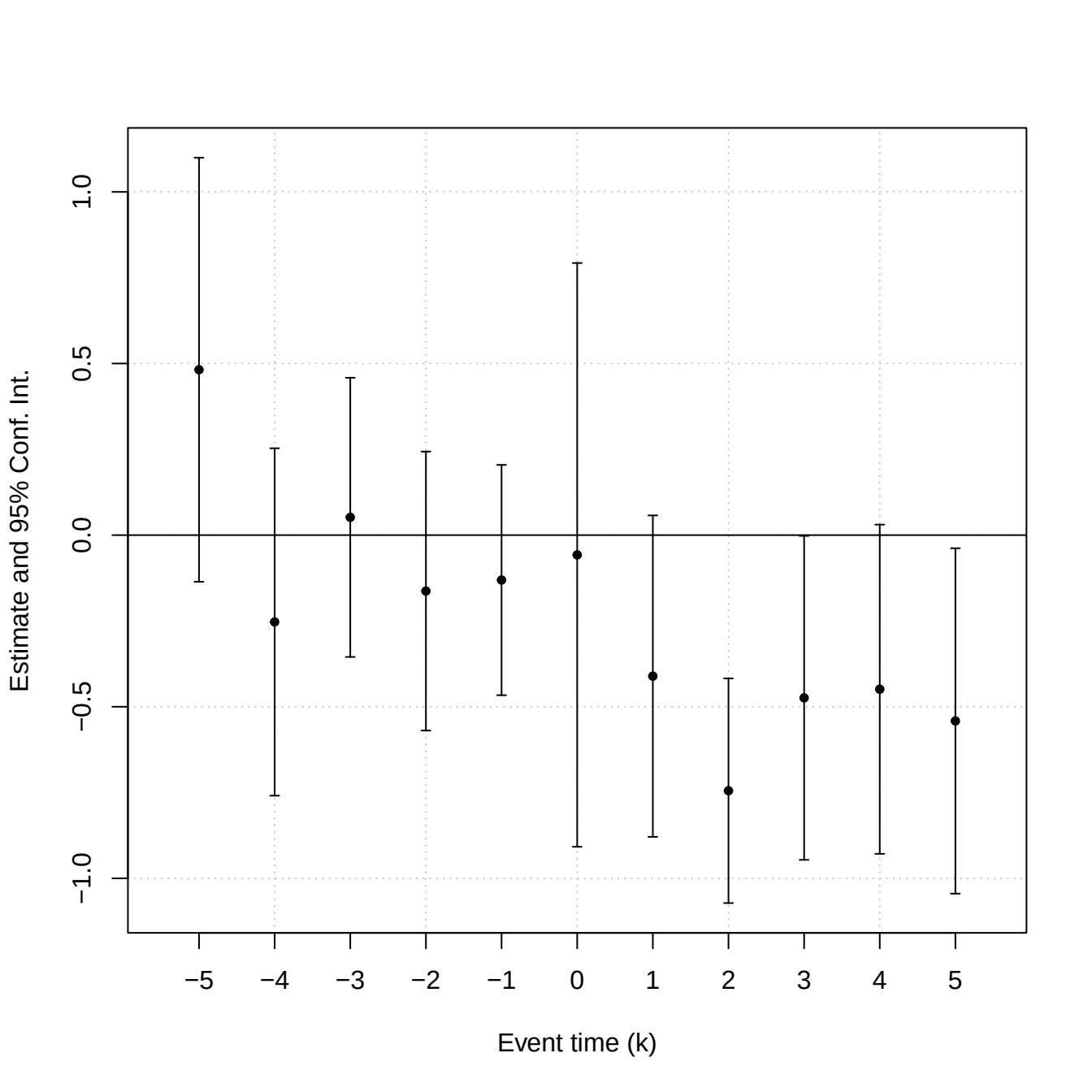

Estimate and 95% Conf. Int.
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

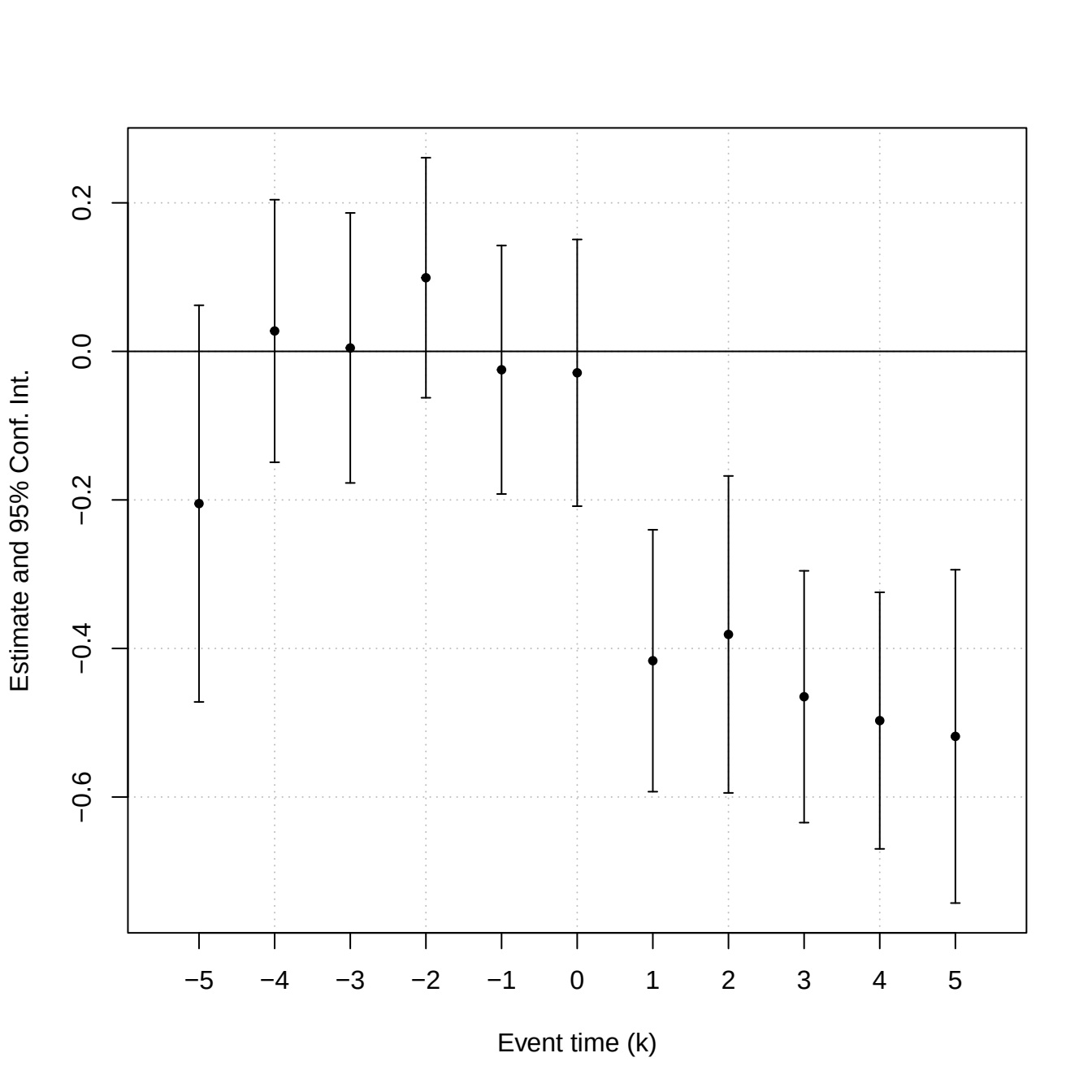

pull_request_merged
organizational_routines −> newcomer_guidelines
good_first_issue −> has_good_first_issue
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.496
Pretrend (Low) p−value: 0.003
Wald test p−value: 0.619
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

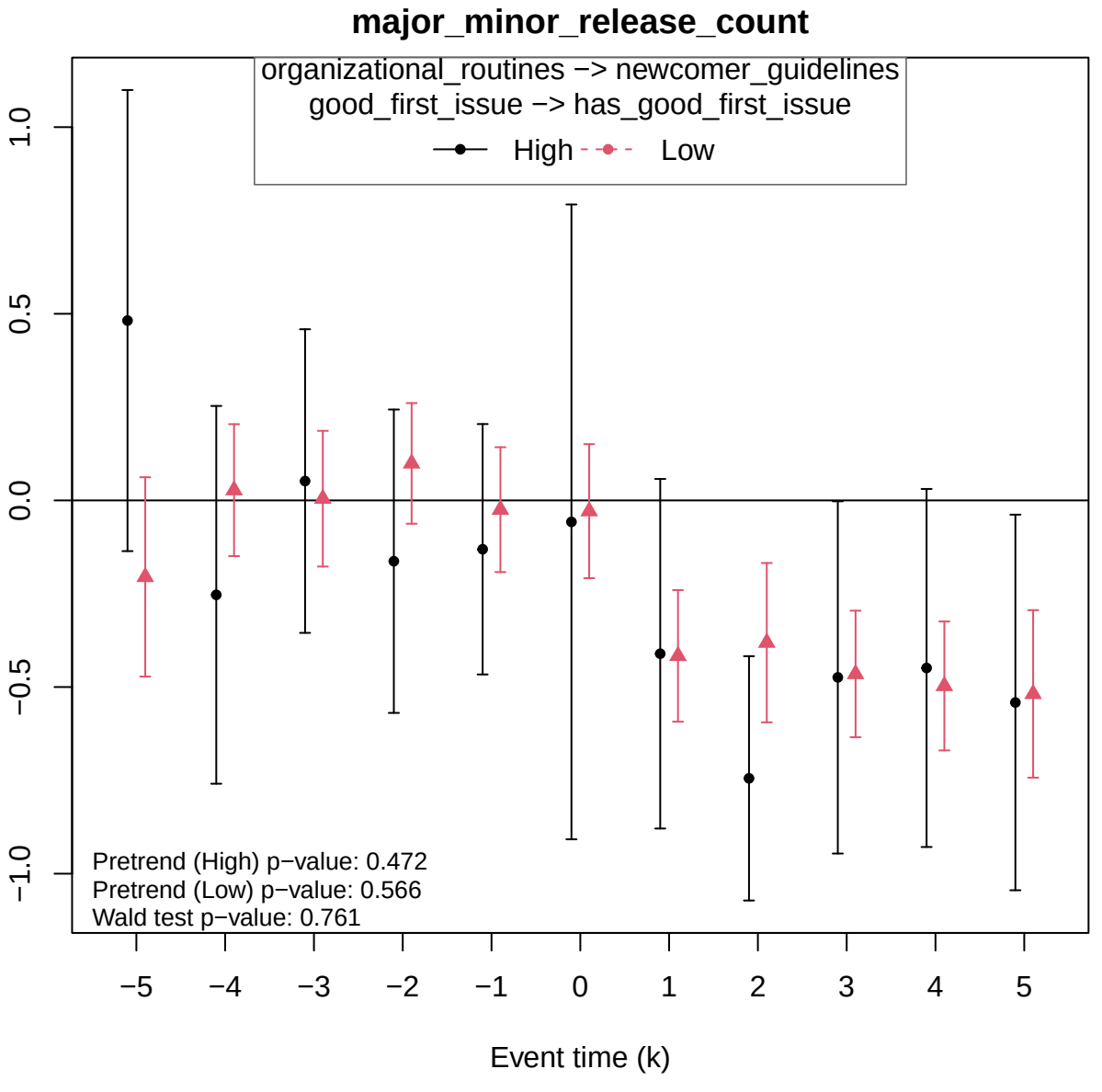

Estimate and 95% Conf. Int.
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

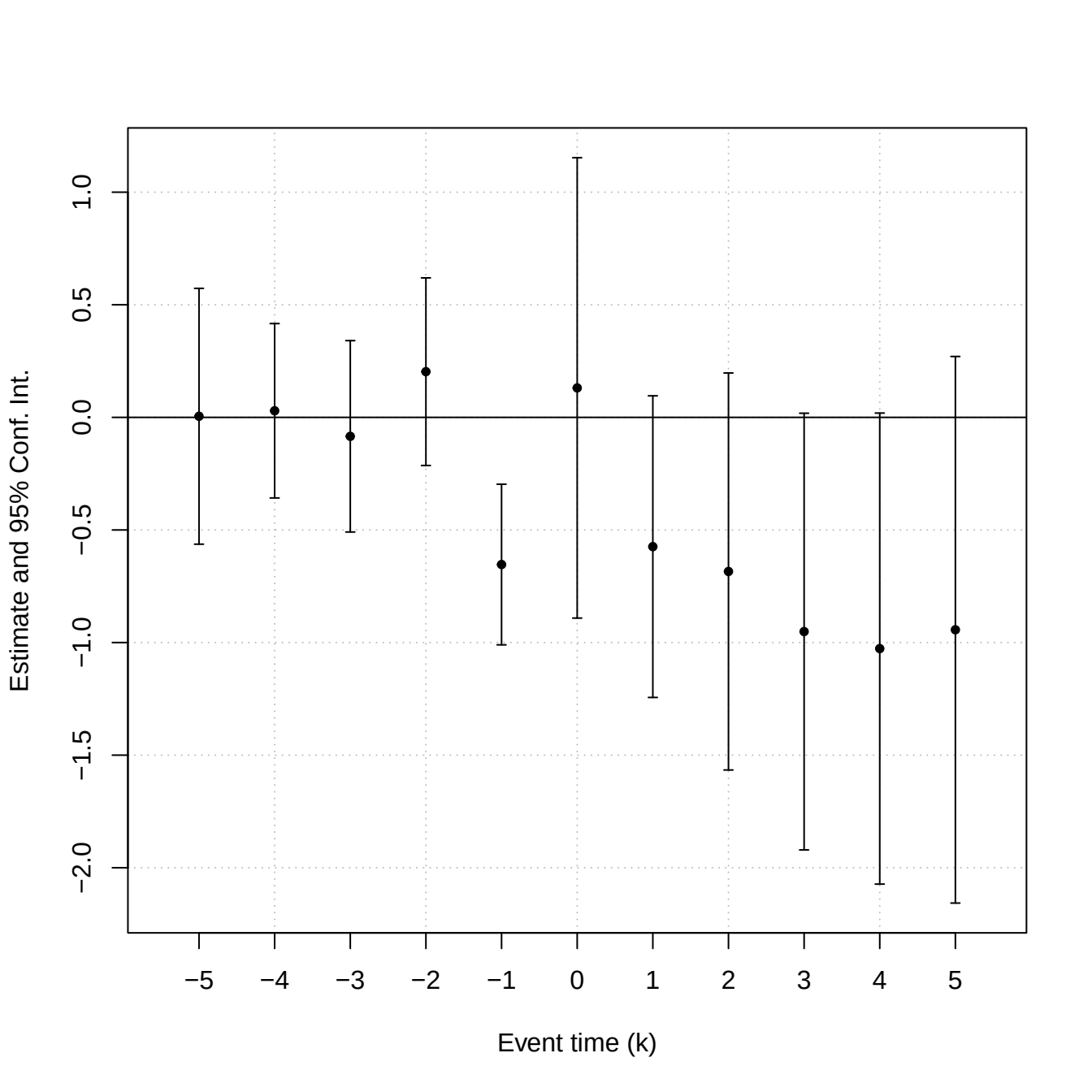

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

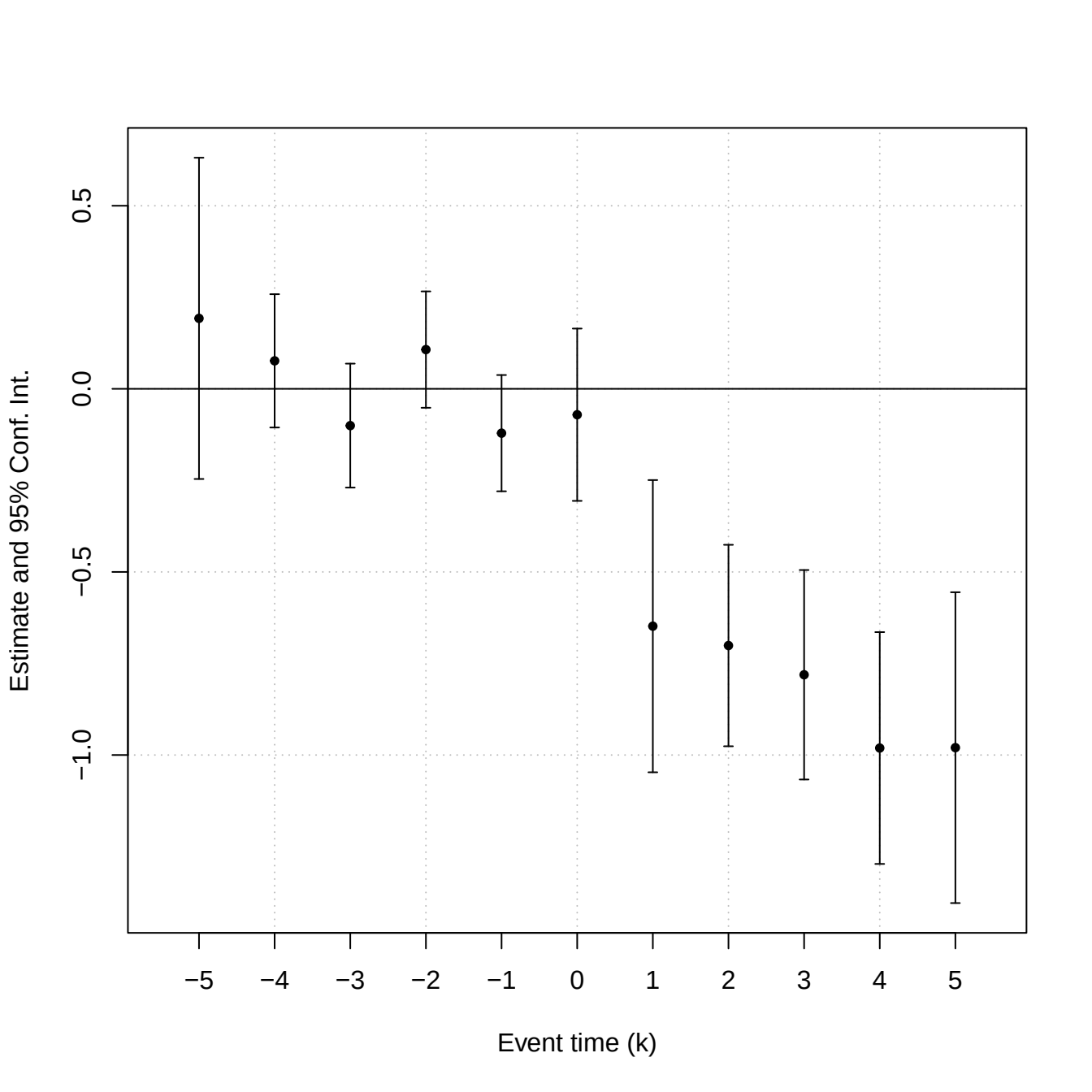

overall_new_release_count
organizational_routines −> newcomer_guidelines
good_first_issue −> has_good_first_issue
High
Low
Pretrend (High) p−value: 0.549
Pretrend (Low) p−value: 0.288
Wald test p−value: 0.152
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

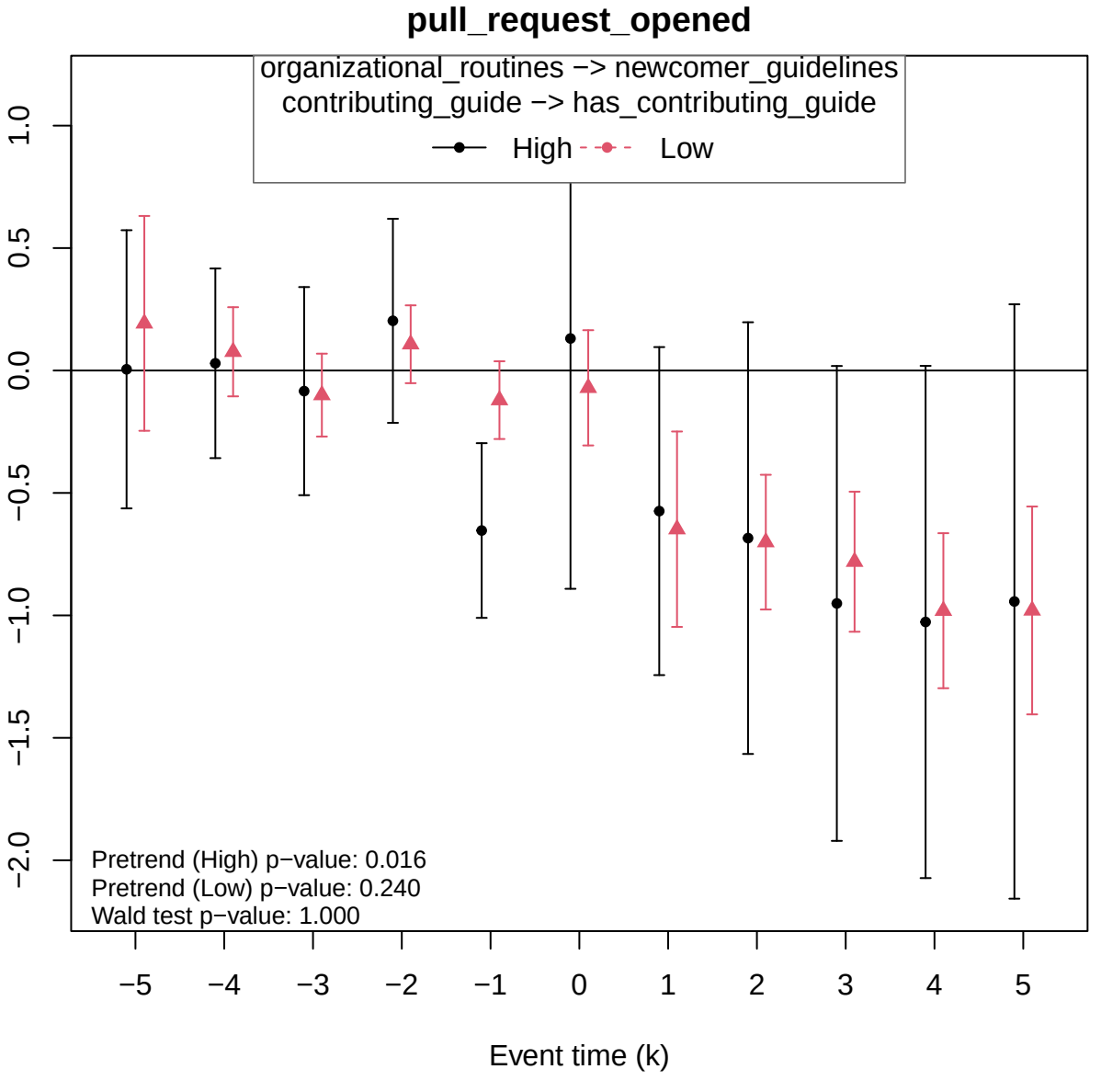

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

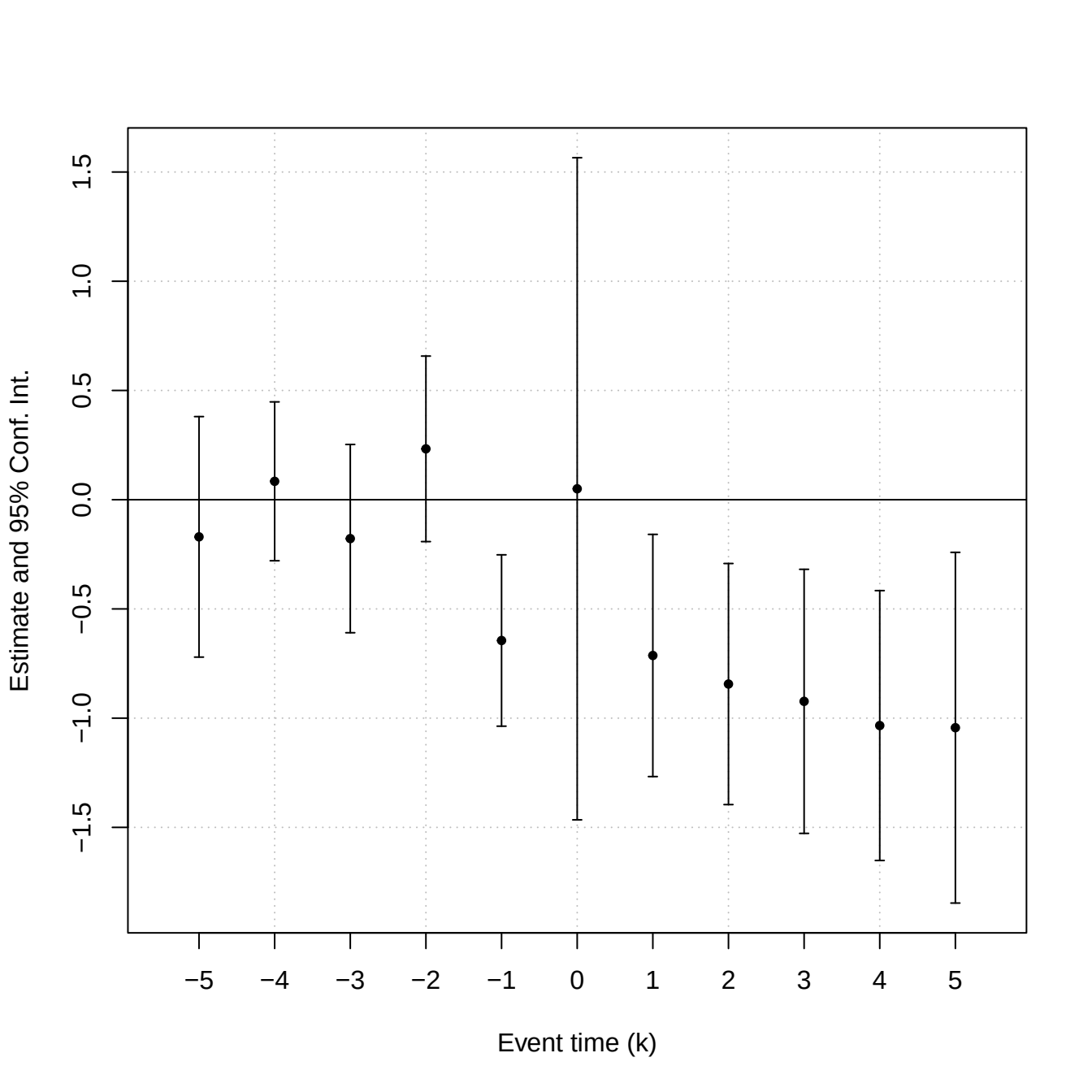

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

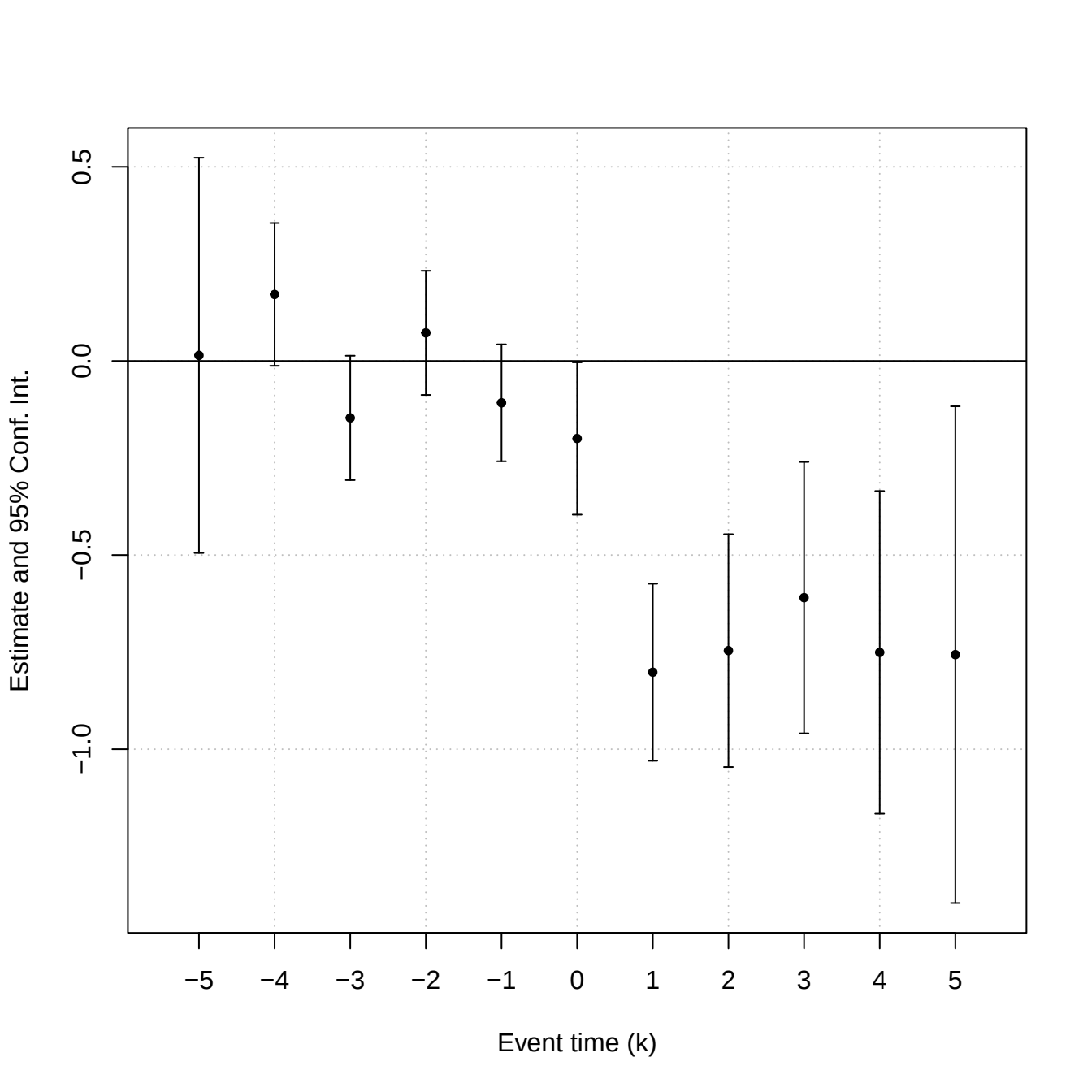

major_minor_release_count
organizational_routines −> newcomer_guidelines
good_first_issue −> has_good_first_issue
High
Low
1.0
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.472
Pretrend (Low) p−value: 0.566
Wald test p−value: 0.761
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

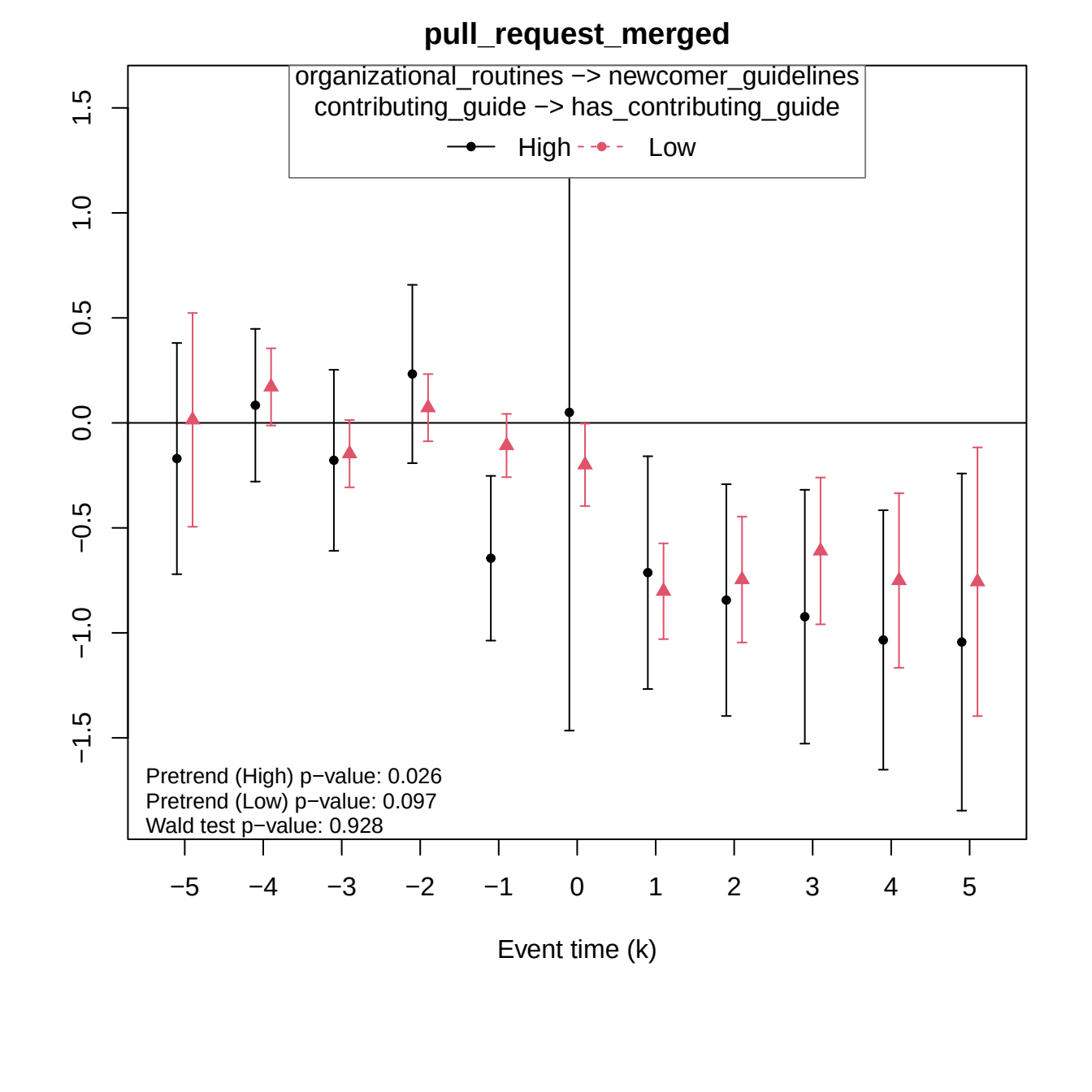

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

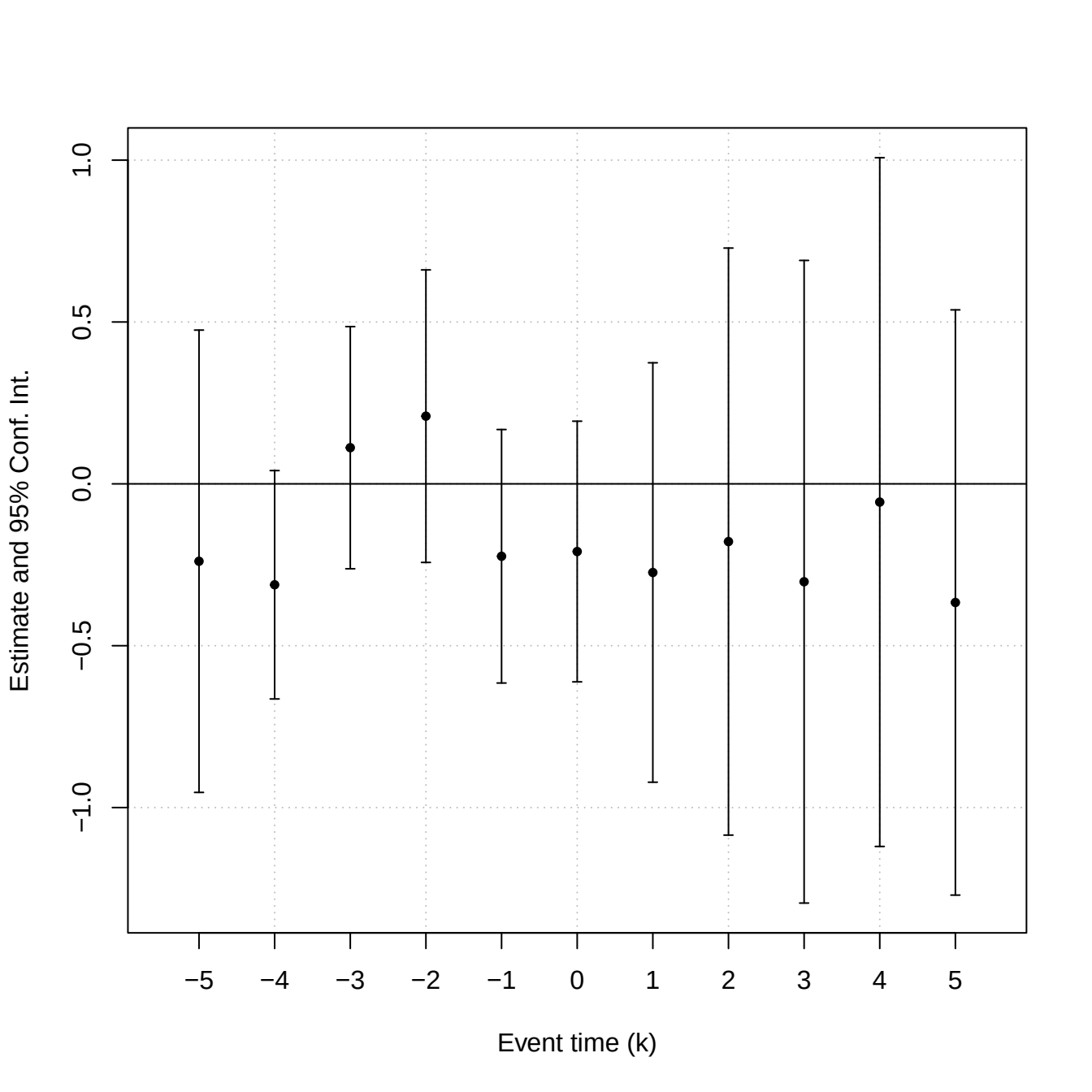

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

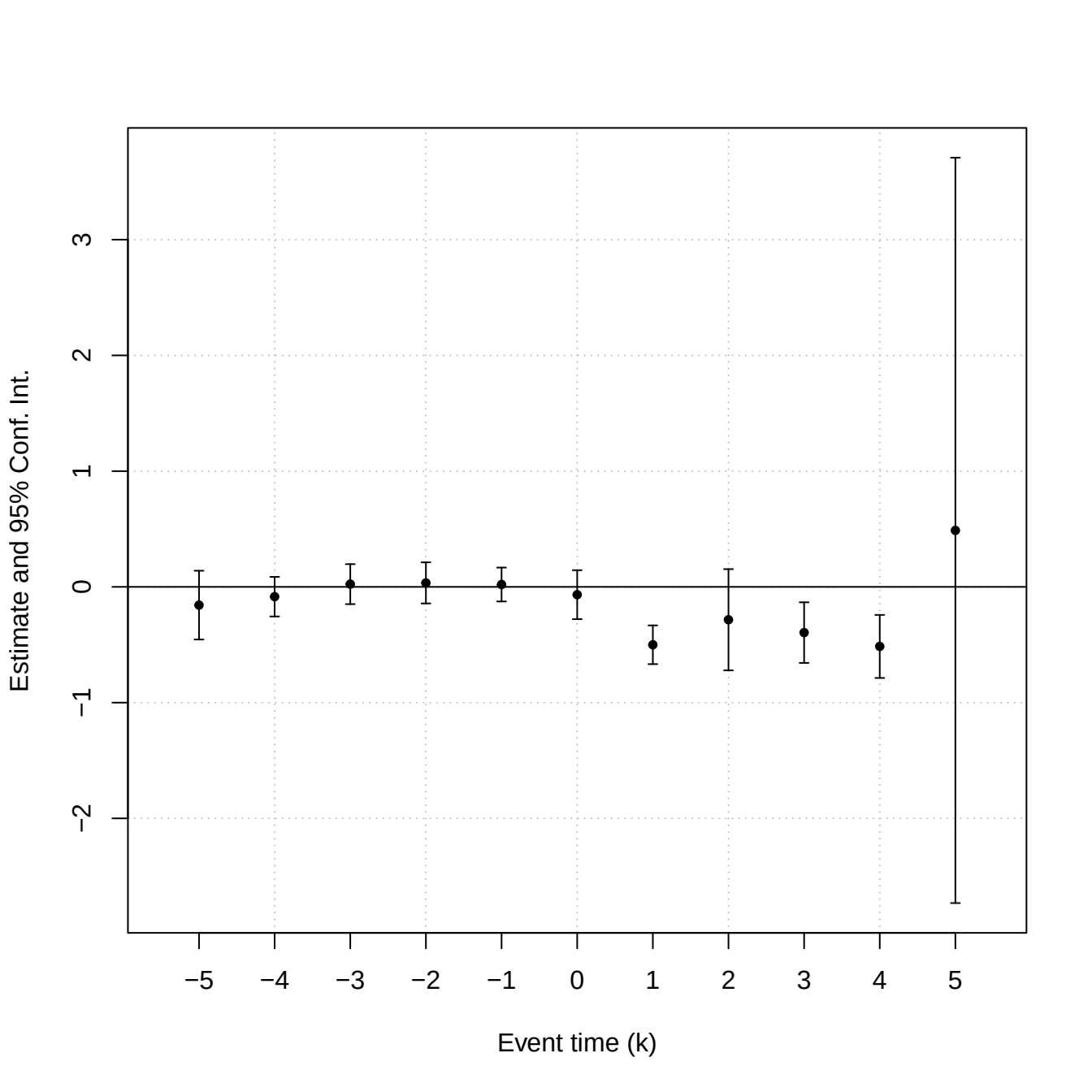

pull_request_opened
organizational_routines −> newcomer_guidelines
contributing_guide −> has_contributing_guide
High
Low
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
Pretrend (High) p−value: 0.016
Pretrend (Low) p−value: 0.240
Wald test p−value: 1.000
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

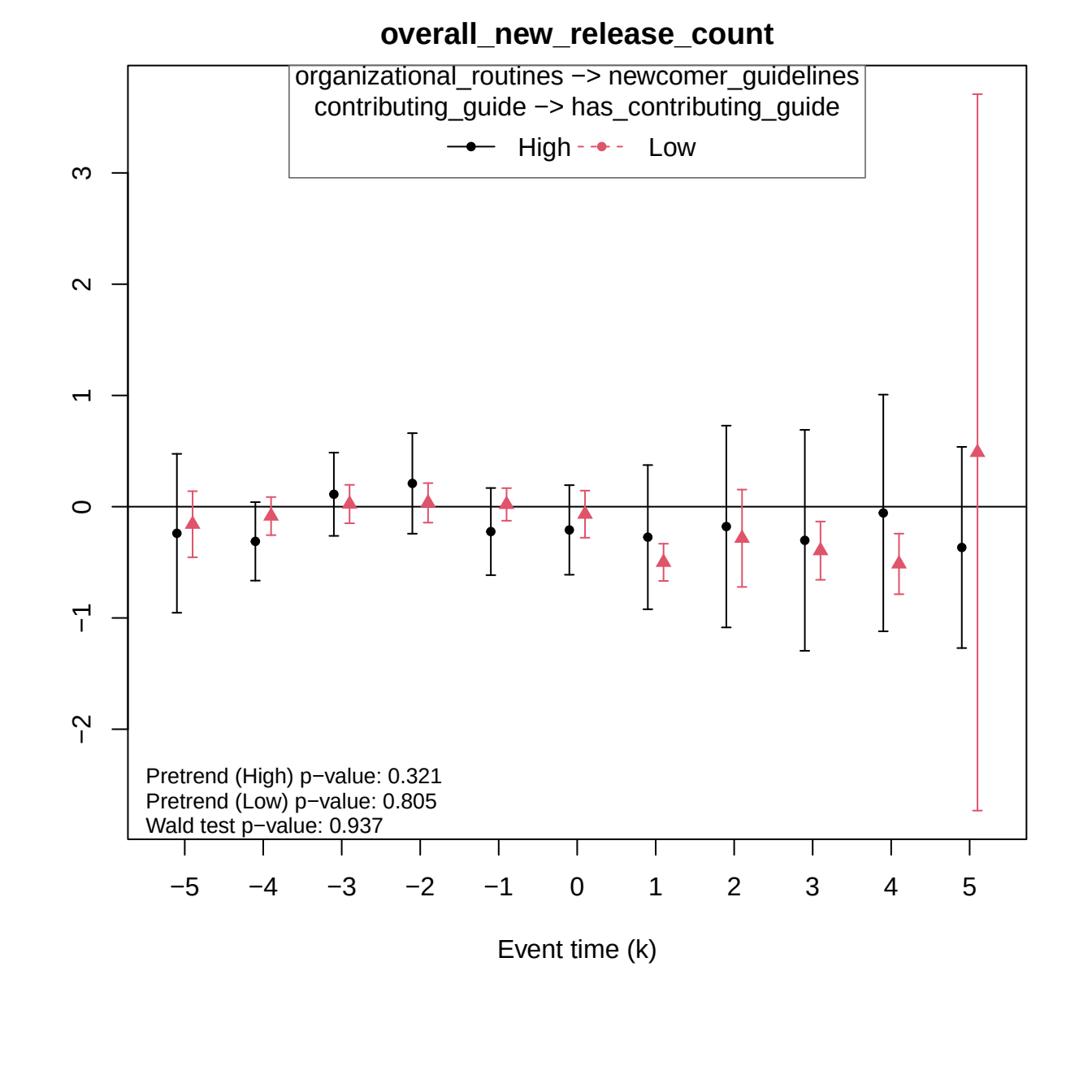

Estimate and 95% Conf. Int.
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

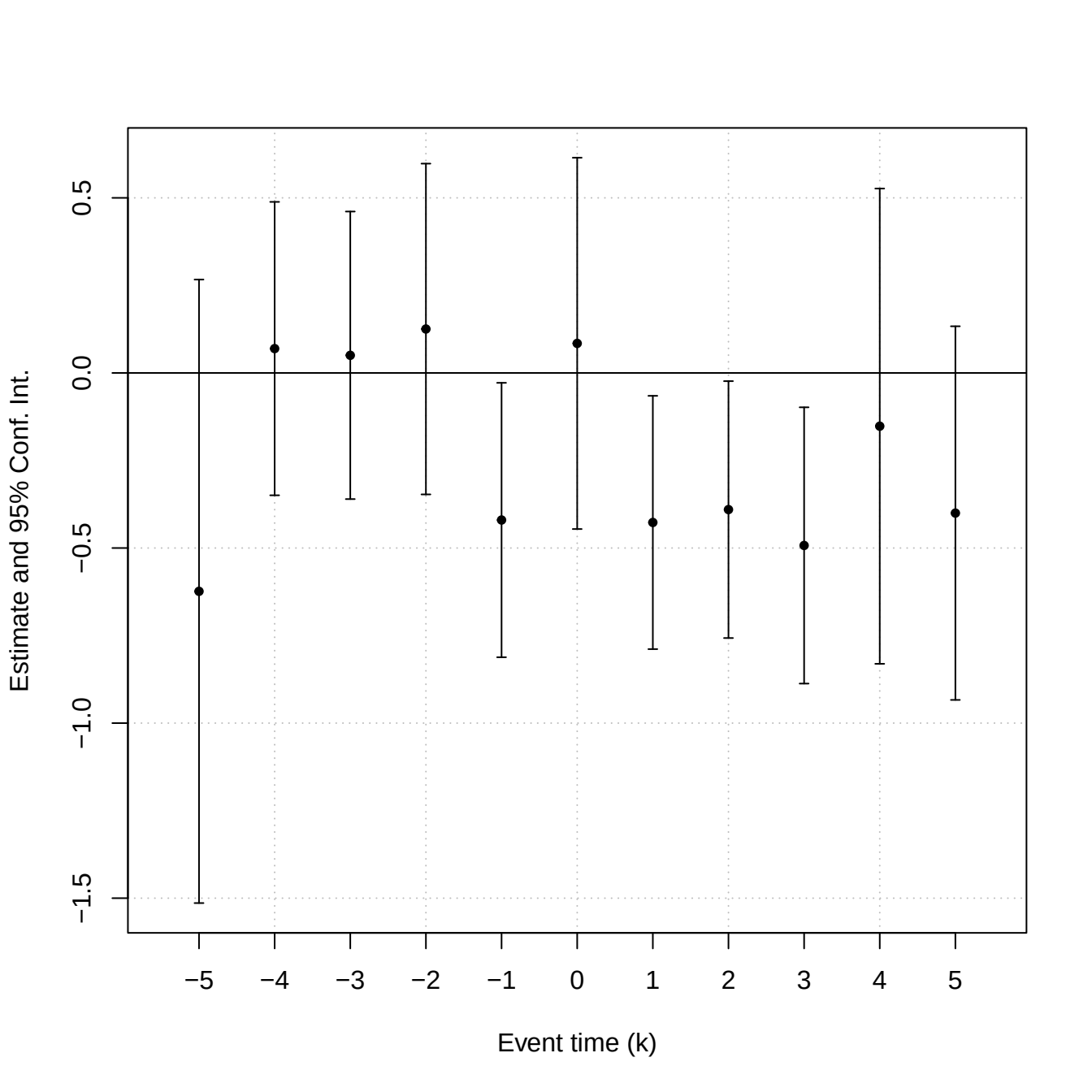

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

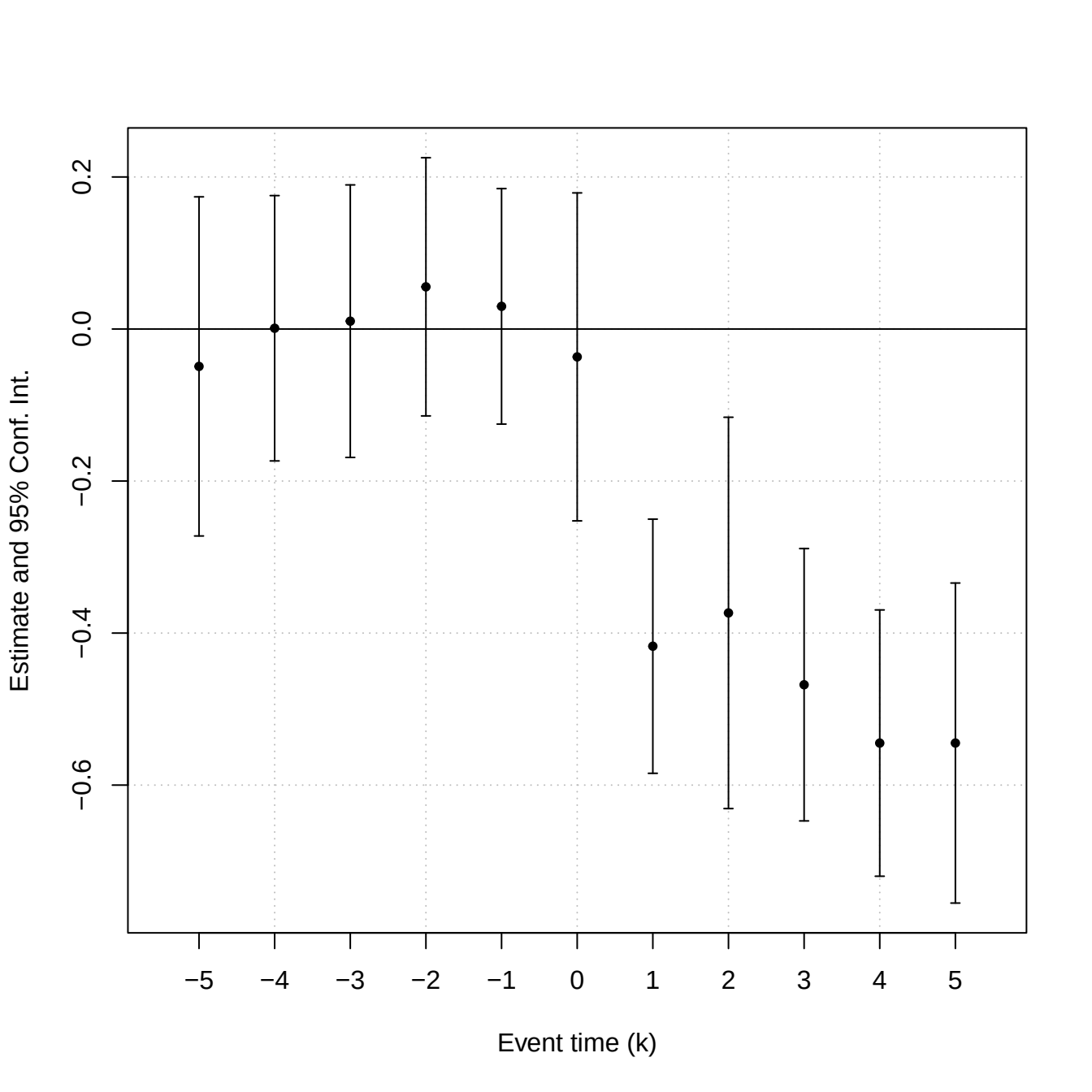

pull_request_merged
organizational_routines −> newcomer_guidelines
contributing_guide −> has_contributing_guide
High
Low
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.026
Pretrend (Low) p−value: 0.097
Wald test p−value: 0.928
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

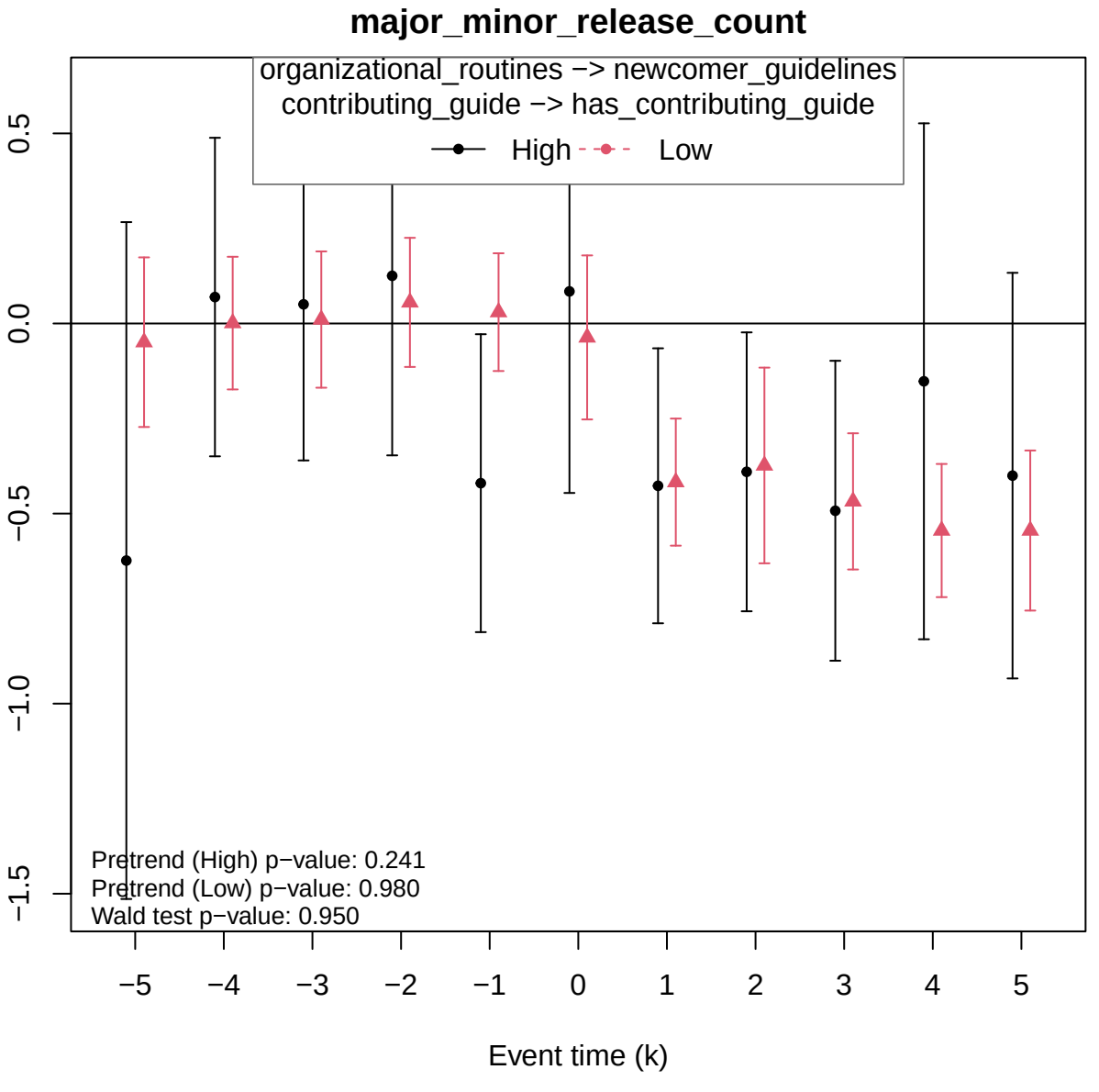

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

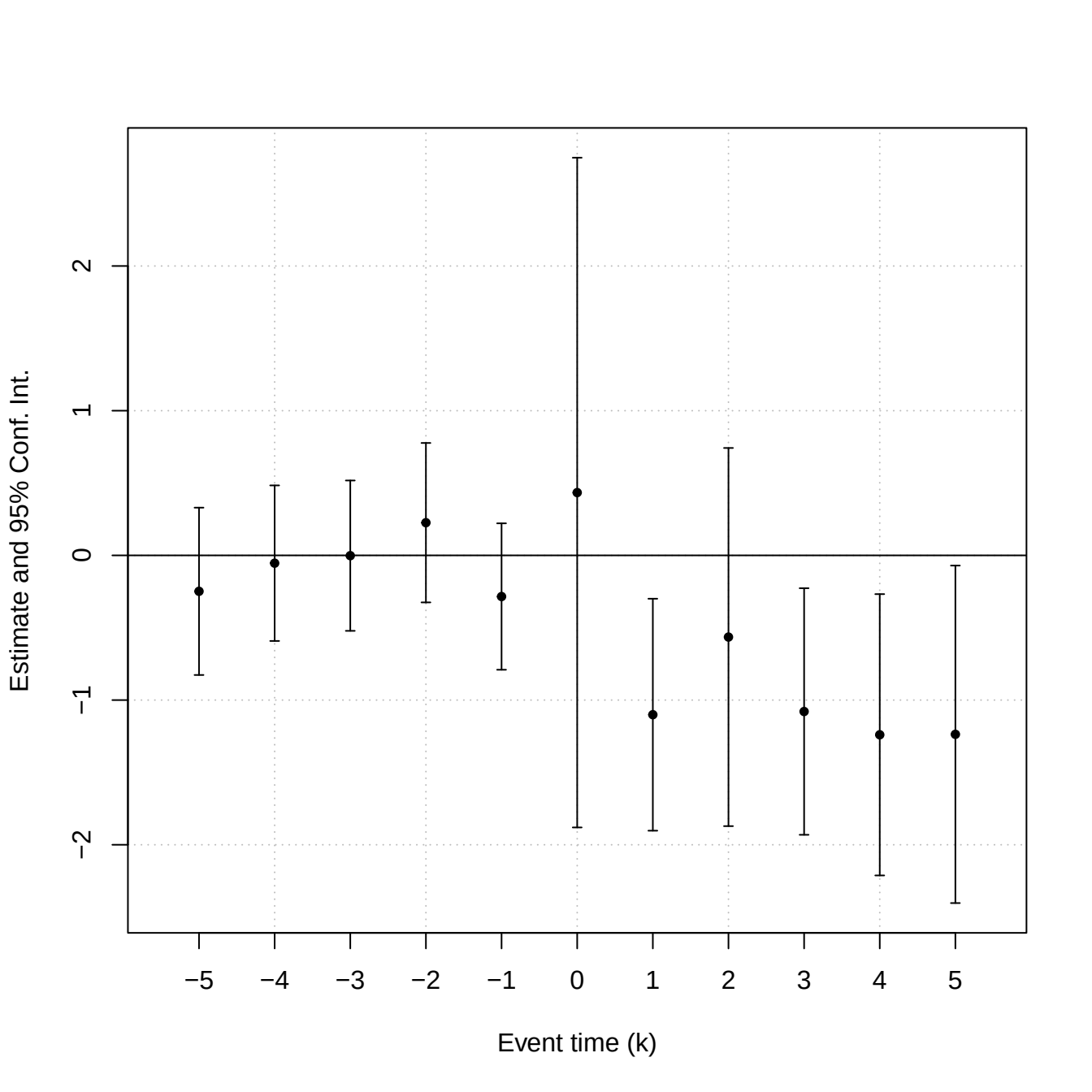

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

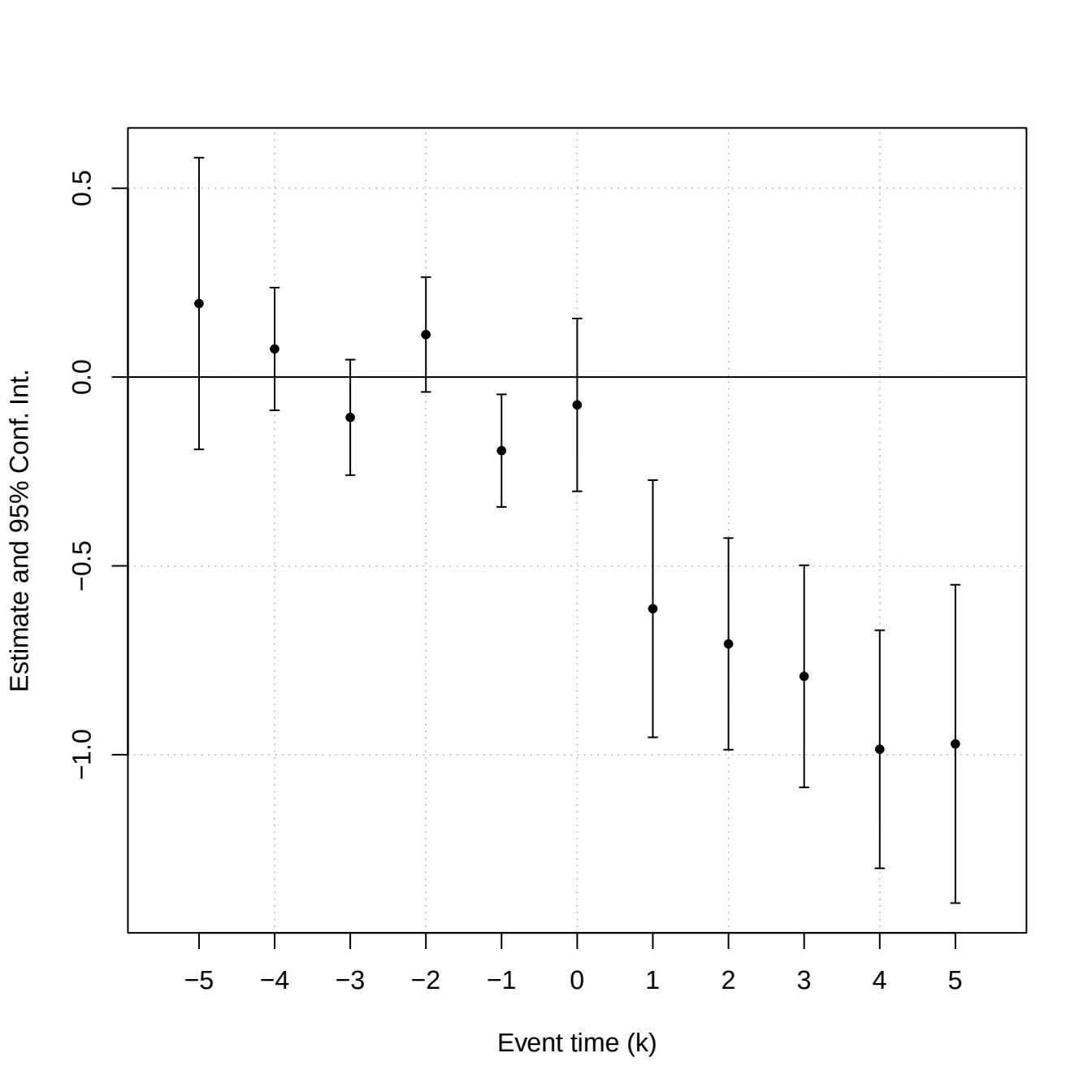

overall_new_release_count
organizational_routines −> newcomer_guidelines
contributing_guide −> has_contributing_guide
High
Low
3
2
1
0
−1
−2
Pretrend (High) p−value: 0.321
Pretrend (Low) p−value: 0.805
Wald test p−value: 0.937
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

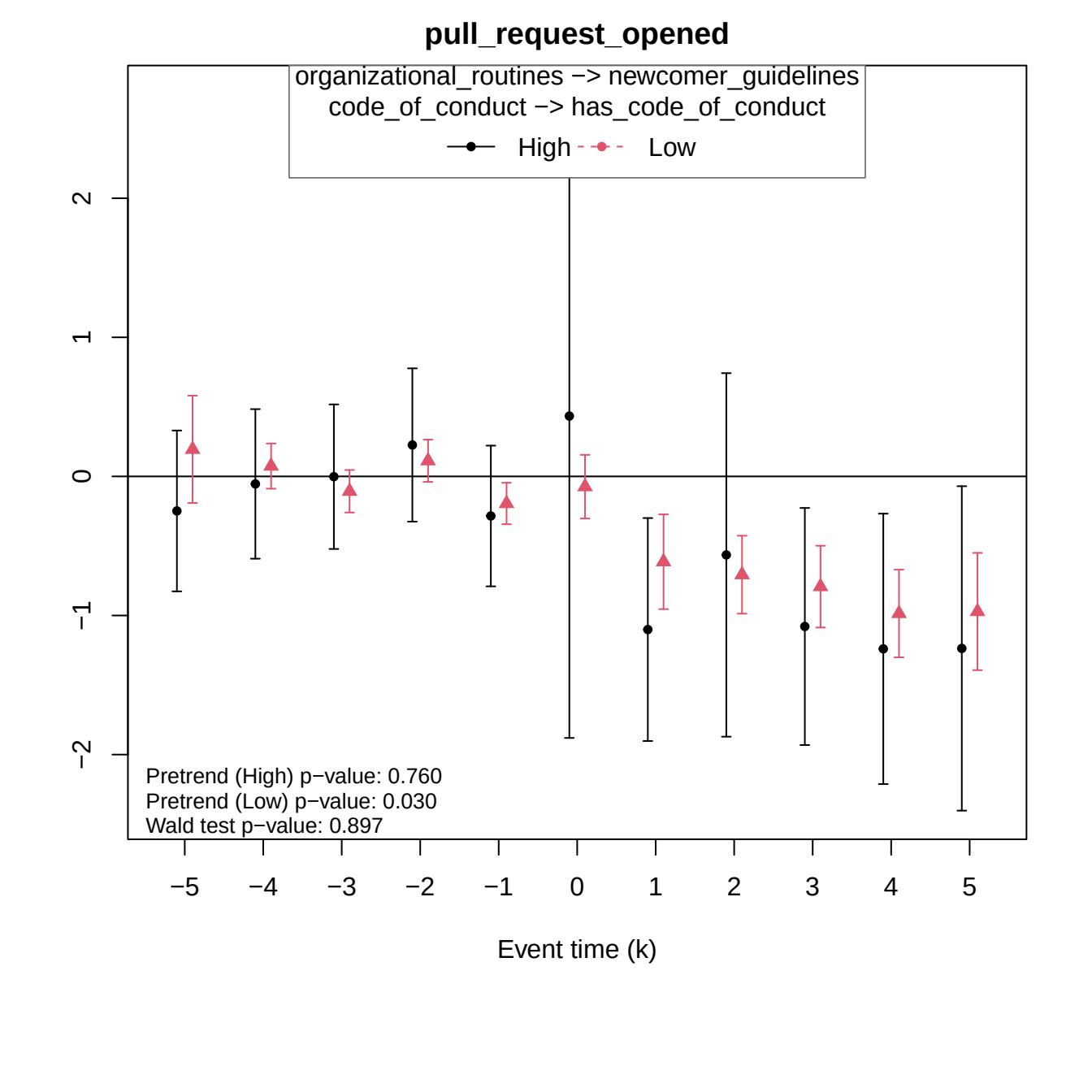

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−1.5
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

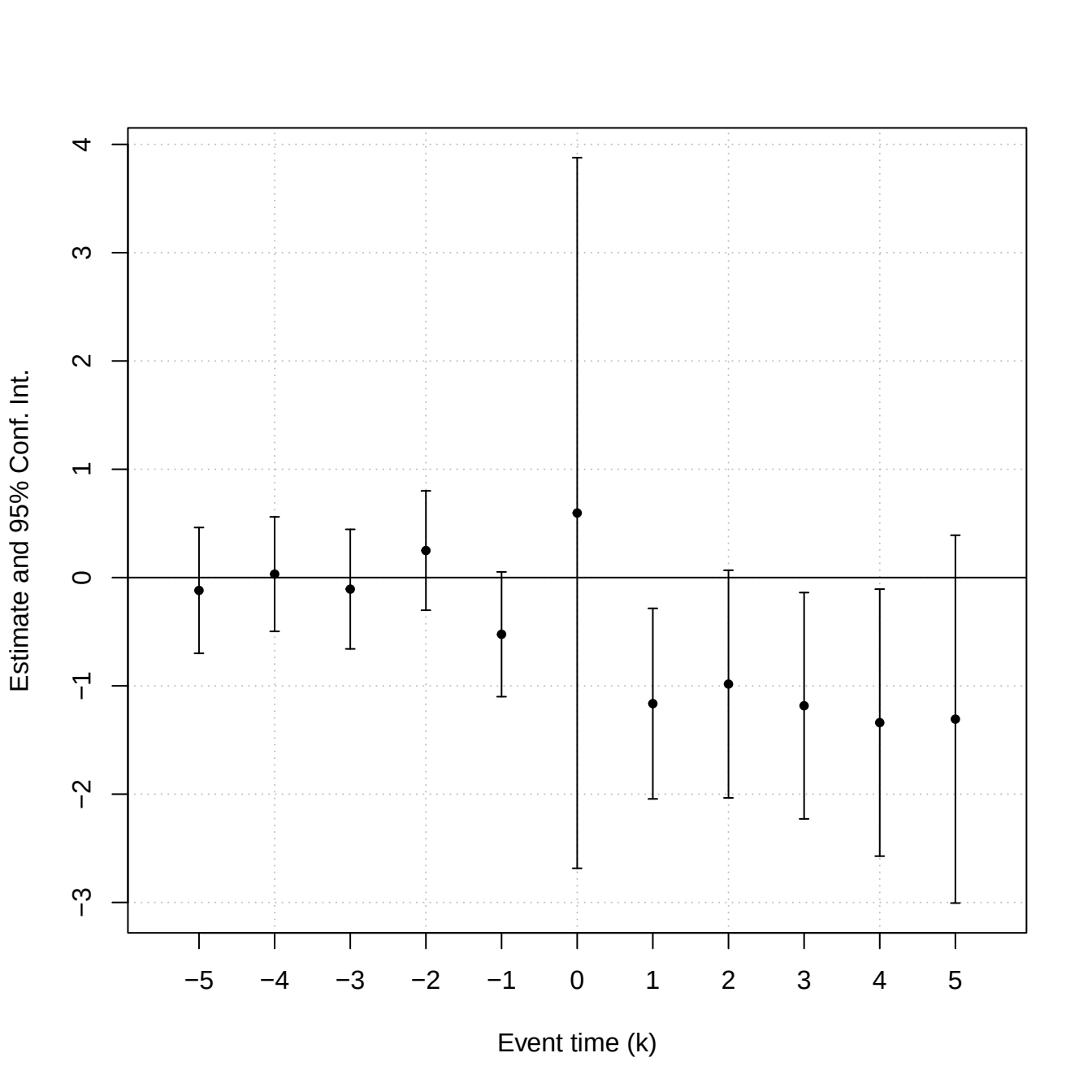

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

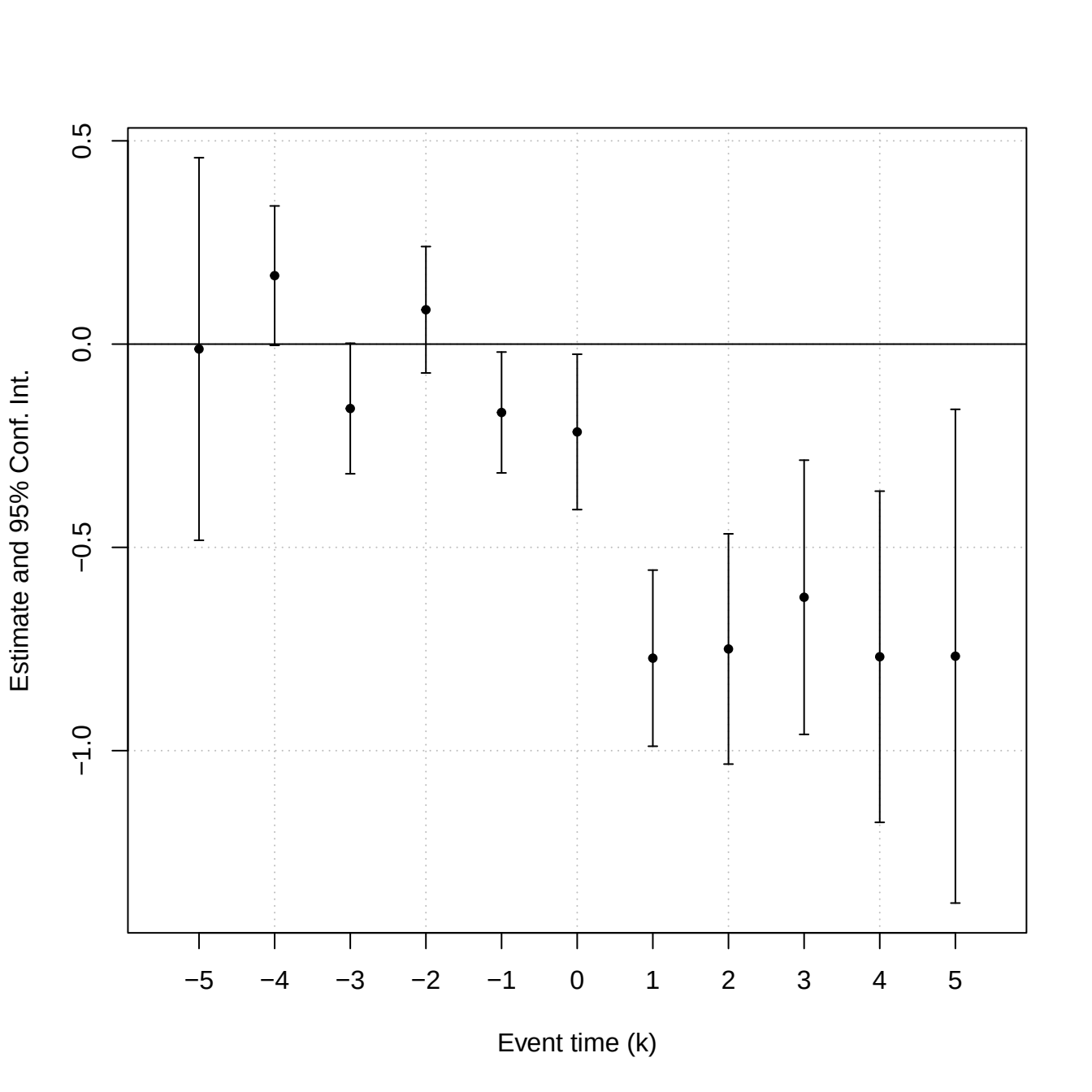

major_minor_release_count
organizational_routines −> newcomer_guidelines
contributing_guide −> has_contributing_guide
High
Low
0.5
0.0
−0.5
−1.0
−1.5
Pretrend (High) p−value: 0.241
Pretrend (Low) p−value: 0.980
Wald test p−value: 0.950
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

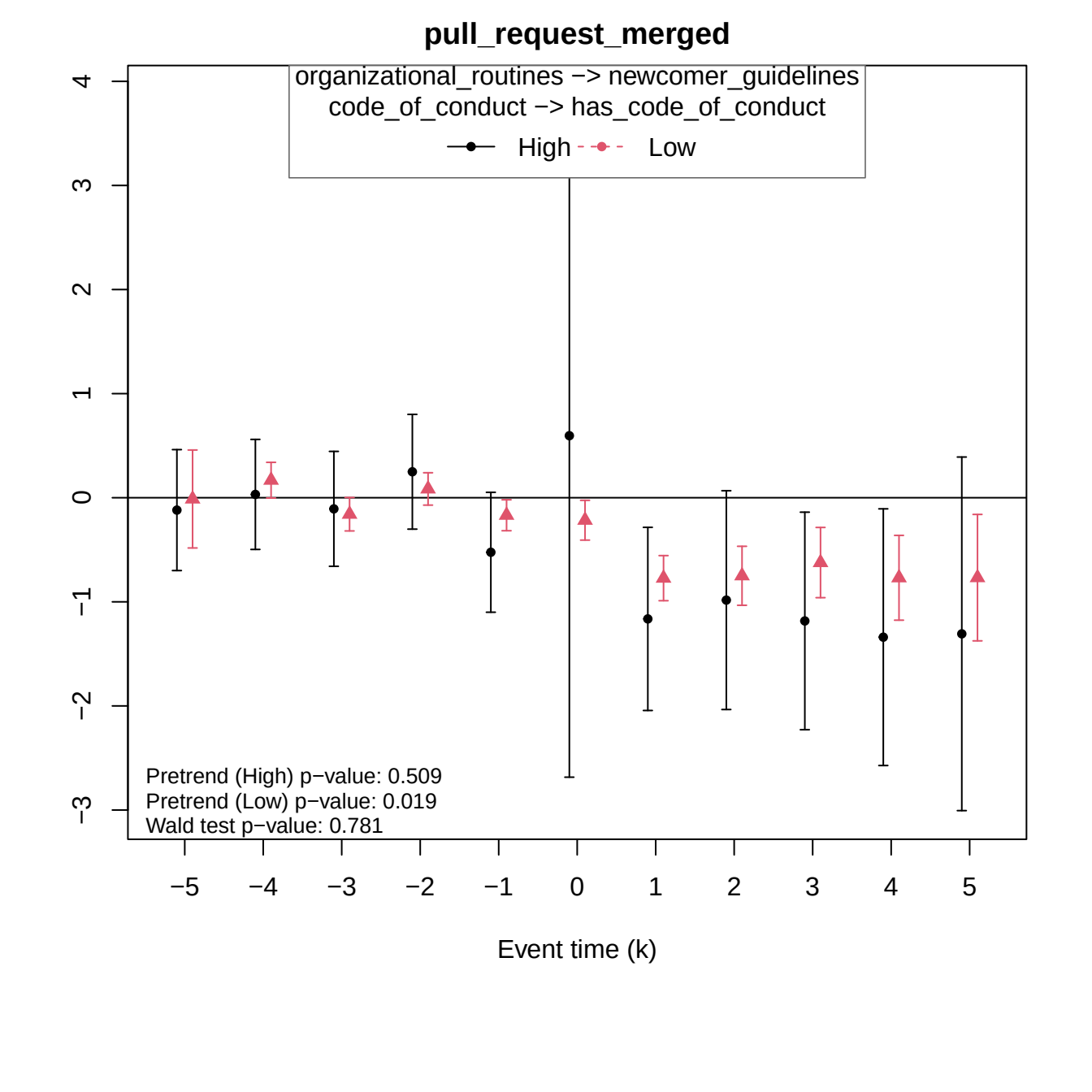

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

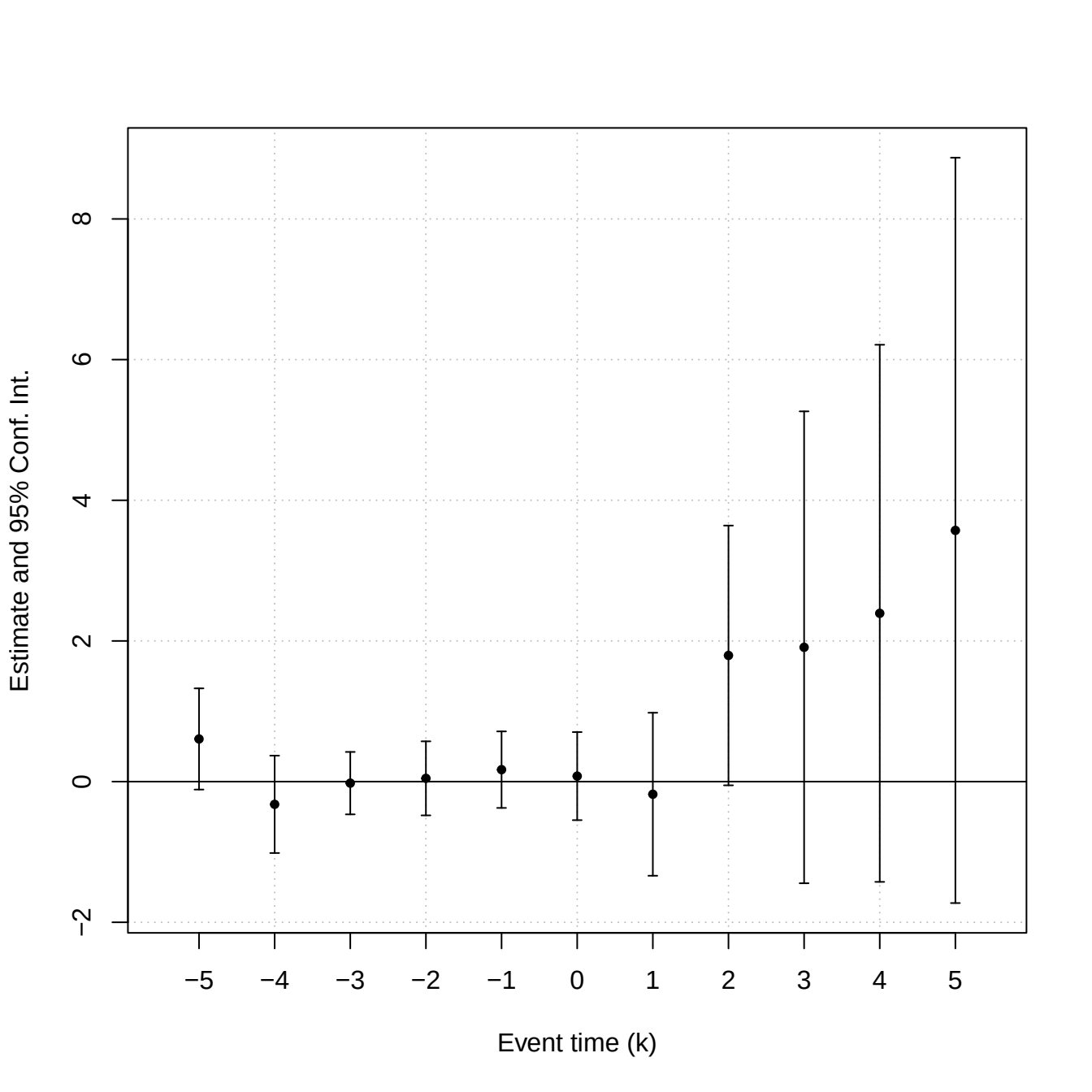

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

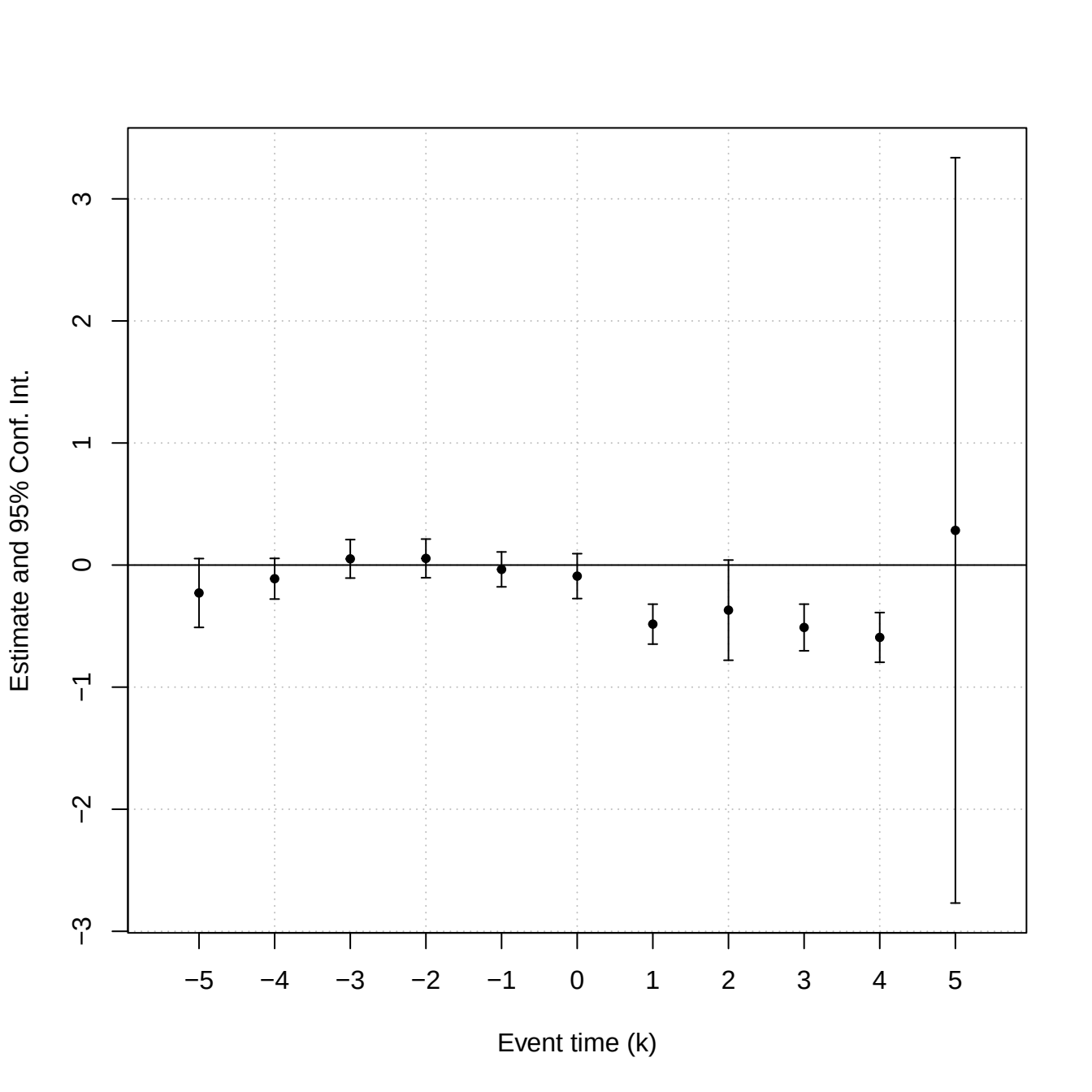

pull_request_opened
organizational_routines -> newcomer_guidelines
code_of_conduct -> has_code_of_conduct
High
Low
2
1
0
−1
−2
Pretrend (High) p−value: 0.760
Pretrend (Low) p−value: 0.030
Wald test p−value: 0.897
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

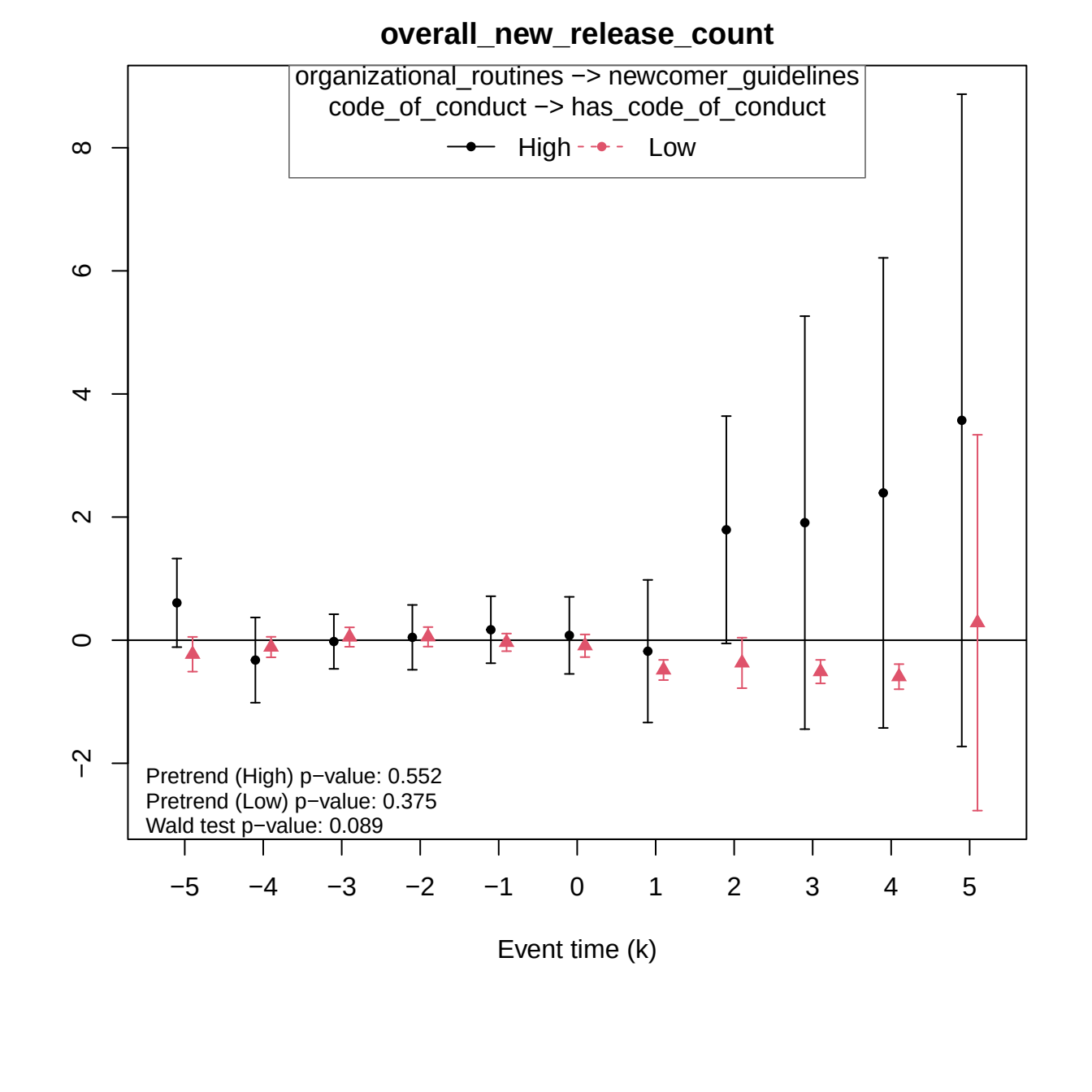

Estimate and 95% Conf. Int.
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

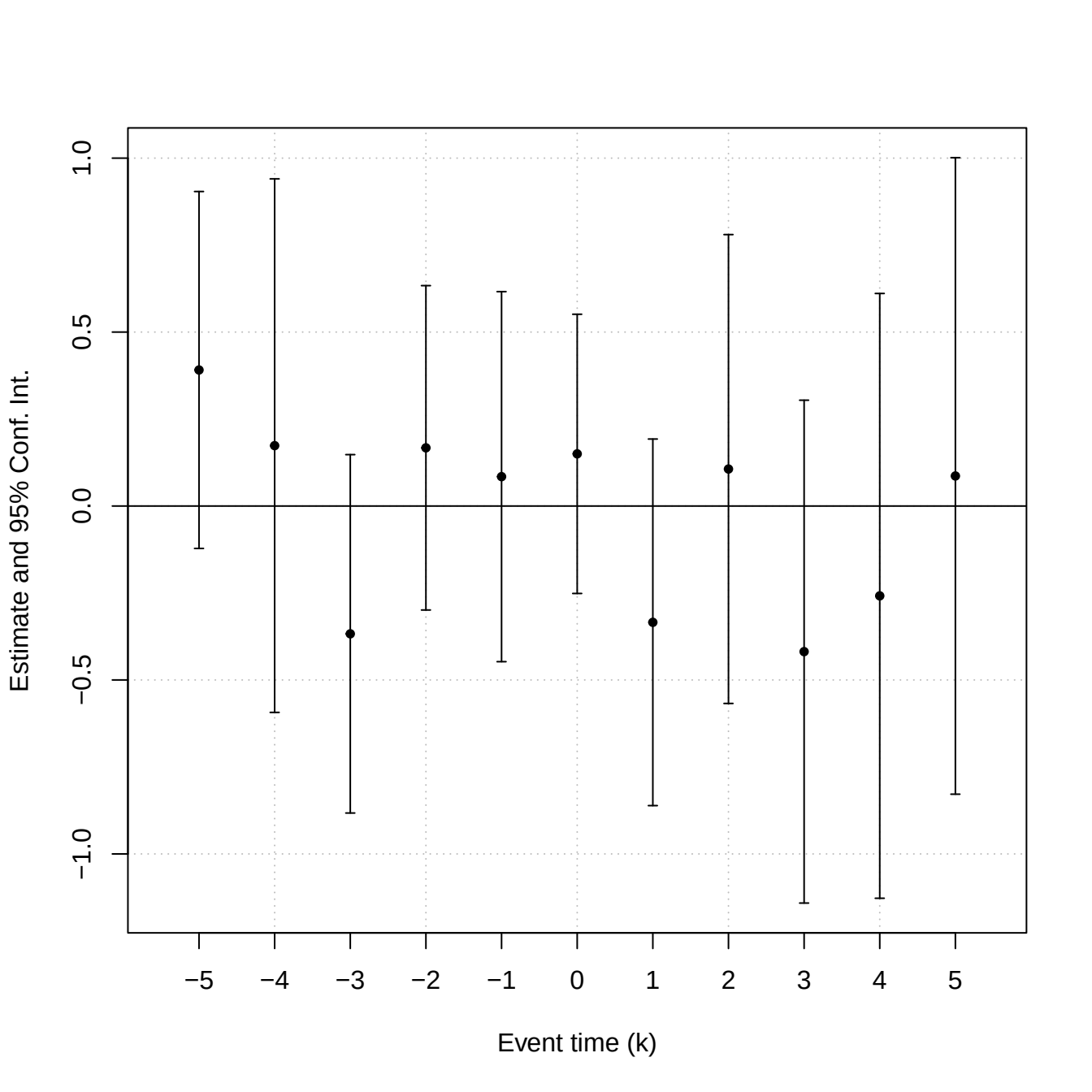

Estimate and 95% Conf. Int.
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

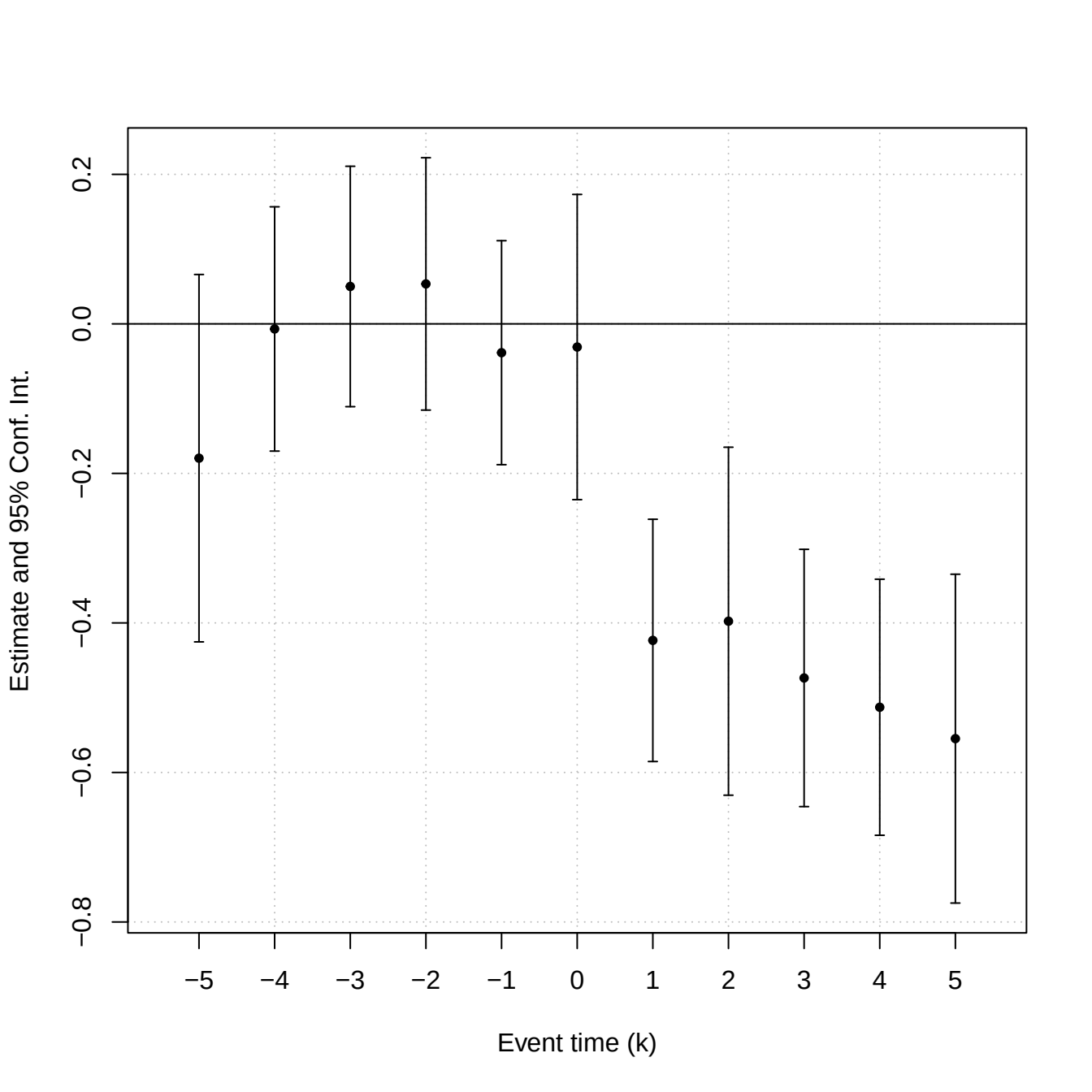

pull_request_merged
organizational_routines −> newcomer_guidelines
code_of_conduct −> has_code_of_conduct
High
Low
Pretrend (High) p−value: 0.509
Pretrend (Low) p−value: 0.019
Wald test p−value: 0.781
4
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

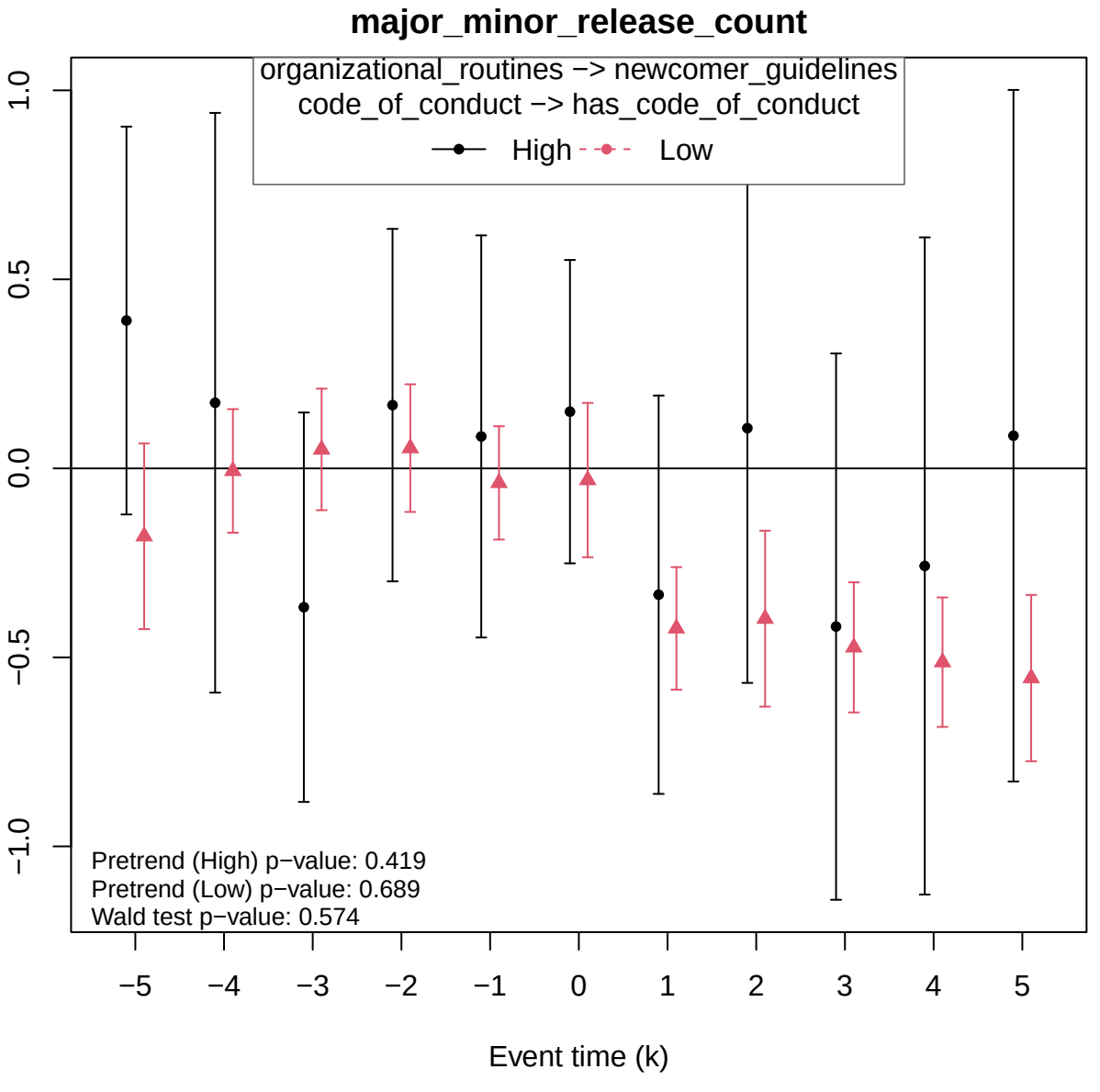

Estimate and 95% Conf. Int.
8
6
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

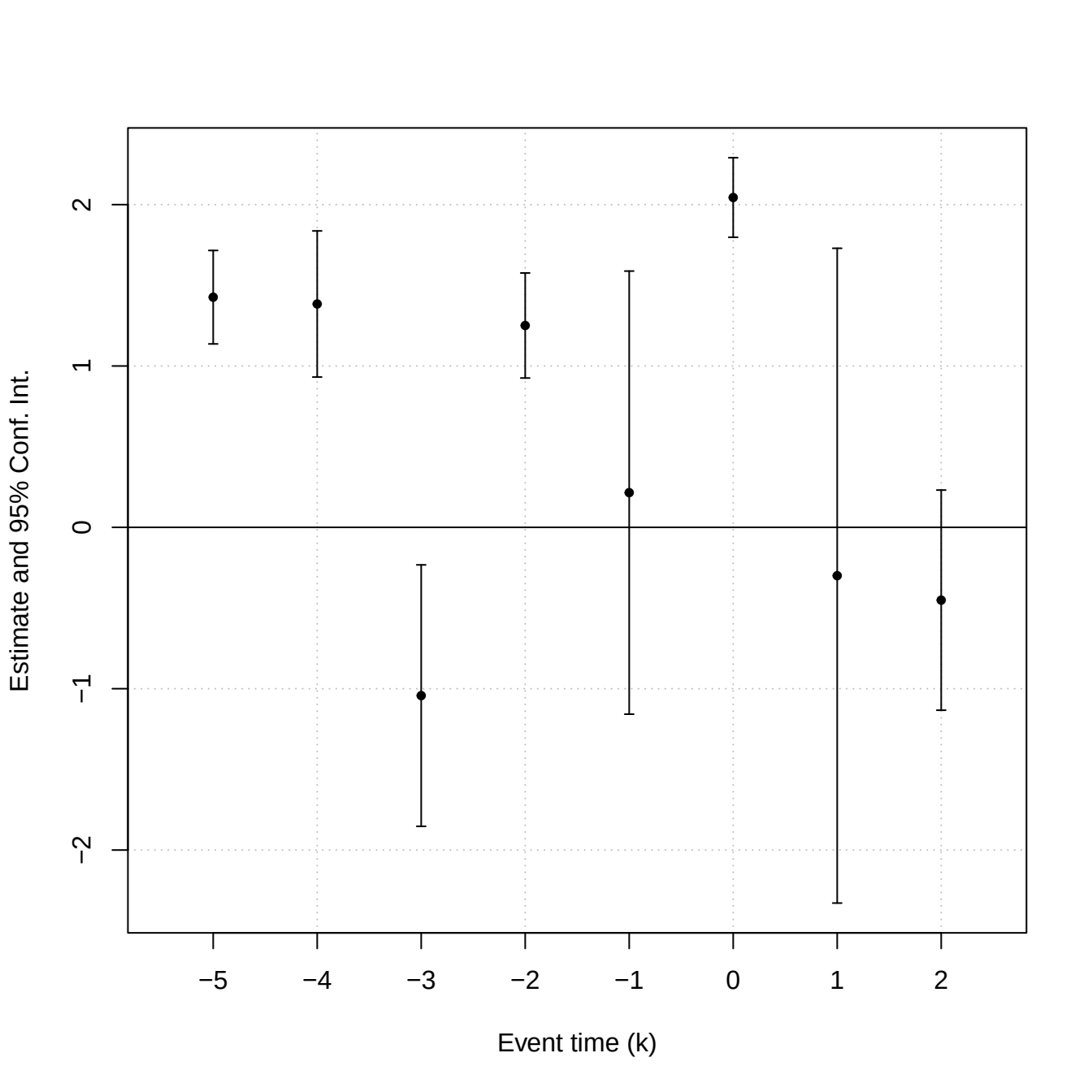

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−3
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

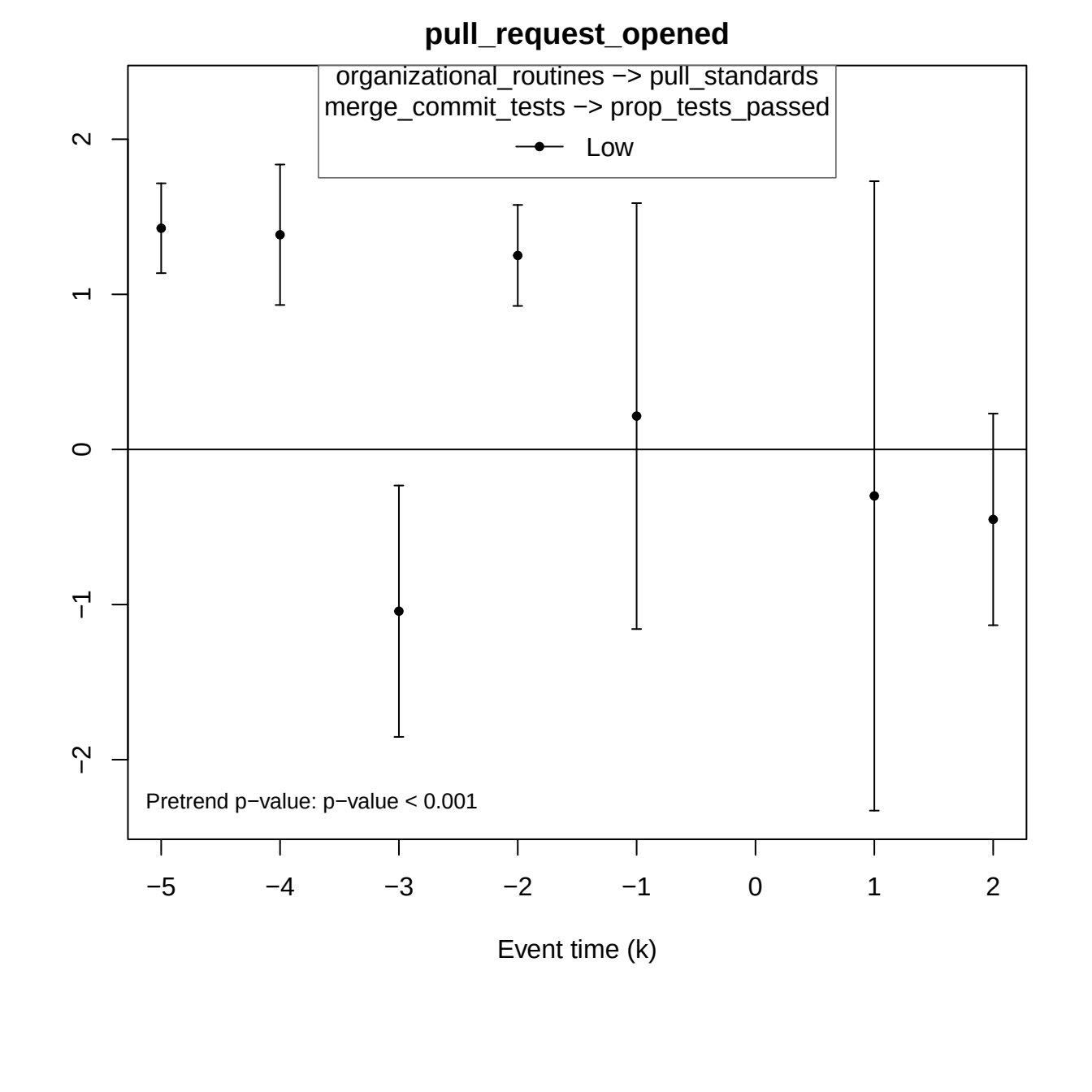

overall_new_release_count
organizational_routines -> newcomer_guidelines
code_of_conduct -> has_code_of_conduct
High
Low
Pretrend (High) p−value: 0.552
Pretrend (Low) p−value: 0.375
Wald test p−value: 0.089
8
6
4
2
0
−2
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

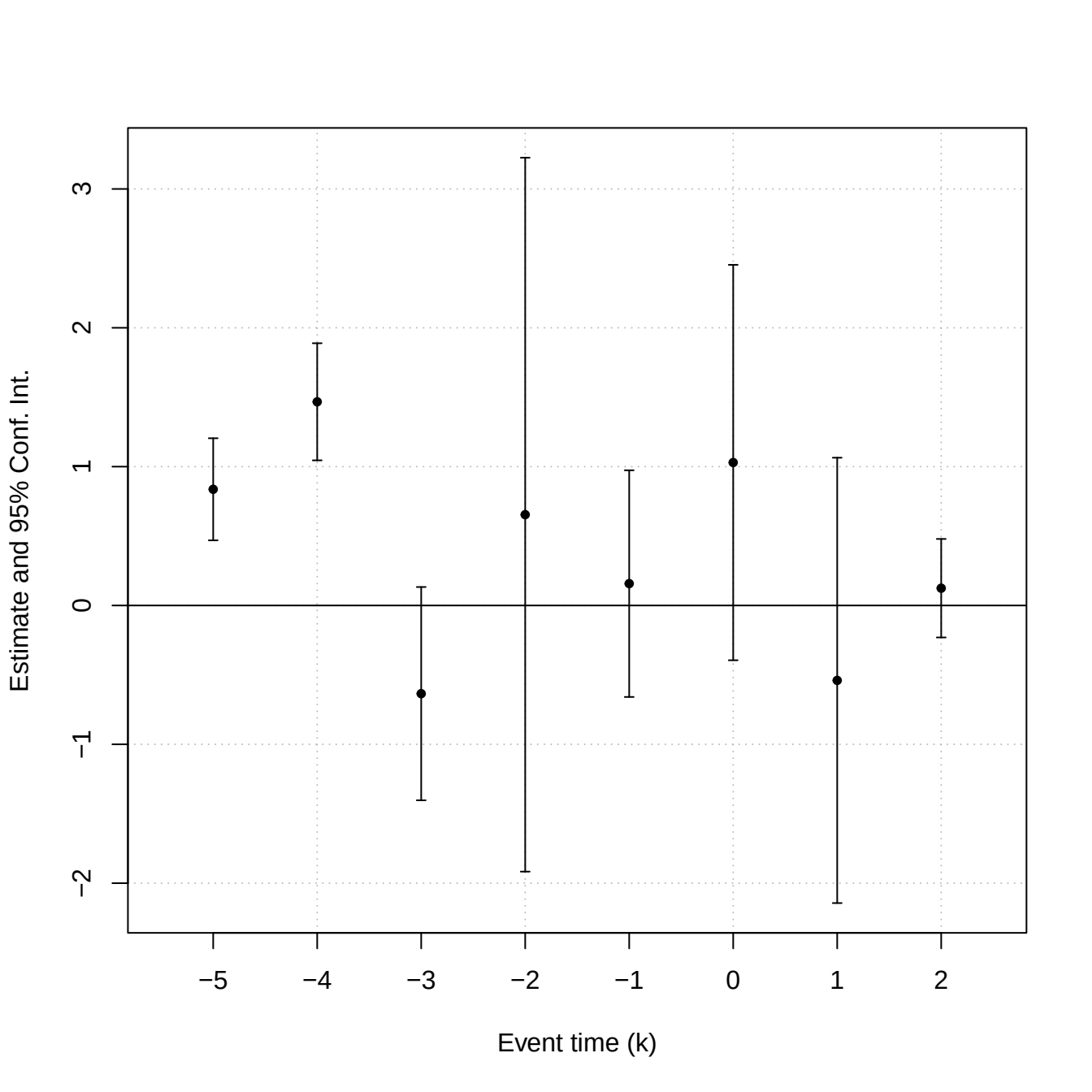

Estimate and 95% Conf. Int.
1.0
0.5
0.0
−0.5
−1.0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

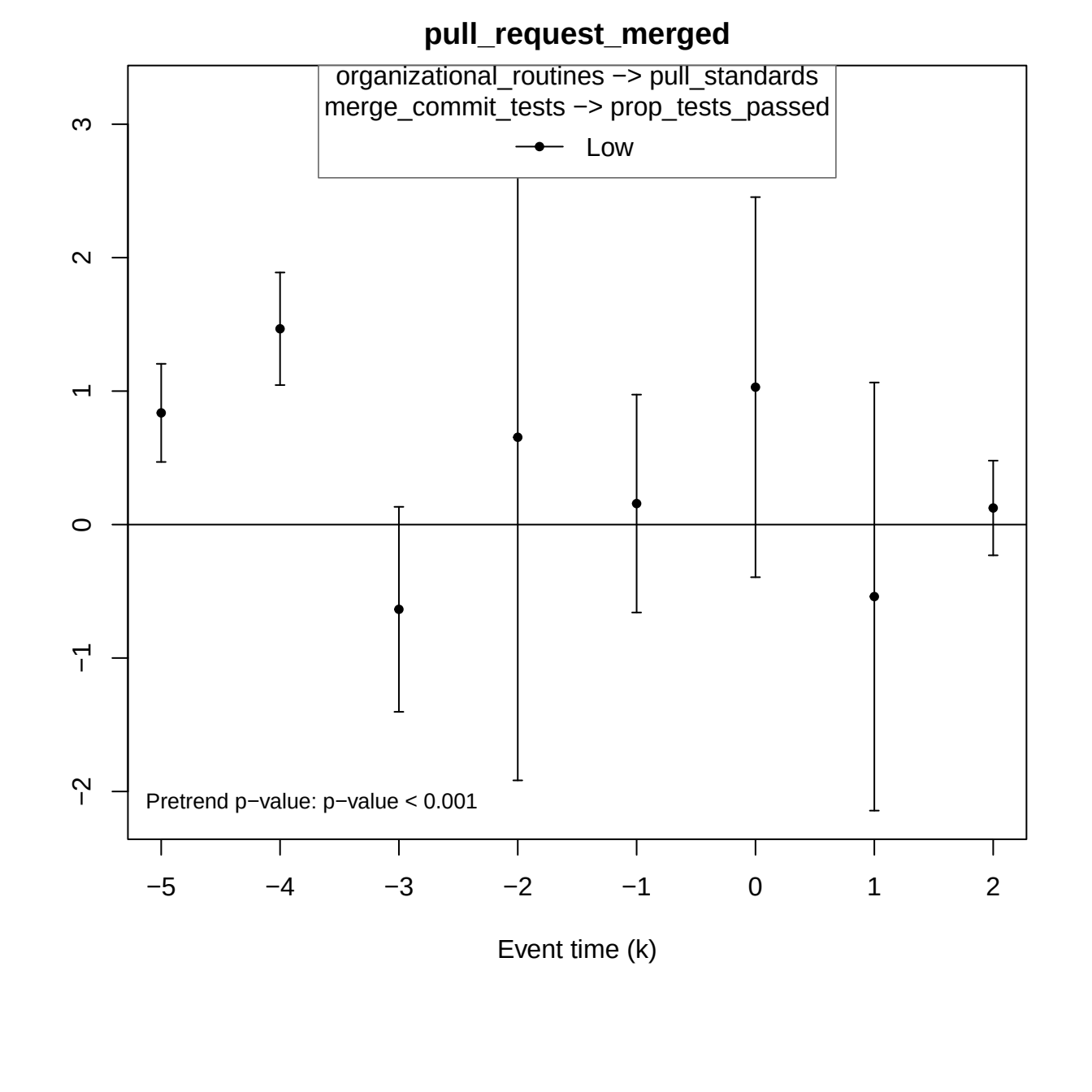

Estimate and 95% Conf. Int.
0.2
0.0
−0.2
−0.4
−0.6
−0.8
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

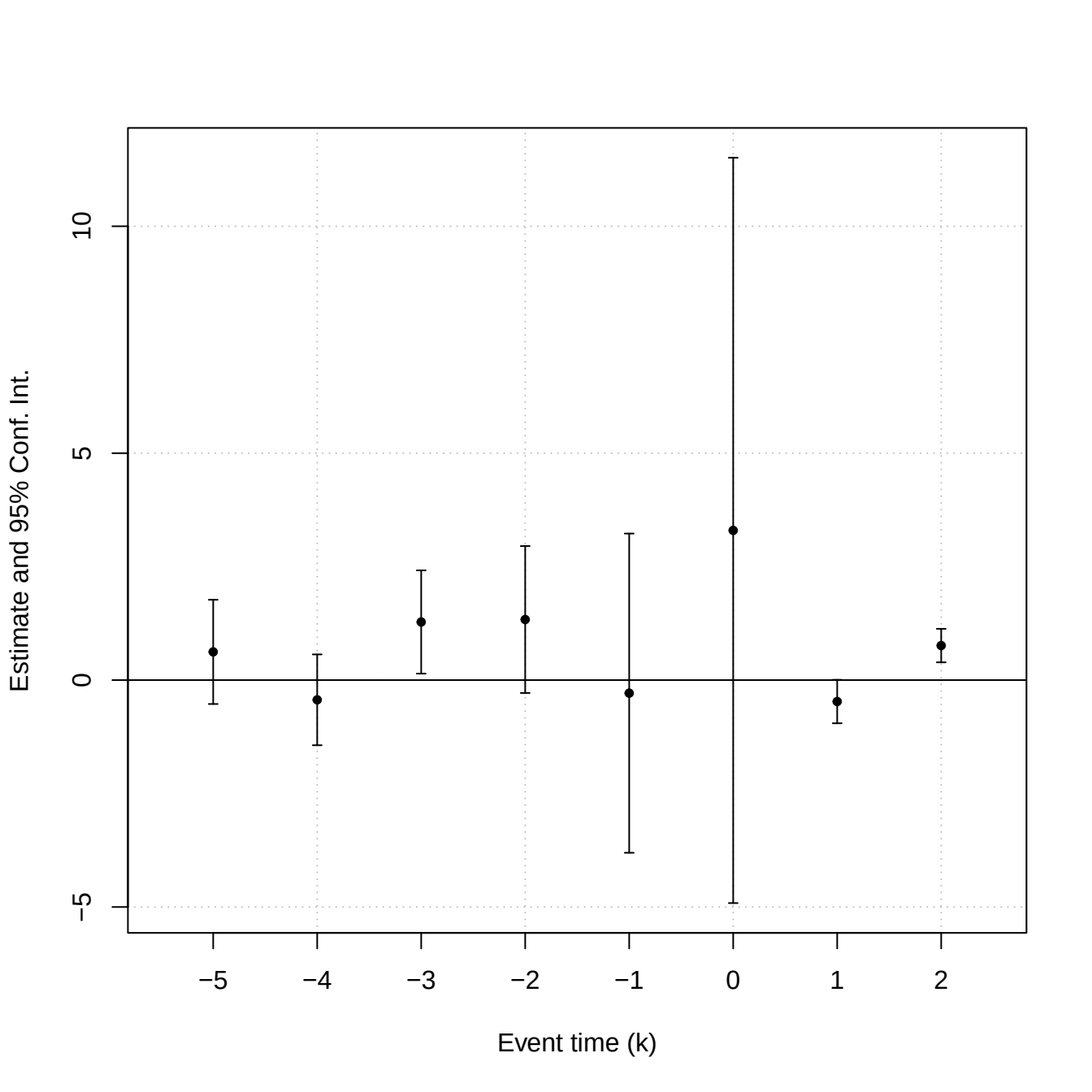

major_minor_release_count
organizational_routines −> newcomer_guidelines
code_of_conduct −> has_code_of_conduct
High
Low
1.0
0.5
0.0
−0.5
−1.0
Pretrend (High) p−value: 0.419
Pretrend (Low) p−value: 0.689
Wald test p−value: 0.574
−5
−4
−3
−2
−1
0
1
2
3
4
5
Event time (k)

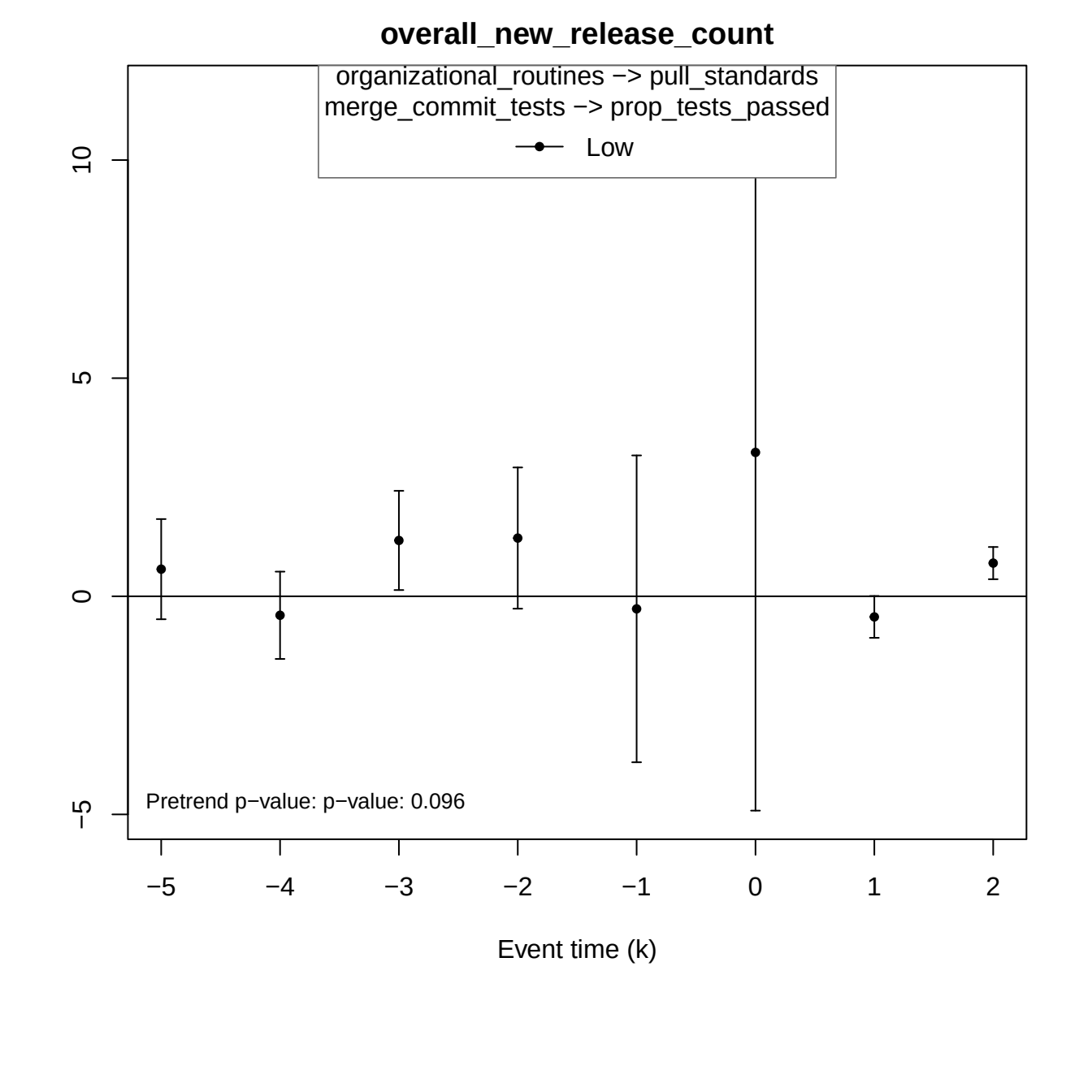

Estimate and 95% Conf. Int.
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)

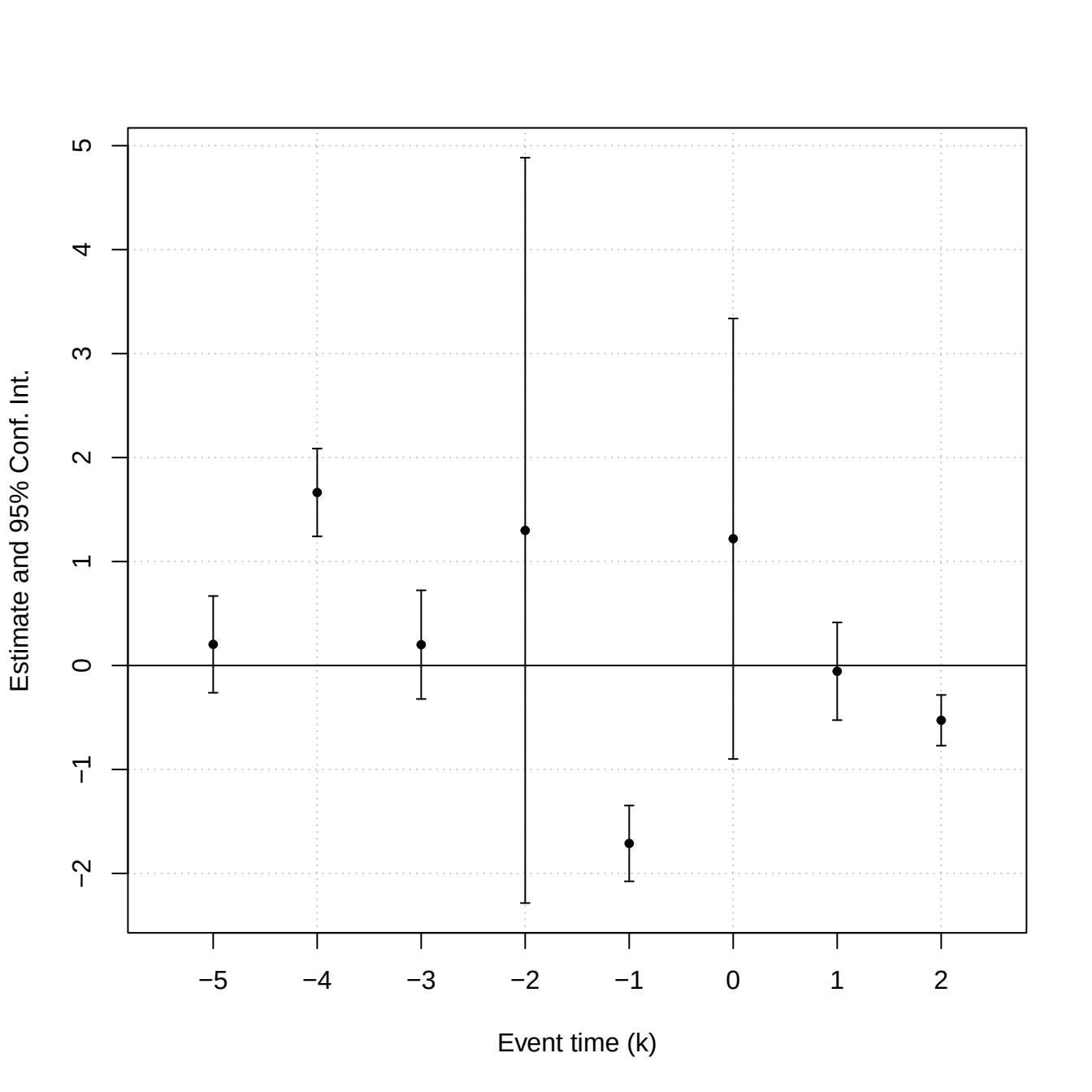

pull_request_opened
organizational_routines −> pull_standards
merge_commit_tests −> prop_tests_passed
Low
Pretrend p−value: p−value < 0.001
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)

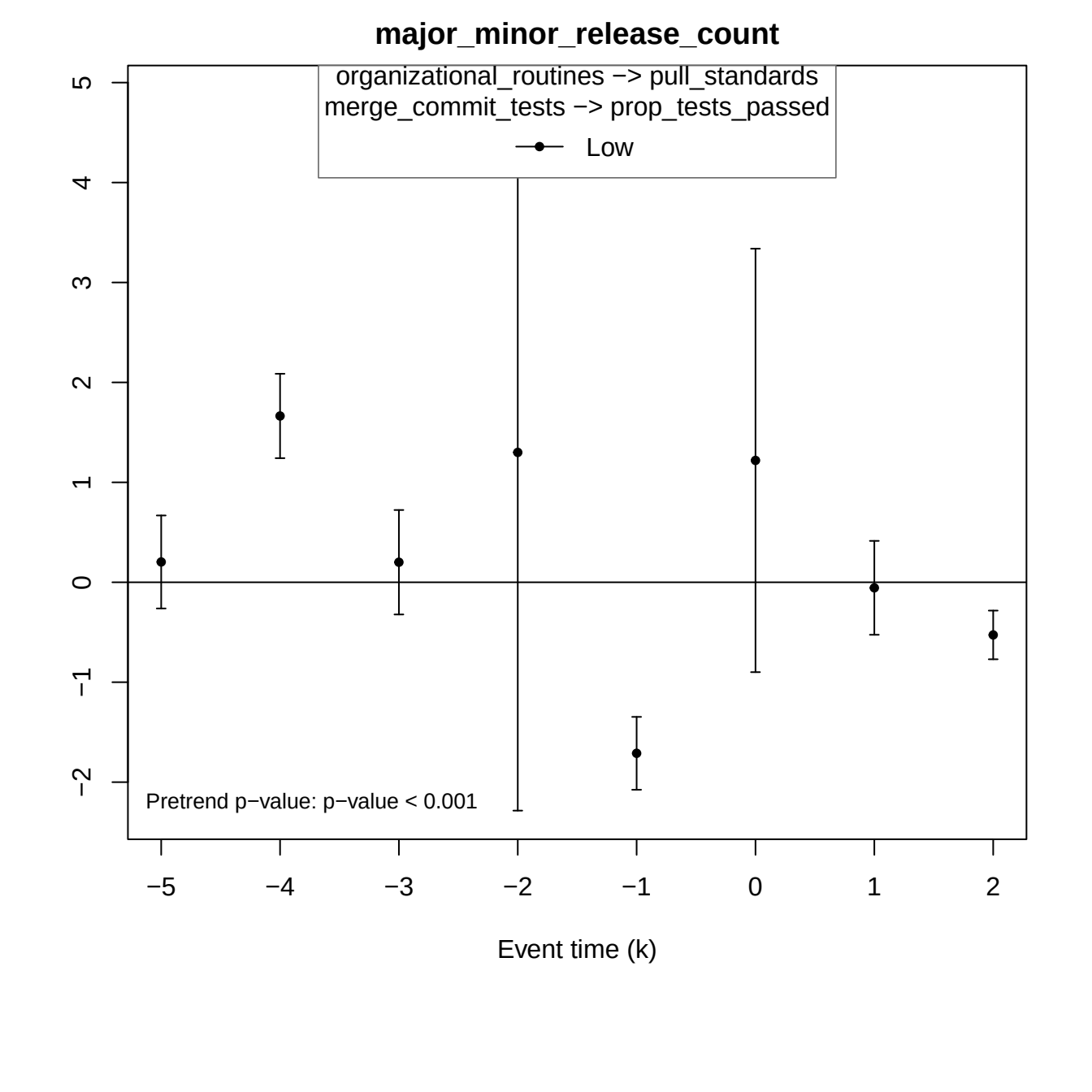

Estimate and 95% Conf. Int.
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)


pull_request_merged
organizational_routines −> pull_standards
merge_commit_tests −> prop_tests_passed
Low
Pretrend p−value: p−value < 0.001
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)


Estimate and 95% Conf. Int.
10
5
0
−5
−5
−4
−3
−2
−1
0
1
2
Event time (k)


overall_new_release_count
organizational_routines −> pull_standards
merge_commit_tests −> prop_tests_passed
Low
10
5
0
−5
Pretrend p−value: p−value: 0.096
−5
−4
−3
−2
−1
0
1
2
Event time (k)


Estimate and 95% Conf. Int.
5
4
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)


major_minor_release_count
organizational_routines −> pull_standards
merge_commit_tests −> prop_tests_passed
Low
Pretrend p−value: p−value < 0.001
5
4
3
2
1
0
−1
−2
−5
−4
−3
−2
−1
0
1
2
Event time (k)