

Research note: Trade dependencies and power

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Abstract: This research note addresses the current lack of a comprehensive economic framework for analysing power in international trade. The paper traces the historical understanding of trade dependency from mercantilist doctrines, which focused on the "balance of trade," to modern analyses incorporating concepts like national power, game theory, and international political economy/geoeconomics. It highlights that "critical" trade links are those that could cause significant economic or societal damage, be used for coercion, or threaten national security. The core of the document outlines five categories of methodologies to understand power relations in trade. The conclusions emphasize that in an era of global economic disturbances, understanding trade dependencies and power is crucial.

Keywords: power, international relations, mercantilism, network, vulnerability

Introduction

Economists lack a framework for analysing power comparable to those for scarcity or preferences. Their assumptions—voluntary transactions and optimal conditions in free markets—render power largely irrelevant. Some theories do question market situations where a few firms influence prices or quantities. In particular, the *size* of a country is interpreted in international trade theory as its capacity to manipulate its terms of trade or secure additional earnings from global competitors. Nevertheless, interdisciplinary economists such as Hirschman (1945), Galbraith (1967), Kindleberger (1970) and Bairoch (1993) argue that the concept of power is understated in economic analysis. Their study, which builds on ideas from Aristotle through to the mercantilists of the 1600s, highlights the way power structures generate dependency and externally motivated, non-voluntary actions that merit as much scholarly attention as other central economic themes.

This work seeks to add to this interdisciplinary effort by reviewing the underlying methodology to study the application of power by national governments or political entities in general. The discussion is therefore incomplete, since non-state actors, formal or informal, can also exert major market influence. The study's scope is further restricted to trade exchanges, which necessarily excludes related but

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equally significant power dynamics like bargaining in negotiations, lobbying for policy influence, or rent-seeking within coalition formation.

Even with a restricted focus, the current research note appears to successfully confront the realities of the modern commercial environment, characterized by dominant entities—including the United States, China, Brazil, and the European Union—trying to shape favourable market conditions directly. The parallel with the period of the 17th and 18th centuries is striking, a period in which *the mercantilist* doctrine dominated the economic debates. The promoters of the doctrine aimed at the accumulation through export of quantities of gold and silver, seen as indicators of national power and prosperity. In a broader sense, this orientation did not represent a conjunctural vision, but only another phase of intellectual history regarding the exercise of power in international relations, in particular through trade. From this starting point, we will review the theoretical frameworks to provide a synthetic form to the analysis of the concept of power, understood as commercial dependence.

1. From the trade balance concept to trade dependency

Thomas Mun, perhaps the best-known mercantilist advocate of the “balance of trade” doctrine (Hirschman, 1945, p. 4), stated the simplest rule of government policy: to ensure that “more is sold to foreigners each year than we consume from them in value” (Mun, 1664, Chapter 2). The mercantilists, a heterogeneous group of people of different professions, especially from France, Germany and England, expressed a lasting concern with achieving prosperity in a world where self-interest and national interest are paramount. Their beliefs laid the groundwork for protectionist theory and influenced various economic disciplines that matured independently over the years. Three centuries after its emergence as an economic doctrine, it was interpreted as a comprehensive theory of power in foreign relations, of protectionism, the monetary system, and society, all grounded in the balance of payments (Heckscher, 1931/1955, Vol. 1, pp. 25–28).

This study integrates this long-standing tradition with current research by offering a brief primer on the broad theoretical framework resulting from them, before transitioning into a more elaborate description of the specific methodological principles and practices that characterize this approach. In our view, the present theoretical foundation may be construed from three major intellectual currents that significantly reshaped the construct of power in trade analysis. Each of them inevitably reflects disconnected lines of inquiry since their primary research goals existed primarily beyond the central tenets of traditional economic theory.

In chronological order, Hirschman’s theory of national power (Hirschman 1945) is an obvious start. Hirschman developed several methods for estimating trade dependence. Some will make him famous (e.g., the ‘Herfindahl-Hirschman market concentration index’ - HHI), and his entire theoretical construction will become a reference for contemporary studies of power in international economic relations.

What Hirschman calls the “root cause” of dependency formation, i.e., “conditions that make the disruption of trade much worse for its trading partners than for itself” (Hirschman, 1945, p. 16), will eventually become part of the basic theory of conflict analysis in international trade (Lindert, 1953/1991, pp. 188–193; Conybeare, 1987, Chapter 2, p. 284, Footnote 4; Hufbauer et al., 2007, p. 212).

Game theory, a discipline of mathematics that saw intense use in military practice during World War II, was also relatively early adopted in the social sciences because of its realistic approach to analysing a context in which the preferences of economic subjects are neither diametrically opposed nor perfectly convergent (towards a “social optimum”), but are rather characterized by “the mixture of mutual dependence and conflict, of partnership and competition” (Schelling, 1958). The analytical framework is multidisciplinary, where usually economic analysis and game theory are placed alongside political science and history (see Conybeare, 1987). At its heart, the argument illustrates the competing priorities of actors in an interdependent process, which could potentially lead to a state of conflict.

The overlap between political and economic disciplines created new investigative paths by the 1970s (Kindleberger, 1970, p. v), resulting in various implications like strategic trade protectionism models and economic activism designed to further the national interest. Sometimes called “neomercantilism” (Helleiner, 2021, p. 4), “international political economy” (Oatley, 2006) or “geoeconomics” (Clayton et al., 2025), unlike classical economic studies, this investigation centres on how political and other non-economic motivations can become just as significant as economic ones when power is being exercised.

In the period of mercantilism, the trade balance was considered “critical” as it represented an indicator of the flow of quantities of precious metals. While their argument regarding the protection of national wealth has been preserved to this day, including by monitoring the trade balance (e.g., Office of the United States Trade Representative, 2025), the ways in which “critical” is defined and assessed have diversified in parallel with the evolution of theoretical understanding we have just sketched. The next section elaborates on these recent developments in methodology.

2. Methodologies to understand power relations in trade

Understanding trade dependence starts with how each state defines terms such as “critical,” or “vulnerable” or “strategic. Trade dependence creates a vulnerability, the risk of which is estimated according to the economic context of each country, but its identification seems to follow a general rule, namely in circumstances characterized by

Trade links that could cause serious economic or societal damage in the event of unexpected disruptions, or that could be used as an instrument of coercion or that could create risks to national security, affect the sovereignty of

countries, or undermine economic or non-economic activities considered ‘strategic’. (Arriola et al., 2024, p. 11)

In this definition, the dual aspects of a critical link are addressed: its potential to act as a source of disruptions, coercion or security hazards, and its extensive impact on the social and economic landscape. It is expected that the methods used for estimating and measuring dependency will cover this relatively wide range of topics. These methods differ in their representation, ranging from specific indicators, e.g., HHI, to more abstract approaches such as general equilibrium models. Furthermore, their nature varies (qualitative, quantitative, or combined), as does their level of complexity, which should not be confused with their degree of realism. The subsequent sections briefly outline five methodological classes identified as significant for the assessment of trade dependency.

3.1. Trade data analysis

By gathering information on basic market position metrics (like market share or trade flow share) or their derivatives (such as HHI, trade intensity index, or intra-industry index), one can identify vulnerable flows. Available data indicate that international markets are typically subject to competition. Only about 30% of export products showed notably high concentration indices; however, global product exports are presently, on average, twice as concentrated in exporting nations compared to imports in importing nations (Arriola et al., 2024, p. 12). Since these calculations involve accessing databases with detailed product information, typically around 5,000 groups of goods identified at the 6-digit Harmonized System (HS) aggregation level, it is possible to credibly and comprehensively document a country’s or sector’s vulnerability to supply or sales disruptions. This type of descriptive statistical analysis is commonly conducted at two distinct levels.

Vulnerable trade structures can be identified by first assessing trade flows at country level. A trade flow is deemed critical if, firstly, a substantial share of a country’s imports or exports involves a particular partner, and secondly, the country faces difficulty replacing these specific bilateral transactions with other sources or markets due to its reliance on a limited number of suppliers or destinations (Arriola et al., 2024, p. 15). The selection of parameters that meet these criteria, exemplified in Table 1, along with the determination of the period under investigation, require methodological deliberation, often involving the use of other analytical methods.

Concerning the analysis timeframe, it is generally accepted that production and trade arrangements typically settle after around 5 to 10 years (Arriola et al., 2024, pp. 88-89). As for the cut-off points, even those that appear straightforward can be open to interpretation: for instance, defining a significant proportion of a country’s exports as 10% or more when originating from any single partner.

Table 1. Examples of criteria for identifying trade dependency

1 – Significant trade deficit when a country’s imports of goods are twice as large as its exports.	Source: Mercator
2 – Significant bilateral supplier as a country that accounts for more than 30% of all imports of a particular good.	Institute for China Studies,
3 – World exports of the product reach an HHI index of 0.25 or more.	2024, Annex 1
1 – Excessive concentration of imports is defined in cases of bilateral import links at product level, where the country-level HHI value for imports is more than double the corresponding HHI value for global exports.	Source: Arriola et al.,
2 – A minimum HHI limit value calculated for global exports at product level was set at 0.2 and at least 0.4 for country-level import products.	2024, p. 15

Explanatory note: HHI is calculated as the sum of market shares squared and is between $1/n$, when all n suppliers have equal shares, and one, in a monopoly. For example, a value of 0.2 for HHI is given by the presence of only five suppliers and each of them would provide an equal share of 20%, while a value of 0.1 would be obtained if there were ten suppliers with equal shares of 10%. (Arriola et al., 2024, p. 108).

Source: author’s compilation

The outcomes of a statistical dependency assessment are influenced by the predefined thresholds used to identify vulnerability. Arriola et al. (2024, p. 30) highlight that the European Commission views even minimal trade deficits as a threshold, while the supplier import threshold in their study deviates from that presented in the MERICS study (2024) (see Table 1). Moreover, Australia’s Productivity Commission (2021) set the threshold at more than 80% of imports for goods to be deemed prone to supply disruptions. Specific aspects can be underscored by integrating supplementary indicators and non-economic attributes related to risk. In its assessment of critical mineral supply risks, the European Commission (European Commission, 2017) computes a substitution index, while other research incorporates factors like natural endowments, comparative advantage, production and processing costs, and aspects of economies of scale or value chain fragmentation into their investigations (Arriola et al., 2024, pp. 13, 25).

A further research focus involves the effort to identify and define strategic sectors. Their definition can stem from two approaches: calculating their degree of trade dependence (see European Commission, 2021) or applying criteria determined by specific national interests (see Tran, 2022, European Commission, 2022, International Monetary Fund, 2023), followed by the selection of an appropriate analytical method.

3.2. Analysis of trade networks

A “cumulative causality” is fostered by network economies, in addition to economies of scale, leading to an amplification of benefits and drawbacks once they take hold. The impact of this phenomenon is so significant presently, that certain

authors (e.g., Farrell & Newman, 2019; Ferguson, 2018) offer an understanding of international relations exclusively from this viewpoint.

The mathematical field of graph theory can be applied to analyse the intricate web of connections that exist among various nations. Network analysis offers a range of methods for measuring and understanding the interactions between entities in a network, known as nodes—such as individuals, companies, or states—via their interconnections, referred to as edges or arcs. These connections are quantified using specific metrics that evaluate, firstly, the network’s symmetry or level of cohesion (e.g., path, chain, centrality), and secondly, how its different components are linked (e.g., optimal path). To these techniques, which are mostly descriptive, more complex processing can be added to highlight the statistical relevance of the data processed by regression techniques such as the quadratic assignment procedure (QAP), exponential random graph models (ERGM) and stochastic actor-oriented models (SOAM) (Cronin, 2016). Multiple software packages have been developed to cover data processing (and visualization) functions (see Social network analysis software, n.d.).

By representing international trade as a network where countries are nodes and trade flows are links, relationships can be analysed using indicators derived from trade data. For example, trade between any two countries forms a link with a specific weight, such as the intensity of bilateral trade (Iapadre & Tajoli, 2014), which assesses the state of connections between network participants based on selected economic variables. Analysing systems structured as “hub and spoke” offers broad applicability when understanding dependencies. Through this analysis, one can identify and assess networks within the supply chain that rely on a limited number of suppliers, which helps to pinpoint products with significant potential for external supply interruption (Ferrarini, 2011). Such analysis also reveals instances where network structures are employed as coercive tools, a trend observed in business areas such as financial communications, supply chains, and internet management (Farrell & Newman, 2019).

Data about link attributes is gathered through various metrics; a case in point is node centrality, which points out influential nodes and reflects the importance of their links within the general network framework. There is direct rivalry between states and private entities concerning the establishment of authority over the network’s essential nodes, often referred to as *centres of gravity*. Thus, the theory suggests that a core point in the system has the power to increase the scale of both beneficial developments and detrimental disruptions, passing them on to a significant number of entities within the global commerce structure.

3.3. Input-output tables

Each industry sector engages in two-way interactions with other industries: it procures necessary products or services for its operations while also supplying

products or services required by others. Evaluating dependencies across global value chains is essentially a type of network analysis. The strong resemblance between these two approaches is evident because input-output (IO) models are typically employed to gauge global value chain dependencies, and these same IO data further highlight the fundamental importance of production network formation. A study conducted by Luu et al. (2018) on 19 Economic and Monetary Union members revealed a subset of industries, termed “key nodes,” that constitute a tightly knit core. These nodes are interconnected and also serve to link sectors in different member countries, profoundly impacting the economies shaped by these networks.

When national industries are exposed to volatile business relationships, both input and output linkages can become critical vulnerabilities. Numerous databases exist to facilitate Input-Output calculations, examples being the U.S. Census Bureau Input-Output, GTAP input output data, OECD Trade in Value Added (TiVA) data, Inter-Country Input-Output (ICIO), and the World Input-Output Database (WIOD). These linkages can be direct (bilateral) or, more significantly, indirect, when their involvement in global supply chains makes them non-obvious. An illustration from Arriola et al. (2024, p. 34) sheds light on these latter interdependencies: computer monitors manufactured in South Korea may have an indirect dependence on copper extracted in Chile, which is then used in the wiring of Chinese LEDs integrated into those South Korean monitors.

3.4. Computable general equilibrium (CGE) modelling

Computable general equilibrium (CGE) is arguably the predominant quantitative analytical approach utilized to assess economic impacts in international trade since 1986 (Deardorff & Stern, 1986). The process of solving a CGE model entails identifying the specific set of prices that achieves market equilibrium, characterized by the condition that no individual’s welfare can be improved without simultaneously worsening the situation of another (Pareto optimization).

The OECD’s METRO 2017 variant (Arriola et al., 2024, pp. 88-89) employs a simulation where the model leverages data on the production characteristics of trade sectors in different countries, such as the proportions of intermediary sources or the distribution of production factors within a sector’s value added, alongside specific parameters like substitution elasticities. A sector is considered “trade-dependent” based on whether viable alternative production options exist, for example, if a high elasticity of substitution between different input countries allows for readily finding new suppliers.

Piermartini and Teh (2005) point out that CGE models should only be used to give an idea of the order of magnitude that a change in policy can mean for economic well-being or trade. This restriction primarily stems from the narrow assumptions underlying quantitative methods, even though these methods share a common logic regarding dependency formation relative to available options like supply or sale. IO

techniques rely on fixed prices and do not incorporate periods for adjusting the production structure in response to price changes. Nevertheless, their lower, more relevant aggregation levels allow them to identify dependencies for specific products. The CGE model, however, assumes perfect mobility of production factors within sectors—a condition for reaching equilibrium—but immobility between national economies (Arriola et al., 2024, pp. 88-89). The quantitative data processing by both IO and CGE models generates results that are by no means negligible in their differences. For example, a 10% reduction in trade between OECD countries and China is estimated to decrease EU27 GDP by roughly 0.3% according to the IO approach, but only by 0.04% using the CGE approach (Arriola et al., 2024, p. 23).

3.5. Case studies and surveys for in-depth analysis

Complementing quantitative approaches, qualitative methods like case studies and comprehensive surveys are indispensable for gathering additional, sometimes exclusive data vital for a precise evaluation of trade relationships that establish a product's economic significance or strategic value. Arriola et al. (2024, p. 109) illustrate this with lithium, a key mineral, where detailed examination of manufacturing processes is essential for assessing its substitutability. This involves differentiating extraction from flat brine using evaporation and chemical recovery (e.g., for batteries) from extraction from lithium ores such as spodumene via crushing, frying, and acid leaching. Similar considerations are pertinent for various other products, including different cereals utilized for consumption and industrial purposes.

The necessity of employing these methods primarily arises from two situations. First, it requires adding detailed situational data to the analysis, specifically regarding state-level mindsets and incentives. Understanding the context - for instance, a complex scenario where a country (as either initiator or target) is economically vulnerable yet politically secure, or any other permutation, enables us to interpret the trajectory of a potential force that will ultimately be critical for strategic response choices.

Secondly, qualitative investigations, such as case studies or surveys, become crucial when insights into human perception—how individuals genuinely consider a subject—can clarify the ambiguous findings of quantitative analyses. For example, Hufbauer et al. (2007) worked with data from 174 case studies on economic sanctions episodes for a statistical analysis of trade gains and losses. Nevertheless, concerning certain indicators, such as those forming estimates for the variable “Economic health and political stability”, “the outcomes (...) are inconsistent and less robust than anticipated” (Hufbauer et al., 2007, p. 99). Direct observations and surveys subsequently demonstrated approaches among the researched populations that diverged from expected behavioural patterns.

The emergence of new qualitative analysis approaches has been made possible by recent progress in computer technology, notably advanced text analysis tools and Large Language Models (LLMs). This includes investigations into “geopolitical rapprochement” based on historical UN voting patterns (International Monetary Fund, 2023; UN Trade and Development, 2023; World Trade Organization, 2022), as well as analyses of strategic orientations in countries such as China (Fang et al., 2025) and North Korea (The Economist, 2025). Since these methodologies are already well-established in general social studies, we foresee their increasing contribution to the field, particularly concerning trade dependency.

Conclusions

Today’s major disruptions in the international economy, often described as economic or trade wars, indicate that future economic policies will increasingly depend on understanding the origins of trade dependencies or, to put it differently, on the diverse forms of power exercised within the world markets. From the balance-of-trade concept to present-day theorists of trade dependency, scholarly work has fragmented into multiple subfields that seldom interact. This research note attempted to reconsider the long-standing theme of trade-based power dynamics within a methodological context that is more complex and multifaceted than its original foundations. A concise overview of the outcome is provided below.

Table 2. Methodological framework for trade dependency

Methodologies	Method Strength	Method Limitation	Links to other methods
Trade Data Analysis (TDA)	Identifies vulnerabilities	Thresholds are arbitrary	Feeds into TNA Feeds into IO tables Define “strategic sectors”
Trade Network Analysis (TNA)	Captures systemic risk and contagion	No strategic interpretation	Uses TDA data as input Provides structural context for CGE modelling
Input–Output (IO) Tables	Captures multi-stage supply chains	Aggregation reduces product specificity	Feeds CGE models Complements TDA
CGE Models	Useful for scenario analysis	Strong assumptions	Uses IO data Interprets TDA vulnerabilities in macro terms
Case Studies & Surveys	Resolves ambiguous quantitative findings	Harder to generalize	Validates or challenges quantitative findings Adds contextual layer to CGE/IO/TDA/TNA results

Source: author’s compilation

Table 2 outlines a basic methodological framework to facilitate the inclusion of the exercise of power as a self-contained and unified subject of inquiry for economists. In order to fulfil this specific target, it is crucial to adhere to four vital and highly significant prerequisite requirements for further study: national-level impacts are multifaceted and economically motivated; dependency variables require classification based on individual country settings; the lack of an overarching theory necessitates multiple analytical approaches; and the investigative framework should be broadened to encompass vital sectors such as financial, information, or energy systems. A concise overview of these research tasks is provided in the following.

(1) *Construction of national influences.* The development of national influences involves states, akin to companies, operating in an international setting that is neither purely adversarial, nor Hobbesian, nor entirely independent of core economic theories. In practice, they chase economic goals influenced by both domestic and foreign pressures. Some states are assertive in this endeavour, whereas others adopt a more collaborative stance. While some market positions can be mirrored or offer guidance, they consistently demand scrutiny and supervision to avoid setbacks and enhance benefits.

(2) *The process involves identifying dependency factors* and categorizing their impact as critical, moderate, or insignificant. By referencing premise (1), we can evaluate what is considered “strategic” within each specific country’s context, which then helps in estimating the critical degree of reliance. Discussing potential alternatives is essential, as is choosing the most suitable analytical tool.

(3) *Use of a wide set of analysis tools (or methods).* There is no single, cohesive theory of economic power, unlike the established theories found in subjects such as “macroeconomic equilibrium”. This means we refer to multiple “methodologies” rather than a singular “methodology”, with their clarity increasing proportionally to their relevance for a specific research interest. There is a collection of available methods, and historical data has pointed out the methods that result in more optimal choice for certain objectives.

(4) *Incorporating other areas of interest.* We ought to broaden our focus to encompass additional fields of interest that are equally crucial for understanding trade dependency yet have been neglected in this note. Examples might include financial, informational, or energy infrastructures, underground economic activities, private financial institutions (big finance), lobbying efforts, or dual-use technologies.

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