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Initial Size and the Persistence of Positive Bilateral Net Investment Positions

Evidence from Selected Economies along the Belt and Road

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Abstract: *The persistence of bilateral investment links is an important dimension of international investment stability, but the persistence of positive net positions and the influence of observation coverage warrant further examination. Using bilateral net direct investment positions for 66 selected economies over 2010–2024, this study constructs a sample of 1,315 entry events and 5,752 annual at-risk records and estimates discrete-time logit models. After controlling for entry characteristics, duration, and source- and destination-economy differences, initial size is negatively associated with the first nonpositive position. Within a restricted prediction sample, a doubling of initial size corresponds to an average decline of 1.31 percentage points in the predicted first-year probability of a nonpositive position. The direction of the association remains negative when only officially reported observations are used, although coverage affects whether persistence can be determined. The association between initial size and a halving of the position in the first year is not statistically significant. Larger initial positions are therefore associated with remaining positive, but this does not establish lower monetary volatility or a causal effect. Assessments of persistence should account for both the net-position definition and data coverage.*

Keywords: *bilateral investment positions; initial size; persistence of positive positions; discrete-time logit; data coverage*

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I. INTRODUCTION

International investment links differ in both size and persistence. Annual aggregates and network centrality describe the distribution of capital, but do not establish whether the position of a particular ordered economy pair remains positive over time. Shifting the unit of observation from an annual network to a bilateral spell can provide complementary evidence on the temporal evolution of investment links.

Bilateral net investment positions aggregate accounting relationships across multiple entities. A nonpositive position may reflect reverse investment, accumulated losses, or statistical adjustments [9], and cannot be equated directly with firm failure or project exit. This study therefore examines positive-position persistence: after an observed position changes from nonpositive to positive, how is its initial size associated with the first subsequent nonpositive observation? How do reporting sources and missing observations affect the identification of this association?

Using data for 66 selected economies over 2010–2024, the study estimates the conditional association between initial size and the endpoint of a positive spell through discrete-time logit models, comparing a specification that supplements official reports with mirror observations against an official-only specification. Its contribution is the reproducible construction of bilateral spells and a joint examination of entry-history classification, comparable samples, and observation coverage. It does not estimate a Belt and Road Initiative policy effect or claim that the size proposition or conventional fixed effects constitute a theoretical innovation.

II. LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

2.1 Investment networks and firm survival

Investment network research examines link structure and dependence. Bolívar et al. [1] study global FDI positions from a network perspective; Schoeneman et al. [2] examine reciprocity and transitive dependence; Zhao and Chen [3] investigate the evolution and resilience of the global FDI backbone network; and Li et al. [4] examine the formation and evolution of enterprise investment networks among development zones. These studies inform the analysis of changing links, but aggregate network properties do not replace the tracking of persistence at the individual-link level.

Firm-survival studies examine outcomes for individual businesses. Li [5] considers entry choices and foreign survival, while Yi et al. [6] investigate institutional distance and the survival of overseas subsidiaries. Their units of analysis differ from bilateral net positions, so firm-exit mechanisms cannot be applied directly to changes in the sign of a net position. This study draws on the duration perspective while retaining the distinction between accounting states and operating outcomes.

2.2 Trade duration and dynamic links

Besedeš and Prusa [7] study the duration of trade links, and Besedeš [8] relates initial transaction size and duration to search costs. Chen et al. [11] use discrete-time methods to examine export duration and its determinants. This literature provides a basis for considering an association between initial size and persistence, but annual trade flows and net investment positions have different economic meanings, requiring a separate empirical examination. Wei and Li [12] study the order in which firms enter markets, a concept distinct from a renewed positive position for the same economy pair.

Hess and Persson [10] discuss annual grouped observations and duration-model choice, providing a methodological basis for discrete-time estimation. Krivitsky and Handcock [13] distinguish link formation from persistence, motivating the construction of spell-level observations. This study does not estimate a network-generating model; it focuses on the positive state of bilateral net positions and the limits imposed by observation coverage.

III. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

Initial size may reflect the resources committed to an investment link and accumulated relationships. Drawing on search-cost and firm-survival research [5,8], larger positions may coexist with more extensive prior search, a greater capacity for continued investment, or deeper established relationships, and thus with longer positive spells. These are potential explanations; the accounting data do not directly identify the corresponding mechanisms.

Initial size and the spell endpoint also share a zero boundary. Given similar subsequent changes, a larger initial net position may be less likely to become nonpositive simply because it starts farther from zero. The observed association may therefore reflect both economic differences and a boundary component. The following hypothesis concerns a conditional association rather than a causal effect.

H1: Within observable positive-position spells, larger initial net investment positions are associated with lower conditional odds of the first nonpositive position, after controlling for entry characteristics, duration, and source- and destination-economy differences.

To assess the scope of H1, the analysis also considers whether the position falls to one-half or less of its initial value in the first year. This relative-contraction measure examines whether the size association extends to proportional monetary changes; it is not a separate mechanism hypothesis. A difference in statistical significance between the two outcomes does not establish a significant difference between their coefficients.

IV. RESEARCH DESIGN

4.1 Data and sample construction

The data are from the IMF Coordinated Direct Investment Survey (CDIS), covering 2010–2024 for China and 65 economies in the existing Belt and Road research framework (Appendix A). This is a fixed selection rather than an exhaustive set of participating economies or a policy-treatment group. The analysis uses outward net asset positions by immediate counterpart economy, covering all financial instruments and entities, in millions of US dollars, and excludes self-links. For each economy-pair-year cell, an available official report takes priority, including zero and negative values. Mirror observations supplement missing official reports only; the two sources are not added together.

An entry event requires observations in two consecutive years: the earlier position is nonpositive and the current position is positive. Links already positive in 2010, or positive after an unobserved preceding year, are not classified as new entries. An event is classified as the first confirmed positive entry within the observation window if every prior year is observed and none is positive; as reentry if a positive position was previously observed; and as having incomplete history if no prior positive value is observed but earlier years are missing. A first confirmed entry within the window is not necessarily the first investment in the pair's history.

Tracking begins in the year after entry and stops at the first nonpositive observation, the first missing observation, or the end of 2024. Each annual at-risk record requires a continuously observed positive history since entry and an observed current value. Missing observations are not coded as zero, and a spell is not resumed after a missing year. Becoming positive again after a nonpositive endpoint does not extend the original spell. Of 1,421 identified entries, 1,315 have usable follow-up, yielding 5,752 at-risk records and 570 nonpositive endpoints. The remaining 106 entries are not counted as successful persistence.

4.2 Variables and model

The dependent variable indicates the first nonpositive position in an at-risk year. The main explanatory variable is the natural logarithm of the positive entry-year position, without adding one. Controls cover entry history, a negative preceding position, the reporting source at entry, and a source switch at the entry boundary. Duration, entry-year, and economy-role effects are included as specified below. Table 1 defines the variables.

Table 1. Variable definitions

Variable	Definition and coding	Role or reference
Nonpositive endpoint event_nonpositive	1 if the current observed year is the first nonpositive position after a continuously positive observed history; 0 otherwise.	Outcome; missing years are not coded 0 or 1.
Initial size ln_initial_position	Natural logarithm of the positive entry-year net position (millions of USD); no addition of 1.	Main regressor; measured at entry only.
Reentry reentry	1 if an earlier positive position is observed before entry.	Reference: first confirmed positive entry within the window.
Incomplete history history_incomplete	1 if no prior positive position is observed but earlier years are missing.	Separate indicator; not treated as a first entry.
Previously negative previous_negative	1 if the preceding year is negative; 0 if zero.	Reference: zero; both adjacent years must be observed.
Mirror source at entry mirror_at_entry	1 for mirror supplementation in the entry year; 0 for an official report.	Reference: official; omitted in official-only models.
Source switch at entry source_switch_at_entry	1 if the official/mirror source category differs between the preceding and entry years.	Reference: no switch; always 0 in official-only models.
Duration and entry year duration_band / entry_year	Duration groups: 1, 2, 3, 4, and 5+ years; entry cohorts by year.	Indicators; references: duration 1 and entry year 2011.
Economy-role effects source_code / target_code	Separate indicators for source and destination economies.	Included by specification; not pair fixed effects.
Ordered-pair clustering dyad	Ordered combination of source and destination codes; reverse directions differ.	Inference clusters, not an additional regressor.

Note: The reference entry-history category is the first confirmed positive entry within the window. The reference duration is year 1 and the reference entry cohort is 2011. The ordered pair is used for clustering, not as an additional regressor.

The analysis uses discrete-time logit models. Let e denote an entry event, i and j its source and destination economies, c its entry year, d elapsed duration after entry, and W its positive entry-year position. R indicates membership in the observable risk set, and Y indicates the first nonpositive observation. The model is:

$$h_{ed} = \Pr(Y_{ed} = 1 \mid R_{ed} = 1, Z_e, W_e, i, j, c) \quad (1)$$

$$\log\left(\frac{h_{ed}}{1-h_{ed}}\right) = \alpha + \beta \ln W_e + \gamma' Z_e + \delta_{g(d)} + \lambda_c + \mu_i + \nu_j \quad (2)$$

Z contains entry characteristics, and g(d) groups duration into years 1, 2, 3, 4, and 5 or more. Entry-cohort and source- and destination-economy indicators are included; calendar-year effects are not added. Equation (2) is the model with both economy-role effects; other specifications omit these effects or include only one role. The conditional odds ratio associated with doubling initial size is:

$$\mathrm{OR}_2 = \exp(\beta \ln 2) \quad (3)$$

An odds ratio is not a probability change. To express the magnitude on a probability scale, the study also holds other covariates fixed and calculates the paired average difference between doubled-size and original-size prediction scenarios.

4.3 Estimation samples and inference

Comparisons of economy-role effects exclude 137 records and 3 endpoints associated with perfectly predicting economy groups. All four specifications are estimated on a common sample of 5,615 records, 1,288 entry events, and 971 ordered economy pairs. Standard errors are clustered by ordered pair, with two-way clustering by source and destination economy as a supplementary check. Economy-role effects are not pair fixed effects and do not account for all network dependence. The magnitudes of coefficients from different logit specifications cannot be compared directly as economic effects.

Sensitivity analyses use official reports only, compare history classifications on fixed common records, and examine relative contraction. The estimated probabilities are conditional on the observable risk set, and missingness may be selective. For three-year persistence, the lower bound is the number of confirmed continuously positive events divided by the number of calendar-eligible events; the upper bound also counts unresolved events as persistent. These bounds are not confidence intervals.

V. EMPIRICAL RESULTS

5.1 Persistence and initial-size groups

Among 1,073 entries during 2011–2021 with complete observations in the following three years, the proportions remaining continuously positive for one, two, and three years are 75.86%, 67.19%, and 61.32%, respectively. Among all 1,150 calendar-eligible entries, 658 are confirmed continuously positive for three years, 437 become nonpositive, and 55 have unresolved status. The resulting bounds on three-year persistence are 57.22%–62.00%. The complete-observation proportions and missingness bounds use different denominators and should not be conflated.

Grouping entries into initial-size quartiles, the lowest and highest groups in the original specification have first-year nonpositive proportions of 30.09% and 14.29%, and halving proportions of 33.74% and 26.44%. The corresponding official-only proportions are 29.09% and 11.82%, and 31.82% and 26.36% (Fig. 1). Some intermediate groups are not monotonic, and the group proportions are not adjusted for covariates.

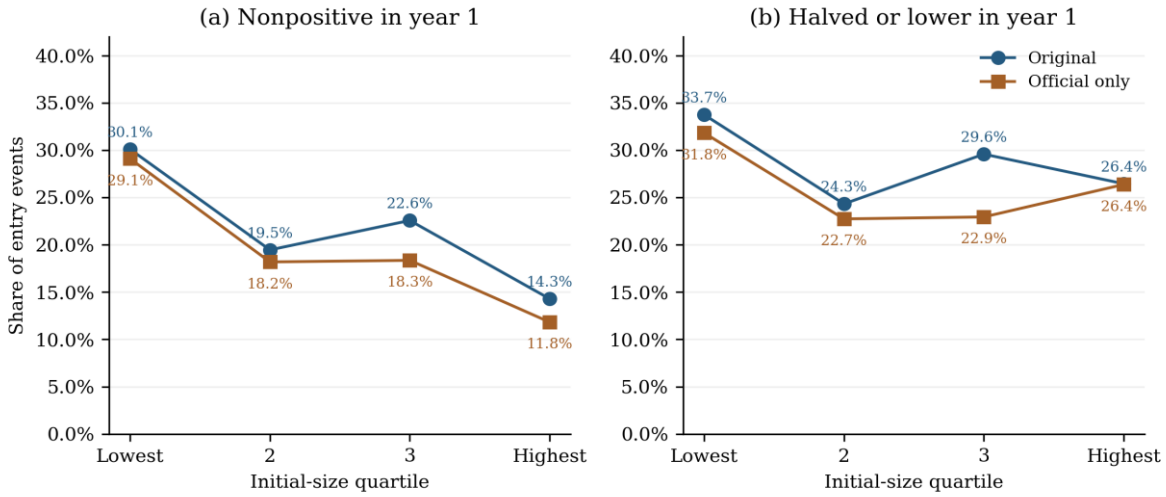


Fig. 1. First-year state proportions by initial-size quartile

Note: There are 1,315 entries in the original specification and 439 with official-only follow-up. Quartiles are formed separately within each sample. Halving means that the next-year position is no more than one-half of its initial value. Source: CDIS; author's calculations.

5.2 Baseline estimates and probability magnitudes

In the baseline model using all 5,752 records, the initial-size coefficient is −0.0681, with a clustered standard error of 0.0233. The coefficient is negative in all four common-sample specifications, reaching −0.1276 (SE = 0.0322) with both economy-role effects, consistent with H1 (Table 2). Doubling initial size corresponds to an odds ratio of 0.9153, with a 95% interval of 0.8761–0.9563. The p-value under two-way economy clustering is approximately 0.00138.

Table 2. Economy-role effects in the common sample

Variable or sample	Baseline	Source effects	Destination effects	Both effects
Log initial position	-0.0679	-0.0968	-0.0905	-0.1276
Pair-clustered SE	(0.0235)	(0.0269)	(0.0264)	(0.0322)
At-risk annual records	5615	5615	5615	5615
Entry events	1288	1288	1288	1288
Nonpositive endpoints	567	567	567	567

Note: The outcome is the first nonpositive position. All columns control for entry characteristics, duration, and entry year. SE denotes the standard error clustered by ordered economy pair.

Of the 1,288 common-sample events, 1,124 are retained for prediction because the doubled position remains within the observed ranges for the source and destination roles separately. The average predicted first-year probability changes from 22.50% to 21.19%, giving a paired difference of −1.31 percentage points and a 95% interval of −1.95 to −0.67 percentage points (Fig. 2). This is a probability-scale expression of the existing model, not independent robustness evidence. The separate role-range restriction does not guarantee joint common support.

5.3 Reporting-source and coverage sensitivity

Removing mirror supplementation yields 473 official-only entries, of which 439 have follow-up, producing 1,900 annual records and 163 endpoints. The baseline size coefficient is −0.1258 (SE = 0.0361). Excluding a further 279 records and 2 endpoints associated with perfectly predicting groups gives a common sample of 1,621 records; the coefficient with both economy-role effects is −0.3641 (Table 3). Its direction agrees with the original specification. However, this model estimates 96 parameters from only 161 endpoints, raising substantial finite-sample concerns. The larger absolute coefficient cannot be interpreted as a stronger economic association.

Table 3. Sensitivity analysis using official reports only

Variable or sample	All official records: baseline	Common official sample: baseline	Common official sample: both effects
Log initial position	-0.1258	-0.1012	-0.3641
Pair-clustered SE	(0.0361)	(0.0380)	(0.0781)
At-risk annual records	1900	1621	1621
Entry events	439	376	376
Nonpositive endpoints	163	161	161
Parameters	21	21	96

Note: Entry characteristics, duration, and entry year are controlled for. Mirror-source and source-switch indicators are identically zero in this sample and are omitted. Sample coverage and economy-effect specifications differ across columns.

The 1,900 records common to the two reporting specifications have identical position values and current-year endpoint indicators, but differ in earlier coverage. Fourteen events previously classified as first confirmed positive entries and 42 classified as reentries become events with incomplete history. Holding the same 1,621 regression records fixed, the size coefficient remains negative under either history classification. Thus, classification changes alone do not explain its direction, although selective observation remains possible.

For the same 392 official entry events eligible for three-year follow-up by calendar time, 13 have unresolved status in the original specification and 35 in the official-only specification. The bounds on three-year persistence widen from 62.76%–66.07% to 58.42%–67.35%. Reduced coverage makes states harder to determine; newly unresolved cases should not be interpreted as investment exits.

5.4 Relative contraction and interpretive limits

Among the same 1,315 events with first-year observations, nonpositive positions and halving occur in 284 and 375 cases, respectively. Controlling for entry year and entry characteristics, without economy-role effects, the size coefficients are −0.0966 (p = 0.0010) and −0.0328 (p = 0.1553). In the 439-event official-only sample, the corresponding estimates are −0.1559 (p = 0.0034) and −0.0551 (p = 0.2279). A nonsignificant halving coefficient does not establish a zero association, nor does the contrast in significance establish that the two coefficients differ significantly.

Excluding the single entry with an initial value no greater than 10^{-8} million US dollars leaves the first-year nonpositive coefficient negative at −0.1156, but does not eliminate the zero-boundary explanation. In first-year prediction scenarios, the average nonpositive and halving probability differences are −1.09 and −0.45 percentage points in the original specification and −1.60 and −0.70 percentage points with official reports only. Both halving intervals include zero.

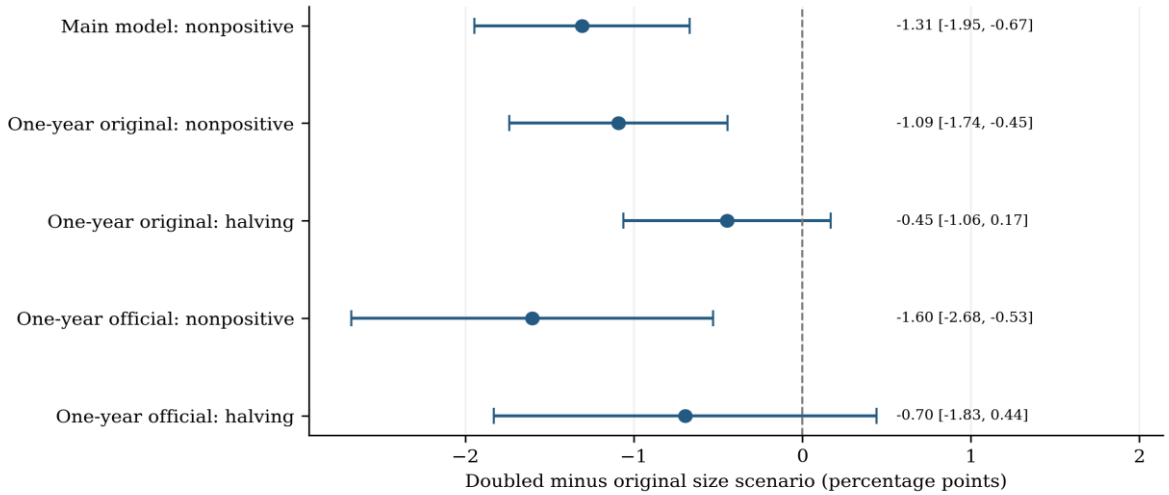


Fig. 2. Predicted probability differences under a doubling of initial size

Note: Points are paired average differences between doubled-size and original-size scenarios; bars are 95% delta-method intervals with ordered-pair clustering. Prediction samples comprise 1,124 events for the main model, 1,143 for the original one-year models, and 332 for the official-only one-year models. Within each one-year reporting specification, both outcomes use the same prediction cohort. Other covariates are fixed. The scenario differences are not causal effects. Source: CDIS; author's calculations.

VI. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Within observable positive-position spells with estimable support in the selected economies, initial size is negatively associated with the first nonpositive state. This direction persists after controlling for economy-role differences and restricting the data to official reports. The first-year probability difference in the restricted prediction sample is approximately −1.31 percentage points. Reporting coverage also changes entry-history classifications and the ability to determine persistence, so the size association must be interpreted alongside sample comparability.

The continuous log-size association with relative halving is not statistically significant. The evidence therefore does not justify equating fewer crossings of zero with lower monetary volatility. The zero-boundary component, unobserved bilateral differences, and selective missingness remain unresolved, while the many-parameter official-only model is vulnerable to finite-sample bias. The findings do not identify causal effects on size expansion, firm survival, or the Belt and Road Initiative.

6.2 Practical implications and future research

Investment monitoring should report changes in the sign of net positions, relative monetary contraction, and observation interruptions separately, without coding missing observations as zero or treating a nonpositive position as firm failure. Cross-economy comparisons should disclose official and mirror sources, supplementation rules, and unresolved-state proportions, and conduct sensitivity analyses on comparable samples. Investment decisions should draw on business performance, project progress, and valuation information to establish why positions change. The present findings do not support a recommendation simply to increase initial investment amounts.

Future research could use more detailed bilateral and valuation information to distinguish zero-boundary factors from continued-investment mechanisms and examine the selectivity of observation interruptions. Such work could improve both the interpretation and applicability of the findings.

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APPENDIX A. STUDY ECONOMIES

The fixed framework contains 66 economies, 4,290 potential ordered pairs, and 64,350 economy-pair-year cells; these are not regression sample sizes. The original model with both economy-role effects covers 65 source and 60 destination economies and estimates 146 parameters. The official-only common sample covers 22 source and 55 destination economies and estimates 96 parameters. The list does not define a policy-treatment group. Codes follow the input data; PSE denotes Palestine. An economy without an estimable role record remains part of the 66-economy framework.

Table A1. Selected economies and input codes

Code	Economy	Code	Economy	Code	Economy
AFG	Afghanistan	IND	India	OMN	Oman
ALB	Albania	IRN	Iran	PAK	Pakistan
ARE	United Arab Emirates	IRQ	Iraq	PHL	Philippines
ARM	Armenia	ISR	Israel	POL	Poland
AZE	Azerbaijan	JOR	Jordan	PSE	Palestine
BGD	Bangladesh	KAZ	Kazakhstan	QAT	Qatar
BGR	Bulgaria	KGZ	Kyrgyzstan	ROU	Romania
BHR	Bahrain	KHM	Cambodia	RUS	Russia
BIH	Bosnia and Herzegovina	KWT	Kuwait	SAU	Saudi Arabia
BLR	Belarus	LAO	Lao PDR	SGP	Singapore
BRN	Brunei	LBN	Lebanon	SRB	Serbia
BTN	Bhutan	LKA	Sri Lanka	SVK	Slovakia
CHN	China	LTU	Lithuania	SVN	Slovenia
CYP	Cyprus	LVA	Latvia	SYR	Syria
CZE	Czechia	MDA	Moldova	THA	Thailand
EGY	Egypt	MDV	Maldives	TJK	Tajikistan
EST	Estonia	MKD	North Macedonia	TKM	Turkmenistan
GEO	Georgia	MMR	Myanmar	TUR	Türkiye
GRC	Greece	MNE	Montenegro	UKR	Ukraine
HRV	Croatia	MNG	Mongolia	UZB	Uzbekistan
HUN	Hungary	MYS	Malaysia	VNM	Viet Nam
IDN	Indonesia	NPL	Nepal	YEM	Yemen