Read Me for Code for “Race and Economic Opportunity in the United States: An Intergenerational Perspective” (Chetty, Hendren, Jones and Porter, 2020)

This code produces the analysis presented in “Race and Economic Opportunity in the United States: An Intergenerational Perspective” (Chetty, Hendren, Jones and Porter, 2020).

File Paths

The file paths used in the code cannot be released publicly. These file paths have been replaced with globals that are not defined in the code.

Data

The data are described in Section III and Appendices A-D of the paper. The data in ${raw} and ${in} is raw individual-level microdata. These data cannot be released publicly. The data in ${ext} is produced externally to this project. For example, the tract-level variables in ${ext}/tract_covariates are produced for Chetty et al. (2018) “The Opportunity Atlas: Mapping the Childhood Roots of Social Mobility”.

Structure

The code can be run from the metafile ***${code}/Overall Metafile.do***. This metafile runs over all the code.

There are four main components to the code: (1) building the data for national/geographic analysis of racial gaps in mobility; (2) building the data for the movers analysis; (3) creating figures; and (4) creating tables for the paper, and online data tables. The metafile ***${code}/Overall Metafile.do*** runs over all of these components. The notes below describe each component individually.

Component 1: National/Geographic Analysis of Racial Gaps in Mobility

The metafile ***${code}/build data/national analysis/build national analysis.do*** defines the cohorts, variables of interest, file paths and other parameters of interest. It then calls the files that run the analysis. These files are described individually below.

- ***${code}/build data/national analysis/indiv/make_work.do:*** builds the main micro data “work” files for the first component of the analysis, by pulling the relevant variables from data at Census.
    - Inputs from Census data:
        - ${raw}/intergen_[1978]-intergen_[1991]
        - ${in}/skinny

        - ${in}/spine
        - ${in}/2010_short
        - ${in}/2000_short
        - ${in}/acs
        - ${in}/2000_long
        - ${in}/long
    - Outputs:
        - ${work}/race_work
        - ${work}/race_work_78_83
        - ${work}/race_work_long_78_83
- ***${code}/build data/national analysis/indiv/pctile_collapse.do:*** creates a national percentile collapse by race and gender.
    - Inputs:
        - ${work}/race_work_78_83
    - Outputs:
        - ${out}/pctile_clps
- ***${code}/build data/national analysis/indiv/conditional_gaps.do***: runs regressions of [minority]-white income gaps conditional on different parental or neighborhood-level characteristics. Note that the correction for the unobserved component of wealth occurs in a subsequent .do file.
    - Inputs:
        - ${work}/race_work_78_83
    - Outputs
        - ${out}/raw_regressions
        - ${out}/cond_regressions
- ***${code}/build data/national analysis/indiv/geo_collapse.do:*** builds tract and CZ-level datasets.
    - Inputs:
        - ${work}/race_work_long_78_83
    - Outputs
        - ${out}/cz mobility
        - ${out}/tract mobility
- ***${code}/build data/national analysis/indiv/mask_tract_mobility.do:*** masks tract_mobility. Follows the same steps as ***${code}/build data/national analysis/indiv/masking.do***, but we mask this output earlier so that we can use the masked version in creating other files.
    - Inputs:
        - ${out}/tract_mobility
    - Outputs:
        - ${final}/tract_mobility_mskd
- ***${code}/build data/national analysis/indiv/build_tract_race_gender.do:*** reads in the long dataset of tract-level outcomes and reshapes it to be wide on gender and race.
    - Inputs:

        - ${final}/tract_mobility_mskd
    - Outputs:
        - ${final}/tract_race_gender_mskd
- ***${code}/build data/national analysis/indiv/sum_stats.do:*** creates summary statistics by race and gender, separately for children and parents. In the case of summary statistics for children, creates a separate dataset for children of native-born parents
    - Inputs:
        - ${ext}/covariates
        - ${work}/race_work_78_83
        - ${out}/tract_mobility
    - Outputs:
        - ${out}/baseline_sum_stats
        - ${out}/par_sum_stats
- ***${code}/build data/national analysis/indiv/occupation.do:*** produces 1-digit ACS occupation code distributions by race-gender-parent decile.
    - Inputs:
        - ${work}/race_work_78_83
    - Outputs:
        - ${out}/occupation_histogram
- ***${code}/build data/national analysis/indiv/rank_rank.do:*** regresses kid family rank on parent rank, separately by cohort.
    - Inputs:
        - ${work}/race_work
    - Outputs:
        - ${out}/rank_rank_cohort
- ***${code}/build data/national analysis/indiv/nbhd_quality.do:*** produces statistics on quality of neighborhoods in which kids live when they reach adulthood, cut by income percentile.
    - Inputs:
        - ${out}/tract_mobility
        - ${work}/race_work
        - ${work}/race_work_78_83
        - ${ext}/covariates
    - Outputs:
        - ${out}/dad_regressions
        - ${out}/nbhd_quality
- ***${code}/build data/national analysis/indiv/transition_matrix.do:*** constructs quintile-quintile transition matrices by race-gender-mom immigrant status, and a separate version for children who grew up in “good” neighborhoods.
    - Inputs:
        - ${work}/race_work_78_83
        - ${final}/tract_race_gender_mskd
        - ${ext}/covariates

    - Outputs:
        - ${out}/transition_matrix
- ***${code}/build data/national analysis/indiv/edu_transition_matrix.do:*** produces a transition matrix of education levels by race and gender, for kids who appear in the ACS and whose parents appear in either the ACS or the 2000 long form.
    - Inputs:
        - ${in}/skinny
        - ${in}/spine
        - ${in}/acs
        - ${in}/2000_long
    - Outputs:
        - ${out}/edu_transition_matrix
- ***${code}/build data/national analysis/indiv/pctile_cutoffs.do:*** calculates mean kid family, kid individual and parent income in each percentile bin; the output is a crosswalk between ranks and dollars.
    - Inputs:
        - ${work}/race_work_78_83
    - Outputs:
        - ${out}/pctile_cutoffs
- ***${code}/build data/national analysis/indiv/gender_count.do:*** counts men in each tract in the 2000 decennial as well as the number of fathers in our data in each tract, in the year 2000.
    - Inputs:
        - ${in}/tax_2000
        - ${in}/2000_short
        - ${raw}/maf_tract
        - ${work}/race_work_long_78_83
    - Outputs:
        - ${out}/tract_dad_counts
        - ${out}/tract_gender
- ***${code}/build data/national analysis/indiv/par_indv_rank.do:*** regresses kid rank on mother rank and father rank separately by kid race and gender.
    - Inputs:
        - ${work}/race_work_78_83
    - Outputs:
        - ${out}/par_indv_regressions
- ***${code}/build data/national analysis/indiv/data_quality.do:*** produces a series of tables on data quality for the appendix. The .do file also outputs some scalars used when describing data quality.
    - Inputs:
        - ${raw}/acs_raw_2015
        - ${work}/race_work
        - ${work}/race_work_78_83

        - ${in}/spine
        - ${in}/acs
        - ${raw}/dm1_sample
        - ${raw}/intergen_13
        - ${raw}/intergen_[1978]-[1983]
        - ${ext}/state_region_cw
        - ${raw}/db_small
        - ${raw}/claiming_2000
        - ${in}/2000_short
        - ${in}/2010_short
    - Outputs:
        - ${out}/appdx_linkage_counts
        - ${out}/appdx_sample_bias
        - ${out}/appdx_income_quality
        - ${out}/appdx_acs_tax_matrix
        - Various scalars in ${out}/data_quality_numbers.csv
- ***${code}/build data/national analysis/indiv/robustness_par_immig.do:*** produces parametric and non-parametric rank-rank slopes for immigrant parents by parent's country of birth, where the number of immigrants from the country is sufficiently large; includes a parent income definition that was father individual income in 2005-2006, and so also produces a ventile-to-dollar crosswalk for this definition.
    - Inputs:
        - ${in}/skinny
        - ${in}/spine
        - ${in}/acs
        - ${in}/2000_long
        - ${ext}/place_codes
        - ${raw}/intergen_[1978]-intergen_[1991]
    - Outputs:
        - ${out}/robustness_immig_par
        - ${out}/robustness_immig_nonpar
        - ${out}/robustness_immig_income_vent_cw
- ***${code}/build data/national analysis/indiv/check_black_imm_native_has_dad.do:*** checks that the results involving the has_dad variable hold when restricting only to children with native-born mothers
    - Inputs:
        - ${work}/race_work_long_78_83
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
        - ${out}/tract_gender
        - ${out}/tract_dad_counts
    - Outputs:
        - ${out}/mean_kfr_kir_natives

- ***${code}/build data/national analysis/indiv/check_black_imm_native_corrs.do:*** checks that the key tract-level correlations also hold when restricting only to children with native-born mothers, To deal with small ACS samples, we use mean ranks for kids with parents below median income in each tract, as opposed to the formal P25 prediction.
    - Inputs:
        - ${ext}/home_value_race
        - ${ext}/tract_covars
        - ${final}/tract_race_gender_mskd
        - ${out}/mean_kfr_kir_natives
- ***${code}/build data/national analysis/indiv/masking.do:*** rounds values in output files, suppresses output for small *n*.
    - Inputs:
        - ${out}/pctile_clps
        - ${out}/pctile_cutoffs
        - ${out}/transition_matrix
        - ${out}/edu_transition_matrix
        - ${out}/rank_rank_cohort
        - ${out}/occupation_histogram
        - ${out}/cond_regressions
        - ${out}/nbhd_quality
        - ${out}/dad_regressions
        - ${out}/par_ind_regressions
        - ${out}/baseline_sum_stats
        - ${out}/par_sum_stats
        - ${out}/appdx_linkage_counts
        - ${out}/appdx_sample_bias
        - ${out}/appdx_income_quality
        - ${out}/appdx_acs_tax_matrix
        - ${out}/data_quality_numbers.csv
        - ${out}/tract_mobility
        - ${out}/cz_mobility
        - ${out}/robustness_immig_par
        - ${out}/robustness_immig_nonpar
        - ${out}/robustness_immig_income_vent_cw
    - Outputs
        - ${final}/pctile_clps_mskd
        - ${online_data_tables}/pctile_cutoffs_mskd
        - ${final}/transition_matrix_mskd
        - ${final}/rank_rank_cohort_mskd
        - ${final}/occupation_histogram_mskd
        - ${final}/cond_regressions_mskd
        - ${final}/nbhd_quality_mskd
        - ${final}/edu_transition_matrix_mskd

        - ${final}/dad_regressions_mskd
        - ${final}/par_indiv_regressions_mskd
        - ${final}/baseline_sum_stats_mskd
        - ${final}/par_sum_stats_mskd
        - ${final}/appdx_linkage_counts_mskd
        - ${final}/appdx_sample_bias_mskd
        - ${final}/appdx_income_quality_mskd
        - ${final}/appdx_acs_tax_matrix_mskd
        - ${final}/data_quality_numbers_mskd.csv
        - ${final}/cz_mobility_mskd
        - ${final}/robustness_immig_par_mskd
        - ${final}/robustness_immig_nonpar_mskd
        - ${final}/robustness_immig_income_vent_cw
- ***${code}/build data/national analysis/indiv/scf_correction.do:*** corrects for imperfect observation of wealth in administrative data using the SCF sample.
    - Inputs:
        - ${ext}/rscfp2001
    - Outputs:
        - ${final}/wealth proxies correction 25
        - ${final}/wealth proxies correction 75
        - ${final}/scf_correction
- ***${code}/build data/national analysis/indiv/cz_maps.do:*** prepares CZ-level mobility estimates for mapping.
    - Inputs:
        - ${final}/cz_mobility_mskd
    - Outputs:
        - ${final}/map_cz_estimate
        - ${final}/map_cz_bin_min_max
- ***${code}/build data/national analysis/indiv/cz_collapse.do***: creates CZ-level statistics by race and parent income rank. Although the CZ collapse is used as one of the online data tables, we make it with the build data because it is used to create various other figures and tables.
    - Inputs:
        - ${ext}/county_pop_by_race_gender2000.csv
        - ${ext}/cty_cz_cw.dta
        - ${final}/map_cz_bin_min_max.dta
        - ${final}/map_cz_estimate
    - Outputs:
        - Online Data Table 4: ${online_data_tables}/cz_collapse
- ***${code}/build data/national analysis/indiv/tract_correlations.do:*** correlates various neighborhood characteristics with predicted individual income ranks of black and white males and females, at the 25th and 75th percentiles of the parental income distribution.
    - Inputs:

        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
        - ${ext}/racevars
        - ${ext}/poor_share_race
        - ${ext}/home_value_race
        - ${ext}/test_score_composite
        - ${ext}/iat_county
    - Outputs:
        - ${final}/sig_corr_male_mskd
        - ${final}/sig_corr_male_lowpov_mskd
        - ${final}/sig_corr_female_mskd
        - ${final}/sig_corr_female_mskd

Component 2: Movers Analysis

The metafile ***${code}/build data/movers/build movers.do*** defines the cohorts and other parameters of interest. It then calls the files that run the analysis. These files are described individually below.

- ***${code}/build data/movers/indiv/make_long.do:*** builds the main input data for the movers analysis
    - Inputs:
        - ${in}/long
        - ${ext}/zip_latlon
    - Outputs:
        - ${out}/movers_long
- ***${code}/build data/movers/indiv/make_invariant:*** builds a dataset with one row per child for our cohorts of interest. Each row contains the outcome variables for the child, and parent income.
    - Inputs
        - ${in}/skinny
        - ${in}/2010_short
    - Outputs
        - ${out}/movers_invariant
- ***${code}/build data/movers/indiv/make_movers.do:*** builds a dataset with one row per one-time movers that is wide on origin and destination CZ (par_cz0 and par_cz1 respectively) and includes age at move, distance of moves, outcome variables and parent income. For kids whose parents moved between two consecutive calendar years with non-missing location, age at move is defined as the age of the child in the first year the family lived in the destination. For kids whose parents moved between two ordered but non-consecutive calendar years, age at move is defined as the age of the child at the midpoint between the last year the parents were observed in the origin CZ and the first year the parents were observed in the destination CZ.

    - Inputs
        - ${out}/movers_long
        - ${out}/movers_invariant
    - Outputs
        - ${out}/movers
- ***${code}/build data/movers/indiv/make_xw_estimates.do:*** makes exposure-weighted estimates of outcomes by CZ, parent income, race, gender, and birth cohort, excluding children whose parents moved exactly once. (That is, the analysis is similar to ***geo_collapse.do***, but has separate outcomes, different cohort restrictions, and excludes one-time movers.)
    - Inputs:
        - ${out}/movers_long
    - Outputs:
        - ${out}/xw_estimates
- ***${code}/build data/movers/indiv/hs_standard.do:*** estimates "hockey sticks" (i.e. graphs of outcome variable by age of move) separately by outcome variable and race. We round age at move randomly, rounding age of move down if the last digit of a child's PIK is 0-4, and rounding up if the last digit is 5-9.
    - Inputs:
        - ${out}/movers
    - Outputs:
        - ${out}/hs_standard
- ***${code}/build data/movers/indiv/hs_placebo.do:*** estimates hockey sticks separately by outcome variable and race, including placebo specifications. We round age at move randomly, rounding age of move down if the last digit of a child's PIK is 0-4, and rounding up if the last digit is 5-9.
    - Inputs:
        - ${out}/movers
    - Outputs:
        - ${out}/hs_placebo
- ***${code}/build data/movers/indiv/hs_exposure_effects.do:*** creates exposure slopes.
    - Inputs:
        - ${out}/movers
    - Outputs:
        - ${out}/hs_exposure_effects
- ***${code}/build data/movers/indiv/masking.do:*** rounds values in output files according to data requirements.
    - Inputs:
        - ${out}/hs_standard
        - ${out}/hs_placebo
        - ${out}/hs_exposure_effects
    - Outputs:
        - ${final}/hs_standard_mskd

        - ${final}/hs_placebo_mskd
        - ${final}/hs_exposure_effects_mskd

Component 3: Produce Figures

The metafile ***${code}/figures/create figures.do*** is the metafile that sets globals relating to image format and creates all of the figures. Many of the figures require the data to first be rearranged. This usually happens in a separate .do file. Some of the figures are manually edited before they are included in the paper.

- Figure 1, Panel A: ***${code}/figures/individual_figures/Figure 1A.do***: graphs the mean parent ranks for blacks and whites in the first generation and predicts the gap in the second generation and in the steady states if blacks and whites had *the same* intergenerational mobility curves.
    - Inputs:
        - None
    - Outputs:
        - Figure 1A: ${figures}/bin_kfr_par_rank_theory_pooled
- Figure 1, Panel B: ***${code}/figures/individual_figures/Figure 1B.do***: graphs the mean parent ranks for blacks and whites in the first generation and predicts the gap in the second generation and in the steady states if blacks and whites had *different* intergenerational mobility curves.
    - Inputs:
        - None
    - Outputs:
        - Figure 1B: ${figures}/bin_kfr_par_rank_theory_bw
- Figure 2, Panel A (data): ***${code}/figures/individual_figures/Figure 2A data.do:*** rearranges data for graphing in Figure 2A.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kfr_par_rank
        - ${final}/bin_kfr_native_par_rank
- Figure 2, Panel A (graph): ***${code}/figures/individual_figures/Figure 2A.do***: graphs empirical estimates of intergenerational mobility and steady states for blacks vs. whites.
    - Inputs:
        - ${final}/bin_kfr_par_rank
    - Outputs:
        - Figure 2A: ${figures}/bin_theory_bw_ss_mean
- Figure 2, Panel B: ***${code}/figures/individual_figures/Figure 2B.do:*** graphs current mean ranks vs. predicted ranks in steady-state by race.
    - Inputs:
        - None

    - Outputs:
        - Figure 2B: ${figures}/scatter_kfr_par_rank_steady_state
- Figure 3: ***${code}/figures/individual_figures/Figure 3.do:*** graphs intergenerational mobility by race, for all children, children with mothers born in the U.S., and children with mothers born outside the U.S.
    - Inputs:
        - ${final}/national_percentile_outcomes
    - Outputs:
        - Figure 3A: ${figures}/bin_kfr_par_rank_all_race
        - Figure 3B: ${figures}/bin_kfr_native_par_rank_all_race
        - Figure 3C: ${figures}/bin_imm_native_par_rank
- Figure 4, Panel A (data): ***${code}/figures/individual_figures/Figure 4A data.do:*** rearranges the data for Figure 4A.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kid_married_par_rank_bw
- Figure 4, Panel A: ***${code}/figures/individual_figures/Figure 4A.do:*** graphs the share of children married in 2015 by parent household income rank.
    - Inputs:
        - ${final}/bin_kid_married_par_rank_bw
    - Outputs:
        - Figure 4A: ${figures}/bin_kid_married_par_rank_bw
- Figure 4, Panel B (data): ***${code}/figures/individual_figures/Figure 4B data.do:*** rearranges the data for Figure 4B.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kir_par_rank_bw
- Figure 4, Panel B: ***${code}/figures/individual_figures/Figure 4B.do:*** graphs mean child individual income rank by parent household income rank.
    - Inputs:
        - ${final}/bin_kir_par_rank_bw
    - Outputs:
        - Figure 4B: ${figures}/bin_kir_par_rank_bw
- Figure 5 (data): ***${code}/figures/individual_figures/Figure 5 data.do:*** rearranges the data for Figure 5.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kir_par_rank_M
        - ${final}/bin_kir_par_rank_F

- Figure 5: ***${code}/figures/individual_figures/Figure 5.do:*** graphs the mean child child individual income rank by parent household income rank and gender.
    - Inputs:
        - ${final}/bin_kir_rank_M
        - ${final}/bin_kir_rank_F
    - Outputs:
        - Figure 5A: ${figures}/bin_kir_par_rank_M
        - Figure 5B: ${figures}/bin_kir_par_rank_F
- Figure 6A-B, E-F, Figure 7C-D (data): ***${code}/figures/individual_figures/Figure 6-7 wage work college data.do:*** rearranges the data on wage and employment (for Figure 6, Panels A-B and E-F) and college completion (For Figure 7, Panels C-D).
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kid_wageflex_rank_par_rank_M
        - ${final}/bin_kid_wageflex_rank_par_rank_F
        - ${final}/bin_kid_pos_hours_par_rank_M
        - ${final}/bin_kid_pos_hours_par_rank_F
        - ${final}/bin_kid_somecoll_par_rank_M
        - ${final}/bin_kid_somecoll_par_rank_F
- Figure 6A-B, E-F, Figure 7C-D (data): ***${code}/figures/individual_figures/Figure 6-7 wage work college.do:*** graphs mean wages (Figure 6A-B), employment (Figure 6 E-F) and college (Figure 7 C-D) by race, gender and parental income.
    - Inputs:
        - ${final}/bin_kid_wageflex_rank_par_rank_M
        - ${final}/bin_kid_wageflex_rank_par_rank_F
        - ${final}/bin_kid_pos_hours_par_rank_M
        - ${final}/bin_kid_pos_hours_par_rank_F
        - ${final}/bin_kid_somecoll_par_rank_M
        - ${final}/bin_kid_somecoll_par_rank_F
    - Outputs:
        - Figure 6A: ${figures}/bin_kid_wageflex_rank_par_rank_F
        - Figure 6B: ${figures}/bin_kid_wageflex_rank_par_rank_M
        - Figure 6E: ${figures}/bin_kid_pos_hours_par_rank_F
        - Figure 6F: ${figures}/bin_kid_pos_hours_par_rank_M
        - Figure 7C: ${figures}/bin_kid_somecoll_par_rank_M
        - Figure 7D: ${figures}/bin_kid_somecoll_par_rank_F
- Figure 6C-D, Figure 7A-B, Appendix Figure 5 (data): ***${code}/figures/individual_figures/Figure 6-7, Appendix Figure 5 hours high school spouse rank kfr data.do:*** rearranges the data for graphing.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:

        - ${final}/bin_kid_hours_yr_par_rank_F
        - ${final}/bin_kid_hours_yr_par_rank_M
        - ${final}/bin_kid_hs_par_rank_F
        - ${final}/bin_kid_hs_par_rank_M
        - ${final}/bin_spouse_rank_par_rank_M
        - ${final}/bin_spouse_rank_par_rank_F
        - ${final}/bin_kfr_par_rank_M
        - ${final}/bin_kfr_par_rank_F
- Figure 6C-D, Figure 7A-D, Appendix Figure 5: ***${code}/figures/individual_figures/Figure 6-7, Appendix Figure 5 kid hours high school spouse rank kfr.do:*** graphs hours worked (Figures 6C-D), high school degree completion (Figures 7 A-D), household income rank (Appendix Figure 4 A-B) and spouse income rank (Appendix Figure 4 C-D) by parent household income rank gender.
    - Inputs:
        - ${final}/bin_kid_hours_yr_par_rank_M
        - ${final}/bin_kid_hours_yr_par_rank_F
        - ${final}/bin_kid_no_hs_par_rank_M
        - ${final}/bin_kid_no_hs_par_rank_F
        - ${final}/bin_spouse_rank_par_rank_M
        - ${final}/bin_spouse_rank_par_rank_F
        - ${final}/bin_kfr_par_rank_M
        - ${final}/bin_kfr_par_rank_F
    - Outputs:
        - Figure 6C: ${figures}/bin_kid_hours_yr_par_rank_F
        - Figure 6D: ${figures}/bin_kid_hours_yr_par_rank_M
        - Figure 7A: ${figures}/bin_kid_hs_par_rank_F
        - Figure 7B: ${figures}/bin_kid_hs_par_rank_M
        - Appendix Figure 5A: ${figures}/bin_kfr_par_rank_F
        - Appendix Figure 5B: ${figures}/bin_kfr_par_rank_M
        - Appendix Figure 5C: ${figures}/bin_spouse_rank_par_rank_F
        - Appendix Figure 5D: ${figures}/bin_spouse_rank_par_rank_M
- Figure 7E-F (data): ***${code}/figures/individual_figures/Figure 7 incarceration data.do:*** rearranges the data on incarceration for graphing.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_incarcerated_par_rank_bw_M
        - ${final}/bin_incarcerated_par_rank_bw_F
- Figure 7E-F: ***${code}/figures/individual_figures/Figure 7 incarceration.do:*** graphs incarceration rates by parent household income rank and gender.
    - Inputs:
        - ${final}/bin_incarcerated_par_rank_bw_M
        - ${final}/bin_incarcerated_par_rank_bw_F

    - Outputs:
        - Figure 7E: ${figures}/bin_incarcerated_par_rank_bw_F
        - Figure 7F: ${figures}/bin_incarcerated_par_rank_bw_M
- Figure 8 and Appendix Figure 9 (individual covariates): ***${code}/figures/individual_figures/Figure 8, Appendix Figure 9 individual data.do:*** rearranges black-white gap with individual-level controls for graphing.
    - Inputs:
        - ${final}/cond_regressions_mskd
    - Outputs:
        - ${final}/bar_sequential_controls_black_p25
        - ${final}/bar_sequential_controls_black_p75
        - ${final}/bar_sequential_controls_hispanic_p25
        - ${final}/bar_sequential_controls_hispanic_p75
        - ${final}/bar_sequential_controls_asian_p25
        - ${final}/bar_sequential_controls_asian_p75
- Figure 8 (geographic data): ***${code}/figures/individual_figures/Figure 8 geographic data.do:*** rearranges black/white gap with block/tract-level controls for graphing.
    - Inputs
        - ${final}/cond_regressions_mskd
    - Outputs
        - ${final}/bar_kir_black_white_controls_block_tract_p25
        - ${final}/bar_kir_black_white_controls_block_tract_p75
- Figure 8: ***${code}/figures/individual_figures/Figure 8.do:*** graphs the black-white gap by parental income after the sequential inclusion of controls.
    - Inputs:
        - ${final}/bar_sequential_controls_black_p25
        - ${final}/bar_sequential_controls_black_p75
        - ${final}/wealth proxies correction 25
        - ${final}/wealth proxies correction 75
        - ${final}/bar_kir_black_white_controls_block_tract_p25
        - ${final}/bar_kir_black_white_controls_block_tract_p75
    - Outputs:
        - Figure 8A: ${figures}/bar_kir_black-white_gap_indiv_tract_block_controls_p25
        - Figure 8B: ${figures}/bar_kir_black-white_gap_indiv_tract_block_controls_p75
- Figure 9, Appendix Figure 11: ***${code}/figures/individual_figures/Figure 9, Appendix Figure 11.do:*** graphs upward mobility (using individual income) in each commuting zone by race.
    - Inputs:
        - ${online_tables}/cz_collapse.dta
    - Outputs:
        - Figure 9A: ${figures}/map_kir_white_male_p25_15bins

        - Figure 9B: ${figures}/map_kir_black_male_p25_15bins
        - Appendix Figure 11A: ${figures}/map_kir_white_female_p25_15bins
        - Appendix Figure 11B: ${figures}/map_kir_black_female_p25_15bins
- Figure 10A: ***${code}/figures/individual_figures/Figure 10A.do:*** graphs the correlation between tract-level characteristics and upward mobility for black and white males.
    - Inputs:
        - ${final}/sig_corr_male_mskd
    - Outputs:
        - Figure 10A (after manual edits): ${figures}/corrplot_paper_kirmale_p25
- Figure 10B (data): ***${code}/figures/individual_figures/Figure 10B data.do:*** rearranges data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
    - Outputs:
        - ${final}/bin_kir_gap_notpoor_20bin
- Figure 10B: ***${code}/figures/individual_figures/Figure 10B.do:*** creates a binned scatterplot of the black-white intergenerational gap for men against the share above the poverty line.
    - Inputs:
        - ${final}/bin_kir_gap_notpoor_20bin
        - ${ext}/tract_covars
    - Outputs:
        - Figure 10B (after manual edits): ${figures}/bin_kir_bw_gap_nonpoor
- Figure 11: ***${code}/figures/individual_figures/Figure 11.do:*** graphs the correlation between tract-level characteristics and the black-white gap for men with parents at the 25th percentile in the income distribution.
    - Inputs:
        - ${final}/sig_corr_male_lowpov_mskd
    - Outputs:
        - Figure 11: ${output}/bar_corr_kir_gap_covar_pos
- Figure 12A-C (data): ***${code}/figures/individual_figures/Figure 12A-C (data).do:*** rearranges data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
    - Outputs:
        - ${final}/bin_kir_hasdad
        - ${final}/bin_kir_ewrk_hasdad
        - ${final}/bin_kid_jail_hasdad
- Figure 12A-C: ***${code}/figures/individual_figures/Figure 12A-C.do:*** graphs the relationship between various outcomes as adults (individual income, employment rates, incarceration rates) and percentage of low income families whose father is present for black vs white males by census tract.

    - Inputs:
        - ${final}/bin_kir_hasdad
        - ${final}/bin_kir_ewrk_hasdad
        - ${final}/bin_kid_jail_hasdad
    - Outputs:
        - Figure 12A: ${figures}/bin_kir_hasdad
        - Figure 12B: ${figures}/bin_kir_ewrk_hasdad
        - Figure 12C: ${figures}/bin_kid_jail_hasdad
- Figure 12D (data): ***${code}/figures/individual_figures/Figure 12D data.do:*** rearranges data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
    - Outputs
        - ${final}/bin_kir_ewrk_black_male_female_hasdad
- Figure 12D: ***${code}/figures/individual_figures/Figure 12D.do:*** graphs the relationship between employment rates and percentage of low income families whose father is present for black males vs. females by census tract.
    - Inputs:
        - ${final}/bin_kir_ewrk_black_male_female_hasdad
        - ${ext}/tract_covars
    - Outputs:
        - Figure 12D: ${figures}/bin_kir_ewrk_black_male_female_hasdad
- Figure 13: ***${code}/figures/individual_figures/Figure 13.do:*** graphs estimates of childhood exposure effects on income and incarceration in adulthood.
    - Inputs:
        - ${final}/hs_standard_mskd
    - Outputs:
        - ${figures}/bin_hockey_male_kir30_white
        - ${figures}/bin_hockey_male_kir30_black
        - ${figures}/bin_hockey_male_incarcerated_white
        - ${figures}/bin_hockey_male_incarcerated_black
- Figure 14 (data): ***${code}/figures/individual_figures/Figure 14 (data).do:*** rearranges the data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
    - Outputs:
        - ${final}/bar_has_dad_by_pov_wtall
- Figure 14: ***${code}/figures/individual_figures/Figure 14.do:*** graphs the share of black and white children who grow up in four types of Census tracts: high poverty, low father presence; high poverty, high father presence; low poverty, low father presence; and low poverty, high father presence.

    - Inputs:
        - ${final}/bar_has_dad_by_pov_wtall
    - Outputs:
        - Figure 14: ${figures}/bar_has_dad_by_pov_wtall
- Appendix Figure 1 (data): ***${code}/figures/individual_figures/Appendix Figure 1 data.do:*** rearranges data for graphing.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kfr_par_rank_pooled_notmissingrace
- Appendix Figure 1 (data): ***${code}/figures/individual_figures/Appendix Figure 1 data.do:*** rearranges the data for graphing in Appendix Figure 1.
    - Inputs:
        - ${final}/bin_kfr_par_rank_pooled_notmissingrace
    - Outputs:
        - Appendix Figure 1: ${final}/bin_kfr_par_rank_pooled_notmissingrace
- Appendix Figure 1: ***${code}/figures/individual_figures/Appendix Figure 1.do:*** graphs graphs the mean household income rank of children vs. parent household income rank in the primary analysis sample.
    - Inputs:
        - ${final}/bin_kfr_par_rank_pooled_notmissingrace
    - Outputs:
        - Appendix Figure 1: ${figures}/bin_kfr_par_rank_pooled_notmissingrace
- Appendix Figure 2 (data): ***${code}/figures/individual_figures/Appendix Figure 2 data.do:*** creates the data for graphing in Appendix Figure 2.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/density_byrace
- Appendix Figure 2: ***${code}/figures/individual_figures/Appendix Figure 2.do:*** graphs the empirical distribution of parental income by race and ethnicity in our primary analysis sample.
    - Inputs:
        - ${final}/density_byrace
    - Outputs:
        - Appendix Figure 2: ${figures}/bin_density_kfr_par_rank_all_race
- Appendix Figure 3: ***${code}/figures/individual_figures/Appendix Figure 3.do:*** graphs mobility by race and whether parent is born overseas.
    - Inputs
        - ${final}/national_percentile_outcomes
    - Outputs:
        - Figure 3A: ${figures}/bin_all_imm_native_white_par_rank
        - Figure 3B: ${figures}/bin_all_imm_native_black_par_rank

        - Figure 3C: ${figures}/bin_all_imm_native_hisp_par_rank
        - Figure 3D: ${figures}/bin_all_imm_native_asian_par_rank
- Appendix Figure 4 (data): ***${code}/figures/individual_figures/Appendix Figure 4 data.do:*** rearranges the data for graphing.
    - Inputs:
        - ${final}/occupation_histogram_mskd
    - Outputs:
        - ${final}/bar_occ_by_gender_pardec3
        - ${final}/bar_occ_by_gender_pardec8
- Appendix Figure 4: ***${code}/figures/individual_figures/Appendix Figure 4.do:*** graphs the occupation distribution for children born to parents in the 3rd and 8th income decile by race and gender.
    - Inputs:
        - ${final}/bar_occ_by_gender_pardec3
        - ${final}/bar_occ_by_gender_pardec8
    - Outputs:
        - Appendix Figure 4A: ${figures}/bar_occ_by_gender_pardec3
        - Appendix Figure 4B: ${figures}/bar_occ_by_gender_pardec8
- Appendix Figure 6 (data): ***${code}/figures/individual_figures/Appendix Figure 6 data.do:*** rearranges the data for graphing in Appendix Figure 6.
    - Inputs:
        - ${final}/pctile_clps_mskd
    - Outputs:
        - ${final}/bin_kir_2par_par_rank_M
        - ${final}/bin_kir_par_no_home_par_rank_M
        - ${final}/bin_kir_1par_par_rank_M
- Appendix Figure 6: ***${code}/figures/individual_figures/Appendix Figure 6.do:*** graphs the black-white gap for single and two parent families and parents who do not own a home by income percentile.
    - Inputs:
        - ${final}/bin_kir_2par_par_rank_M
        - ${final}/bin_kir_par_no_home_par_rank_M
        - ${final}/bin_kir_1par_par_rank_M
    - Outputs:
        - Appendix Figure 6A: ${figures}/bin_kir_par_no_home_par_rank_M
        - Appendix Figure 6B: ${figures}/bin_kir_2par_par_rank_M
        - Appendix Figure 6C: ${figures}/bin_kir_1par_par_rank_M
- Appendix Figure 7 (data): ***${code}/figures/individual_figures/Appendix Figure 7 data.do:*** rearranges data for graphing in Figure 7.
    - Inputs:
        - ${final}/cond_regressions_mskd
    - Outputs:
        - ${final}/bar_univariate_controls_black_p25

- Appendix Figure 7: ***${code}/figures/individual_figures/Appendix Figure 7.do:*** graphs the black-white intergenerational gap after controlling for family-level factors.
    - Inputs:
        - ${final}/bar_univariate_controls_black_p25
    - Outputs:
        - Appendix Figure 7: ${figures}/bar_kir_black_white_gap_controls_univar
- Appendix Figure 8: ***${code}/figures/individual_figures/Appendix Figure 8.do:*** plots mean math test scores from the National Assessment of Educational Progress for blacks and whites by gender.
    - Inputs:
        - ${ext}/naep_math
    - Outputs:
        - Appendix Figure 8A: ${figures}/bar_naep_math_by_race_gender_9
        - Appendix Figure 8B: ${figures}/bar_naep_math_by_race_gender_17
- Appendix Figure 9: ***${code}/figures/individual_figures/Appendix Figure 9.do:*** graphs intergenerational gap vs. white children for Hispanic (Panels A-B), American Indian (Panels C-D) and East Asian (Panels E-F) children, varying controls and parental income.
    - Inputs:
        - ${final}/bar_nativemom_sequential_controls_asian_p25
        - ${final}/bar_nativemom_sequential_controls_asian_p75
        - ${final}/bar_sequential_controls_hisp_p25
        - ${final}/bar_sequential_controls_hisp_p75
        - ${final}/bar_sequential_controls_natam_p25
        - ${final}/bar_sequential_controls_natam_p75
    - Outputs:
        - Appendix Figure 9A: ${figures}/bar_kir_hisp_white_gap_controls_seq_paper_p25
        - Appendix Figure 9B: ${figures}/bar_kir_hisp_white_gap_controls_seq_paper_p75${figures}/bar_kir_asian_white_gap_controls_seq_paper_p25
        - Appendix Figure 9C: ${figures}/bar_kir_natam_white_gap_controls_seq_paper_p25
        - Appendix Figure 9D: ${figures}/bar_kir_natam_white_gap_controls_seq_paper_p75
        - Appendix Figure 9E: ${figures}/bar_kir_asian_white_gap_controls_seq_paper_p25
        - Appendix Figure 9F: ${figures}/bar_kir_asian_white_gap_controls_seq_paper_p75
- Appendix Figure 10: ***${code}/figures/individual_figures/Appendix Figure 10.do:*** graphs upward mobility (using family income) in each commuting zone by race.
    - Inputs:
        - ${online_tables}/cz_collapse

    - Outputs:
        - Appendix Figure 10A (after manual edits): ${figures}/map_kfr_pooled_p25_15bins
        - Appendix Figure 10B (after manual edits): ${figures}/map_kfr_white_p25_15bins
        - Appendix Figure 10C (after manual edits): ${figures}/map_kfr_black_p25_15bins
- Appendix Figures 12 and 13 (data): ***${code}/figures/individual_figures/Appendix Figure 12, 13 data.do:*** rearranges data for graphing in Appendix Figures 12 and 13.
    - Inputs:
        - ${final}/cz_mobility_mskd
    - Outputs:
        - ${final}/map_cz_estimate
        - ${final}/map_cz_bin_min_max
- Appendix Figures 12 and 13: ***${code}/figures/individual_figures/Appendix Figure 12, 13.do:*** graphs upward mobility in each commuting zone for white and black males and females at the 75th percentile of the parental income distribution (Appendix Figure 12) and for Hispanic males and females at the 25th and 75th percentiles of the parental income distribution (Appendix Figure 13).
    - Inputs:
        - ${final}/map_cz_estimate
        - ${final}/map_cz_bin_min_max
    - Outputs:
        - Appendix Figure 12A: ${figures}/kir_p75_white_M
        - Appendix Figure 12B: ${figures}/kir_p75_black_M
        - Appendix Figure 12C: ${figures}/kir_p75_white_F
        - Appendix Figure 12D: ${figures}/kir_p75_black_F
        - Appendix Figure 13A: ${figures}/kir_p25_hispanic_F
        - Appendix Figure 13B: ${figures}/kir_p25_hispanic_M
        - Appendix Figure 13C: ${figures}/kir_p25_hispanic_F
        - Appendix Figure 13D: ${figures}/kir_p25_hispanic_M
- Appendix Figures 14 and 15 (data): ***${code}/figures/individual_figures/Appendix Figure 14, 15 data.do:*** rearranges the data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
    - Outputs:
        - ${final}/hist_white_black_gap_histogram_M_p25
        - ${final}/hist_white_black_gap_histogram_M_p75
        - ${final}/hist_white_black_gap_histogram_F_p25
        - ${final}/hist_white_black_gap_histogram_F_p75
- Appendix Figures 14 and 15: ***${code}/figures/individual_figures/Appendix Figure 14-15.do:*** creates histograms of black-white gaps across tracts for men (Figure 14) and women (Figure 15), varying the percentile of the parental income distribution.

    - Inputs:
        - ${final}/hist_white_black_gap_histogram_M_p25
        - ${final}/hist_white_black_gap_histogram_M_p75
        - ${final}/hist_white_black_gap_histogram_F_p25
        - ${final}/hist_white_black_gap_histogram_F_p75
    - Outputs:
        - Appendix Figure 14A: ${figures}/histogram_black_white_gap_male_p25.${img}
        - Appendix Figure 14B: ${figures}/histogram_black_white_gap_male_p75.${img}
        - Appendix Figure 15A: ${figures}/histogram_black_white_gap_female_p25.${img}
        - Appendix Figure 15B: ${figures}/histogram_black_white_gap_female_p75.${img}
- Appendix Figure 16 (data): ***${code}/figures/individual_figures/Appendix Figure 16 data.do:*** rearranges data for graphing.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
    - Outputs:
        - ${final}/bin_black_rank_median_poor_share
- Appendix Figure 16: ***${code}/figures/individual_figures/Appendix Figure 16.do:*** plots the fraction of tracts with high upward mobility rates for black men vs. share above poverty line.
    - Inputs:
        - ${final}/bin_black_rank_median_poor_share
    - Outputs:
        - Appendix Figure 16: ${figures}/bin_frac_high_black_v_nonpoor

Component 4: Compile Tables

The metafile ***${code}/tables/create tables.do*** runs over all the files needed to create the tables.

Some tables are produced in a .do file that specifically creates that table. Other .do files are created in earlier output and are converted to text files here. The tables are manually reformatted after being outputted. Note that Appendix Tables 1 is a literature review table that does not involve any code.

- Tables converted to text: ***${code}/tables/individual paper tables/table_dta_to_txt.do:*** the majority of tables have been produced earlier in the analysis. This .do file converts the tables from .dta files to .txt files.
    - Inputs:

        - ${final}/baseline_sum_stats_mskd
        - ${final}/dad_regressions_mskd
        - ${final}/appdx_linkage_counts_mskd
        - ${final}/appdx_sample_bias_mskd
        - ${final}/appdx_acs_tax_matrix_mskd
        - ${final}/appdx_income_quality_mskd
        - ${final}/rank_rank_cohort_mskd
        - ${final}/par_sum_stats_mskd
        - ${final}/scf_correction
        - ${final}/sig_corr_male_mskd
        - ${final}/sig_corr_male_lowpov_mskd
        - ${final}/sig_corr_female_mskd
    - Outputs:
        - Table 1, Appendix Tables 5, 6, 7, and 8: ${tables}/baseline_sum_stats_mskd
        - Table 2 Specification (9): ${tables}/dad_regressions_mskd
        - Appendix Table 2 Panel A: ${tables}/appdx_linkage_counts_mskd
        - Appendix Table 2 Panel B: ${tables}/appdx_sample_bias_mskd
        - Appendix Table 3: ${tables}/appdx_income_quality_mskd
        - Appendix Table 4: ${tables}/appdx_acs_tax_matrix_mskd
        - Appendix Table 9: ${tables}/par_sum_stats_mskd
        - Appendix Table 10: ${tables}/rank_rank_cohort_mskd
        - Appendix Table 11: ${tables}/sig_corr_male_mskd
        - Appendix Table 12: ${tables}/sig_corr_male_lowpov_mskd
        - Appendix Table 13: ${tables}/sig_corr_female_mskd
        - Appendix Table 17: ${tables}|/scf_correction
- Table 2: ***${code}/tables/individual paper tables/Table 2.do:*** runs regressions of kid income rank on father presence using various specifications; produces the majority of the output for Table II, with the last column from *${tables}/dad_regressions_mskd*.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
        - ${out}/tract_gender
        - ${out}/tract_dad_counts
    - Outputs:
        - Table 2 (except last column): ${tables}/has_dad_ols_kir_mskd
- Table 3, Appendix Table 14: ***${code}/tables/individual paper tables/Table 3, Appendix Table 14.do:*** runs regressions of kid outcomes on racial bias scores to produce Table 3 and Appendix Table 14.
    - Inputs:
        - ${final}/tract_race_gender_mskd
        - ${ext}/tract_covars
        - ${ext}/iat_county

    - Outputs
        - Table 3 and Appendix Table 14 (after manual reformatting): ${tables}/racial_bias_A
        - Table 3 and Appendix Table 14 (after manual reformatting): ${tables}/racial_bias_B
- Appendix Table 15: ***${code}/tables/individual paper tables/Appendix Table 15.do:*** creates table showing quasi-experimental estimates of childhood exposure effects for black vs. white men.
    - Inputs:
        - ${final}/hs_exposure_effects_mskd
    - Outputs:
        - Appendix Table 15: ${tables}/movers_exposure_effects_male_mskd
        - ${tables}/movers_exposure_effects_female_mskd.txt
- Appendix Table 16: ***${code}/tables/individual paper tables/Appendix Table 16.do:*** creates table showing selected Census tracts in terms of upward mobility and other tract-level characteristics, using data from the Opportunity Atlas.
    - Inputs:
        - ${ext}/tract_outcomes
        - ${ext}/tract_nhbd_wide
        - ${ext}/tract_covars
        - ${cty}/cty_cz_st_names
    - Outputs:
        - Appendix Table 16: ${tables}/list_of_places
- Online Data Table 1: National Statistics by Parent Income Percentile, Gender and Race: ***${code}/tables/individual online tables/Online Data Table 1.do:*** produces national statistics of child outcomes, counts, summary statistics and densities by parent income percentile, gender and race.
    - Inputs:
        - ${final}/bin_kfr_par_rank
        - ${final}/bin_kfr_native_par_rank
        - ${final}/bin_kfr_par_rank_F
        - ${final}/bin_kfr_par_rank_pooled_notmissingrace
        - ${final}/bin_kid_hours_yr_par_rank_F
        - ${final}/bin_kid_married_par_rank_bw
        - ${final}/bin_kid_no_hs_par_rank_F
        - ${final}/bin_kid_pos_hours_par_rank_F
        - ${final}/bin_kid_somecoll_par_rank_F
        - ${final}/bin_kid_wageflex_rank_par_rank_F
        - ${final}/bin_kir_1par_par_rank_M
        - ${final}/bin_kir_2par_par_rank_M
        - ${final}/bin_kir_par_nohome_par_rank_M
        - ${final}/bin_kir_par_rank_bw
        - ${final}/bin_kir_par_rank_M

        - ${final}/bin_spouse_rank_par_rank_F
        - ${final}/bin_incarcerated_par_rank_bw_M
        - ${final}/bin_incarcerated_par_rank_bw_F
        - ${final}/baseline_sum_stats
        - ${final}/density_byrace
    - Outputs:
        - Online Data Table 1: ${online_data_tables}/pctile_clps_complete
- Online Data Table 2, 3: ***${code}/tables/individual online tables/Online Data Table 2, 3.do:*** cleans the national income transition matrices.
    - Inputs:
        - ${final}/transition_matrix_mskd
    - Outputs:
        - Online Data Tables 1 and 2 (after formatting): ${online_data_tables}/transition_matrix_table
- Online Data Table 4: made above in ***${code}/build data/national analysis/indiv/cz_collapse.do***.
- Online Data Table 5: made above in ***${code}/build data/national analysis/indiv/masking.do***.
- Online Data Tables 6 and 7: ***${code}/tables/individual online tables/Online Data Table 6, 7.do:*** rearranges parametric and non-parametric statistics of children's outcomes by parental county of birth.
    - Inputs:
        - ${final}/robustness_immig_par_mskd
        - ${final}/robustness_immig_nonpar_mskd
    - Outputs:
        - ${online_data_tables}/parametric
        - ${online_data_tables}/nonparametric
- Online Data Table 8: ***${code}/tables/individual online tables/Online Data Table 8.do:*** cleans the national education transition matrix.
    - Inputs:
        - ${final}/edu_transition_matrix_mskd
    - Outputs:
        - ${online_data_tables}/edu_transition_matrix

Ado Files

Several .ado files are called in the code.

- ***${code}/ado/inflate.ado:*** contains scaling factors used to inflation-adjust incomes.
- ***${code}/ado/makerace.ado:*** takes in Census race codes and assigns a race variable.
- ***${code}/ado/mask.ado:*** rounds statistics for public release, and replaces with missing if count is too small.
- ***${code}/ado/regressby3.ado:*** performs fast grouped univariate OLS regressions.

- ***${code}/ado/regsave.ado:*** produced by Julian Reif (2019); outputs regression results.