
title: "Verified final workplace closure and two-year adverse occupational destination" **subtitle:** "Outcome-blind preregistration report" **date:** "2026-09-04T15:00:00-05:00"

Registration boundary

- Research ID: `restricted42_workplace_closure`
- Mode: `schema_first`
- Version: 1
- Knowledge cutoff: 2026-09-04T15:00:00-05:00
- Outcome data accessed: **no**

Research scope

Question. Among incumbent Danish workers exposed to a verified final workplace closure, what is the effect on having an adverse employment-and-occupational destination two calendar years later relative to comparable incumbents at surviving workplaces?

Primary estimand. The overlap-weighted average treatment effect on treated incumbent workers of verified final workplace closure on the probability of adverse destination at event time +2, versus continued workplace operation.

Population and setting. Employees aged 25-54 at baseline, in principal employee jobs at Danish workplaces in closure cohorts 2012-2015, with usable DISCO-08 major groups 2-9 and three pre-event years of common coverage. Unit: Person indexed to one baseline workplace and one event-year risk-set stack; treatment is collectively assigned at workplace level.. Setting: Danish linked IDAN, IDAS, IND, and AKM annual register tables inside `readable_42_table_schema..` Period: Event cohorts 2012-2015; baseline event times -3 through -1; closure year 0; primary follow-up event time +2..

Inferential ceiling. A conditional collective-assignment causal effect for supported incumbents only if all closure, measurement, overlap, cluster, and pretrend gates pass; otherwise feasibility-only or descriptive claims as routed below.

Theory and contribution

Focal mechanism. Final closure destroys a workplace match and can cause joblessness or re-employment in an occupation requiring a lower skill level.

Rival mechanisms.

- Latent establishment distress or industry demand can cause both closure and adverse destinations.
- Identifier churn, merger, split, absorption, or intra-enterprise transfer can mimic closure.
- Intervening joblessness and repeated displacement may mediate persistence rather than occupational switching itself.
- Coding changes or missing occupation conditional on nonemployment can create apparent occupational decline.

Contribution. A narrowed occupational-destination estimand that combines nonemployment and lower-skill re-employment without conditioning on a post-treatment collider; it does not claim novelty for broad earnings, employment, or health effects.

Question-to-output map

Question

Can authorized IDAS histories verify genuine final closure and construct supported incumbent workplace risk set?
 Can authorized IDAN documentation support a stable, ordered ISCO-08 skill-level outcome and deterministic pr
 What is the effect of verified final workplace closure on adverse employment-and-occupational destination two ca

Execution governance

Authority. This YAML, the four digested upstream artifacts, and authorized schema/codebook documentation jointly govern execution; this YAML controls analysis choices.

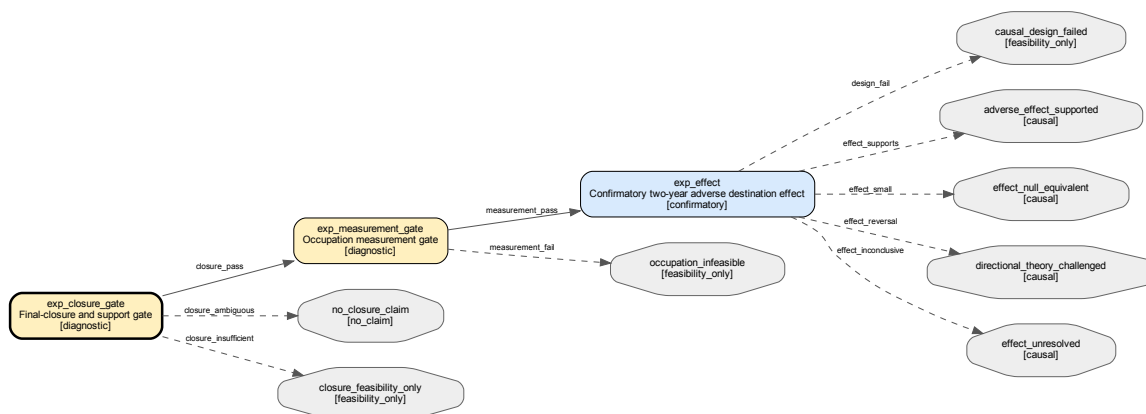
Execution order. exp_closure_gate -> exp_measurement_gate -> exp_effect

Environment. Python 3.12; pandas 2.2.2, pyarrow 16.1.0, numpy 2.0.1, statsmodels 0.14.2, scipy 1.14.0. Capture: Write python version and pip freeze to preregistration/run/environment.txt before reading analysis rows. Seed: Set NumPy seed 420904 for synthetic tests and bootstrap resampling; deterministic operations use stable sorting. Time zone: Europe/Copenhagen. Locale: C.UTF-8.

Data-access sequence. Verify authorized documentation and value labels, run synthetic dry runs, execute closure and measurement gates on pre-outcome fields, freeze their reports, then and only then construct post-event outcomes and estimate.

Failure policy. Assertion failure stops the named experiment; only registered graph routes may run, and no alternate field, threshold, cohort, estimator, or outcome may replace a failed component.

Experiment graph



exp_closure_gate: Final-closure and support gate

Epistemic role: **diagnostic**. Establish genuine collective closure assignment, incumbent rosters, and comparator support without outcomes.

Activation. Run when Always first.; skip when Never..

Hypothesis. Authorized fields classify at least 20 genuine final-closure workplace clusters and at least 20 surviving comparator clusters.

Design and estimand. descriptive; The count and share of candidate workplace disappearances that satisfy the deterministic final-closure definition and retain eligible incumbent and comparator workplace clusters.

Identifying variation. No effect identification; this is an outcome-free measurement and support audit.

Counterfactual. No outcome counterfactual is estimated.

Analysis. Deterministic rule evaluation and counts.: Count verified closures and survivors by cohort after exact filters.

Pseudocode execution plan

Closed identity. Can authorized IDAS histories verify genuine final closure and construct supported incumbent workplace risk sets without outcome inspection? -> The count and share of candidate workplace disappearances that satisfy the deterministic final-closure definition and retain eligible incumbent and comparator workplace clusters. -> `verified_closure_flag` -> `verified_closure_count_and_share` -> `closure_gate_report`.

Sources

ID	Resource and tables	Fields
<code>idas_gate</code>	<code>readable_42_table_schema: IDAS</code>	LBNR, <code>calendar_year</code> , IDFREM, FRELFREM, LBNRFREM,
<code>idan_gate</code>	<code>readable_42_table_schema: IDAN</code>	PNR, LBNR, <code>calendar_year</code> , ANSAAR, LOENTIMER, ANSI

Variable construction `verified_closure_flag` (treatment, workplace-event-year).

Sources: LBNR, `calendar_year`, IDFREM, FRELFREM, LBNRFREM, CVRNRFR. Time: Evaluate g in 2012-2015 using $g+1$ and $g+2$ histories. Missingness: Any missing required label sets ambiguity flag and verified flag zero.

1. Parse official authorized value labels and normalize whitespace and case without reading worker outcomes.
2. Mark a candidate when LBNR is active in year g and absent in $g+1$ and $g+2$.
3. Set one only when every forward/relationship label explicitly denotes final cessation and none denotes successor, continuation, absorption, merger, split, or transfer; otherwise set zero and ambiguity flag.

incumbent_flag (sample, person-workplace-event-year).

Sources: PNR, LBNR, calendar_year, ANSAAR, LOENTIMER, ANSDAGE_2008. Time: Use only g-1 information. Missingness: Missing PNR, LBNR, ANSAAR, or both tie-break measures excludes the record.

1. At g-1 sort jobs per PNR by LOENTIMER descending, ANSDAGE_2008 descending, LBNR ascending and retain first.
2. Set one when retained LBNR is index workplace and ANSAAR is at most g-2.

Equation or algorithm

For candidate workplace j in cohort g , $V_{jg} = 1\{\text{active}_{jg} \text{ and } \text{absent}_{j,g+1} \text{ and } \text{absent}_{j,g+2} \text{ and } \dots\}$

Target statistic: `verified_closure_count_and_share`. Estimator/API: pandas groupby and deterministic boolean evaluation

Weights: No weights. Fixed effects: None. References: Candidate disappearance is denominator.

Uncertainty: None; exact counts. Clustering: Workplace LBNR is the assignment cluster.

Ordered actions a01 — Freeze official continuity-label semantics.

Consumes: `idas_gate`. Produces: `closure_codebook`.

1. Extract value labels for IDFREEM FRELFREM LBNRFREM and CVRNRFR from authorized documentation
2. Write normalized raw-code to label mappings and SHA-256 hashes; reject mappings with duplicates

Assertions: All four fields have unique documented code mappings and final-cessation logic is decidable.

Failure route: `mark_infeasible` — Terminate every closure experiment and permit no identifier-disappearance proxy.

a02 — Classify closure and survivor workplace risk sets.

Consumes: `idas_gate`, `closure_codebook`. Produces: `classified_workplaces`.

1. Sort by LBNR and calendar_year and assert unique workplace-years.
2. Apply the registered two-year absence and label logic for g 2012-2015 and assign one reason

Assertions: One row per LBNR-cohort and mutually exclusive exhaustive classifications.

Failure route: `stop_experiment` — Stop because collective assignment cannot be constructed reproducibly.

a03 — Construct incumbent rosters and final gate report.

Consumes: `idas_gate`, `classified_workplaces`. Produces: `closure_gate_report`.

1. Construct g-1 principal job by registered stable sort and apply ANSAAR at most g-2.
2. Join rosters to classified workplaces and tabulate closures survivors incumbents unmatched

Assertions: One person-baseline-workplace per stack and reported totals reconcile to classified input.

Failure route: `stop_experiment` — Stop because incumbent exposure or risk-set totals do not reconcile.

Output contract

Output	Path	Grain	Required fields
closure_codebook	preregistration/run/closure_codebook.csv	field-code	field, raw_code, n
classified_workplaces	preregistration/run/classified_workplaces.parquet	workplace-cohort	LBNR, cohort, cl
closure_gate_report	preregistration/run/closure_gate_report.csv	cohort-and-total	cohort, candidate

Procedure accounting

- No model fits; the experiment uses deterministic transformations or summaries.
- Full-data passes: 3. Largest intermediate: IDAS workplace-history panel for 2009-2017..

Synthetic dry run. Create synthetic workplace histories containing final closure continuation merger split missing label and duplicate-key cases; require exact reason codes before any register rows are read.

Reconciliation. Sum cohort counts and exclusions to the initial complete-history universe and record a zero residual.

Decision regions.

- **closure_pass** (supports): $\text{ambiguous_count} = 0$ among retained treated workplaces AND $\text{verified_closure_count} \geq \text{min_clusters}$ AND $\text{survivor_count} \geq \text{min_clusters}$. — Closure measurement and minimum independent support pass.
- **closure_ambiguous** (feasibility_failure): Authorized mappings cannot make ambiguity zero among proposed treated workplaces. — No closure claim is permitted.
- **closure_insufficient** (inconclusive): ambiguity is zero after exclusions but $\text{verified_closure_count} < \text{min_clusters}$ OR $\text{survivor_count} < \text{min_clusters}$. — Verified closures may be described in the gate report but the effect experiment is not activated.

exp_measurement_gate: Occupation measurement gate

Epistemic role: **diagnostic**. Freeze principal-job, valid-code, and ordered skill-level definitions before outcomes are constructed.

Activation. Run when `exp_closure_gate` yields `closure_pass`.; skip when Any other closure-gate decision occurs..

Hypothesis. Official documentation supports one stable DISCO-08 and match-priority rule with at least 90 percent valid baseline classification.

Design and estimand. descriptive; The documentation-defined availability and pre-outcome coverage share of eligible incumbent person-years with valid principal-job and ordered skill-level classification.

Identifying variation. No effect identification; this is a pre-outcome measurement audit.

Counterfactual. No outcome counterfactual is estimated.

Analysis. Deterministic mapping and proportions.: Skill levels are group 2=4, group 3=3, groups 4-8=2, group 9=1; groups 0 and 1 excluded.

Pseudocode execution plan

Closed identity. Can authorized IDAN documentation support a stable, ordered ISCO-08 skill-level outcome and deterministic principal-job construction? -> The documentation-defined availability and pre-outcome coverage share of eligible incumbent person-years with valid principal-job and ordered skill-level classification. -> `valid_skill_flag` -> `baseline_valid_skill_share` -> `measurement_gate_report`.

Sources

ID	Resource and tables	Fields
idan_measure	readable_42_table_schema: IDAN	PNR, LBNR, calendar_year, DISCO_KODE, DISCO_M

Variable construction `valid_skill_flag` (outcome, person-stack-baseline).

Sources: PNR, LBNR, calendar_year, DISCO_KODE, DISCO_MATCHPRIO_KODE, LOENTIMER, ANSDAGE_2008. Time: Calculate at g-1 only; audit code-system labels for 2011-2016. Missingness: Missing malformed group 0 group 1 or invalid priority yields zero valid flag and no skill value.

1. Select principal job by LOENTIMER descending ANSDAGE_2008 descending LBNR ascending.
2. Parse DISCO major group and accept only groups 2-9 with a match-priority code documented as valid.
3. Map groups 2 3 4-8 9 to skill levels 4 3 2 1 respectively.

Equation or algorithm

`valid_i = 1{documented DISCO-08 code, documented valid match priority, major group in 2..9}; sl`

Target statistic: `baseline_valid_skill_share`. Estimator/API: pandas deterministic mapping and groupby mean

Weights: No weights. Fixed effects: None. References: Full incumbent roster is coverage denominator.

Uncertainty: None; exact proportions. Clustering: Workplace LBNR for arm-specific tabulation.

Ordered actions **a01 — Freeze occupation and employment code mappings.**

Consumes: `idan_measure`. Produces: `occupation_codebook`.

1. Extract authorized DISCO regime and match-priority value labels for all retained years and L
2. Verify one DISCO-08 regime and label valid priority states; encode the registered major-gro

Assertions: Every retained year has documented comparable DISCO-08 semantics and unique priority labels.

Failure route: `mark_infeasible` — Abandon occupational estimation and do not substitute an outcome.

a02 — Compute baseline skill coverage.

Consumes: idan_measure, occupation_codebook. Produces: measurement_gate_report.

1. Select principal g-1 job with the registered ordering.
2. Apply validity rules and calculate coverage overall by arm and cohort with reason counts.

Assertions: Coverage numerators plus invalid-reason counts equal roster denominators.

Failure route: **stop_experiment** — Stop because occupational measurement totals fail reconciliation.

Output contract

Output	Path	Grain	Requirement
occupation_codebook	preregistration/run/occupation_codebook.csv	field-code-year	year, field
measurement_gate_report	preregistration/run/measurement_gate_report.csv	arm-cohort-and-total	arm, cohort

Procedure accounting

- No model fits; the experiment uses deterministic transformations or summaries.
- Full-data passes: 2. Largest intermediate: Incumbent person-job-year records for baseline principal-job selection..

Synthetic dry run. Test ties valid groups 2-9 excluded groups 0-1 malformed codes invalid priorities and missing values; require exact expected mapping.

Reconciliation. Sum valid and each exclusive invalid reason to each arm-cohort denominator with zero residual.

Decision regions.

- **measurement_pass** (supports): valid_share $\geq$ min_valid_share overall AND separately in treated and comparator arms, with comparable DISCO-08 documentation in all source years. — Occupational outcome construction is activated.
- **measurement_fail** (feasibility_failure): Any required year lacks comparable documentation OR valid_share $<$ min_valid_share overall or in either arm. — Occupational question is infeasible; no replacement outcome is selected.

exp_effect: Confirmatory two-year adverse destination effect

Epistemic role: **confirmatory**. Estimate the frozen closure effect on one binary adverse employment-and-occupation outcome family.

Activation. Run when exp_measurement_gate yields measurement_pass.; skip when exp_measurement_gate yields measurement_fail..

Hypothesis. Verified final closure increases adverse destination at +2 by at least 0.05 probability points on the absolute probability scale.

Design and estimand. did_event_study; The overlap-weighted average treatment effect on treated incumbent workers of verified final workplace closure on the probability of adverse destination at event time +2, versus continued workplace operation.

Identifying variation. Collective variation between verified closure workplaces and surviving workplaces within event-year, industry, municipality, and baseline-size support, after propensity overlap weighting.

Counterfactual. The +2 adverse-destination probability the same treated incumbents would have had if their workplace continued, represented by weighted supported incumbents at workplaces present through g+2.

Analysis. Cohort-specific overlap-weighted linear probability DiD with workplace-cluster wild bootstrap.: One propensity logit per cohort; weights treated=1-p and control=p; weighted regression of adverse outcome on treated with exact cohort-specific samples, then treated-count aggregation across cohorts.

Pseudocode execution plan

Closed identity. What is the effect of verified final workplace closure on adverse employment-and-occupational destination two calendar years later among supported incumbents? -> The overlap-weighted average treatment effect on treated incumbent workers of verified final workplace closure on the probability of adverse destination at event time +2, versus continued workplace operation. -> `adverse_destination_y2` -> `aggregated_att_y2` -> `primary_effect`.

Sources

ID	Resource and tables	Fields
<code>idan_effect</code>	<code>readable_42_table_schema: IDAN</code>	PNR, LBNR, <code>calendar_year</code> , ANSAAR, LOENTIMER, ANS
<code>idas_effect</code>	<code>readable_42_table_schema: IDAS</code>	LBNR, <code>calendar_year</code> , ANTNOV, AARSVRK, ARB_HOVE
<code>ind_effect</code>	<code>readable_42_table_schema: IND</code>	PNR, <code>calendar_year</code> , ALDER_ULI_INK, OMFANG
<code>akm_effect</code>	<code>readable_42_table_schema: AKM</code>	PNR, <code>calendar_year</code> , BESKST13

Variable construction `closure_treatment` (treatment, person-stack).

Sources: LBNR, `calendar_year`. Time: Fixed at cohort g and inherited from baseline workplace. Missingness: Missing classification excludes the person-stack.

1. Merge the frozen gate classification by LBNR and cohort.
2. Set one for verified closures and zero for surviving comparators.

`adverse_destination_y2` (outcome, person-stack).

Sources: PNR, `calendar_year`, DISCO_KODE, DISCO_MATCHPRIO_KODE, LOENTIMER, ANSDAGE_2008, SOC_STATUS_KODE, OMFANG, BESKST13. Time: Compare g+2 principal job with frozen g-1 baseline skill. Missingness: Invalid occupation among observed jobs and observed nonemployment equal one; total cross-source absence is missing and excluded.

1. Select principal +2 employee job by LOENTIMER descending ANSDAGE_2008 descending LBNR ascending.
2. If no qualifying employee job but IND or AKM shows person-year observability set one.
3. If a job exists map skill using frozen codebook and set one for invalid code or post skill below baseline skill otherwise zero.
4. If IDAN IND and AKM all lack a +2 person-year record set `unobserved_exit` and no outcome value.

baseline_covariates (covariate, person-stack).

Sources: LOENTIMER, DISCO_KODE, ANTNOV, AARSVRK, ARB_HOVED_BRA_DB07, KOM, ALDER_ULT_INK. Time: All values use g-3 through g-1 only. Missingness: Missing any registered baseline covariate excludes the person-stack before propensity fitting.

1. Construct age age-squared skill indicators log1p size and FTE industry municipality and -3 to -1 hours and employment.
2. One-hot encode categorical levels on pooled pre-outcome risk set with the lexicographically first observed code as reference.

overlap_weight (weight, person-stack).

Sources: PNR, LBNR, calendar_year. Time: Propensity uses baseline fields only. Missingness: Nonfinite propensity or weight excludes person-stack and is counted.

1. Fit cohort logit of closure_treatment on baseline_covariates.
2. Retain propensity 0.10 through 0.90 inclusive and set treated weight 1-p and control weight p.
3. Normalize weights within cohort-arm to sum to its unweighted retained count.

Equation or algorithm

Within each cohort g and time k in {-3,-2,+2}, fit weighted least squares $Y_{igk} = \alpha_{gk} + \tau_{gk}$

Target statistic: aggregated_att_y2. Estimator/API: statsmodels.api.WLS with hasconst add_constant and numpy.linalg; propensity via statsmodels.api.Logit

Weights: Registered normalized overlap_weight. Fixed effects: Cohort-specific fitting makes cohort fixed effects implicit; categorical baseline industry municipality and skill indicators enter X. References: Comparator T=0; event-time diagnostics compare -3 and -2 to baseline construction at -1; lexicographically first category is reference.

Uncertainty: 9,999 Rademacher wild-bootstrap draws at baseline workplace, refitting outcome WLS but holding propensity scores and sample fixed; percentile-t interval. Clustering: Baseline workplace LBNR, shared across every person and event-time record from that workplace.

Ordered actions a01 — Build the frozen eligible baseline panel.

Consumes: idan_effect, idas_effect, ind_effect, akm_effect. Produces: baseline_panel.

1. Load gate outputs and join source tables in registered order after key assertions.
2. Apply sample steps s01 and s02 and write exclusion ledger before any +2 outcome summary.

Assertions: One person-stack row and one baseline workplace cluster; no post-event outcome field is summarized.

Failure route: stop_experiment — Stop because baseline eligibility or joins are not reproducible.

a02 — Fit propensity models and freeze overlap sample.

Consumes: baseline_panel. Produces: design_diagnostics.

1. For each of four cohorts fit the exact Logit formula and calculate propensities.
2. Apply closed interval trim and normalized overlap weights then calculate balance effective :

Assertions: Four propensity fits converge and all retained weights satisfy invariants.

Failure route: `stop_experiment` — Stop causal analysis; do not change model or trim bounds.

a03 — Construct placebo and primary outcomes.

Consumes: `idan_effect`, `ind_effect`, `akm_effect`, `baseline_panel`, `design_diagnostics`. Produces: `analysis_panel`.

1. Select principal jobs at -3 -2 and +2 with the same frozen rule and map skills.
2. Apply observed nonemployment invalid-code and total-absence rules and write arm-cohort attr

Assertions: Every observed outcome is binary and construction is identical across arms and times.

Failure route: `stop_experiment` — Stop because the registered outcome cannot be constructed consistently.

a04 — Execute diagnostics and estimate the primary effect.

Consumes: `analysis_panel`, `design_diagnostics`. Produces: `primary_effect`.

1. Fit 12 cohort-time WLS models and aggregate -3 -2 and +2 ATTs by treated cohort counts.
2. Run 9999 workplace-cluster wild-bootstrap repetitions and write estimates intervals p-values

Assertions: Twelve analytic fits and 119988 bootstrap refits complete; output contains every decision field.

Failure route: `stop_experiment` — Mark result inconclusive and report the failed assertion without alternate inference.

Output contract

Output	Path	Grain	Required fields
<code>baseline_panel</code>	<code>preregistration/run/baseline_panel.parquet</code>	person-stack	PNR, cohort, LBN
<code>design_diagnostics</code>	<code>preregistration/run/design_diagnostics.csv</code>	cohort-covariate-and-arm	cohort, arm, covar
<code>analysis_panel</code>	<code>preregistration/run/analysis_panel.parquet</code>	person-stack-event-time	PNR, cohort, LBN
<code>primary_effect</code>	<code>preregistration/run/primary_effect.csv</code>	target-statistic	target, estimate, s

Procedure accounting

- `propensity_logits`: 1 calls per unit $\times$ 4 fitted units $\times$ 1 repetitions = 4 fits. One propensity model for each cohort.
- `analytic_wls`: 1 calls per unit $\times$ 12 fitted units $\times$ 1 repetitions = 12 fits. Four cohorts crossed with three event times.
- `wild_bootstrap_wls`: 1 calls per unit $\times$ 12 fitted units $\times$ 9999 repetitions = 119988 fits. Refit every cohort-time WLS in each bootstrap draw.
- `robustness_unweighted_wls`: 1 calls per unit $\times$ 4 fitted units $\times$ 1 repetitions = 4 fits. One non-primary unweighted +2 fit per cohort.
- Full-data passes: 4. Largest intermediate: Person-stack-event-time analysis panel with three rows per retained person-stack..

Synthetic dry run. Generate four cohorts with known treatment effect 0.08, closures, survivors, ties, nonemployment, invalid codes, total absence, and clustered errors; require recovered construction and estimate within Monte Carlo tolerance 0.03.

Reconciliation. Reconcile baseline exclusions to gate rosters, overlap exclusions to baseline panel, and outcome attrition to analysis rows; require zero residual at each stage.

Decision regions.

- **design_fail** (feasibility_failure): $\text{max_smd} > \text{smd_limit}$ OR $\text{effective_control_n} < \text{min_effective_control}$ OR $\text{treated_clusters} < \text{min_clusters}$ OR $\text{control_clusters} < \text{min_clusters}$ OR $\text{placebo_max_abs} > \text{placebo_margin}$ OR $\text{placebo_simultaneous_bound} > \text{placebo_margin}$ OR $\text{attrition_difference} > \text{attrition_limit}$. — Conditional causal assumptions are not credible enough for an effect claim.
- **effect_supports** (supports): All design gates pass AND $\text{estimate} \geq \text{sei}$ AND $\text{ci_low} > 0$ AND $\text{interval_half_width} \leq \text{precision_limit}$. — Supports a policy-relevant adverse causal effect in the overlap population.
- **effect_small** (null_equivalent): All design gates pass AND $\text{ci_low} \geq -\text{equivalence_margin}$ AND $\text{ci_high} \leq \text{equivalence_margin}$. — Effect is null-equivalent at the registered margin.
- **effect_reversal** (challenges): All design gates pass AND $\text{ci_high} < 0$. — Challenges the directional theory with a precise beneficial estimate.
- **effect_inconclusive** (inconclusive): All design gates pass and none of **effect_supports**, **effect_small** or **effect_reversal** applies, including positive estimates below **sei** or **interval_half_width** above **precision_limit**. — Direction or magnitude is not resolved; report estimate and interval without affirmative or null claim.

Synthesis worlds

world_invalid_closure

Trigger. `closure_ambiguous`

Interpretation. Authorized data cannot distinguish final closure from continuity.

Allowed claim. No workplace-closure substantive claim.

world_infeasible

Trigger. `closure_insufficient` OR `measurement_fail` OR `design_fail`

Interpretation. Closure may be measurable but support measurement or identifying diagnostics fail.

Allowed claim. Feasibility and diagnostic results only.

world_adverse

Trigger. `effect_supports`

Interpretation. Closure raises adverse two-year destinations by a precise policy-relevant amount.

Allowed claim. Conditional causal effect in the registered overlap population.

world_small

Trigger. effect_small

Interpretation. Any effect is smaller than the registered practical margin.

Allowed claim. Conditional null-equivalence within plus or minus 0.05 probability points.

world_reversal

Trigger. effect_reversal

Interpretation. Supported workers have a precisely lower adverse-destination probability after closure.

Allowed claim. Conditional causal sign reversal that challenges the directional theory.

world_unresolved

Trigger. effect_inconclusive

Interpretation. Data do not resolve direction magnitude or practical equivalence.

Allowed claim. Estimate and interval only without affirmative or null conclusion.

Frozen machine-readable preregistration

This appendix is authoritative and contains the complete registered plan.

```
schema_version: '1.1'
artifact: preregistration
registration:
  rq_id: restricted42_workplace_closure
  title: Verified final workplace closure and two-year adverse occupational destination
  mode: schema_first
  version: 1
  status: under_review
  generated_at: '2026-09-04T15:00:00-05:00'
  knowledge_cutoff: '2026-09-04T15:00:00-05:00'
  outcome_blind: true
  input_digests:
    research_brief: c267ea103adc3ae7f96c3dd87f7b1eba893e6e2234e8aaae94f8c94679f1b449
    literature_map: 1bc3060223651f0ecad849056f4c8450b2f77f3b0d86e92ac8502e3d338e1f01
    data_feasibility: 084ff11e03cac6fa4cfa91595d9e5915f21014fca71f4a352e6488bb470aa874
    design_space: 9c8b0d360273f58c2842ebf86a9b760761e3bca044771e3fa48052610925e1ca
scope:
  research_question: Among incumbent Danish workers exposed to a verified final workplace closure,
    is the effect on having an adverse employment-and-occupational destination two calendar years
    relative to comparable incumbents at surviving workplaces?
  population: Employees aged 25-54 at baseline, in principal employee jobs at Danish workplaces;
    cohorts 2012-2015, with usable DISCO-08 major groups 2-9 and three pre-event years of commu
  unit: Person indexed to one baseline workplace and one event-year risk-set stack; treatment :
```

assigned at workplace level.

setting: Danish linked IDAN, IDAS, IND, and AKM annual register tables inside readable_42_tables

time_period: Event cohorts 2012–2015; baseline event times -3 through -1; closure year 0; primary event time +2.

primary_estimand: The overlap-weighted average treatment effect on treated incumbent workers of the final workplace closure on the probability of adverse destination at event time +2, versus continued workplace operation.

inferential_ceiling: A conditional collective-assignment causal effect for supported incumbents if all closure, measurement, overlap, cluster, and pretrend gates pass; otherwise feasibility or descriptive claims as routed below.

exclusions:

- Health outcomes, mechanisms, survivor-only occupation effects, and population-wide Danish effects are outside confirmatory scope.
- Managers (DISCO major group 1), armed forces (group 0), self-employment, and voluntary or involuntary separations are excluded.
- No birth date, sex, residence, family relationship, death, or emigration is inferred from linked data.

theory:

focal_mechanism: Final closure destroys a workplace match and can cause joblessness or re-employment in an occupation requiring a lower skill level.

rival_mechanisms:

- Latent establishment distress or industry demand can cause both closure and adverse destination.
- Identifier churn, merger, split, absorption, or intra-enterprise transfer can mimic closure.
- Intervening joblessness and repeated displacement may mediate persistence rather than occupation switching itself.
- Coding changes or missing occupation conditional on nonemployment can create apparent occupation decline.

directional_predictions:

- Verified closure increases the probability of no qualifying employee job or a lower-skill occupation at event time +2.

scope_conditions:

- The effect pertains to common-support incumbents at collectively assigned verified closures and displaced workers.
- Annual timing identifies calendar-year event effects, not duration since an exact shutdown.
- The composite treats nonemployment as adverse and avoids conditioning the primary estimand on re-employment.

literature_basis:

nearest_work:

- bertheau_et_al_2023
- ivandic_lassen_2023
- browning_heinesen_2012

established_knowledge:

- bertheau_et_al_2023 verifies that Danish earnings effects have close precedent and that merger split-ups must be checked when defining establishment shutdown.
- ivandic_lassen_2023 provides a close Danish plant-closure employment and earnings precedent.
- fallick_et_al_2021 and stevens_1997 motivate joblessness and repeated displacement as rival mechanisms.

open_questions:

- Whether verified Danish final closures increase adverse occupational destination beyond establishment employment and earnings margins.

- Whether authorized IDAS continuity fields can distinguish final closure from economic contribution: A narrowed occupational-destination estimand that combines nonemployment and 1 re-employment without conditioning on a post-treatment collider; it does not claim novelty earnings, employment, or health effects.

data_basis:

schema_snapshot_ids:

- readable_42_table_schema

population_construction: Build event-year workplace risk sets in IDAS, attach IDAN incumbents time -1, require age 25-54 from IND.ALDER_ULT_INK and usable baseline DISCO group 2-9, then treated and supported surviving-workplace controls.

linkage_plan: Join IDAN to IDAS on LBNR and calendar_year after uniqueness checks, aggregate a deterministic principal person-year job, and join IND and AKM on PNR and calendar_year; LBNR are keys only.

construct_map:

- construct_id: verified_final_closure

role: treatment

operational_definition: Last active IDAS year followed by absence for two years, with IDFR LBNRFREM, and CVRNRFR labels showing no continuation, absorption, split, merger, or success the deterministic documentation audit.

source_fields:

 - IDAS.LBNR
 - IDAS.IDFREEM
 - IDAS.FRELFREM
 - IDAS.LBNRFREM
 - IDAS.CVRNRFR

timing: Workplace event year 0.

alternatives:

 - If labels do not uniquely encode final closure
 - terminate without a closure claim.
- construct_id: incumbent

role: exposure

operational_definition: Person's principal IDAN employee job is at the index workplace in c -1 and ANSAAR is no later than event time -2.

source_fields:

 - IDAN.PNR
 - IDAN.LBNR
 - IDAN.ANSAAR
 - IDAN.LOENTIMER
 - IDAN.ANSDAGE_2008

timing: Event time -1 using tenure known by that year.

alternatives:

 - Ties are resolved by LOENTIMER descending
 - ANSDAGE_2008 descending
 - then LBNR ascending.
- construct_id: adverse_destination_y2

role: outcome

operational_definition: One if no qualifying principal employee job at +2 or its ISCO-08 sl is below the -1 level; zero for same or higher skill level.

```

source_fields:
- IDAN.PNR
- IDAN.DISCO_KODE
- IDAN.DISCO_MATCHPRIO_KODE
- IDAN.LOENTIMER
- IDAN.ANSDAGE_2008
- IDAN.SOC_STATUS_KODE
- AKM.BESKST13
timing: Baseline -1 and outcome +2.
alternatives:
- No survivor-only outcome substitutes for this composite.
- construct_id: baseline_factors
role: confounder
operational_definition: Pre-event age, employment, occupation skill level, workplace size,
equivalents, industry, municipality, and their -3 to -1 trajectories.
source_fields:
- IND.ALDER_ULT_INK
- IDAS.ANTNOV
- IDAS.AARSVRK
- IDAS.ARB_HOVED_BRA_DB07
- IDAS.KOM
- IDAN.DISCO_KODE
- IDAN.LOENTIMER
timing: Event times -3 through -1 only.
alternatives: []
unresolved_quantities:
- Closure counts, supported workplace clusters, match rates, and outcome precision remain unknown until execution.
- Exact authorized value labels for continuity, employment status, and DISCO match priority remain unknown until the outcome-free documentation gates execute.
- Real outcome values and row-level observations remain unknown until the registered post-gate executes.
no_outcome_data_accessed: true
study_dag:
source_design_space_sha256: 9c8b0d360273f58c2842ebf86a9b760761e3bca044771e3fa48052610925e1ca
estimand_context: For pre-closure incumbent workers at verified final workplaces in the over-
estimate cohort/event-time effects of collective closure versus continued operation on employment
and occupational destination; time zero is the last verified active year.
nodes:
- node_id: baseline_worker
label: Pre-closure worker age and labor history
role: confounder
observed: true
- node_id: baseline_workplace
label: Pre-closure workplace size industry sector municipality and trends
role: confounder
observed: true
- node_id: latent_distress

```

```

    label: Unmeasured workplace distress and demand shocks
    role: confounder
    observed: false
- node_id: genuine_closure
  label: Verified final workplace closure
  role: treatment
  observed: true
- node_id: closure_measurement
  label: IDAS continuity-based closure classification
  role: measurement
  observed: true
- node_id: joblessness
  label: Intervening joblessness
  role: mediator
  observed: true
- node_id: reemployment
  label: Post-closure re-employment
  role: mediator
  observed: true
- node_id: occupation_destination
  label: Post-event occupation destination or downgrade
  role: outcome
  observed: true
- node_id: earnings
  label: Post-event earnings
  role: outcome
  observed: true
- node_id: repeated_displacement
  label: Subsequent displacement
  role: mediator
  observed: true
- node_id: occupation_observed
  label: Occupation code observed
  role: selection
  observed: true
- node_id: coding_regime
  label: Occupation coding regime and match quality
  role: measurement
  observed: true
- node_id: unobserved_exit
  label: Death emigration or other unobserved exit
  role: selection
  observed: false
edges:
- from: baseline_worker
  to: genuine_closure
  relation: causal
  warrant:

```

```

    basis: maintained_assumption
    statement: Worker sorting and tenure can affect exposure to closure-prone workplaces.
- from: baseline_worker
  to: occupation_destination
  relation: causal
  warrant:
    basis: theory
    statement: Prior labor history and age shape feasible occupational destinations.
- from: baseline_workplace
  to: genuine_closure
  relation: causal
  warrant:
    basis: theory
    statement: Establishment size industry location and prior trajectory affect closure risk
- from: baseline_workplace
  to: occupation_destination
  relation: causal
  warrant:
    basis: theory
    statement: Baseline workplace and local-sector context shape workers next-job opportunities
- from: latent_distress
  to: genuine_closure
  relation: causal
  warrant:
    basis: maintained_assumption
    statement: Unrecorded adverse demand can precipitate final closure.
- from: latent_distress
  to: occupation_destination
  relation: causal
  warrant:
    basis: maintained_assumption
    statement: The same demand shock can reduce suitable destination jobs.
- from: genuine_closure
  to: joblessness
  relation: causal
  warrant:
    basis: theory
    statement: Destruction of the incumbent job match can create a nonemployment spell.
- from: genuine_closure
  to: reemployment
  relation: causal
  warrant:
    basis: theory
    statement: Closure changes subsequent employment probability and timing.
- from: joblessness
  to: occupation_destination
  relation: causal
  warrant:

```

```

    basis: prior_evidence
    statement: Joblessness can alter mobility and destination quality.
    source_ids:
      - fallick_et_al_2021
- from: reemployment
  to: occupation_destination
  relation: causal
  warrant:
    basis: institution
    statement: A post-event occupation exists only through an observed job.
- from: genuine_closure
  to: occupation_destination
  relation: causal
  warrant:
    basis: theory
    statement: Loss of a workplace match may directly force occupational switching.
- from: genuine_closure
  to: earnings
  relation: causal
  warrant:
    basis: prior_evidence
    statement: Danish and international displacement designs motivate earnings as a joint out
    source_ids:
      - bertheau_et_al_2023
- from: joblessness
  to: earnings
  relation: causal
  warrant:
    basis: prior_evidence
    statement: Earnings persistence can be concentrated among movers experiencing joblessness.
    source_ids:
      - fallick_et_al_2021
- from: repeated_displacement
  to: earnings
  relation: causal
  warrant:
    basis: prior_evidence
    statement: Repeated job loss can contribute to persistent earnings reductions.
    source_ids:
      - stevens_1997
- from: genuine_closure
  to: repeated_displacement
  relation: causal
  warrant:
    basis: theory
    statement: Initial disruption may place workers into less stable subsequent matches.
- from: reemployment
  to: occupation_observed

```

```

relation: selection
warrant:
  basis: institution
  statement: Occupation is observed only for workers with a coded post-event job.
- from: unobserved_exit
  to: occupation_observed
  relation: selection
  warrant:
    basis: institution
    statement: Death emigration and other exits can remove labor-record observability but the
      are unavailable.
- from: coding_regime
  to: occupation_observed
  relation: measurement
  warrant:
    basis: institution
    statement: Coding coverage and match-priority rules determine whether occupation is usable.
- from: genuine_closure
  to: closure_measurement
  relation: measurement
  warrant:
    basis: institution
    statement: IDAS continuity fields imperfectly encode the latent economic event.
- from: baseline_workplace
  to: closure_measurement
  relation: measurement
  warrant:
    basis: prior_evidence
    statement: Mergers and split-ups can induce identifier changes that resemble displacement.
    source_ids:
      - bertheau_et_al_2023
open_paths:
- genuine_closure <- latent_distress -> occupation_destination remains unclosed; matching and
  probe but cannot close it.
- genuine_closure <- baseline_workplace -> occupation_destination is addressed using frozen
  workplace factors and trends.
- genuine_closure <- baseline_worker -> occupation_destination is addressed using frozen pre-
  histories and age.
- Conditioning only on occupation_observed opens selection through reemployment or unobserved
  the composite avoids that conditioning.
forbidden_adjustment:
- joblessness
- reemployment
- repeated_displacement
- occupation_observed
- closure_measurement
adjustment_sets:
- experiment_id: exp_effect

```

```

covariates:
- baseline_worker
- baseline_workplace
rationale: Only pre-treatment worker and workplace factors enter matching and regression adjustment.
remaining_open_paths:
- genuine_closure <- latent_distress -> occupation_destination
rationale: This is the full study-specific DAG from the design-space artifact. Baseline history nodes are pre-treatment or measurement nodes and forbidden for total-effect adjustment. Latent nodes are post-treatment or measurement nodes and forbidden for total-effect adjustment. Latent nodes remain the central identifying threat.
question_map:
- question_id: q_closure_validity
  question_clause: Can authorized IDAS histories verify genuine final closure and construct supported incumbent workplace risk sets without outcome inspection?
  experiment_id: exp_closure_gate
  estimand: The count and share of candidate workplace disappearances that satisfy the deterministic definition and retain eligible incumbent and comparator workplace clusters.
  output_id: closure_gate_report
  claim_ceiling: feasibility_only
- question_id: q_occupation_validity
  question_clause: Can authorized IDAN documentation support a stable, ordered ISCO-08 skill-level and deterministic principal-job construction?
  experiment_id: exp_measurement_gate
  estimand: The documentation-defined availability and pre-outcome coverage share of eligible person-years with valid principal-job and ordered skill-level classification.
  output_id: measurement_gate_report
  claim_ceiling: feasibility_only
- question_id: q_primary_effect
  question_clause: What is the effect of verified final workplace closure on adverse employment destination two calendar years later among supported incumbents?
  experiment_id: exp_effect
  estimand: The overlap-weighted average treatment effect on treated incumbent workers of verified workplace closure on the probability of adverse destination at event time +2, versus continued operation.
  output_id: primary_effect
  claim_ceiling: causal
execution_governance:
  authority: This YAML, the four digested upstream artifacts, and authorized schema/codebook definitions jointly govern execution; this YAML controls analysis choices.
  execution_order:
  - exp_closure_gate
  - exp_measurement_gate
  - exp_effect
environment:
  language: Python 3.12
  software:
  - pandas 2.2.2
  - pyarrow 16.1.0

```

- numpy 2.0.1
- statsmodels 0.14.2
- scipy 1.14.0

environment_capture: Write python version and pip freeze to preregistration/run/environment reading analysis rows.

seed_policy: Set NumPy seed 420904 for synthetic tests and bootstrap resampling; deterministic use stable sorting.

time_zone: Europe/Copenhagen

locale: C.UTF-8

data_access_sequence: Verify authorized documentation and value labels, run synthetic dry run closure and measurement gates on pre-outcome fields, freeze their reports, then and only then post-event outcomes and estimate.

global_invariants:

- Never derive attributes from PNR or LBNR; use identifiers only as keys.
- Do not inspect, summarize, or branch on post-event outcomes before both gates pass.
- Each person has one principal job per year after deterministic sorting and one baseline work per stack.
- Every treated worker inherits treatment and cluster from the workplace assignment unit.

failure_policy: Assertion failure stops the named experiment; only registered graph routes may and no alternate field, threshold, cohort, estimator, or outcome may replace a failed comparison.

deviation_log: preregistration/run/deviations.yaml

experiments:

- **experiment_id:** exp_closure_gate
- title:** Final-closure and support gate
- epistemic_role:** diagnostic
- specification_status:** frozen
- unresolved_choices:** []
- purpose:** Establish genuine collective closure assignment, incumbent rosters, and comparator without outcomes.
- dependencies:** []
- activation:**
 - when:** Always first.
 - skip_when:** Never.
- hypothesis:**
 - claim:** Authorized fields classify at least 20 genuine final-closure workplace clusters and 20 surviving comparator clusters.
 - 'null':** Fewer than 20 clusters in either arm or closure labels are ambiguous.
 - alternative:** Both arms contain at least 20 independent clusters and labels uniquely establish closure.
 - directional:** false
- design:**
 - family:** descriptive
 - estimand:** The count and share of candidate workplace disappearances that satisfy the deterministic final-closure definition and retain eligible incumbent and comparator workplace clusters
 - identifying_variation:** No effect identification; this is an outcome-free measurement and standard
 - counterfactual:** No outcome counterfactual is estimated.
 - assignment_mechanism:** Collective assignment by workplace final closure, audited here but not for effect estimation.

assumptions:

- Authorized value labels faithfully describe economic continuity
- IDAS workplace-year keys can be made unique without discarding conflicting records.

diagnostics:

- Two-year successor search
- enterprise-continuity check
- roster and comparator cluster counts.

downgrade_path: Ambiguous closure terminates all claims; inadequate comparative support terminates the confirmatory effect.

domain_fit: Institutional closure measurement is prior to econometric estimation.

operationalization:

sample: All IDAS workplaces active in 2012-2015 with complete adjacent histories, then can be matched to and same-cohort survivors.

treatment_or_exposure: Verified final closure at workplace-year level.

outcome: Feasibility indicators and counts only; no worker outcome values.

covariates:

- ANTNOV
- AARSVRK
- ARB_HOVED_BRA_DB07
- KOM

time: Candidate event years 2012-2015 with histories through +2.

exclusions:

- Any continuity
- absorption
- split
- merger
- successor
- duplicate-key conflict
- or fewer than two eligible incumbents.

analysis:

estimator: Deterministic rule evaluation and counts.

specification: Count verified closures and survivors by cohort after exact filters.

uncertainty: None; census counts within authorized data.

clustering: Workplace LBNR.

missingness: Missing any continuity field required by the official label rule makes the case ambiguous and excluded.

multiplicity_family: null

robustness: []

prospective_assessment:

expected_direction: unknown

smallest_effect_of_interest:

status: not_applicable

value: null

unit: not_applicable

rationale: This diagnostic estimates no effect.

precision_plan: Require 20 independent workplace clusters per arm as a design floor; record counts without inspecting outcomes.

weak_data_scenario: If support is below the floor, terminate effect estimation.

```

surprising_result: A high candidate-to-verified rejection share indicates identifier disappearance is a poor closure proxy.
execution:
identity_chain:
  question_clause: Can authorized IDAS histories verify genuine final closure and construction of incumbent workplace risk sets without outcome inspection?
  estimand: The count and share of candidate workplace disappearances that satisfy the definition of final-closure and retain eligible incumbent and comparator workplace clusters
  analysis_variable: verified_closure_flag
  target_statistic: verified_closure_count_and_share
  primary_output_id: closure_gate_report
sources:
- source_id: idas_gate
  resource_id: readable_42_table_schema
  tables:
  - IDAS
  fields:
  - LBNR
  - calendar_year
  - IDFREEM
  - FRELFREM
  - LBNRFREM
  - CVRNRFR
  - ANTNOV
  - AARSVRK
  - ARB_HOVED_BRA_DB07
  - KOM
  grain: workplace-year
  keys:
  - LBNR
  - calendar_year
  temporal_semantics: Annual workplace state; year 0 is last verified active calendar year
  filters:
  - calendar_year 2009-2017 to support 2012-2015 events and adjacent histories
- source_id: idan_gate
  resource_id: readable_42_table_schema
  tables:
  - IDAN
  fields:
  - PNR
  - LBNR
  - calendar_year
  - ANSAAR
  - LOENTIMER
  - ANSDAGE_2008
  - DISCO_KODE
  grain: person-job-year
  keys:

```

- PNR
- LBNR
- calendar_year
- temporal_semantics: Annual employee-job records; incumbency is assessed at event time -1
- filters:
 - employee-job records in calendar years 2011-2014
- joins:
 - join_id: roster_to_workplace
 - left_source: idan_gate
 - right_source: idas_gate
 - keys:
 - left_field: LBNR
 - right_field: LBNR
 - left_field: calendar_year
 - right_field: calendar_year
 - cardinality: many_to_one
 - retained_side: inner
 - unmatched_rule: Exclude unmatched employee jobs and count them in the gate report.
 - validation: IDAS is unique on LBNR-year and every retained job matches exactly one workplace
- variables:
 - variable_id: verified_closure_flag
 - role: treatment
 - grain: workplace-event-year
 - source_ids:
 - idas_gate
 - source_fields:
 - LBNR
 - calendar_year
 - IDFREM
 - FRELFREM
 - LBNRFREM
 - CVRNRFR
 - ordered_steps:
 - Parse official authorized value labels and normalize whitespace and case without reading outcomes.
 - Mark a candidate when LBNR is active in year g and absent in g+1 and g+2.
 - Set one only when every forward/relationship label explicitly denotes final cessation or denotes successor, continuation, absorption, merger, split, or transfer; otherwise set ambiguity flag.
 - temporal_rule: Evaluate g in 2012-2015 using g+1 and g+2 histories.
 - missing_rule: Any missing required label sets ambiguity flag and verified flag zero.
 - output_type: boolean plus reason code
 - validation: Every candidate receives exactly one mutually exclusive reason code.
- variable_id: incumbent_flag
- role: sample
- grain: person-workplace-event-year
- source_ids:
 - idan_gate

```

source_fields:
- PNR
- LBNR
- calendar_year
- ANSAAR
- LOENTIMER
- ANSDAGE_2008
ordered_steps:
- At g-1 sort jobs per PNR by LOENTIMER descending, ANSDAGE_2008 descending, LBNR ascending,
  retain first.
- Set one when retained LBNR is index workplace and ANSAAR is at most g-2.
temporal_rule: Use only g-1 information.
missing_rule: Missing PNR, LBNR, ANSAAR, or both tie-break measures excludes the record.
output_type: boolean
validation: At most one incumbent record per PNR and event-year stack.
sample_flow:
- step_id: s01
  input_population: IDAS workplace-years 2012-2015
  operation: Retain workplace-years with observable histories from g-3 through g+2.
  output_population: history_complete_workplaces
  exclusion_record: Record missing history count by cohort.
- step_id: s02
  input_population: history_complete_workplaces
  operation: Apply final-closure label algorithm and separately identify workplaces present at
    g+2 as survivors.
  output_population: classified_risk_sets
  exclusion_record: Record every ambiguity reason.
- step_id: s03
  input_population: classified_risk_sets
  operation: Join g-1 principal jobs and retain workplaces with at least two incumbents.
  output_population: supported_rosters
  exclusion_record: Record unmatched and small-roster workplaces.
model:
model_id: closure_rule
equation_or_algorithm: For candidate workplace j in cohort g,  $V_{jg} = 1\{\text{active}_{jg} \text{ and } \text{absent}_{j,g+2} \text{ and all continuity labels equal official final-cessation states and none equals a continuity state}\}$ ; report  $\text{sum}(V)$  and  $\text{sum}(V)/\text{candidate\_count}$ .
target_statistic: verified_closure_count_and_share
symbol_map:
- symbol:  $V_{jg}$ 
  meaning: Verified final-closure indicator
  source_fields:
  - LBNR
  - calendar_year
  - IDFREEM
  - FRELFREEM
  - LBNRFREEM
  - CVRNRFR

```

```

    construction_variables:
      - verified_closure_flag
estimator_api: pandas groupby and deterministic boolean evaluation
weights: No weights.
fixed_effects: None.
reference_levels: Candidate disappearance is denominator.
uncertainty: None; exact counts.
clustering: Workplace LBNR is the assignment cluster.
diagnostics:
  - reason-code exhaustiveness
  - workplace-year uniqueness
  - roster-size distribution
actions:
- action_id: a01
  goal: Freeze official continuity-label semantics.
  consumes:
    - idas_gate
  procedure:
    - Extract value labels for IDFREEM FRELFREEM LBNRFREEM and CVRNRFR from authorized documents.
    - Write normalized raw-code to label mappings and SHA-256 hashes; reject mappings with duplicate codes or labels that do not uniquely distinguish cessation from continuity.
  produces:
    - closure_codebook
  assertions:
    - All four fields have unique documented code mappings and final-cessation logic is decided.
  on_failure:
    route: mark_infeasible
    detail: Terminate every closure experiment and permit no identifier-disappearance proxy.
- action_id: a02
  goal: Classify closure and survivor workplace risk sets.
  consumes:
    - idas_gate
    - closure_codebook
  procedure:
    - Sort by LBNR and calendar_year and assert unique workplace-years.
    - Apply the registered two-year absence and label logic for g 2012-2015 and assign one risk set per workplace-cohort.
  produces:
    - classified_workplaces
  assertions:
    - One row per LBNR-cohort and mutually exclusive exhaustive classifications.
  on_failure:
    route: stop_experiment
    detail: Stop because collective assignment cannot be constructed reproducibly.
- action_id: a03
  goal: Construct incumbent rosters and final gate report.
  consumes:
    - idan_gate

```

```

- classified_workplaces
procedure:
- Construct g-1 principal job by registered stable sort and apply ANSAAR at most g-2.
- Join rosters to classified workplaces and tabulate closures survivors incumbents unmat
  and reason codes by cohort.
produces:
- closure_gate_report
assertions:
- One person-baseline-workplace per stack and reported totals reconcile to classified in
on_failure:
  route: stop_experiment
  detail: Stop because incumbent exposure or risk-set totals do not reconcile.
outputs:
- output_id: closure_codebook
  path: preregistration/run/closure_codebook.csv
  format: csv
  grain: field-code
  fields:
  - field
  - raw_code
  - normalized_label
  - semantic_class
  - source_hash
  produced_by: a01
  consumers:
  - a02
- output_id: classified_workplaces
  path: preregistration/run/classified_workplaces.parquet
  format: parquet
  grain: workplace-cohort
  fields:
  - LBNR
  - cohort
  - classification
  - reason_code
  produced_by: a02
  consumers:
  - a03
- output_id: closure_gate_report
  path: preregistration/run/closure_gate_report.csv
  format: csv
  grain: cohort-and-total
  fields:
  - cohort
  - candidate_count
  - verified_closure_count
  - survivor_count
  - closure_incumbents

```

- survivor_incumbents
- ambiguous_count
- unmatched_count

produced_by: a03

consumers:

- closure_pass
- closure_ambiguous
- closure_insufficient

quality_control:

synthetic_dry_run: Create synthetic workplace histories containing final closure continuation split missing label and duplicate-key cases; require exact reason codes before any regression are read.

invariant_checks:

- Classifications are mutually exclusive and exhaustive.
- Workplace-year keys are unique.
- Roster totals reconcile before and after join.

reconciliation: Sum cohort counts and exclusions to the initial complete-history universes a zero residual.

run_log: preregistration/run/closure_gate.log

stop_conditions:

- Ambiguous code semantics
- duplicate unresolved workplace-years
- fewer than 20 clusters in either arm.

compute_plan:

fit_operations: []

full_data_passes: 3

largest_intermediate: IDAS workplace-history panel for 2009-2017.

feasibility_note: Three deterministic passes cover code validation, workplace classification, roster construction.

decision_regions:

- decision_id: closure_pass

condition: ambiguous_count = 0 among retained treated workplaces AND verified_closure_count AND survivor_count >= min_clusters.

parameters:

 - name: min_clusters
 - value: 20
 - unit: workplace clusters per arm
 - rationale: Below 20 clusters cluster-robust causal inference is not credible.

interpretation: Closure measurement and minimum independent support pass.

claim_status: supports
- decision_id: closure_ambiguous

condition: Authorized mappings cannot make ambiguity zero among proposed treated workplaces

parameters:

 - name: required_ambiguity
 - value: 0
 - unit: retained treated workplaces
 - rationale: Every treated workplace must be verified.

interpretation: No closure claim is permitted.

```

    claim_status: feasibility_failure
- decision_id: closure_insufficient
  condition: ambiguity is zero after exclusions but verified_closure_count < min_clusters OR
    < min_clusters.
  parameters:
    - name: min_clusters
      value: 20
      unit: workplace clusters per arm
      rationale: Frozen inference floor.
  interpretation: Verified closures may be described in the gate report but the effect exper
    not activated.
  claim_status: inconclusive
- experiment_id: exp_measurement_gate
  title: Occupation measurement gate
  epistemic_role: diagnostic
  specification_status: frozen
  unresolved_choices: []
  purpose: Freeze principal-job, valid-code, and ordered skill-level definitions before outcome
  dependencies:
    - exp_closure_gate
  activation:
    when: exp_closure_gate yields closure_pass.
    skip_when: Any other closure-gate decision occurs.
  hypothesis:
    claim: Official documentation supports one stable DISCO-08 and match-priority rule with at
      percent valid baseline classification.
    'null': Documentation is non-comparable or baseline valid coverage is below 90 percent.
    alternative: Stable documentation and coverage at least 90 percent.
    directional: false
  design:
    family: descriptive
    estimand: The documentation-defined availability and pre-outcome coverage share of eligibl
      person-years with valid principal-job and ordered skill-level classification.
    identifying_variation: No effect identification; this is a pre-outcome measurement audit.
    counterfactual: No outcome counterfactual is estimated.
    assignment_mechanism: Uses rosters from collectively assigned closure and survivor workpla
    assumptions:
      - DISCO_KODE is DISCO-08 in retained years
      - documented match-priority labels identify valid codes.
    diagnostics:
      - Code-system identity
      - valid baseline coverage
      - deterministic tie resolution.
    downgrade_path: Failure abandons the occupational question rather than substituting another
    domain_fit: Ordered occupational skill measurement precedes labor-econometric estimation.
  operationalization:
    sample: Incumbent rosters from closure_pass, using only pre-event years for coverage diagn
    treatment_or_exposure: Closure-arm label carried from the gate report but not contrasted on

```

```

outcome: Baseline valid ordered skill-level availability.
covariates: []
time: Event time -1 for coverage; documentation must cover all 2011-2016 outcome source years.
exclusions:
- DISCO major groups 0 and 1
- invalid match priority
- malformed or missing code.
analysis:
estimator: Deterministic mapping and proportions.
specification: Skill levels are group 2=4, group 3=3, groups 4-8=2, group 9=1; groups 0 and 1 are excluded.
uncertainty: None; exact coverage proportions.
clustering: Workplace LBNR for tabulation.
missingness: Missing or invalid DISCO is not assigned a skill level and is counted in coverage.
multiplicity_family: null
robustness: []
prospective_assessment:
expected_direction: unknown
smallest_effect_of_interest:
status: not_applicable
value: null
unit: not_applicable
rationale: This diagnostic estimates no treatment effect.
precision_plan: Require baseline valid coverage of 0.90 overall and in each treatment arm.
weak_data_scenario: Coverage below 0.90 or non-comparable coding terminates the occupational analysis.
surprising_result: Large arm-specific coverage differences indicate measurement selection bias.
execution:
identity_chain:
question_clause: Can authorized IDAN documentation support a stable, ordered ISCO-08 skill-level classification,
outcome and deterministic principal-job construction?
estimand: The documentation-defined availability and pre-outcome coverage share of eligible
person-years with valid principal-job and ordered skill-level classification.
analysis_variable: valid_skill_flag
target_statistic: baseline_valid_skill_share
primary_output_id: measurement_gate_report
sources:
- source_id: idan_measure
resource_id: readable_42_table_schema
tables:
- IDAN
fields:
- PNR
- LBNR
- calendar_year
- DISCO_KODE
- DISCO_MATCHPRIO_KODE
- LOENTIMER
- ANSDAGE_2008
- SOC_STATUS_KODE

```

```

grain: person-job-year
keys:
- PNR
- LBNR
- calendar_year
temporal_semantics: Annual jobs; gate calculations use g-1 only and documentation spans c
    source year.
filters:
- incumbent roster members from closure_gate_report cohorts
joins: []
variables:
- variable_id: valid_skill_flag
  role: outcome
  grain: person-stack-baseline
  source_ids:
  - idan_measure
  source_fields:
  - PNR
  - LBNR
  - calendar_year
  - DISCO_KODE
  - DISCO_MATCHPRIO_KODE
  - LOENTIMER
  - ANSDAGE_2008
  ordered_steps:
  - Select principal job by LOENTIMER descending ANSDAGE_2008 descending LBNR ascending.
  - Parse DISCO major group and accept only groups 2-9 with a match-priority code document
  - Map groups 2 3 4-8 9 to skill levels 4 3 2 1 respectively.
  temporal_rule: Calculate at g-1 only; audit code-system labels for 2011-2016.
  missing_rule: Missing malformed group 0 group 1 or invalid priority yields zero valid fl
    skill value.
  output_type: boolean plus integer skill level
  validation: Skill is one through four exactly when valid flag equals one.
sample_flow:
- step_id: s01
  input_population: closure_pass incumbent rosters
  operation: Select one principal g-1 job per person-stack by registered stable sort.
  output_population: baseline_principal_jobs
  exclusion_record: Record missing tie-break fields.
- step_id: s02
  input_population: baseline_principal_jobs
  operation: Apply documented code validity and frozen skill mapping.
  output_population: classified_baseline_jobs
  exclusion_record: Count every invalidity reason by arm and cohort.
model:
  model_id: measurement_rule
  equation_or_algorithm: valid_i = 1{documented DISCO-08 code, documented valid match prior
    group in 2..9}; skill_i = 4 for group 2, 3 for group 3, 2 for groups 4..8, and 1 for g

```

```

    report mean(valid_i).
target_statistic: baseline_valid_skill_share
symbol_map:
- symbol: valid_i
  meaning: Valid ordered baseline occupation indicator
  source_fields:
  - DISCO_KODE
  - DISCO_MATCHPRIO_KODE
  construction_variables:
  - valid_skill_flag
estimator_api: pandas deterministic mapping and groupby mean
weights: No weights.
fixed_effects: None.
reference_levels: Full incumbent roster is coverage denominator.
uncertainty: None; exact proportions.
clustering: Workplace LBNR for arm-specific tabulation.
diagnostics:
- mapping exhaustiveness
- arm-specific coverage
- cohort-specific coverage
actions:
- action_id: a01
  goal: Freeze occupation and employment code mappings.
  consumes:
  - idan_measure
  procedure:
  - Extract authorized DISCO regime and match-priority value labels for all retained years
    source documentation.
  - Verify one DISCO-08 regime and label valid priority states; encode the registered major
    skill mapping.
  produces:
  - occupation_codebook
  assertions:
  - Every retained year has documented comparable DISCO-08 semantics and unique priority la
on_failure:
  route: mark_infeasible
  detail: Abandon occupational estimation and do not substitute an outcome.
- action_id: a02
  goal: Compute baseline skill coverage.
  consumes:
  - idan_measure
  - occupation_codebook
  procedure:
  - Select principal g-1 job with the registered ordering.
  - Apply validity rules and calculate coverage overall by arm and cohort with reason count
  produces:
  - measurement_gate_report
  assertions:

```

- Coverage numerators plus invalid-reason counts equal roster denominators.

on_failure:

- route:** stop_experiment
- detail:** Stop because occupational measurement totals fail reconciliation.

outputs:

- **output_id:** occupation_codebook
 - path:** preregistration/run/occupation_codebook.csv
 - format:** csv
 - grain:** field-code-year
 - fields:**
 - year
 - field
 - raw_code
 - normalized_label
 - validity
 - skill_level
 - source_hash
 - produced_by:** a01
 - consumers:**
 - a02
- **output_id:** measurement_gate_report
 - path:** preregistration/run/measurement_gate_report.csv
 - format:** csv
 - grain:** arm-cohort-and-total
 - fields:**
 - arm
 - cohort
 - denominator
 - valid_count
 - valid_share
 - invalid_reason
 - produced_by:** a02
 - consumers:**
 - measurement_pass
 - measurement_fail

quality_control:

- synthetic_dry_run:** Test ties valid groups 2-9 excluded groups 0-1 malformed codes invalid and missing values; require exact expected mapping.
- invariant_checks:**
 - One principal job per person-stack.
 - Valid flag and skill level are logically equivalent.
 - Coverage reconciles to rosters.
- reconciliation:** Sum valid and each exclusive invalid reason to each arm-cohort denominator zero residual.
- run_log:** preregistration/run/measurement_gate.log
- stop_conditions:**
 - Non-comparable code regime
 - ambiguous validity labels

- coverage below 0.90 in either arm.

```

compute_plan:
  fit_operations: []
  full_data_passes: 2
  largest_intermediate: Incumbent person-job-year records for baseline principal-job selection
  feasibility_note: Documentation extraction and one baseline classification pass determined
decision_regions:
- decision_id: measurement_pass
  condition: valid_share >= min_valid_share overall AND separately in treated and comparator
    comparable DISCO-08 documentation in all source years.
  parameters:
    - name: min_valid_share
      value: 0.9
      unit: proportion
      rationale: Limits baseline occupation measurement exclusion to 10 percent per arm.
  interpretation: Occupational outcome construction is activated.
  claim_status: supports
- decision_id: measurement_fail
  condition: Any required year lacks comparable documentation OR valid_share < min_valid_share
    or in either arm.
  parameters:
    - name: min_valid_share
      value: 0.9
      unit: proportion
      rationale: Frozen measurement floor.
  interpretation: Occupational question is infeasible; no replacement outcome is selected.
  claim_status: feasibility_failure
- experiment_id: exp_effect
  title: Confirmatory two-year adverse destination effect
  epistemic_role: confirmatory
  specification_status: frozen
  unresolved_choices: []
  purpose: Estimate the frozen closure effect on one binary adverse employment-and-occupation
    family.
  dependencies:
    - exp_measurement_gate
  activation:
    when: exp_measurement_gate yields measurement_pass.
    skip_when: exp_measurement_gate yields measurement_fail.
  hypothesis:
    claim: Verified final closure increases adverse destination at +2 by at least 0.05 probability
      on the absolute probability scale.
    'null': ATT at +2 is at most 0.
    alternative: ATT at +2 is greater than 0.
    directional: true
  design:
    family: did_event_study
    estimand: The overlap-weighted average treatment effect on treated incumbent workers of verified

```

workplace closure on the probability of adverse destination at event time +2, versus continued operation.

identifying_variation: Collective variation between verified closure workplaces and survivors within event-year, industry, municipality, and baseline-size support, after propensity overlap.

counterfactual: The +2 adverse-destination probability the same treated incumbents would have if their workplace continued, represented by weighted supported incumbents at workplaces through g+2.

assignment_mechanism: Workplace-level verified final closure collectively assigns all retained incumbents; no individual random assignment is claimed.

assumptions:

- Correct closure classification
- conditional parallel trends after frozen baseline adjustment
- no anticipation through g-1
- no material cross-workplace interference
- stable linkage
- positivity in the retained overlap population.

diagnostics:

- Propensity overlap
- effective sample size
- standardized mean differences
- -3 and -2 placebo ATT equivalence
- cluster count.

downgrade_path: Any overlap, balance, cluster, or pretrend failure terminates causal estimation limits reporting to diagnostic feasibility outputs.

domain_fit: Matched/weighted cohort-specific DiD follows collective employer-side assignment timing.

method_specific:

- treatment_timing:** Cohort g is last verified active workplace year; primary follow-up is g+2.
- comparison_group:** Incumbents at workplaces present continuously through g+2 and never closed as closure in g-1 through g+2.
- parallel_trends:** Conditional equality of untreated adverse-destination trends after overlap.
- no_anticipation:** No closure effect before g; tested with -3 and -2 placebo contrasts relative to g-1.
- heterogeneity_estimand:** Cohort-specific ATTs aggregated using treated-worker cohort share of overlap restriction.
- pretrend_response:** Require both placebo absolute estimates and simultaneous 95 percent confidence bounds within 0.05; otherwise terminate causal claims.

operationalization:

- sample:** Gate-passing treated and surviving-workplace incumbents aged 25-54 at g-1, baseline group 2-9, with pre-event fields and propensity scores between 0.10 and 0.90.
- treatment_or_exposure:** Workplace-level verified final closure in g, inherited by incumbents.
- outcome:** Binary adverse_destination_y2 equals one for no qualifying principal employee job or skill level at g+2, zero for qualifying same/higher skill job.
- covariates:**
 - Age and age squared
 - baseline skill level indicators
 - log1p ANTNOV
 - log1p AARSVRK

- industry indicators
- municipality indicators
- g-3 to g-1 principal-job hours and employment indicators.

time: Cohorts 2012-2015; diagnostics at -3 and -2 relative to -1; primary +2.

exclusions:

- Managers
- armed forces
- invalid baseline occupation
- age outside 25-54
- missing baseline covariates
- out-of-overlap propensity
- workplace cluster below two incumbents.

analysis:

estimator: Cohort-specific overlap-weighted linear probability DiD with workplace-cluster v

specification: One propensity logit per cohort; weights treated=1-p and control=p; weighted of adverse outcome on treated with exact cohort-specific samples, then treated-count aggregated across cohorts.

uncertainty: 9,999 Rademacher wild-cluster bootstrap repetitions at baseline workplace; per 95 percent interval and one-sided p-value.

clustering: Baseline workplace LBNR.

missingness: No qualifying employee job at +2 is outcome one; a job with missing or invalid is outcome one; total absence from every IDAN AKM and IND person-year source at +2 is unexit and excluded with arm-specific attrition reported, triggering failure if difference 0.05.

multiplicity_family: primary_adverse_destination

robustness:

- Report unweighted cohort ATT as non-primary robustness without decision use.

prospective_assessment:

expected_direction: positive

smallest_effect_of_interest:

- status:** fixed
- value:** 0.05
- unit:** probability points
- rationale:** Five additional adverse destinations per 100 workers is a policy-relevant absolute

precision_plan: Report point estimate and 95 percent interval; classify precision as adequate when interval half-width is at most 0.05.

weak_data_scenario: Fewer than 20 clusters per arm, effective control sample below 100, or half-width above 0.05 yields an inconclusive rather than null claim.

surprising_result: A negative estimate with its 95 percent interval below zero challenges the match-destruction account and motivates separate future research, not outcome redefinition

execution:

identity_chain:

- question_clause:** What is the effect of verified final workplace closure on adverse employment destination two calendar years later among supported incumbents?
- estimand:** The overlap-weighted average treatment effect on treated incumbent workers of verified final workplace closure on the probability of adverse destination at event time +2, verified workplace operation.
- analysis_variable:** adverse_destination_y2

```

    target_statistic: aggregated_att_y2
    primary_output_id: primary_effect
sources:
- source_id: idan_effect
  resource_id: readable_42_table_schema
  tables:
    - IDAN
  fields:
    - PNR
    - LBNR
    - calendar_year
    - ANSAAR
    - LOENTIMER
    - ANSDAGE_2008
    - DISCO_KODE
    - DISCO_MATCHPRIO_KODE
    - SOC_STATUS_KODE
  grain: person-job-year
  keys:
    - PNR
    - LBNR
    - calendar_year
  temporal_semantics: Annual jobs indexed to cohort g; baseline is g-1 and primary outcome
  filters:
    - cohort years and event times -3 -2 -1 +2
- source_id: idas_effect
  resource_id: readable_42_table_schema
  tables:
    - IDAS
  fields:
    - LBNR
    - calendar_year
    - ANTNOV
    - AARSVRK
    - ARB_HOVED_BRA_DB07
    - KOM
  grain: workplace-year
  keys:
    - LBNR
    - calendar_year
  temporal_semantics: Workplace covariates are measured at g-1 only.
  filters:
    - workplaces in gate-passing risk sets
- source_id: ind_effect
  resource_id: readable_42_table_schema
  tables:
    - IND
  fields:

```

```

- PNR
- calendar_year
- ALDER_ULT_INK
- OMFANG
grain: person-year
keys:
- PNR
- calendar_year
temporal_semantics: Age measured at g-1; OMFANG contributes only to +2 observability class
filters:
- incumbent PNRs at g-1 and g+2
- source_id: akm_effect
resource_id: readable_42_table_schema
tables:
- AKM
fields:
- PNR
- calendar_year
- BESKST13
grain: person-year
keys:
- PNR
- calendar_year
temporal_semantics: BESKST13 contributes only to distinguishing nonemployment from total
  exit at g+2.
filters:
- incumbent PNRs at g+2
joins:
- join_id: job_workplace_join
  left_source: idan_effect
  right_source: idas_effect
  keys:
  - left_field: LBNR
    right_field: LBNR
  - left_field: calendar_year
    right_field: calendar_year
  cardinality: many_to_one
  retained_side: inner
  unmatched_rule: Exclude unmatched baseline jobs and record count.
  validation: One IDAS match per retained job.
- join_id: job_income_join
  left_source: idan_effect
  right_source: ind_effect
  keys:
  - left_field: PNR
    right_field: PNR
  - left_field: calendar_year
    right_field: calendar_year

```

```

cardinality: many_to_one
retained_side: left
unmatched_rule: Preserve job row with missing IND fields and apply registered missingness.
validation: At most one IND row per person-year.
- join_id: job_akm_join
  left_source: idan_effect
  right_source: akm_effect
  keys:
    - left_field: PNR
      right_field: PNR
    - left_field: calendar_year
      right_field: calendar_year
  cardinality: many_to_one
  retained_side: left
  unmatched_rule: Preserve job row with missing AKM fields and apply registered observability.
  validation: At most one AKM row per person-year.
variables:
- variable_id: closure_treatment
  role: treatment
  grain: person-stack
  source_ids:
    - idas_effect
  source_fields:
    - LBNR
    - calendar_year
  ordered_steps:
    - Merge the frozen gate classification by LBNR and cohort.
    - Set one for verified closures and zero for surviving comparators.
  temporal_rule: Fixed at cohort g and inherited from baseline workplace.
  missing_rule: Missing classification excludes the person-stack.
  output_type: boolean
  validation: Constant within baseline workplace-cohort.
- variable_id: adverse_destination_y2
  role: outcome
  grain: person-stack
  source_ids:
    - idan_effect
    - ind_effect
    - akm_effect
  source_fields:
    - PNR
    - calendar_year
    - DISCO_KODE
    - DISCO_MATCHPRIO_KODE
    - LOENTIMER
    - ANSDAGE_2008
    - SOC_STATUS_KODE
    - OMFANG

```

- BESKST13
- ordered_steps:**
 - Select principal +2 employee job by LOENTIMER descending ANSDAGE_2008 descending LBNR and
 - If no qualifying employee job but IND or AKM shows person-year observability set one.
 - If a job exists map skill using frozen codebook and set one for invalid code or post skill baseline skill otherwise zero.
 - If IDAN IND and AKM all lack a +2 person-year record set unobserved_exit and no outcome
- temporal_rule:** Compare g+2 principal job with frozen g-1 baseline skill.
- missing_rule:** Invalid occupation among observed jobs and observed nonemployment equal one if cross-source absence is missing and excluded.
- output_type:** boolean nullable only for total unobserved exit
- validation:** Every retained observed person-stack has exactly value zero or one.
- **variable_id:** baseline_covariates
 - role:** covariate
 - grain:** person-stack
 - source_ids:**
 - idan_effect
 - idas_effect
 - ind_effect
 - source_fields:**
 - LOENTIMER
 - DISCO_KODE
 - ANTNOV
 - AARSVRK
 - ARB_HOVED_BRA_DB07
 - KOM
 - ALDER_ULT_INK
 - ordered_steps:**
 - Construct age age-squared skill indicators log1p size and FTE industry municipality and
 - -1 hours and employment.
 - One-hot encode categorical levels on pooled pre-outcome risk set with the lexicographical
 - observed code as reference.
 - temporal_rule:** All values use g-3 through g-1 only.
 - missing_rule:** Missing any registered baseline covariate excludes the person-stack before
 - fitting.
 - output_type:** numeric design vector
 - validation:** No post-g values enter the vector and all columns are finite.
 - **variable_id:** overlap_weight
 - role:** weight
 - grain:** person-stack
 - source_ids:**
 - idan_effect
 - idas_effect
 - ind_effect
 - source_fields:**
 - PNR
 - LBNR
 - calendar_year

```

ordered_steps:
- Fit cohort logit of closure_treatment on baseline_covariates.
- Retain propensity 0.10 through 0.90 inclusive and set treated weight 1-p and control w
- Normalize weights within cohort-arm to sum to its unweighted retained count.
temporal_rule: Propensity uses baseline fields only.
missing_rule: Nonfinite propensity or weight excludes person-stack and is counted.
output_type: positive float
validation: Every retained weight is finite positive and propensity lies in closed inter
            to 0.90.
sample_flow:
- step_id: s01
  input_population: gate-passing incumbent rosters
  operation: Join baseline workplace and person fields and retain age 25-54 with valid bas
            groups 2-9.
  output_population: eligible_incumbents
  exclusion_record: Record exclusions by arm cohort and reason.
- step_id: s02
  input_population: eligible_incumbents
  operation: Require complete registered baseline covariates and at least two incumbents p
  output_population: complete_baseline_sample
  exclusion_record: Record missing-covariate and cluster-size exclusions.
- step_id: s03
  input_population: complete_baseline_sample
  operation: Fit cohort propensity logits and retain scores from 0.10 through 0.90.
  output_population: overlap_sample
  exclusion_record: Record trimming by arm cohort and workplace.
- step_id: s04
  input_population: overlap_sample
  operation: Construct -3 -2 and +2 outcomes with one rule and exclude total unobserved ex
  output_population: analytic_sample
  exclusion_record: Record unobserved exit by arm cohort and event time.
model:
  model_id: weighted_att
  equation_or_algorithm: Within each cohort g and time k in {-3,-2,+2}, fit weighted least
    
$$Y_{igk} = \alpha_{gk} + \tau_{gk} \cdot T_{ig} + X_i' \beta_{gk} + \text{error}$$

    using overlap_weight; aggregate t
    Primary target is tau_+2.
  target_statistic: aggregated_att_y2
  symbol_map:
  - symbol: Y_igk
    meaning: Adverse destination for person i cohort g event time k
    source_fields:
    - DISCO_KODE
    - DISCO_MATCHPRIO_KODE
    - LOENTIMER
    - ANSDAGE_2008
    - SOC_STATUS_KODE
    - OMFANG
    - BESKST13

```

```

    construction_variables:
      - adverse_destination_y2
- symbol: T_ig
  meaning: Verified closure treatment inherited from workplace
  source_fields:
    - LBNR
    - calendar_year
  construction_variables:
    - closure_treatment
- symbol: X_i
  meaning: Frozen pre-event adjustment vector
  source_fields:
    - LOENTIMER
    - DISCO_KODE
    - ANTNOV
    - AARSVRK
    - ARB_HOVED_BRA_DB07
    - KOM
    - ALDER_ULT_INK
  construction_variables:
    - baseline_covariates
- symbol: w_i
  meaning: Normalized cohort-arm overlap weight
  source_fields:
    - PNR
    - LBNR
    - calendar_year
  construction_variables:
    - overlap_weight
estimator_api: statsmodels.api.WLS with hasconst add_constant and numpy.linalg; propensity
weights: Registered normalized overlap_weight.
fixed_effects: Cohort-specific fitting makes cohort fixed effects implicit; categorical
  industry municipality and skill indicators enter X.
reference_levels: Comparator T=0; event-time diagnostics compare -3 and -2 to baseline c
  at -1; lexicographically first category is reference.
uncertainty: 9,999 Rademacher wild-bootstrap draws at baseline workplace, refitting outco
  but holding propensity scores and sample fixed; percentile-t interval.
clustering: Baseline workplace LBNR, shared across every person and event-time record fr
  workplace.
diagnostics:
  - absolute standardized mean difference <=0.10 for every covariate
  - effective control N >=100
  - at least 20 clusters per arm
  - absolute placebo ATT and simultaneous confidence bounds <=0.05
  - attrition difference <=0.05
actions:
- action_id: a01
  goal: Build the frozen eligible baseline panel.

```

```

consumes:
- idan_effect
- idas_effect
- ind_effect
- akm_effect
procedure:
- Load gate outputs and join source tables in registered order after key assertions.
- Apply sample steps s01 and s02 and write exclusion ledger before any +2 outcome summary.
produces:
- baseline_panel
assertions:
- One person-stack row and one baseline workplace cluster; no post-event outcome field is
on_failure:
  route: stop_experiment
  detail: Stop because baseline eligibility or joins are not reproducible.
- action_id: a02
goal: Fit propensity models and freeze overlap sample.
consumes:
- baseline_panel
procedure:
- For each of four cohorts fit the exact Logit formula and calculate propensities.
- Apply closed interval trim and normalized overlap weights then calculate balance effect
  size and cluster counts.
produces:
- design_diagnostics
assertions:
- Four propensity fits converge and all retained weights satisfy invariants.
on_failure:
  route: stop_experiment
  detail: Stop causal analysis; do not change model or trim bounds.
- action_id: a03
goal: Construct placebo and primary outcomes.
consumes:
- idan_effect
- ind_effect
- akm_effect
- baseline_panel
- design_diagnostics
procedure:
- Select principal jobs at -3 -2 and +2 with the same frozen rule and map skills.
- Apply observed nonemployment invalid-code and total-absence rules and write arm-cohort
  counts.
produces:
- analysis_panel
assertions:
- Every observed outcome is binary and construction is identical across arms and times.
on_failure:
  route: stop_experiment

```

```

    detail: Stop because the registered outcome cannot be constructed consistently.
- action_id: a04
  goal: Execute diagnostics and estimate the primary effect.
  consumes:
    - analysis_panel
    - design_diagnostics
  procedure:
    - Fit 12 cohort-time WLS models and aggregate -3 -2 and +2 ATTs by treated cohort counts
    - Run 9999 workplace-cluster wild-bootstrap repetitions and write estimates intervals p-
      pretrend and attrition fields.
  produces:
    - primary_effect
  assertions:
    - Twelve analytic fits and 119988 bootstrap refits complete; output contains every decis
  on_failure:
    route: stop_experiment
    detail: Mark result inconclusive and report the failed assertion without alternate inf
outputs:
- output_id: baseline_panel
  path: preregistration/run/baseline_panel.parquet
  format: parquet
  grain: person-stack
  fields:
    - PNR
    - cohort
    - LBNR
    - treatment
    - age
    - baseline_skill
    - covariate_vector
    - exclusion_code
  produced_by: a01
  consumers:
    - a02
- output_id: design_diagnostics
  path: preregistration/run/design_diagnostics.csv
  format: csv
  grain: cohort-covariate-and-arm
  fields:
    - cohort
    - arm
    - covariate
    - propensity
    - weight
    - smd
    - effective_n
    - cluster_count
    - convergence

```

```

produced_by: a02
consumers:
- a03
- design_fail
- effect_supports
- effect_small
- effect_inconclusive
- effect_reversal
- output_id: analysis_panel
path: preregistration/run/analysis_panel.parquet
format: parquet
grain: person-stack-event-time
fields:
- PNR
- cohort
- LBNR
- treatment
- event_time
- adverse_destination
- weight
- attrition_flag
produced_by: a03
consumers:
- a04
- output_id: primary_effect
path: preregistration/run/primary_effect.csv
format: csv
grain: target-statistic
fields:
- target
- estimate
- standard_error
- ci_low
- ci_high
- one_sided_p
- interval_half_width
- placebo_max_abs
- placebo_simultaneous_bound
- attrition_difference
- min_smd
- max_smd
- effective_control_n
- treated_clusters
- control_clusters
produced_by: a04
consumers:
- design_fail
- effect_supports

```

- effect_small
- effect_inconclusive
- effect_reversal

quality_control:

synthetic_dry_run: Generate four cohorts with known treatment effect 0.08, closures, surties, nonemployment, invalid codes, total absence, and clustered errors; require recovery and estimate within Monte Carlo tolerance 0.03.

invariant_checks:

- Treatment is constant within workplace-cohort.
- No forbidden post-treatment node enters X.
- Outcome is binary for observed persons.
- Fit and bootstrap counts reconcile.

reconciliation: Reconcile baseline exclusions to gate rosters, overlap exclusions to baseline and outcome attrition to analysis rows; require zero residual at each stage.

run_log: preregistration/run/effect.log

stop_conditions:

- Propensity nonconvergence
- overlap or balance failure
- fewer than 20 clusters per arm
- pretrend bound failure
- attrition difference above 0.05
- fit-count mismatch.

compute_plan:

fit_operations:

- operation_id: propensity_logits
 - calls_per_unit: 1
 - fitted_units: 4
 - repetitions: 1
 - total_fits: 4
 - justification: One propensity model for each cohort.
- operation_id: analytic_wls
 - calls_per_unit: 1
 - fitted_units: 12
 - repetitions: 1
 - total_fits: 12
 - justification: Four cohorts crossed with three event times.
- operation_id: wild_bootstrap_wls
 - calls_per_unit: 1
 - fitted_units: 12
 - repetitions: 9999
 - total_fits: 119988
 - justification: Refit every cohort-time WLS in each bootstrap draw.
- operation_id: robustness_unweighted_wls
 - calls_per_unit: 1
 - fitted_units: 4
 - repetitions: 1
 - total_fits: 4
 - justification: One non-primary unweighted +2 fit per cohort.

```

    full_data_passes: 4
    largest_intermediate: Person-stack-event-time analysis panel with three rows per retained
    feasibility_note: Four passes cover joins and baseline construction, propensity design, c
        construction, and estimation output.
decision_regions:
- decision_id: design_fail
  condition: max_smd > smd_limit OR effective_control_n < min_effective_control OR treated_c
    < min_clusters OR control_clusters < min_clusters OR placebo_max_abs > placebo_margin OR
    > placebo_margin OR attrition_difference > attrition_limit.
  parameters:
    - name: smd_limit
      value: 0.1
      unit: absolute standardized mean difference
      rationale: Frozen balance ceiling.
    - name: min_effective_control
      value: 100
      unit: effective workers
      rationale: Prevent extremely concentrated control weights.
    - name: min_clusters
      value: 20
      unit: workplaces per arm
      rationale: Frozen independent-cluster floor.
    - name: placebo_margin
      value: 0.05
      unit: probability points
      rationale: Same scale as the smallest effect of interest.
    - name: attrition_limit
      value: 0.05
      unit: absolute arm difference in proportion
      rationale: Limits differential total unobserved exit.
  interpretation: Conditional causal assumptions are not credible enough for an effect claim
  claim_status: feasibility_failure
- decision_id: effect_supports
  condition: All design gates pass AND estimate >= sei AND ci_low > 0 AND interval_half_width
  parameters:
    - name: sei
      value: 0.05
      unit: probability points
      rationale: Registered smallest effect of interest.
    - name: precision_limit
      value: 0.05
      unit: probability points
      rationale: Adequate prospective precision ceiling.
  interpretation: Supports a policy-relevant adverse causal effect in the overlap population
  claim_status: supports
- decision_id: effect_small
  condition: All design gates pass AND ci_low >= -equivalence_margin AND ci_high <= equivalen
  parameters:

```

- name: equivalence_margin
 - value: 0.05
 - unit: probability points
 - rationale: Effects wholly inside this interval are practically null-equivalent.
 - interpretation: Effect is null-equivalent at the registered margin.
 - claim_status: null_equivalent
- decision_id: effect_reversal
 - condition: All design gates pass AND ci_high < 0.
 - parameters:
 - name: zero_effect
 - value: 0
 - unit: probability points
 - rationale: Sign boundary for a precise reversal.
 - interpretation: Challenges the directional theory with a precise beneficial estimate.
 - claim_status: challenges
 - decision_id: effect_inconclusive
 - condition: All design gates pass and none of effect_supports effect_small or effect_reversal including positive estimates below sei or interval_half_width above precision_limit.
 - parameters:
 - name: sei
 - value: 0.05
 - unit: probability points
 - rationale: Registered smallest effect.
 - name: precision_limit
 - value: 0.05
 - unit: probability points
 - rationale: Registered precision ceiling.
 - interpretation: Direction or magnitude is not resolved; report estimate and interval without or null claim.
 - claim_status: inconclusive

experiment_graph:

entry_experiments:

 - exp_closure_gate

activations:

 - from: exp_closure_gate
 - on_decision: closure_pass
 - to: exp_measurement_gate
 - meaning: Verified collective assignment and minimum support activate occupation measurement
 - from: exp_measurement_gate
 - on_decision: measurement_pass
 - to: exp_effect
 - meaning: Valid frozen occupational measurement activates confirmatory estimation.

terminals:

 - from: exp_closure_gate
 - on_decision: closure_ambiguous
 - terminal_state: no_closure_claim
 - meaning: Identifier disappearance cannot establish genuine closure.
 - claim_ceiling: no_claim

- from: exp_closure_gate
 - on_decision: closure_insufficient
 - terminal_state: closure_feasibility_only
 - meaning: Report gate counts only and do not estimate effects.
 - claim_ceiling: feasibility_only
- from: exp_measurement_gate
 - on_decision: measurement_fail
 - terminal_state: occupation_infeasible
 - meaning: Do not substitute another outcome.
 - claim_ceiling: feasibility_only
- from: exp_effect
 - on_decision: design_fail
 - terminal_state: causal_design_failed
 - meaning: Report diagnostics only.
 - claim_ceiling: feasibility_only
- from: exp_effect
 - on_decision: effect_supports
 - terminal_state: adverse_effect_supported
 - meaning: Report conditional causal adverse effect.
 - claim_ceiling: causal
- from: exp_effect
 - on_decision: effect_small
 - terminal_state: effect_null_equivalent
 - meaning: Report conditional causal equivalence within margin.
 - claim_ceiling: causal
- from: exp_effect
 - on_decision: effect_reversal
 - terminal_state: directional_theory_challenged
 - meaning: Report conditional causal sign reversal.
 - claim_ceiling: causal
- from: exp_effect
 - on_decision: effect_inconclusive
 - terminal_state: effect_unresolved
 - meaning: Report estimate without affirmative or null claim.
 - claim_ceiling: causal

completion_rule: Stop at the first terminal reached; no downstream experiment runs after a failure and exp_effect decisions are evaluated with design_fail first then effect_supports effect_small and effect_inconclusive.

synthesis_worlds:

- world_id: world_invalid_closure
 - triggering_pattern: closure_ambiguous
 - substantive_interpretation: Authorized data cannot distinguish final closure from continuity
 - allowed_claim: No workplace-closure substantive claim.
 - next_research: Obtain authoritative restructuring data or documentation.
- world_id: world_infeasible
 - triggering_pattern: closure_insufficient OR measurement_fail OR design_fail
 - substantive_interpretation: Closure may be measurable but support measurement or identifying fail.

```

    allowed_claim: Feasibility and diagnostic results only.
    next_research: Seek broader cohorts or richer pre-treatment and continuity data under a new plan.
- world_id: world_adverse
  triggering_pattern: effect_supports
  substantive_interpretation: Closure raises adverse two-year destinations by a precise policy.
    amount.
    allowed_claim: Conditional causal effect in the registered overlap population.
    next_research: Study mechanisms and distributional heterogeneity under separate registrations.
- world_id: world_small
  triggering_pattern: effect_small
  substantive_interpretation: Any effect is smaller than the registered practical margin.
  allowed_claim: Conditional null-equivalence within plus or minus 0.05 probability points.
  next_research: Examine longer horizons with prospective power planning.
- world_id: world_reversal
  triggering_pattern: effect_reversal
  substantive_interpretation: Supported workers have a precisely lower adverse-destination probability
    after closure.
  allowed_claim: Conditional causal sign reversal that challenges the directional theory.
  next_research: Replicate and study compensating mobility under a new plan.
- world_id: world_unresolved
  triggering_pattern: effect_inconclusive
  substantive_interpretation: Data do not resolve direction magnitude or practical equivalence.
  allowed_claim: Estimate and interval only without affirmative or null conclusion.
  next_research: Increase independent closure clusters.
synthesis_resolution:
  selection: ordered_precedence
  precedence:
    - world_invalid_closure
    - world_infeasible
    - world_adverse
    - world_small
    - world_reversal
    - world_unresolved
  unmatched_action: Treat any unmatched output pattern as a validation failure and make no substantive
    claim.
multiplicity:
  families:
    - One confirmatory family containing only aggregated_att_y2 for adverse_destination_y2.
  correction: No multiplicity correction is needed for one primary statistic; pretrend diagnostic
    simultaneous via the registered bootstrap maximum statistic.
  reporting: Report the sole primary estimate interval and p-value; label placebo and unweighted
    diagnostic or robustness and prohibit decision substitution.
deviations:
  permitted:
    - Software patch-version changes required for security if API behavior is unchanged and syntactic
      pass
    - correction of typographical output labels that cannot affect rows or estimates.
  prohibited:

```

- Changing cohorts treatment outcome comparison unit horizon skill mapping thresholds weights estimator cluster level bootstrap repetitions decision precedence or claim ceiling after outcome
- substituting earnings health or survivor-only occupation outcomes after a failed gate.

disclosure: Log every deviation before execution where possible with timestamp reason affected outcome-access status and effect on interpretation; any prohibited deviation creates a new analysis and cannot be called confirmatory.