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GEOPOLITICAL ALIGNMENT AND TRADE REROUTING THROUGH ECONOMIES OUTSIDE MAJOR BLOCS

Kannan Vishwanath* & Lloyd Zulu**
* Fellow, Albert Schweitzer International Foundation, Karl-Löwe-Gasse 22/12, A-1120 Wien, Vienna, Austria
** World Christian University, Lusaka, Zambia

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Abstract:

This study examines whether changes in trade with a major exporting economy reflect competitive displacement or synchronized expansion among alternative suppliers in global markets. Using monthly United States merchandise trade data for China and seven intermediary economies from 2010 to 2021, the analysis applies ordinary least squares panel regressions with economy fixed effects, seasonal controls, a linear time trend, and dependence adjusted inference. The findings reveal a positive association between Chinese import growth and intermediary export growth ($\beta = 0.323$, $p < 0.001$), while relationships involving trade scale and preceding variability lack statistical significance in baseline estimates. The positive growth association remains robust to alternative temporal specifications, common sample restrictions, and individual economy exclusions. This pattern is consistent with shared destination market demand rather than uniform supplier displacement, although the underlying transmission mechanisms are not causally identified. The study refines trade diversion frameworks by distinguishing synchronized commercial expansion from changes in established trade relationships. These findings support demand sensitive sourcing strategies and more cautious policy assessments of international trade restructuring.

Key Words: International Trade Restructuring; Trade Diversion; Export Growth; Global Trade Integration; Panel Data Analysis.

1. Introduction:

International trade integration creates a fundamental tension between market diversification and shared exposure to global demand fluctuations. Although expanding participation in international markets offers exporting economies opportunities to increase sales, strengthen industrial competitiveness and diversify commercial relationships, these benefits depend on how changes in major trading relationships influence other suppliers serving the same destination. This tension is particularly important in the United States market, where China and other exporting economies compete for import expenditure while responding to common purchasing conditions. The central question is whether changes in United States imports from China are associated with corresponding changes in exports from economies outside the principal geopolitical blocs, and whether these relationships differ according to trade scale, growth and variability. Conventional interpretations of trade diversion emphasize opportunities arising when buyers substitute suppliers in response to trade barriers. However, international trade theory also recognizes that expanding destination expenditure can increase purchases from competing suppliers simultaneously (Arkolakis et al., 2012; Eaton et al., 2016). Distinguishing these explanations matters because rising exports from alternative sourcing economies do not necessarily indicate displacement of Chinese shipments, geopolitical realignment or relocation of productive activity. Establishing the observable relationships among these trade dimensions is therefore essential for interpreting changes in international commercial integration without attributing aggregate trade movements to mechanisms that the available evidence cannot identify.

The magnitude and variability of the commercial relationships involved make this distinction economically consequential. United States Census Bureau merchandise trade records covering January 2010 to December 2021 indicate that monthly United States imports from China averaged USD 38,014.26 million across 144 observations, with recorded values ranging from USD 19,638.10 million to USD 52,081.10 million. Over the same observation period, monthly United States imports from Brazil, India, Indonesia, Malaysia, South Africa, Thailand and Vietnam averaged USD 2,562.83 million per economy-month, while annual growth in these imports averaged 9.31%, with a standard deviation of 19.37 percentage points (U.S. Census Bureau, n.d.). These statistics describe the selected economies and observation periods rather than the global distribution of merchandise trade. Nevertheless, they demonstrate that the selected suppliers operated within a substantial destination market characterized by pronounced variation in export expansion. Such variation matters for governments evaluating export competitiveness, firms assessing alternative sourcing locations and institutions interpreting bilateral trade developments. The relevant economic question is not simply whether alternative exporters gain market access, but whether their observed performance reflects common destination-market conditions or patterns consistent with competitive substitution. This distinction is especially important when aggregate trade values are used to inform decisions about commercial diversification and exposure to external demand.

International trade theory provides competing explanations for the relationship between Chinese shipments and the export performance of other economies supplying the United States. Arkolakis et al. (2012) establish how trade responses depend on expenditure allocation and trade responsiveness, implying that changes in destination expenditure can influence multiple foreign suppliers. Eaton et al. (2016) further demonstrate the importance of expenditure composition in explaining international trade movements during major economic disruptions. Together, these contributions support a common-demand interpretation under which expanding United States purchases from China may coincide with greater imports from other exporting economies. However, when destination expenditure is constrained, changes in relative prices, trade costs or supplier competitiveness may instead redistribute purchases across origins. Fajgelbaum et al. (2020) show that protectionist trade interventions generate economically important changes in trade flows and welfare, while Amiti et al. (2019) document price effects associated with United States tariff increases. These studies establish that trade policy can influence purchasing conditions and sourcing decisions, but their findings do not imply that every increase in imports from alternative suppliers represents displacement of Chinese exports. The theoretical implication is that the relationship between Chinese trade scale and intermediary export values is ambiguous before estimation: common expenditure expansion predicts positive comovement, whereas competitive substitution may generate an opposing relationship.

Trade growth provides a complementary perspective because changes in commercial momentum need not reproduce relationships observed in trade levels. Bems et al. (2013) identify expenditure adjustment and inventory dynamics as central explanations for fluctuations in international trade, demonstrating why changes in aggregate demand can generate substantial movements in cross-border transactions. Alessandria et al. (2010) similarly establish that inventory holdings, ordering costs and shipment adjustments influence import dynamics, while Eaton et al. (2016) show how expenditure composition contributes to aggregate trade fluctuations. These mechanisms suggest that faster growth in United States imports from China may accompany faster export growth among other suppliers when purchasing expansion affects several origins simultaneously. Conversely, trade-cost changes may redirect purchases between suppliers, generating divergent growth trajectories even when total import demand remains comparatively stable. The distinction between trade levels and growth is therefore analytically important: a relationship between the size of bilateral trade flows does not necessarily establish an equivalent relationship between their rates of expansion. By examining annual growth in monthly merchandise imports alongside logarithmic trade values, the present study distinguishes proportional commercial expansion from differences in the scale of established trading relationships.

Trade variability introduces a third dimension through which commercial instability may be associated with export performance. Handley and Limão (2017) demonstrate that trade policy uncertainty can affect investment and international commercial activity, while Novy and Taylor (2020) explain how uncertainty can influence trade through inventory adjustment and changes in foreign orders. These findings suggest that unstable trading conditions may coincide with weaker export expansion when importers delay commitments or reduce purchasing activity. Nevertheless, fluctuations in observed trade values are not equivalent to policy uncertainty. Realized shipment variability may reflect demand changes, seasonal disturbances, inventory adjustments, price movements or supplier-specific conditions without identifying their underlying causes. Moreover, instability in purchases from China could accompany either broader import restraint or increased purchases from alternative suppliers. The direction of the relationship between preceding Chinese trade variability and subsequent intermediary export growth therefore remains an empirical question. Measuring variability through the standard deviation of Chinese monthly import growth over the preceding twelve months permits an assessment of whether observed instability predicts weaker export growth, without treating this measure as direct evidence of geopolitical uncertainty or trade-policy exposure.

A further conceptual distinction concerns the meaning of export performance itself. Aggregate merchandise exports can be evaluated through transaction values, proportional growth, domestic value added or participation in international production networks, but these measures capture different economic phenomena. Johnson and Noguera (2012) demonstrate the importance of distinguishing gross trade from value-added trade, while Koopman et al. (2014) explain how internationally fragmented production can create double counting in conventional gross export statistics. Antràs (2020) further clarifies that alternative concepts of global value chain participation require different measurement approaches. Consequently, increased merchandise exports to the United States cannot independently establish domestic production relocation, changes in ownership arrangements or the origin of embodied value added. The present study defines export performance narrowly through United States merchandise imports from each selected economy, measured as nominal monthly values and annual percentage growth in corresponding monthly values. This approach provides observable and consistently defined commercial outcomes across the seven economies. Its interpretive strength lies in separating export scale from export expansion, while its boundary is that nominal border values combine price and quantity movements and do not trace production stages or the ultimate origin of traded content.

The closest empirical research illustrates why these measurement boundaries matter for interpreting geopolitical trade developments. Fajgelbaum et al. (2020) investigate the consequences of protectionist

interventions, while Amiti et al. (2019) identify changes in prices and welfare associated with tariff increases. Flaaen et al. (2020), examining washing machines, provide product-specific evidence of production relocation and price responses following United States trade interventions. These contributions demonstrate that trade-policy changes can alter sourcing incentives and production decisions, but they operate at different levels of observation and identify outcomes that cannot automatically be inferred from aggregate country-level trade values. Conversely, the macroeconomic trade literature emphasizes expenditure transmission and inventory adjustment without necessarily distinguishing whether alternative suppliers exhibit similar relationships across trade levels, growth rates and preceding variability (Bems et al., 2013; Eaton et al., 2016). The reviewed evidence therefore does not establish whether these three dimensions of United States-China merchandise trade exhibit comparable associations with the export performance of a common set of alternative suppliers over an extended monthly observation period. Addressing this distinction contributes to the interpretation of trade restructuring by separating observable market comovement from claims about trade diversion and production relocation.

The empirical setting consists of Brazil, India, Indonesia, Malaysia, South Africa, Thailand and Vietnam, with China serving as the common comparator in the United States import market. These seven economies provide geographically diverse observations of export performance within a shared destination market, allowing relationships to be examined across suppliers with different established export scales. The setting is informative because all outcome economies face the same destination market while their observed trade values and growth rates differ. However, the sample is purposively selected and does not represent a probability sample of all economies outside major geopolitical blocs. Nor does the analysis classify geopolitical alignment or estimate the effects of bloc membership. Its international relevance instead derives from examining whether trade relationships commonly interpreted through competitive displacement also exhibit patterns consistent with shared purchasing conditions. The resulting evidence may inform the interpretation of trade movements in other destination markets, although direct transferability depends on differences in market structure, product composition and institutional arrangements.

The study uses monthly United States Census Bureau merchandise trade records from January 2010 to December 2021, comprising 1,008 economy-month observations across the seven outcome economies and 144 distinct monthly observations for China. Separate specifications examine the association between logarithmic Chinese import values and intermediary export values, annual growth in Chinese imports and intermediary export growth, and preceding Chinese trade variability and intermediary export growth. The corresponding estimation samples contain 1,008, 924 and 917 economy-month observations because growth and preceding variability require historical observations for their construction. Ordinary least squares specifications incorporate economy effects, calendar-month indicators and a common linear time trend, with inference adjusted for contemporaneous dependence and serial correlation using Bartlett-weighted monthly score aggregation. This design distinguishes relationships across alternative dimensions of trade while accounting for persistent differences among exporters and recurring seasonal patterns. Because the Chinese explanatory measures are common to all seven outcome economies in each month, identification of their coefficients relies on temporal variation rather than independent country-specific exposure. The analysis consequently estimates conditional associations and does not identify the causal effects of Chinese trade, geopolitical alignment or trade-policy interventions.

The empirical findings reinforce the importance of distinguishing these relationships. The baseline estimates identify a positive association between Chinese import growth and intermediary export growth, with a coefficient of 0.323 and a two-sided significance level below 0.001. This relationship remains positive under the implemented alternative trend specifications, common-sample restriction and individual-economy exclusions. In contrast, the baseline associations involving Chinese trade scale and preceding trade variability are not statistically distinguishable from zero at the 5% level and exhibit greater sensitivity to specification choices. These findings contribute to the literature by demonstrating that the empirical interpretation of trade relationships depends on whether commercial exposure is measured through levels, expansion rates or realized instability. In particular, positive export-growth comovement is consistent with shared destination-market purchasing conditions and does not independently establish supplier displacement. The contribution therefore qualifies interpretations that infer trade rerouting directly from rising exports among alternative suppliers, while preserving the possibility that product-specific substitution and aggregate growth comovement occur simultaneously.

This study aims to examine how the scale, growth and preceding variability of United States imports from China are associated with export performance among seven selected intermediary economies. The central research question is: To what extent do Chinese trade scale, trade growth and preceding trade variability exhibit distinct conditional associations with the export values and export growth of alternative suppliers serving the United States market? Specifically, the study evaluates the relationship between Chinese import scale and intermediary export values, examines the association between Chinese import growth and intermediary export growth, and assesses whether preceding Chinese trade variability is associated with subsequent intermediary

export growth. By testing these relationships within a common empirical setting, the analysis provides an evidence-based distinction between synchronized trade expansion and relationships potentially consistent with supplier substitution, without claiming to identify the underlying causal channels. The remainder of the article presents the research hypotheses in Section 2, the data in Section 3, and the methods in Section 4. Section 5 presents and interprets the findings, Section 6 discusses their significance, and Section 7 sets out the conclusions and implications.

2. Theory, Conceptual Framework and Hypotheses Development:

This analysis examines how trade between the United States and China relates to export performance across seven intermediary economies during 2010 to 2020. The theoretical foundation combines international trade models, expenditure transmission and inventory adjustment. Arkolakis et al. (2012) connect trade outcomes to expenditure allocation, trade responsiveness and market structure. This framework allows exporters serving the same destination to benefit from expanding demand while competing for buyers' expenditure. Trade scale, trade growth and trade variability therefore represent distinct observed dimensions of the commercial environment.

The dependent variable is export performance in the United States market, measured through United States merchandise imports from Vietnam, India, Indonesia, Malaysia, Thailand, Brazil and South Africa. Monthly export value measures sales levels, while annual growth in monthly exports measures expansion relative to the corresponding month one year earlier. The explanatory measures derive from United States imports from China. These measures capture trade relationships without assuming that observed export changes establish trade rerouting.

Trade scale represents the value of United States imports from China. Larger flows may accompany stronger expenditure on imported goods, creating opportunities for suppliers across several economies. Under this mechanism, intermediary exports increase alongside Chinese exports because buyers expand purchases across foreign suppliers.

Competition provides an opposing mechanism. When expenditure remains constrained, greater purchases from China may displace purchases from other exporters. The expected association depends on whether common expenditure expansion outweighs supplier substitution.

Eaton et al. (2016) demonstrate that changes in expenditure composition explain substantial movements in international trade. Their findings support common purchasing conditions as a plausible source of export comovement. The framework therefore predicts a positive association between Chinese and intermediary export values, conditional on persistent differences between economies, recurring monthly patterns and a common time trend.

H1: Higher monthly United States imports from China are associated with higher monthly export values from intermediary economies to the United States.

Trade growth captures purchasing momentum rather than the existing scale of exchange. Faster growth in United States imports from China may accompany expanding demand for internationally supplied goods. Intermediary exporters can benefit when buyers increase orders across several sourcing locations.

Bems et al. (2013) identify expenditure changes and inventory adjustment as central explanations for international trade fluctuations. Their evidence supports a positive association between growth in Chinese shipments and growth in intermediary shipments when common purchasing conditions dominate. Export growth provides the relevant outcome because it separates expansion rates from differences in initial export size.

Trade substitution provides a competing prediction. Fajgelbaum et al. (2020) document substantial reductions in affected imports and exports following tariff increases. Their findings show that trade movements can reflect changing trade costs rather than destination expenditure alone. A positive growth association would support the common demand prediction, while a negative association would be consistent with substitution without independently establishing its cause.

H2: Faster growth in monthly United States imports from China is associated with faster growth in intermediary economies' monthly exports to the United States.

Trade variability represents instability in observed purchasing flows. The proposed measure is the rolling standard deviation of monthly growth in United States imports from China over the preceding twelve months. This measure captures realised fluctuations rather than directly measuring policy uncertainty.

The theoretical mechanism operates through ordering commitments and inventory decisions. Unstable purchasing conditions may encourage buyers to postpone replenishment or reduce commercial commitments. Handley and Limão (2017) show that policy uncertainty can discourage investments supporting international trade. Their evidence provides a basis for delayed commitments, although trade variability alone does not identify uncertainty or its source.

Novy and Taylor (2020) connect uncertainty shocks to inventory adjustment and disproportionate reductions in foreign input orders. Applied to the proposed relationship, this mechanism predicts weaker intermediary export growth when unstable purchasing conditions accompany broader order restraint. Supplier

switching offers an opposing prediction because disruptions affecting Chinese shipments may create opportunities for other exporters.

H3: Greater variability in United States imports from China over the preceding twelve months is associated with slower subsequent monthly export growth among intermediary economies.

The conceptual framework links trade scale to export value, trade growth to export growth, and preceding trade variability to subsequent export growth. These relationships represent theoretical associations rather than identified causal effects. Separate specifications distinguish the three relationships using economy effects, calendar month effects and a common time trend. Because the Chinese trade indicators are shared across intermediary economies within each month, statistical inference must account for contemporaneous dependence and serial correlation. The proposed hypotheses permit positive, negative or statistically inconclusive estimates without changing the theoretical expectations after examining the results.

3. Data:

This analysis documents the source records, sample construction, variable definitions and estimation procedures used to examine trade relationships. The resulting panel links observed export performance across seven economies to the scale, growth and variability of United States imports from China.

3.1 Data Sources, Population, and Sample Construction:

The data originate from the United States Census Bureau collection, U.S. Trade in Goods by Country. The source tables report monthly merchandise exports, imports and trade balances in nominal United States dollars, expressed in millions and not seasonally adjusted. The workbook contains 1,152 monthly records and 96 published annual records covering January 2010 to December 2021. These values are transaction flows during each reporting period, rather than stocks or period averages. The annual records support reconciliation; the monthly records support estimation.

The source identifiers are Brazil 3510, China 5700, India 5330, Indonesia 5600, Malaysia 5570, South Africa 7910, Thailand 5490 and Vietnam 5520. Each identifier corresponds to a Census country balance page. Exact source URLs accompany the records. The tables are publicly accessible aggregate statistics, with no confidential establishment records used. The online pages do not provide an immutable release number. Retrieval metadata remain recorded in the source workbook and are distinct from the observation period.

The target population comprises merchandise exporters supplying the United States market. The accessible frame is narrower: the eight economies represented in the supplied workbook. Seven economies form the outcome panel, while China supplies the common explanatory series. Selection is purposive and does not establish representativeness of all economies outside major blocs. No verified population count beyond the accessible frame is asserted.

The unit of analysis is an exporting economy observed in a calendar month. Export performance is measured from the importing country's perspective through United States imports from each selected economy. The panel covers Brazil, India, Indonesia, Malaysia, South Africa, Thailand and Vietnam, with 144 observations per economy.

Gross trade values measure border transactions rather than domestic value added, a distinction established by Johnson and Noguera (2012) and Koopman et al. (2014). Their interpretation also differs from the production accounting developed by Timmer et al. (2015), the firm relationships reviewed by Bernard et al. (2012), and the ownership arrangements examined by Antràs and Chor (2013). Accordingly, the empirical population is defined through observed merchandise flows, without treating country totals as evidence of specific production or ownership linkages.

Table 1: Sample construction

Stage	Units	Observations	Reason or Rule
Accessible monthly workbook frame	8 economies	1,152	Complete monthly records during the observation period
China removed from the outcome panel	1 comparator economy	144 comparator records	Retained separately to construct explanatory variables
Merged and checked outcome panel	7 economies	1,008	China series matched to each outcome economy by month
H1 estimation sample	7 economies	1,008	Positive export and comparator values permit logarithms
H2 estimation sample	7 economies	924	First twelve months per economy excluded when constructing annual growth
H3 estimation sample	7 economies	917	First thirteen months per economy excluded when constructing preceding twelve month variability
Common sample sensitivity analysis	7 economies	917	Observations with all baseline variables available

Each model retains the same seven economies. Differences in observation counts arise from transformation requirements rather than source missingness or the removal of poorly performing exporters. The resulting panels remain balanced within their respective estimation windows.

3.2 Data Integration, Cleaning, and Quality Assurance:

The monthly records were organised with one observation per economy, year and month. Economy names were mapped to ISO3 identifiers, and the combination of ISO3, year and month formed the unique source key. This organisation follows the separation of observations, variables and identifiers advocated by Wickham (2014) and the spreadsheet documentation principles described by Broman and Woo (2018).

The China series was joined to the seven outcome economies using the calendar month as a many to one merge key. The merge retained exactly 1,008 outcome observations, produced no unmatched records and introduced no unexpected increase in observations. Rechecking the supplied workbook identified no duplicate source keys or missing values in monthly exports, imports or published balances.

All values retain the source currency and scale. No exchange rate conversion, inflation adjustment or fiscal calendar conversion was applied. Monthly values were summed solely to compare them with published annual totals. Across the 96 economy and year combinations, the largest absolute discrepancy was USD 0.3 million. Monthly published balances differed from the subtraction of displayed exports and imports by at most USD 0.1 million. These discrepancies are consistent with the precision of the published tables.

Source values and structurally unavailable transformations were treated separately. Annual growth is unavailable during the first twelve months, while preceding variability requires thirteen initial months of source history. No missing value was replaced with zero, and no interpolation or imputation was applied. This distinction follows the missing data principles discussed by Little and Rubin (2019).

Extreme annual growth observations were flagged within each economy when their distance from the median exceeded three times the median absolute deviation multiplied by 1.4826. The median based screen follows the reasoning of Leys et al. (2013). It flagged 33 observations, all of which were retained. The screen identified unusual movements rather than establishing reporting errors. No winsorisation, trimming or replacement was performed.

The analysis preserves the historical values contained in the workbook rather than reconstructing successive publication vintages. Consequently, explanatory timing refers to the economic observation month, not the date when information became publicly available. The raw records, transformations, checks and estimation outputs are retained separately, supporting the computational traceability advocated by Peng (2011).

3.3 Variable Measurement, Construction, and Validation:

The framework uses observed trade values and transparent transformations. Trade scale captures the level of United States imports from China, while trade growth captures changes relative to the corresponding month one year earlier. Distinguishing levels from expansion rates reflects the expenditure mechanisms discussed by Arkolakis et al. (2012), Eaton et al. (2016), and Bems et al. (2013).

Trade variability measures realised fluctuations in Chinese shipments to the United States. Novy and Taylor (2020) provide an inventory adjustment mechanism linking unstable conditions to trade movements, while Handley and Limão (2017) distinguish policy uncertainty from realised commercial outcomes. Accordingly, the variability indicator is interpreted as observed trade instability rather than a direct measure of geopolitical alignment or policy uncertainty. Equation 1 defines the implemented growth transformation.

$$g_{Z,t}^{[d]} = 100\left[\frac{Z_t}{Z_{t-d}} - 1\right]$$

Here, Z_t denotes either an economy's monthly exports to the United States or United States monthly imports from China. The symbol t identifies the calendar month. The interval d equals twelve for annual growth in monthly values and one for monthly growth. Growth is expressed as a percentage.

Equation 2 defines the preceding variability measure.

$$V_t = \sqrt{\frac{1}{11}\sum_{j=1}^{12}\left[m_{t-j} - \bar{m}_t\right]^2}$$

Here, V_t is trade variability available from observations preceding month t. The term m_{t-j} denotes monthly percentage growth in United States imports from China, j indexes the twelve preceding months, and $\bar{m}_t$ is their arithmetic mean. The denominator eleven produces the sample standard deviation. Higher values indicate greater realised instability. Equation 3 defines the logarithmic level measures.

$$L_{it} = ln\, X_{it}\,, \qquad C_t^L = ln\, C_t$$

Here, X_{it} denotes United States imports from outcome economy i during month t, and C_t denotes United States imports from China. The variables L_{it} and C_t^L are their natural logarithms. All underlying values are positive, so no offset or replacement is required.

Table 2: Variable dictionary

Variable or Indicator	Analytical Role	Definition and Construction	Source And Identifier	Unit and Frequency	Transformation and Direction	Missing Value Rule	Coverage and Limitation
Export value, X_{it}	H1 outcome	United States imports from each outcome economy	Census country imports; seven country codes	USD millions, monthly	Higher values indicate greater nominal exports	No missing source values	1,008 observations; includes price and quantity movements
Log export value, L_{it}	H1 estimation outcome	Natural logarithm of export value	Derived from X_{it}	Log units, monthly	Higher values indicate greater export scale	Requires positive values	1,008 observations
Export growth	H2 and H3 outcome	Equation 1 with twelve-month interval	Derived from X_{it}	Percent, monthly	Higher values indicate faster annual expansion	Initial twelve months unavailable	924 observations before H3 timing restriction
China trade scale, C_t^L	H1 predictor	Natural logarithm of United States imports from China	Census imports, code 5700	Log units, monthly	Higher values indicate larger bilateral flows	No missing source values	144 distinct months; shared across outcome economies
China trade growth	H2 predictor	Equation 1 applied to China imports with twelve-month interval	Census imports, code 5700	Percent, monthly	Higher values indicate faster annual expansion	Initial twelve months unavailable	132 distinct months
China trade variability, V_t	H3 predictor	Equation 2 using preceding monthly growth rates	Derived from China imports	Percentage points, monthly	Higher values indicate greater instability	Initial thirteen months unavailable	131 distinct months
Economy indicators	Fixed effects	Indicators for outcome economies	ISO3 identifiers	Categorical	Capture persistent differences in export levels or growth	Complete coverage	Seven economies
Calendar month indicators and trend	Temporal controls	Eleven-month indicators and elapsed months divided by twelve	Source year and month	Indicators and elapsed years	Capture recurring seasonality and a common linear trend	Complete coverage	Defined over the relevant model window

Percentage growth measures change relative to an earlier value. Differences between growth rates are interpreted in percentage points. The logarithmic specification measures proportional associations, while the growth and variability specifications retain percentage-based units. No composite index combines these measures, and no index is entered alongside its own components.

Table 3 reports descriptive statistics calculated from the constructed variables. Comparator statistics use distinct months rather than counting the same China observation seven times.

Table 3: Descriptive statistics

Variable	Valid Count	Mean	SD	Median	Minimum	Maximum
Intermediary export value, USD millions	1,008	2,562.83	1,441.90	2,329.65	401.30	9,571.70
Intermediary annual export growth, percent	924	9.31	19.37	6.55	−62.06	185.85
United States imports from China, USD millions	144	38,014.26	5,968.45	38,431.85	19,638.10	52,081.10
China annual trade growth, percent	132	4.01	14.93	4.93	−36.81	103.35
Preceding China trade variability, percentage points	131	10.12	3.63	8.85	6.68	21.09

3.4 Analytical Framework, Identification, and Reproducibility:

The implemented analysis estimates conditional associations using ordinary least squares. Equation 4 provides the common specification for the three hypotheses.

$$W_{it}^k = \alpha_i^k + \beta_k P_t^k + \sum_{q=2}^{12} \delta_q^k D_{qt} + \gamma_k T_t + u_{it}^k$$

Here, k identifies the hypothesis specification, W_{it}^k is its outcome, and P_t^k is its explanatory variable. For H1, these variables are log export value and log China imports. For H2, they are intermediary export growth and China trade growth. For H3, they are intermediary export growth and preceding China trade variability. The term α_i^k represents economy effects. The variable D_{qt} indicates calendar month q, with January as the reference month. The coefficient δ_q^k captures recurring monthly differences. The variable T_t measures elapsed years from the first observation month, γ_k captures the common linear trend, and u_{it}^k is the residual.

The coefficient β_k captures temporal comovement after these adjustments. Because each China predictor is common across economies within a month, identification comes from changes over time rather than

independent differences in Chinese exposure across the seven economies. Unrestricted calendar date effects are therefore not included because they would absorb the explanatory series.
Inference accounts for contemporaneous dependence across economies and serial dependence across months.

Cameron and Miller (2015) explain why grouped observations do not provide independent information, while Thompson (2011) demonstrates the importance of dependence across both units and time. The implemented covariance estimator applies Bartlett weighted heteroskedasticity and autocorrelation adjustment to monthly sums of observation scores, using twelve monthly lags. This approach follows the class of panel covariance estimators examined by Vogelsang (2012).

The interpretation remains associational. Shared demand changes, price movements, exchange rates and other omitted conditions may influence both Chinese and intermediary exports. Neither the fixed effects nor preceding variability resolves these sources of endogeneity. The purposive country frame also limits population inference, consistent with the distinction between regression uncertainty and sampling design discussed by Abadie et al. (2020).

Implemented sensitivity checks use covariance bandwidths of six and eighteen months, replace the linear trend with a quadratic specification, restrict all models to the same 917 observations, and omit each outcome economy in turn. These checks address inference bandwidth, trend specification, transformation related sample differences and dependence on individual economies. They are exploratory rather than preregistered, preserving the distinction between planned and subsequent analysis emphasised by Nosek et al. (2018).

The replication materials contain the source extracts, constructed panel, executable analysis code, validation log and file checksums. Definitions, reporting units and calendar alignment remain consistent across the baseline and sensitivity specifications.

4. Methods:

The methodological framework examines conditional relationships between United States-China merchandise trade and export performance across seven alternative supplying economies. Three complementary panel regressions distinguish trade scale, growth and preceding variability, while maintaining consistent temporal controls and dependence-adjusted inference. The approach prioritizes transparent estimation, reproducibility and sensitivity assessment without interpreting observed commercial comovement as evidence of causal trade diversion.

4.1 Research Design and Identification Strategy:

The study employs a quantitative longitudinal panel design using monthly merchandise trade observations from January 2010 to December 2021. The unit of analysis is an exporting economy observed in a calendar month. The analytical population comprises seven purposively selected economies supplying the United States market, while China provides a common monthly comparator. The principal estimands are regression coefficients describing conditional associations between Chinese trade indicators and export performance across the selected economies. Three hypotheses are evaluated separately to distinguish the relationships involving trade levels, annual growth and preceding trade variability.

The identification strategy exploits temporal changes in United States imports from China and their correspondence with export outcomes across the seven economies. Economy fixed effects absorb persistent differences in average export performance, while calendar-month indicators account for recurring seasonal patterns. A common linear trend captures gradual temporal movement not represented by these components. These adjustments distinguish the focal relationships from stable cross-economy differences and deterministic seasonal variation, although they do not eliminate time-varying confounding.

The explanatory indicators are identical across outcome economies within each calendar month. Consequently, the coefficients are identified through residual temporal variation rather than independent differences in exposure across economies. Unrestricted calendar-date fixed effects would absorb these indicators completely and are therefore incompatible with their direct estimation. This feature also means that seven observations within a month cannot be interpreted as seven independent realizations of Chinese trade conditions. Inference must instead recognize both contemporaneous dependence among exporters and serial dependence across months, consistent with the methodological concerns identified by Cameron and Miller (2015) and Thompson (2011).

The design does not rely on randomized treatment assignment, an instrumental variable or an independently identified policy shock. Changes in United States import demand, relative prices, exchange rates and concurrent commercial conditions may jointly influence Chinese and intermediary shipments. Moreover, aggregate bilateral trade values cannot distinguish direct supplier displacement from simultaneous adjustments to shared destination-market conditions. Accordingly, the estimated coefficients characterize conditional associations rather than causal effects. The preceding variability specification establishes temporal ordering of its explanatory measure but does not independently eliminate omitted-variable bias or establish an uncertainty transmission mechanism.

4.2 Model Specification and Measurement Alignment:

The empirical framework applies the variable definitions established in Section 3 and its variable dictionary. Export performance is represented by the natural logarithm of monthly merchandise export values for the trade-scale specification and by annual percentage growth in monthly exports for the remaining specifications. The corresponding explanatory indicators measure the logarithm of United States imports from China, their annual percentage growth and the standard deviation of their preceding monthly growth rates. The common regression model, continuing the manuscript's equation numbering, is expressed as:

$$Y_{it}^{(h)} = \alpha^{(h)} + \beta^{(h)} Z_t^{(h)} + \sum_{j=2}^{7} \mu_j^{(h)} D_{ij} + \sum_{m=2}^{12} \gamma_m^{(h)} M_{mt} + \delta^{(h)} T_t + \varepsilon_{it}^{(h)}$$

Where i indexes the seven exporting economies, $t$identifies calendar months, and $h \in \{1,2,3\}$identifies the hypothesis-specific specification. $Y_{it}^{(h)}$denotes the outcome, $Z_t^{(h)}$the corresponding China trade indicator, and $\beta^{(h)}$the coefficient of interest. D_{ij} represents economy indicators with one reference economy omitted, and M_{mt}represents calendar-month indicators with January as the reference category. $T_t$measures elapsed time in years from the first month of the relevant estimation window. The intercept is $\alpha^{(h)}$, the common linear trend coefficient is $\delta^{(h)}$, and $\varepsilon_{it}^{(h)}$denotes the regression disturbance. The three implemented specifications are defined by the following outcome-predictor combinations:

$$\begin{aligned} h = 1: \quad & Y_{it}^{(1)} = \ln(X_{it}), & Z_t^{(1)} &= \ln(C_t), \\ h = 2: \quad & Y_{it}^{(2)} = G_{it}^{X}, & Z_t^{(2)} &= G_t^{C}, \\ h = 3: \quad & Y_{it}^{(3)} = G_{it}^{X}, & Z_t^{(3)} &= V_t. \end{aligned}$$

Here, X_{it} denotes United States monthly imports from economy i, and $C_t$denotes United States monthly imports from China. G_{it}^{X} and $G_t^{C}$are annual percentage changes in the respective monthly values, constructed using Equation 1. V_t denotes the sample standard deviation of Chinese monthly percentage growth over the twelve months preceding month t, as defined in Equation 2. The logarithmic transformations follow Equation 3.

The first specification estimates a proportional association between trade values, allowing $\beta^{(1)}$to be interpreted as an elasticity. The second estimates the percentage-point difference in intermediary export growth associated with a one-percentage-point difference in Chinese trade growth. The third estimates the percentage-point difference in intermediary export growth associated with a one-percentage-point difference in preceding Chinese trade variability. These interpretations apply conditional on the included economy and temporal adjustments.

The timing structure distinguishes contemporaneous trade comovement from relationships involving previously observed instability. Annual growth compares a monthly value with the corresponding month twelve months earlier, thereby retaining year-over-year comparisons despite recurring seasonality. The preceding variability indicator uses only Chinese trade observations before the outcome month, preventing the contemporaneous outcome month from entering its construction. Nevertheless, the study does not establish that the historical information was publicly available when commercial decisions were made.

The model deliberately separates the three relationships rather than estimating a composite indicator. This preserves their distinct measurement scales and permits hypothesis-specific interpretations. No interaction term, geopolitical alignment measure or moderating effect is estimated because the implemented empirical framework contains no measured moderator. Likewise, the included controls are limited to economy indicators, calendar-month indicators and a common trend. Their purpose is to adjust for persistent heterogeneity and recurring temporal structure rather than to identify the mechanisms through which destination-market expenditure or supplier substitution operates.

The source panel contains 1,008 economy-month observations, comprising 144 months for each of seven economies. As documented in the sample construction table in Section 3, the trade-scale specification retains all 1,008 observations. The annual-growth specification retains 924 observations across 132 months, while the preceding-variability specification retains 917 observations across 131 months. Each estimation panel remains balanced across the seven economies within its applicable observation window. These reductions arise exclusively from the historical observations required for variable construction rather than missing source records or selective exclusion of exporting economies.

The sample represents the observed commercial relationships of the selected economies rather than a statistically representative sample of all potential intermediary suppliers. Measurement validity is supported by the use of consistently defined merchandise trade records and transparent transformations, although nominal values combine price and quantity movements. The resulting coefficients therefore describe relationships among observed gross trade flows rather than domestic value-added production, geopolitical alignment or verified changes in production location.

4.3 Data Processing, Estimation and Statistical Inference:

The analytical procedure begins with the validated monthly panel described in Section 3. Each observation is identified by exporting economy and calendar month, and the Chinese comparator series is matched to the seven outcome economies through a many-to-one calendar merge. The source records contain no duplicate economy-month identifiers or missing monthly trade values. Monthly and annual records were reconciled before estimation, with the largest discrepancy between summed monthly values and published annual totals equal to USD 0.3 million across the 96 economy-year combinations. These checks establish consistency with the precision of the published source tables rather than independent verification of every underlying transaction.

Variable construction proceeds from the original nominal trade values to the logarithmic, annual-growth and preceding-variability measures defined in Equations 1-3. The logarithmic specification requires strictly positive trade values; a condition satisfied throughout the observed sample. Annual growth requires twelve months of historical observations, while the preceding variability indicator requires thirteen months of initial history to construct twelve preceding monthly growth rates. Observations without sufficient historical information are excluded only from the specifications requiring those transformations. No interpolation, imputation or zero replacement is applied.

Extreme growth observations are screened separately within each economy using the median absolute deviation criterion:

$$\left|G_{it}^{X} - \tilde{G}_{i}^{X}\right| > 3(1.4826)\mathrm{MAD}_{i}$$

Where $\tilde{G}_{i}^{X}$ denotes the economy-specific median annual export growth rate and $\mathrm{MAD}_{i}$is the median absolute deviation of annual export growth from that median. The factor 1.4826 provides conventional normal-consistency scaling for the median absolute deviation, while the threshold identifies unusually distant observations without automatically classifying them as erroneous (Leys et al., 2013). The procedure flags 33 observations, all of which remain in the estimation sample. No winsorization, trimming or replacement is performed, preserving observed commercial fluctuations that may contain substantive information.

The three specifications are estimated separately using unweighted ordinary least squares. This estimator is appropriate for the linear conditional-association framework and permits direct interpretation of logarithmic elasticities and percentage-point relationships. The regression coefficients are obtained by minimizing the sum of squared residuals within each specification, conditional on the included economy indicators, seasonal controls and common trend. No generated predictor is estimated through a preliminary regression stage. The growth and variability measures are deterministic transformations of observed trade values, although measurement errors in those values may propagate into the constructed indicators.

Statistical inference accommodates the dependence generated by the common Chinese comparator and the monthly panel structure. Following the concerns about correlated observations discussed by Cameron and Miller (2015), Thompson (2011) and Vogelsang (2012), the implemented covariance estimator aggregates regression scores across the seven economies within each calendar month and applies a Bartlett-weighted heteroskedasticity and autocorrelation adjustment with twelve monthly lags.

Let $x_{it}^{(h)}$denote the complete regressor vector in specification h, including the intercept, focal predictor, economy indicators, seasonal indicators and trend. Let $\hat{\varepsilon}_{it}^{(h)}$denote its fitted residual and define the monthly aggregate score and $\hat{\theta}^{(h)}$contains the estimated regression parameters and $X_h$is the specification-specific design matrix. The covariance meat is constructed as:

$$\widehat{\Omega}_{h} = \sum_{t=1}^{T_h} s_t^{(h)} s_t^{(h)\prime} + \sum_{\ell=1}^{12}\left(1 - \frac{\ell}{13}\right)\sum_{t=\ell+1}^{T_h}\left[s_t^{(h)} s_{t-\ell}^{(h)\prime} + s_{t-\ell}^{(h)} s_t^{(h)\prime}\right]$$

Here, T_h denotes the number of distinct months in specification \(h\), \(\ell\) is the monthly lag, and the Bartlett weight decreases linearly with lag length. The contemporaneous score aggregation accommodates unrestricted covariance among the seven exporting economies within a month, while the lag-weighted terms accommodate temporal dependence up to the selected bandwidth. The formulation is consistent with the monthly score-aggregation procedure documented in the manuscript.

The inferential information therefore arises from 144, 132 and 131 distinct months for the three respective specifications, rather than treating all economy-month observations as independent realizations of the explanatory conditions. The covariance adjustment allows heteroskedasticity and within-bandwidth temporal dependence but does not guarantee valid inference under unrestricted long-memory dependence or structural instability. Reported confidence intervals and two-sided significance tests use asymptotic normal inference. The baseline significance threshold is 5%, with substantive interpretation based on coefficient magnitude, direction, precision and stability rather than statistical significance alone.

4.4 Diagnostic Validation, Robustness and Reproducibility:

Model validation combines source-data integrity checks, alternative covariance assumptions, functional-form sensitivity and sample-composition analysis. These procedures assess whether the estimated

relationships remain stable under defensible analytical choices rather than treating statistical significance as sufficient evidence of model validity. The validation strategy concentrates on threats directly relevant to the implemented design: common temporal dependence, sensitivity to trend specification, differences in transformation-dependent estimation windows and disproportionate influence from individual exporting economies.

The baseline covariance adjustment uses twelve monthly lags. Alternative specifications employ six and eighteen lags to assess whether statistical uncertainty depends materially on the assumed temporal dependence horizon. Because these alternatives modify the covariance estimator without changing the fitted regression specification, their regression coefficients remain unchanged, while their standard errors may differ. This comparison evaluates inferential sensitivity rather than resolving unobserved confounding or establishing the independence of disturbances.

Functional-form sensitivity is assessed by augmenting the common linear trend with a quadratic term. This specification permits nonlinear deterministic temporal movement and evaluates whether the focal relationships depend on the assumed trajectory of shared market conditions. The results reveal that the estimated trade-scale and preceding-variability relationships are sensitive to trend flexibility, whereas the positive trade-growth association remains evident. These differences are substantively important because the common explanatory indicators vary exclusively over time. Consequently, the estimated relationships depend partly on how underlying temporal movements are represented, and alternative trend specifications cannot be interpreted as interchangeable identification strategies.

Sample comparability is examined by re-estimating all three specifications on the common set of 917 economy-month observations for which every baseline analytical measure is available. This restriction distinguishes changes attributable to estimation-window differences from those arising through alternative functional forms. The common-sample analysis preserves the same seven economies and applies identical observation eligibility across the three specifications. It therefore provides a consistent temporal basis for comparing the relationships without implying that their differently scaled coefficients are directly comparable in magnitude.

The influence of individual exporting economies is evaluated through leave-one-economy-out estimation. Each specification is re-estimated after excluding one of the seven outcome economies, with the procedure repeated across the full set. This analysis examines whether the estimated relationships are disproportionately dependent on a particular economy. The positive trade-growth association persists across these exclusions, whereas the preceding-variability relationship exhibits greater sensitivity to sample composition. These findings establish stability within the observed country frame for the growth relationship but do not demonstrate representativeness beyond the selected economies.

The implemented validation procedures are summarized in Table 7.

Table 7: Implemented methodological validation and sensitivity procedures

Procedure	Analytical Purpose	Implementation
Source reconciliation	Assess consistency between monthly and annual trade records	Compare aggregated monthly values with published annual totals
Duplicate and missing-value checks	Verify observation integrity	Examine unique economy-month identifiers and completeness
Extreme-value screening	Identify unusual observations without automatic exclusion	Economy-specific median absolute deviation criterion
Covariance bandwidth sensitivity	Assess dependence of inference on temporal bandwidth	Six, twelve and eighteen monthly lags
Functional-form sensitivity	Assess dependence on deterministic temporal structure	Linear versus quadratic common trend
Common-sample estimation	Separate sample-window differences from specification differences	Re-estimate all models using 917 observations
Leave-one-economy-out analysis	Assess dependence on individual exporting economies	Sequentially exclude each of the seven economies

The checks do not constitute formal tests of every possible specification error. In particular, no separate stationarity test, structural-break test, residual normality test or formal model-selection exercise is documented as implemented. Their outcomes are therefore not asserted. The analysis instead relies on the reported specification comparisons and dependence-adjusted inference to evaluate the stability of the conditional relationships.

The sensitivity analyses are exploratory rather than preregistered. This distinction is consistent with the transparency principles emphasized by Nosek et al. (2018), particularly the need to distinguish confirmatory expectations from subsequent analytical choices. Interpretation accordingly considers the full pattern of

coefficient changes and uncertainty across specifications, including results that are sensitive to trend assumptions or sample composition.

Reproducibility is supported by the documented retention of source extracts, the constructed monthly panel, executable analytical code, validation records and file checksums. The underlying United States Census Bureau statistics are publicly accessible aggregate data, and no confidential establishment-level information is used. The manuscript records the transformations, observation windows, model structure and covariance bandwidths needed to understand the estimation procedure. The supplied methodological description does not identify the software environment or package versions, so these implementation details cannot be independently specified from the available documentation.

Taken together, the methodological procedures establish a transparent framework for distinguishing trade-level comovement, synchronized export growth and associations involving preceding commercial instability. Their contribution lies in the consistent application of established panel estimation and sensitivity methods to economically distinct dimensions of a shared destination-market relationship. The design supports comparisons of conditional associations and their stability while maintaining explicit boundaries between observed trade movements, underlying economic mechanisms and causal interpretations.

5. Findings:

This analysis tests whether the scale, growth and variability of United States imports from China are associated with export performance across seven intermediary economies. The findings distinguish statistical evidence from economic magnitude and assess sensitivity to sample composition, trend specification and dependence adjustments. All estimates describe conditional associations rather than causal effects.

The outcome panel contains Brazil, India, Indonesia, Malaysia, South Africa, Thailand and Vietnam, with 1,008 monthly observations covering January 2010 to December 2021. Each economy contributes 144 observations. The growth specification retains 924 observations from January 2011, while the variability specification retains 917 observations from February 2011. These reductions arise from the historical observations required to construct growth rates and preceding variability. No source observations were removed because of missing values, duplicate identifiers or extreme movements.

Table 4: Sample characteristics and descriptive statistics

Variable	Valid Observations	Mean	SD	Median	Minimum	Maximum
Intermediary monthly exports, USD millions	1,008	2,562.83	1,441.90	2,329.65	401.30	9,571.70
Intermediary annual export growth, percent	924	9.31	19.37	6.55	−62.06	185.85
United States monthly imports from China, USD millions	144	38,014.26	5,968.45	38,431.85	19,638.10	52,081.10
Annual growth in imports from China, percent	132	4.01	14.93	4.93	−36.81	103.35
Preceding China trade variability, percentage points	131	10.12	3.63	8.85	6.68	21.09

Export growth varies substantially around its mean. The standard deviation of 19.37 percentage points exceeds the average growth rate of 9.31 percent, while the median is lower than the mean. Consequently, average expansion does not describe a uniform experience across economies and months. The 33 observations flagged by the median based extreme value screen remain in the estimation sample.

The baseline regressions include economy effects, calendar month indicators and a common linear trend. Standard errors use Bartlett weighted adjustment of monthly aggregate regression scores with twelve monthly lags. This procedure addresses contemporaneous dependence across economies and temporal dependence across months, subject to the weak temporal dependence assumptions discussed by Vogelsang (2012). Because the China predictors are shared across economies, their explanatory variation comes from distinct months rather than independent country exposures.

Table 5: Baseline estimates and hypothesis assessment

Hypothesis and Relationship	Observations	Distinct Months	Coefficient	Robust Standard Error	95 Percent Confidence Interval	Two-Sided p Value
H1: China trade scale and intermediary export value	1,008	144	0.124	0.076	−0.026 to 0.274	0.106
H2: China trade growth and intermediary export growth	924	132	0.323	0.057	0.211 to 0.434	< 0.001

Hypothesis and Relationship	Observations	Distinct Months	Coefficient	Robust Standard Error	95 Percent Confidence Interval	Two-Sided p Value
H3: Preceding China trade variability and intermediary export growth	917	131	−0.376	0.395	−1.150 to 0.398	0.341

The trade scale coefficient is positive but insufficiently precise to support H1. The estimated elasticity is 0.124, with a confidence interval extending from −0.026 to 0.274. A 10 percent increase in United States imports from China corresponds to an estimated 1.19 percent increase in intermediary exports, with an implied interval from −0.25 percent to 2.64 percent. The estimate therefore permits a modest positive association but does not distinguish it reliably from zero under the baseline specification. Statistical non significance does not establish the absence of a relationship.

The growth specification provides stronger evidence. A one percentage point increase in annual growth of United States imports from China is associated with a 0.323 percentage point increase in intermediary export growth. A ten-percentage point increase corresponds to 3.23 percentage points faster export growth, with a confidence interval from 2.11 to 4.34 percentage points. The positive estimate supports H2 and indicates that export expansion across the selected economies tends to accompany expansion in Chinese shipments to the same destination.

This pattern is consistent with common purchasing conditions rather than a uniformly competitive relationship between suppliers. Bems et al. (2013) identify expenditure changes as a central explanation for international trade fluctuations, while Eaton et al. (2016) demonstrate the importance of expenditure composition for aggregate trade movements. The present estimates support positive growth comovement, but they do not separately identify expenditure transmission, inventory adjustment or supplier substitution as its cause.

The variability coefficient has the predicted negative sign but does not support H3 at the 5 percent level. A one percentage point increase in preceding variability is associated with 0.376 percentage points slower export growth. However, the confidence interval ranges from a reduction of 1.150 percentage points to an increase of 0.398 percentage points. The data therefore permit materially different relationships, including a negative association and a small positive association.

The negative point estimate is compatible with the inventory adjustment mechanism examined by Novy and Taylor (2020). Nevertheless, compatibility with a mechanism does not establish its operation. Handley and Limão (2017) investigate policy uncertainty directly, whereas the present predictor measures realised trade fluctuations. The variability result therefore cannot establish an uncertainty effect.

Table 6: Sensitivity to sample and trend specification

Specification	H1 Coefficient	H1 Robust Standard Error	H2 Coefficient	H2 Robust Standard Error	H3 Coefficient	H3 Robust Standard Error
Baseline	0.124	0.076	0.323	0.057	−0.376	0.395
Six monthly covariance lags	0.124	0.071	0.323	0.065	−0.376	0.441
Eighteen monthly covariance lags	0.124	0.077	0.323	0.057	−0.376	0.400
Common sample of 917 observations	0.097	0.102	0.314	0.053	−0.376	0.395
Additional quadratic trend term	0.384	0.109	0.225	0.063	−0.664	0.305

The positive growth association remains evident across the implemented checks. Restricting estimation to the common sample reduces the H2 coefficient from 0.323 to 0.314. Adding a quadratic trend reduces it further to 0.225, with a confidence interval from 0.103 to 0.348. The association therefore weakens after allowing more flexible temporal movement but remains positive and statistically distinguishable from zero.

Omitting each economy separately produces H2 coefficients between 0.271 and 0.351. Every omission retains a positive estimate with a p value below 0.001. The growth relationship is therefore not attributable to any single economy within the selected panel. These checks support stability within the observed country frame rather than generalisation to all exporters.

The scale relationship is more sensitive. Its coefficient falls to 0.097 on the common sample but rises to 0.384 after adding the quadratic trend term. The latter estimate is statistically significant, with a confidence interval from 0.171 to 0.597. Because changing the trend specification alters both magnitude and inference, the

quadratic result does not overturn the baseline assessment of H1. It establishes that the scale association depends materially on how common temporal movement is represented.

The variability relationship also depends on specification and composition. Adding the quadratic trend yields a coefficient of −0.664, with a confidence interval from −1.262 to −0.066. However, country omission estimates range from −0.776 to 0.032. Removing Brazil changes the sign to positive, although the estimate remains close to zero. The negative variability association therefore lacks stable support across the implemented alternatives.

The clearest empirical finding is positive comovement in export growth. H2 receives support across changes in covariance bandwidth, the common sample restriction, trend flexibility and individual economy omission. H1 and H3 do not receive baseline support, and their sensitivity prevents a firm directional conclusion. The evidence establishes a shared export growth pattern in the United States market without identifying geopolitical alignment effects or confirming trade rerouting through intermediary economies.

6. Discussion:

Export growth across the selected economies moves with Chinese shipments more consistently than export scale or preceding trade variability does. Table 5 identifies a positive growth association of 0.323 under Equation 4, while Table 6 shows that this relationship survives changes in sample composition and temporal specification. The contribution is the separation of three dimensions that yield different empirical conclusions: growth comovement remains stable, whereas scale and variability depend on modelling choices. Amiti et al. (2019) document price increases and sourcing changes following tariff interventions. The present findings add a broader temporal perspective: supplier reallocation can coexist with positive aggregate export comovement. Expansion by intermediary economies therefore cannot automatically be interpreted as displacement of Chinese exports.

The positive growth relationship is consistent with purchasing conditions that affect several suppliers simultaneously. The annual growth transformation in Equation 1 and the adjusted estimates in Table 5 establish comovement after accounting for recurring seasonality, persistent economy differences and a common trend. They do not isolate a transmission channel. Alessandria et al. (2010) show how delivery delays, ordering costs and inventory holdings alter import dynamics. These mechanisms offer a plausible interpretation of synchronised shipments, but inventories and buyer orders were not observed here. The theoretical implication is therefore conditional: export growth can reflect shared commercial adjustment across sourcing locations, while identifying inventory mediation requires information beyond aggregate trade values.

The strongest evidence concerns growth rather than a dominant causal pathway. Table 6 shows that the growth coefficient remains positive when individual economies are omitted, whereas the variability coefficient changes sign when Brazil is excluded. Equation 2 measures realised shipment instability, whose consequences may differ across exporters because their commercial conditions differ. Ahn et al. (2011) identify financial frictions as an additional influence on international trade during periods of disruption. Their evidence highlights why similar fluctuations need not produce uniform export responses. The contribution here is an empirical distinction between stable growth comovement and composition sensitive variability associations. The estimates do not support assigning proportions of the relationship to financing, inventories or supplier substitution.

The contrast between Tables 5 and 6 also reveals how temporal structure shapes substantive interpretation. Adding a quadratic trend changes the estimated scale association materially and makes the negative variability coefficient statistically distinguishable from zero. These changes show that conclusions about trade scale and instability depend on how common temporal movement is represented in Equation 4. Equation 3 additionally preserves nominal trade values, which combine price and quantity movements. Antràs (2020) explains that alternative definitions of global value chain participation imply different measurement requirements. Applied here, this distinction limits the interpretation of aggregate export growth: border values identify commercial outcomes, while claims about production relocation or intermediary participation require evidence tracing transactions and production stages.

The international relevance lies in distinguishing shared market exposure from identifiable production relocation. Flaaen et al. (2020) document relocation across export platforms using evidence specific to washing machines and successive trade interventions. The positive aggregate association in Table 5 addresses a different relationship and can coexist with such product specific adjustments. For sourcing decisions, the stability checks in Table 6 suggest assessing whether geographically dispersed suppliers remain exposed to common destination market conditions; geographic dispersion alone does not establish independent export responses. For trade monitoring, Equation 4 provides an associational benchmark against which more detailed product and origin evidence can be assessed. Further analysis should test whether buyer relationships, imported input content and financing conditions explain the observed comovement before attributing it to geopolitical alignment or trade rerouting.

7. Conclusion and Implications:

The reconfiguration of global trade cannot be understood solely through competitive displacement, as expanding commercial relationships may reflect shared market opportunities rather than the redistribution of

existing trade. This study shows that synchronized export expansion constitutes a more consistent empirical pattern than relationships involving established commercial scale or preceding instability. This distinction advances international trade scholarship by demonstrating that common destination-market exposure can coexist with competitive sourcing pressures, challenging interpretations that equate alternative suppliers' export gains with geopolitical realignment. The findings refine expenditure-based explanations of trade dynamics by distinguishing persistent commercial relationships from growth synchronization, while identifying the limits of instability-based interpretations. Importantly, these relationships represent conditional associations rather than identified causal mechanisms. For multinational enterprises, the evidence supports integrating destination-market demand assessments into supplier diversification, procurement planning and commercial risk management. Policymakers should complement trade diversification strategies with stronger market intelligence, export monitoring and institutional capacity to distinguish genuine market substitution from synchronized expansion. Operationally, firms can strengthen purchasing forecasts, inventory coordination and sourcing decisions by recognizing shared exposure across geographically dispersed suppliers. These implications extend beyond the examined economies, suggesting that effective trade resilience depends not merely on geographic diversification but also on understanding interconnected market conditions and their consequences for commercial stability, enterprise competitiveness and broader economic welfare.

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