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De-risking India's Trade with China:

Identifying Strategic and Critical Vulnerabilities

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This discussion document studies India's import dependence on China and assesses the resultant extent of its strategic and critical vulnerability. Focusing the exercise on the three largest import categories – Organic Chemicals, Machinery and Mechanical Appliances, and Electrical Machinery and Equipment - the study identifies items that demand state attention in its overall de-risking strategy vis-à-vis China.

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Executive Summary

This paper examines India's import dependence on China across three product categories: Organic Chemicals, Machinery and Mechanical Appliances, and Electrical Machinery and Equipment. Given that these three categories account for over two-thirds of India's total imports from China, this study seeks to examine whether India's dependence renders it strategically vulnerable. Using the Strategic and Critical Vulnerability (SCV) Framework and Relative Impact Factor-Product Complexity Index (RIF-PCI) scale, this study finds that an overwhelming number of items imported from China exhibit a product complexity of either 'low to moderate' or less. Only a few items such as heterocyclic compounds, machine tools, metalworking tools and certain types of textile machines, exhibit 'high' to 'very high' product complexity. But none of the items imported from China display an 'Extremely High' product complexity, suggesting their easy substitutability in case Beijing decides to weaponise its position vis-à-vis New Delhi. The resultant shock from any form of induced disruption in these three categories is likely to be short-to-medium-term.

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I. Introduction

India's trade with China has traditionally been a contentious issue. India has often expressed concern about the burgeoning trade deficit vis-à-vis China. Over the years, the trade imbalance has surged from a mere ~US$ 1 billion in 2001 to over US$ 100 billion in 2023 (see Fig 1).[1] During this period, while imports from China witnessed an exponential rise, India's exports to China marginally increased. In fact, India's exports to China have remained largely stagnant during 2010–2023.

Figure 1: India–China Trade (2001–2023)

In light of the widening trade deficit with China, three broad discourses have emerged, centred on economic nationalism (protectionism), market distortion (unfair competition) and security (de-risking).

The economic nationalism or protectionist school regards imports as problematic and instead advocates national self-sufficiency.[2] Indian firms and corporations with monopolistic and dominant market share in their respective sectors have been the

biggest proponents of this narrative,[3] as it helps them avoid competition with foreign players. The emotive nature of the issue and its ability to easily resonate with people have allowed this school to find maximum purchase among the public. However, large corporations often flout the narrative under the pretext of boosting domestic manufacturing capacity and self-reliance, ostensibly for their benefit. But such protectionist measures would come at the cost of larger consumer welfare and economic interest.

The 'unfair competition' school of thought points to the long-standing concern of China's recourse to market-distorting practices that include subsidies, tax rebates and currency devaluation to make its exports competitive.[4] The exponents of this discourse highlight that Beijing's unfair trade practices have created false incentives for Chinese players to achieve overcapacity at home. As a result, the dumping of cheap Chinese goods in the external market has consistently eroded the domestic manufacturing base of importing countries, including India. The issue is further compounded by China's restrictive policies and denial of market access to Indian products. However, this argument often tends to lead policies towards broad-based trade barriers across all products.

The issue of trade, which was hitherto limited to economic considerations, has lately acquired a third dimension, centring on security. The idea gradually took hold within the geopolitical West in general and the US in particular under the Trump presidency. However, the pandemic-induced supply shock and the episode in Galwan, where Indian and Chinese troops clashed, leading to casualties on both sides, further galvanised the idea of strategic vulnerabilities arising out of excessive import dependence on China.

Thus emerged the third and the most recent school of thought, centred on economic security.[5] The de-risking school argues that import dependence may render a country susceptible to economic coercion, thereby leaving it strategically vulnerable.

The fact that China is *the* global manufacturing hub, producing around 30% of the global output[6] and is deeply integrated into the Global Value Chains, gives it substantial leverage to extract strategic gains. Further, China has displayed its willingness to resort to coercive economic tactics vis-à-vis its competitors and rivals

to enforce its will or express its displeasure more than once.[7] Finally, in light of a worsening India—China relationship, the plausibility of such actions vis-à-vis India cannot be discounted. Thus, an assessment of import dependence-induced strategic vulnerabilities becomes imperative from an Indian interests perspective. The de-risking school of thought has also found purchase among those who espouse greater protectionism. Recognising the relative unsustainability of the self-sufficiency argument, the proponents of the protectionist school have often attempted to piggyback on the security argument to promote autarchy, i.e., a restricted trade regime, to avoid foreign competition.

There is, however, a need to distinguish the motivations behind each of the three grievances and accordingly devise strategies to mitigate the concerns. Conflating the three distinct issues will lead to a disastrous policy outcome.

The protectionist cause, driven by economic nationalism, is devoid of any economic reasoning. Complete self-reliance is a pipe dream. No country, be it the US or China, can achieve absolute self-sufficiency. Even in cases where the trading regimes flout the principle of comparative advantages, appropriate response measures exist to counter them, as suggested by the proponents of the 'unfair competition' school of thought.

The trade imbalance arising from unfair market practices such as subsidies, tax rebates and currency devaluation can be tackled through countervailing and anti-dumping duties. However, two key factors need to be taken into account before imposing duties on imports from China: proportionality and domestic capability.[8]

Any imposition of countervailing or anti-dumping duties must be proportionate to rival state support to compensate for the cheap influx of goods. Not only does this allow for the correction of the distorted market prices of the imports from China and thereby protect domestic players against unfair competition, it also offers domestic consumers a fair choice to still opt for Chinese products, albeit at a higher price. For an economy to continuously innovate, the empowerment of its consumers is a necessary precondition.

The second aspect to consider before imposing countervailing or anti-dumping duties on a commodity is assessing India's domestic capability in that segment.[9] In categories where domestic capability exists, duties are justifiable. However, using the same remedy for commodity segments where India's domestic capability is non-existent punishes a category of manufacturers and traders who rely on cheap imports (including from China) to add value and gain competitiveness in both domestic and external markets. Such a policy also adversely impacts the consumers by raising their cost of living.

If India's developmental goal is to bridge the wide economic asymmetry between China and itself, it shouldn't hesitate to freeride on its adversary's subsidies to aid domestic capability. Given that India's monetary and financial constraints are far greater than China's, it can act prudently by leveraging Beijing's policies to subsidise its own development. In this way, India can ensure that the cost of its development stays as low as it can at a time when the world increasingly turns inwards—a factor that has certainly raised the developmental cost for emerging economies.

Finally, with respect to the de-risking question, an ideal solution has been elusive. As acknowledged earlier, there is a possibility of India's strategic vulnerability arising from its import dependence in certain segments. This study, therefore, attempts to map areas with a high degree of dependence on China and highlight areas of strategic and critical vulnerabilities, if any.

The first section lays out the methodology and the framework that this study applies to examine India's imports from China. The second section highlights all the Harmonised Systems (HS)2 category items that exhibit a significant degree of dependence on imports from China. It subsequently filters the HS2 category items that require deeper scrutiny. The subsequent sections examine the entire list of HS6-level classifications within the selected HS2 categories to highlight areas that require state intervention.

II. Methodology and Framework

This study uses the data on the Harmonised Systems (HS) category goods of import from China in the financial year (FY) 2024, sourced from the Ministry of Commerce and Industry, Government of India.[10] The HS system refers to the universal and standardised numeric coding system used to categorise and classify goods for international trade.[11] The HS codes entail four layers of product classifications: HS2, HS4, HS6 and HS8. While the HS2 code is the broadest classification for traded goods, the HS6 and HS8 codes are the most detailed/fundamental descriptions of individual goods. The HS4 code is an intermediate-level classification that is more detailed than HS2 but relatively broader than HS6 or HS8.

This study employs the 'progression through elimination' methodology: progression through the HS categories (HS2 and HS6) and elimination using the percentage dependence, subjectivity filter, Relative Impact Factor (RIF) and Product Complexity Index (PCI).

The study first maps India's dependence on imports from China across all 99 HS2 categories. The study examines only those items with imports (from China) worth US$ 1 million or more (roughly equating to ₹8.4 crores at the 2024 US$/₹ exchange rate). Consequently, dependence and subjectivity filters are applied to eliminate most HS2 items that prima facie do not appear to hold strategic value. The HS2 items thus obtained are subjected to detailed scrutiny at their HS6-level classification. Every item with an import worth greater than US$1 million is examined using the RIF-PCI scale.

The study finds the HS6 classification most suited to examine India's dependence and the resultant vulnerabilities for primarily three reasons. To begin with, this classification is nearly as detailed in capturing the description of traded goods and items as the HS8, allowing for reasonable and specific categorisation of goods. Secondly, it masks/eliminates unnecessary specifications that HS8 classifications often contain or deal with. Finally, the availability of corresponding data sets available for goods classified under HS6 is greater than that for those classified under HS8.

Furthermore, the amount or the value of imports at the HS8 level of classification is too low to employ economic coercion. To impose effective sanctions, restrictions need to be placed at an intermediate level of classification, either HS4 or HS6. Thus, from a policy perspective, it is more relevant to scrutinise dependence and vulnerabilities at the HS6 level.

The limitation of 'progression through elimination' entails the possibility of omitting some items that may need scrutiny. On the other hand, the advantage of 'progression through elimination' lies in the fact that every item filtered through the process is worthy of scrutiny. It also allows the study to focus on items that are high in order of priority and scrutinise them first.

II.I. Dependence Filter (D)

The study adopts a threshold of 30% to study India's import dependence on China. It eliminates all items with percentage dependence less than 30 from the scope of this exercise. It opts for a 30% cutoff as the figure roughly corresponds to China's global production capacity -both by volume and by value.[12] Thus, a dependence above this threshold highlights the upward standard deviation from the mean. Secondly, the study regards that sufficient diversification exists for items with dependence less than 30%. Thus, by adopting this filter, the study ensures that items exhibiting significant dependence are subjected to maximum scrutiny. The study grades varying degrees of dependence (greater than 30%) into the following three categories (see Table 1).

Table 1: Degrees of Import Dependence

Dependence Category	Range
Moderate [30<=Dependence<50]	Items that exhibit percentage dependence greater than or equal to 30 but less than 50.
High [50<=Dependence<70]	Items that exhibit percentage dependence greater than or equal to 50 but less than 70.
Severe [Dependence>=70]	Items that exhibit percentage dependence greater than or equal to 70.

II.II. Subjectivity Filter

After applying the 30% dependence filter on all the HS2 category goods imported from China, a preliminary subjective analysis is done to eliminate items that prima facie do not appear to hold strategic value. These are categories that do not exhibit a high degree of complexity in the underlying labour and technology. Thus, items such as glass, fabric, leather, furniture, wood, toys, etc. are eliminated.

II.III. Strategic and Critical Vulnerability

Once the relevant HS2 items are selected, the entire list of their HS6 classification items (with imports worth greater than US$1 million) was individually tested against the Strategic and Critical Vulnerability (SCV) framework adopted from "Defining Dependence-induced Vulnerabilities in an Asymmetrical Trade Interdependence".[13] The objective is to identify those product categories where India's dependence on imports from China could be a source of strategic or critical vulnerability.

In the context of asymmetric trade interdependence, the framework posits that an import dependence-induced strategic vulnerability arises when an adversarial state seeks to leverage a case of dependence to impose a strategic cost on its enemy/rival state.

To examine this, the framework proposes a six-stage test, the first two of which are mandatory while the third and fourth are mutually exclusive. If a case of dependence satisfies the first two tests and any of the latter two tests, the dependence would amount to strategic vulnerability. The framework proposes two more tests to distinguish between strategic and critical vulnerabilities.

Adversary Test: This assesses if the dependence is on an adversary that wields both the capability and the willingness to apply economic coercion to secure its strategic interests or maximise strategic gains. By default, all imported product categories where India's dependence on China is significant (>= 30%) clear this test.

Substitutability Test: This test examines if there are existing alternatives that can replace the supply or service if the need arises. It assesses two sub-factors:

a) Scalability of the alternative, to meet demand immediately
b) Economic viability, that is, the switching cost must be reasonable

Incidence Test: This test is designed to capture the relevance and significance of finished items (or final products) for consumers. The test examines if the imported item has the capability to drastically affect the consumption pattern of a large section of the populace. To determine this, it examines both the size and significance of the disruption. Thus, two sub-factors become key here:

a) Size of the population impacted: For instance, an 80% dependency on a luxury item (such as a vehicle) catering to less than 1% of the consumer class cannot be classified as a strategic vulnerability, while significant dependence on critical machinery tools and electronic equipment can be termed as a strategic vulnerability for India if these items satisfy other tests.
b) Product's utility/significance to the populace: Soft toys, idols and decorative items cannot be considered as strategically vulnerable, while drugs (particularly vaccines), oilseeds, laptops and smartphones can be, provided they satisfy other tests.

Cascading Test: The test seeks to assess the cascading effect of the weaponisation of a dependency by an adversary on other domestic sectors within the supply chains or beyond. This test is designed to mainly capture the impact on capital goods and intermediate goods.

Further, if a case of strategic vulnerability satisfies any of the two following tests, it would amount to a Critical Strategic Vulnerability. The two tests entail:

Capability Gap: This examines the capability (technical know-how) gap between the adversary and the existing alternatives. If the adversary has a significant technical or capability lead over others in a sophisticated or specialised product

that can neither be replicated nor sourced from other alternate destinations in the short (up to nine months) to medium-term (nine to eighteen months), it could become a source of critical strategic vulnerability. This test is very similar to the substitutability test. However, the difference lies in the fact that while the substitutability test primarily attempts to measure impact in the short to medium-term, the capability gap test measures long-term (more than 18 months) consequences.

National Security: This assesses dependence on imports from the adversary in sectors such as electricity grids, communications, satellites, banking & finance, digital infrastructure, as well as all Command, Control, Communications, Computers (C4) Intelligence, Surveillance and Reconnaissance (ISR) related sectors. Dependence in these sectors could mean high susceptibility to cyber-attacks. Any exploitation of such vulnerabilities, even through a short-term disruption, can significantly undermine national security and thereby influence decisions in the national interest.

Limitations

While the adversary test is easy to administer, the substitutability, incidence and cascading effect are relatively difficult to measure.

To assess a commodity's substitutability, alternate options must be mapped along with their existing capacities to arrive at a fair decision. Likewise, to measure the possible incidence effect resulting from a disruption in a commodity segment, an evaluation of imports from China as a share of the total domestic market/consumption (as opposed to overall trade) is key. Lastly, measuring the cascading effect should be based on assigning weight to sub-factors such as value addition and employment generation associated with the commodity.

However, calculating this for the over two thousand items assessed in this study is unfeasible, primarily owing to the lack of publicly available data on each front—market concentration, market size, value addition or labour at the HS6-level classification.

II.IV. RIF-PCI Scale

To overcome the shortcomings associated with the Strategic Vulnerability Test, the paper adopts the RIF-PCI scale to model the SCV Framework closely and administer the associated tests.

The RIF-PCI scale uses two metrics, the Relative Impact Factor (RIF), and the Product Complexity Index (PCI), to assess India's strategic vulnerability to imports from China.

Relative Impact Factor (RIF)

The study employs the RIF as a metric to calculate the *factor* of immediate disruption. Operating on the assumption that the disruption will be proportional to the aggregate import value and percentage import dependence on China, the factor by which immediate disruption will vary can be expressed as:

$$RIF \propto \text{Aggregate Import Value}$$

$$RIF \propto \text{Percentage Import Dependence}$$

Thus, the Relative Impact Factor is calculated as:

$$\mathbf{RIF = [\{Import\ from\ China\ (US\$M) * Dependence\ (\%)\}/10{,}000]}$$

The value is divided by 10,000 to limit the scale for better data representation.

It is important to emphasise two points:

a) RIF is a measure of the factor of immediate disruption. It does not give an absolute measure of disruption. It simply indicates the proportion by which disruption for each item will vary. This explains the usage of the term 'relative.'
b) Since it is a measure of the factor of immediate disruption, it doesn't consider the second-order effects of disruption. The variable for second-order effects will vary for each item and thus is an independent exercise.

The RIF score also standardises the inequity, variation or divergence in an item's value of import and dependence ratio. In that regard, it acts as a normalisation score to rank items for which wide variation exists in aggregate import value and percentage import dependence.

For instance, consider item A with a percentage import dependence of 100 but an aggregate import value of US$ 10 million and item B with a percentage import dependence of 75 but an aggregate import value of US$ 50 million. Now, while item A exhibits a 100% dependence, the scale of the economy impacted by item B, which exhibits 75% dependence, will be higher because of the sheer size of the import. In this case, the RIF score for item A amounts to 0.1, while the same for item B would be 0.37. Thus, on the priority scale, item B would be higher than item A.

In part, the incidence and cascading effect will be proportional to the RIF score. This is based on the assumption that the higher the aggregate import value and percentage import dependence, the higher the incidence and cascading effect. However, since there is an element of subjectivity (qualitative analysis) involved in determining the incidence and cascading effect that will vary for every item, it is difficult to account for them using a mathematical formula. Nevertheless, this study acknowledges the scope for devising a more robust metric to measure the incidence and cascading effect. In the meantime, the RIF score serves as the closest indicator of the two effects.

Finally, the study adopts the following classification based on RIF score.

Table 2: Classification of RIF

Impact Factor Description	Insignificant	Substantially High	Exponentially High
Range	RIF < 0.1	0.1 <=RIF< 1	RIF >= 1

Product Complexity Index (PCI)

A measure developed by Hidalgo and Hausmann in 2009,[14] PCI ranks internationally traded products based on the *diversity* and *sophistication* of the technological know-how required to produce them. In other words, PCI is both a measure of the technological complexity of a product and the diffusion of its knowledge or technology among countries.

The Atlas of Economic Complexity[15] states:

> A PCI is calculated based on how many countries, based on their respective economic complexity, can produce the product. A higher score on PCI means that only a few countries have the economic complexity to produce or manufacture the product.

In other words, PCI is a measure of how many countries can produce a product and their respective economic complexity, i.e., the diversity of products they can produce.

That means if a product is manufactured by only a few countries, but by those with lesser economic complexity, such a product will score low on the PCI scale, even if production is concentrated. Alternatively, if a product is produced and exported by a few countries but by those with high economic complexity, the product will score high on the PCI scale.

The PCI score for products roughly ranges between -3 and +3.[16] On this scale, agricultural products and raw materials score the lowest (often negative), while machinery, electronics and chemicals score the highest.

Currently, two entities maintain a repository of PCI for internationally traded goods, namely the Harvard Atlas of Economic Complexity and the Observatory of Economic Complexity (OEC).[17] However, while the Harvard Atlas of Economic Complexity stores data only up to the HS4-level classification, the OEC database maintains data at the HS4 and HS6 levels. Since this study focuses on items at the HS6-level classification, it uses PCI sourced from the OEC

database (2022). However, the classification of PCI data at the HS6-level is not exhaustive in the database. Thus, in cases where PCI scores were not available for items at the HS6-level, this study used their PCI scores at the HS4-level.

This study uses the PCI score to assess the relative substitutability of items (short-term/medium-term/long-term) imported from China that exhibit a percentage dependence higher than 30. In part, this score is also a measure of the capability gap or lead. A product with a higher PCI would prove difficult to substitute for two reasons:

a) A higher technical complexity underlying the product would mean that efforts to build alternate capacities will be capital- and knowledge-intensive and, therefore, costly.
b) A lack of diversity or diffusion in technical know-how would mean either a paucity or absence of existing alternatives.

Similarly, a product with a lower PCI would be easier to substitute for two reasons:

a) A lower technical complexity underlying the product would mean that efforts to build alternate capacities will be relatively inexpensive.
b) Diversity, or diffusion, in technical know-how would mean alternatives can emerge quickly.

This study adopts the classification for technological complexity for products with PCI greater than 1 and their respective substitutability described in Table 3.

Table 3: Classification for Product Complexity and Respective Substitutability for PCI > 1

Complexity	Low	Moderate	High	Very High	Extremely High
Range	1<=PCI<1.25	1.25<=PCI<1.50	1.50<=PCI<1.75	1.75<=PCI<2	PCI>2
Substitutability /Disruption	Short-term	Short to Medium-term	Medium-term	Medium to Long-term	Long-term

Note: This classification is adapted solely for this exercise and shall be accordingly applied.

On the RIF-PCI scale, RIF is an indicator of immediate shock, while PCI is an indicator of period of disruption (based on relative substitutability). Based on below RIF-PCI matrix, following classification for Strategic and Critical Vulnerability is adopted (see Table 4).

Table 4: Classification for Strategic and Critical Vulnerability based on RIF-PCI matrix

Metrics (RIF/PCI)	Low 1<=PCI<1.25	Moderate 1.25<=PCI<1.5	High 1.5<=PCI<1.75	Very High 1.75<=PCI<2	Extremely High PCI>=2
Substantially High 0.1<=RIF<1	Substantially High Shock & Short-term Disruption	Substantially High Shock & Short to Medium-term Disruption	Substantially High Shock & Medium-term Disruption	Substantially High Shock & Medium to Long-term Disruption	Substantially High Shock & Long-term Disruption
Exponentially High RIF>=1	Exponentially High Shock & Short-term Disruption	Exponentially High Shock & Short to Medium-term Disruption	Exponentially High Shock & Medium-term Disruption	Exponentially High Shock & Medium to Long-term Disruption	Exponentially High Shock & Long-term Disruption
	Strategic Vulnerability →				Critical Vulnerability →

Using the RIF-PCI scale, the study seeks to eliminate items with an RIF less than 0.1 and PCI less than 1 to arrive at a list of items at the HS6-level classification that require prioritised attention.

III. Mapping Dependence in the HS2 Category

This section maps India's dependence on imports from China across all HS2 categories.[18] It finds that in 32 of the total 99 HS2 categories, dependence on imports from China exceeds 30%. These categories have been listed in Table 5.

Table 5: Items in the HS2 Category where Dependence on Chinese Imports > 30%

HS2 ID	Description	China ($M)	Total ($M)	D (%)
66	Umbrellas, sun umbrellas, walking sticks, seat sticks, whips, riding crops and parts thereof	48	50	96
60	Knitted or crocheted fabrics	565	728	78
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair	34	46	74
54	Man-made filaments	1203	1656	73
65	Headgear and parts thereof	29	45	64
86	Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical traffic signalling equipment	489	777	63
59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use	465	772	60
96	Miscellaneous manufactured articles	440	740	59
70	Glass and glassware	1034	1784	58
14	Vegetable plaiting materials; vegetable products not elsewhere specified	59	109	54
81	Other base metals; cermets; articles thereof	358	666	54
42	Articles of leather saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm) gut	262	509	51
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	102	200	51
69	Ceramic products	497	967	51
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	503	1011	50
95	Toys, games and sports requisites; parts and accessories thereof	260	518	50
92	Musical instruments, parts and accessories of such articles	33	68	49
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishing; lamps and lighting fittings not elsewhere specified or included	770	1592	48
83	Miscellaneous articles of base metal	564	1206	47

HS2 ID	Description	China ($M)	Total ($M)	D (%)
50	Silk	94	209	45
29	Organic chemicals	11449	26749	43
82	Tools implements, cutlery, spoons and forks of base metal; parts thereof of base metal	555	1361	41
73	Articles of iron or steel	1993	5113	39
84	Nuclear reactors, boilers, machinery & mechanical appliances; parts thereof	22473	57418	39
85	Electrical machinery & equipment and parts thereof; sound recorders & reproducers, television image & sound recorders & reproducers, and parts thereof	31356	81095	39
56	Wadding felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	157	419	37
55	Man-made staple fibres	321	901	36
35	Albuminoidal substances; modified starches; glues; enzymes	278	853	33
43	Fur skins and artificial fur manufactures thereof	2	6	33
46	Manufactures of straw, of esparto or of other plaiting materials; basket ware and wickerwork	3	9	33
64	Footwear, gaiters and the like; parts of such articles	242	724	33
57	Carpets and other textile floor coverings	49	157	31

Source: Ministry of Commerce and Industry, Government of India

On applying the preliminary subjectivity filter, 24 HS2 categories stand eliminated. These include items such as vegetable plaiting material, articles of leather, silk, fibre, yarn and textiles, wood, ceramics, stonework, glass and glassware, cutlery, musical instruments, furniture, bedding and toys.

Only three HS2 category items emerge with dependence greater than 30% that have the potential to induce strategic vulnerability: Organic Chemicals (HS 29), Machinery and Mechanical Appliances (HS 84), and Electrical Machinery and Equipment (HS 85). Incidentally, these three HS2 categories witnessed imports worth more than US$ 10 billion each from China during FY 2024. These three categories constituted more than 65% of India's total imports from China in FY 2024.

Thus, the study progresses further with a focus on each of the HS6 items under these HS2 classifications. The successive sections individually examine these three HS2 classifications and test each item against the SCV Framework.

IV. Organic Chemicals

Organic chemicals find wide-ranging applications across industries, including agriculture, leather, textiles, polymers, chemicals, food and, most importantly, pharmaceuticals.

The often-highlighted Active Pharmaceutical Ingredients (APIs), Key Starting Materials (KSMs) and Drug Intermediates (DIs) belong to the category of Organic Chemicals. It is widely known that India heavily depends on China (~70%) to source these items that are critical to the country's pharmaceutical industry and healthcare.[19] The cheap imports of APIs from China and the waiver of patents from the World Trade Organisation (WTO) have allowed the Indian pharmaceutical industry to emerge as a low-cost option worldwide.[20] This industry has been instrumental in keeping healthcare costs low in India, where the population's out-of-pocket health expenditure remains extremely high compared to the global average. It has also offered low-cost options to foreigners travelling to India, with the resultant comparative economic advantage powering the country's medical tourism industry. Accordingly, India has acquired the status of the pharmacy of the world. However, India's excessive dependence on China for APIs threatens industry-wide consequences.

Organic Chemicals also find extensive applications in material sciences, in the production of plastic, PVC, acrylic, nylon, polyethene and several other complex materials in the polymer industry. They are also critical to the leather and textiles industry, which uses organic chemicals to process raw materials into the final product. They also find applications as solvents, mixers, cleaners and as degradable detergents across the chemical and environmental industries.

The food industry uses organic chemicals as additives and preservatives to extend the shelf life of products. Some specific chemicals are also utilised in the manufacturing of explosives and ammunition. In the agricultural sector, organic

chemicals find application in the preparation of agrochemicals, pesticides and insecticides.

Thus, a disruption in this segment has the potential to trigger a cascading effect across other industrial sectors. It is, therefore, necessary to map India's dependencies and assess the possible strategic vulnerabilities in this segment.

IV.I. Distribution by Dependence Category

The tables that follow segregate the commodities, as per their dependence, into severe, high and moderate, at the HS6-level classification. They list all Organic Chemicals at HS6-level classification with an RIF>= 0.1, with their PCI scores. The PCI scores for items whose HS4-level classification value is given are depicted with asterisks (*). The tables use the RIF-PCI scale to highlight items of priority within each dependence category.

Severe Dependence Category

There are 64 items with a percentage dependence higher than or equal to 70 and RIF>= 0.1; these are listed in Table 6.

Table 6: Items under Organic Chemicals in the Severe Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
294190	Antibiotics nes, in bulk	823	970	85	7.0	0.76
294110	Penicillin, derivatives, in bulk; salts	673	780	86	5.8	0.83
293339	Heterocyclic compounds with unfused pyridine ring, nes	309	388	80	2.5	1.14
294200	Organic compounds, Not Elsewhere Specified (nes)	304	388	78	2.4	0.18
293359	Heterocyclic compounds with pyrimidine ring (w/n hydrogenated) nes	265	352	75	2.0	0.57
293319	Heterocyclic compounds with unfused pyrazole ring, nes	228	301	76	1.7	1.33
292229	Amino-naphthols/phenols nes, their ethers/esters/salt	190	207	92	1.7	0.12
292429	Cyclic amides, derivatives, nes, salts thereof	176	204	86	1.5	0.74
294150	Erythromycin, derivatives, in bulk, salts	154	165	93	1.4	0.56
293299	Heterocyclic compounds with oxygen hetero-atom(s)	163	225	72	1.2	1.03*
293369	Heterocyclic compounds with an unfused triazine ring,nes	125	143	87	1.1	1.26

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
291639	Aromatic monocarboxylic acids and derivatives, nes	107	118	91	1.0	-0.14
292249	Amino-acids nes, esters, salts thereof	107	129	83	0.9	0.90
290499	Sulfonated, nitrated or nitrosated derivatives of hydrocarbons, w/n halogenated, others	87	93	94	0.8	-1.15*
292241	Lysine, esters, salts thereof	93	109	85	0.8	-0.02
292620	1-Cyanoguanidine (dicyndiamide)	77	78	99	0.8	1.02*
293361	Melamine	84	92	91	0.8	0.20
293729	Adrenal cortical hormones nes, in bulk, derivatives	101	131	77	0.8	1.08
291814	Citric acid	84	96	88	0.7	0.05
292242	Glutamic acid, salts	65	69	94	0.6	-0.33
293219	Heterocyclic compounds with unfused furan ring, nes	68	76	89	0.6	1.12
293329	Heterocyclic compounds with unfused imidazole ring, nes	73	89	82	0.6	1.36
291830	Carboxylic acids (aldehyde, ketone function), derivatives	62	84	74	0.5	1.36
292142	Aniline derivatives and their salts	54	59	92	0.5	1.01*
292221	Aminohydroxynaphthalenesulphonic acids and their salts	54	56	96	0.5	0.63*
290715	Naphthols and their salts	43	44	98	0.4	1.48*
291620	Cyclan-/cyclen-/cycloterpen-monocarboxylic acid/derivatives	38	40	95	0.4	0.77
291712	Adipic acid, its salts & esters	61	84	73	0.4	1.21
291719	Acyclic polycarboxylic acids, derivatives, nes	47	63	75	0.4	0.89
292090	Esters of inorganic acids, nes, their salts, derivatives	52	66	79	0.4	1.75
292143	Toluidines and their derivatives, salts, thereof	47	55	85	0.4	1.01*
292149	Aromatic monoamines nes, derivatives, salts thereof	39	42	93	0.4	1.00
293349	Heterocyclic compounds containing a quinoline or isoquinoline ring-system (w/n hydrogenated), not fused	50	70	71	0.4	1.15*
290629	Benzyl alcohols	33	37	89	0.3	0.70*
291300	Halogenated, sulphonated, nitrated nitrosated products	26	27	96	0.3	-
291479	Ketones and quinones; halogenated, sulphonated, nitrated or nitrosated derivatives, other than chlordecone (ISO)	30	35	86	0.3	1.31*
291529	Other acetic acids and its salts	42	54	78	0.3	0.86*
291631	Benzoic acid, its salts & esters	38	51	75	0.3	0.83
291816	Gluconic acid its salts and esters	34	36	94	0.3	0.87*
292119	Acyclic monoamines nes, derivatives and salts	36	49	73	0.3	0.63
292151	O-,M-,P-phenylenediamine,diaminotoluenes, derivatives, salt	35	47	74	0.3	0.87
292700	Diazo-, azo- or azoxy-compounds	31	38	82	0.3	0.82
293331	Pyridine and its salts	29	31	94	0.3	1.15*
293626	Vitamin B12 and its derivatives	32	35	91	0.3	1.03*

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
290342	Difluoromethane (HFC -32)	17	17	100	0.2	0.96*
290559	Other acrylic alcohols	18	21	86	0.2	-0.26*
291221	Benzaldehyde	18	19	95	0.2	1.15*
291241	Vanillin	19	21	90	0.2	0.10
291439	Other aromatic ketones without other oxygen functions	29	36	81	0.2	1.31*
291469	Quinones other than anthraquinone	22	28	79	0.2	0.22
291812	Tartaric Acid	19	24	79	0.2	0.87*
291821	Salicylic Acid and its Salts	26	33	79	0.2	0.87*
292145	Naphthylamines, derivatives, salts thereof	25	27	93	0.2	1.01*
292421	Ureines and their derivatives, salts thereof	23	24	96	0.2	1.31*
293420	Heterocyclic compounds containing a benzothiazole ring	24	26	92	0.2	0.75
293627	Vitamin C, derivatives, unmixed	21	26	81	0.2	0.06
290329	Other saturated fluorinated derivatives of acyclic-hydrocarbons	15	17	88	0.1	0.96*
290343	Fluoromethane (HFC-41), 1,2- DifluoroethanC (HFC-152) And 1,1- Difluoroehtane (HFC 152-A)	11	11	100	0.1	0.96*
291090	Epoxides, epoxy-alcohols, -phenols,-ethers nes, derivatives	17	20	85	0.1	0.99
291711	Oxalic acid its salts and esters	10	10	100	0.1	0.59*
292159	Aromatic polyamines nes, derivatives, salts thereof	18	24	75	0.1	1.23
293214	Sucralose	14	16	88	0.1	1.03*
293622	Vitamin B1 and its derivatives	13	15	87	0.1	1.03*
293719	Polypeptide hormones and their derivatives and structural analogues	19	27	70	0.1	1.01*

Source: Ministry of Commerce and Industry, Government of India; OEC

High Dependence Category

There are 29 items with a percentage dependence greater than or equal to 50 but less than 70 and RIF>= 0.1; these are listed in Table 7.

Table 7: Items under Organic Chemicals in the High Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
293499	Other heterocyclic compounds	428	687	62	2.7	1.54*
293090	Organo-sulphur compounds, nes	175	262	67	1.2	1.27
292690	Nitrile-function compounds, nes	123	185	66	0.8	1.17

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
291539	Acetic acid esters nes	60	96	63	0.4	0.70
292250	Amino-alcohol-phenols etc with oxygen function	61	101	60	0.4	0.98
291429	Cyclic ketones, no oxygen function	53	101	52	0.3	1.14
291714	Maleic anhydride	49	83	59	0.3	1.16
291829	Carboxylic acids (phenol function only) & derivatives	42	63	67	0.3	1.58
291899	Carboxylic acids, with additional oxygen function (not alcohol, phenol, aldehyde or ketone) and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives; other than 2,4,5-T (ISO)	41	61	67	0.3	0.87*
293590	Sulphonamides, others	49	75	65	0.3	0.85*
293790	Other hormones, natural or reproduced by synthesis used as hormones	40	64	63	0.3	1.01*
290290	Cyclic hydrocarbons nes	34	66	52	0.2	0.66
290619	Cyclic alcohols, derivatives, other than aromatic, nes	28	48	58	0.2	0.47
290919	Acyclic ethers nes, derivatives of acyclic ethers	32	60	53	0.2	0.39
290960	Alcohol, ether, ketone peroxides, derivatives	26	38	68	0.2	0.96
291419	Other acyclic ketones without other oxygen function	32	54	59	0.2	1.31*
291619	Unsaturated acyclic monocarboxylic acids, derivatives	24	35	69	0.2	1.30
292130	Cyclanic, cyclenic and cycloterpenic amines, compound	33	58	57	0.2	1.11
292529	Imines and their derivatives; salts thereof (excl. chlordimeform [ISO])	38	67	57	0.2	1.33*
293220	Lactones	44	85	52	0.2	1.03*
293379	Lactams other than 6-hexanelactam	31	59	53	0.2	1.63
290345	1,1,1,2-Tetrafluroethane (HFC-134A) And 1,1,2,2-Tetrafluroethane (HFC-134)	18	27	67	0.1	0.96*
290930	Aromatic ethers, derivatives	18	27	67	0.1	1.15
291512	Salts of formic acid	20	32	63	0.1	0.86*
291550	Propionic acid its salts and esters	20	30	67	0.1	0.86*
292390	Quarternary ammonium salts and hydroxides, nes	20	30	67	0.1	1.15
292800	Organic derivatives of hydrazine or of hydroxylamine	21	42	50	0.1	1.00
293211	Tetrahydrofuran	27	49	55	0.1	0.96
293371	6-hexanelactam (epsilon-captolactam)	23	36	64	0.1	1.19

Source: Ministry of Commerce and Industry, Government of India; OEC

Moderate Dependence Category

There are 14 items with a percentage dependence greater than or equal to 30 but less than 50 and an RIF >= 0.1; these are listed in Table 8.

Table 8: Items under Organic Chemicals in the Moderate Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
293399	Heterocyclic compounds with nitrogen heteroatom(s)only	1323	2748	48	6.4	1.15*
291736	Terephthalic acid, its salts	432	1322	33	1.4	0.62
291521	Acetic acid	231	504	46	1.1	0.92
291612	Acrylic acid esters	171	344	50	0.9	0.97
292910	Isocyanates	111	288	39	0.4	1.16
291590	Saturated acyclic monocarboxylic acids, derivatives, nes	86	249	35	0.3	1.05
292141	Aniline and its salts	83	225	37	0.3	0.93
290611	Menthol	46	132	35	0.2	0.68
292219	Amino-alcohols nes, their ethers and esters, salts	54	153	35	0.2	1.10
290512	Propyl alcohol and isopropyl alcohol	35	114	31	0.1	0.65
291560	Butyric acids, valeric acids, their salts & esters	29	65	45	0.1	0.92
291735	Phthalic anhydride	35	88	40	0.1	0.64
292800	Organic derivatives of hydrazine or hydroxylamine	21	42	50	0.1	1.00
294130	Tetracyclines, derivatives, in bulk, salts	30	65	46	0.1	0.79

Source: Ministry of Commerce and Industry, Government of India; OEC

Key Inferences

- Import dependence (in aggregate and percentage terms) on China for penicillin and other antibiotics is excessive, as is evident from their RIF score. Further, given their utility in the health sector, antibiotics are a strategic commodity. However, their PCI is less than 1, suggesting easy substitutability in case of disruption. Nevertheless, the immediate shock (as is evident in their 'Exponentially High' RIF) in case of a disruption will be substantial. The ideal de-risking strategy in this regard is stockpiling reserves and mandating a buffer.
- Heterocyclic compounds also exhibit high deviation from the threshold RIF of 0.1 and product complexity mostly ranging from 'Moderate' to 'High'.

Even in cases, where certain heterocyclic compounds do exhibit a product complexity of less than one, they display 'Exponentially High' RIF.

- ❖ Heterocyclic compounds act as ingredients for a range of pharmaceutical products that include drugs for inflammation, cancer and viral infection, among others. They also find application in agrochemicals such as pesticides, insecticides, herbicides, etc.
- ❖ Thus, a disruption in the supply of heterocyclic compounds can trigger a huge cascading effect in a series of other sectors. Given their lack of relative substitutability (medium to long-term) owing to their high PCI scores, state intervention in some form to encourage domestic production or reduce dependence on China is justified.
- ❖ Most of the highlighted items, such as heterocyclic compounds, carboxylic acids and epsilon-caprolactam, among others, have applications in the pharmaceutical industry. Collectively, they exhibit relatively higher product complexity compared to most. In this light, some de-risking efforts are justified, which could range from stockpiling and diversification to domestic production.
- ❖ It does, however, need to be noted that not all APIs are a priority area as per the RFI-PCI scale.
- ❖ Organo-sulphur compounds; Napthols and their salts; and Ketones and Quinones are other notable organic chemicals that warrant attention in the state's de-risking strategy.

IV.II. Distribution on the RIF-PCI Scale

The scatter plots given here represent all the items at the HS6-level classification in the 'Organic Chemicals' category, which exhibit Dependence>= 30% and RIF=> 0.1, along with their respective PCI scores. For those items whose PCI scores at the HS6-level classification weren't available, their PCI scores at the HS4-level classification were plotted.

Figure 2: Organic Chemicals exhibiting 0.1<=RIF<1

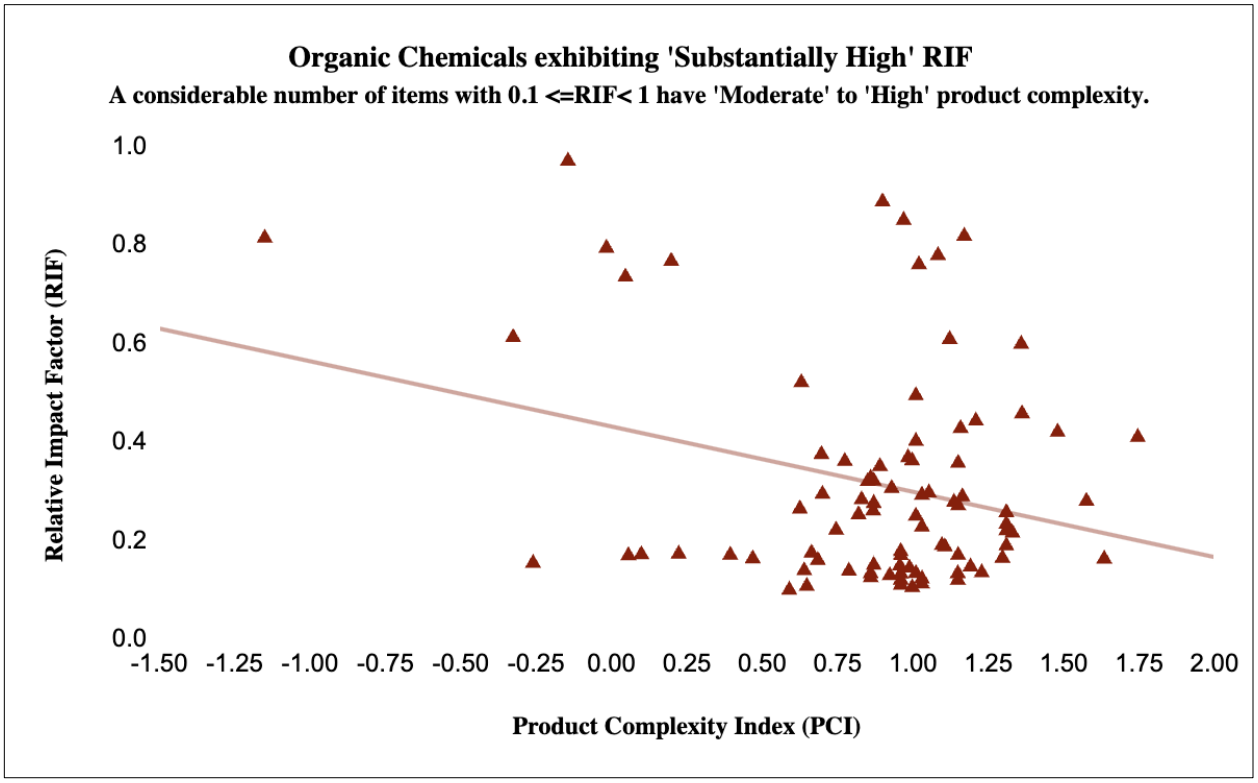
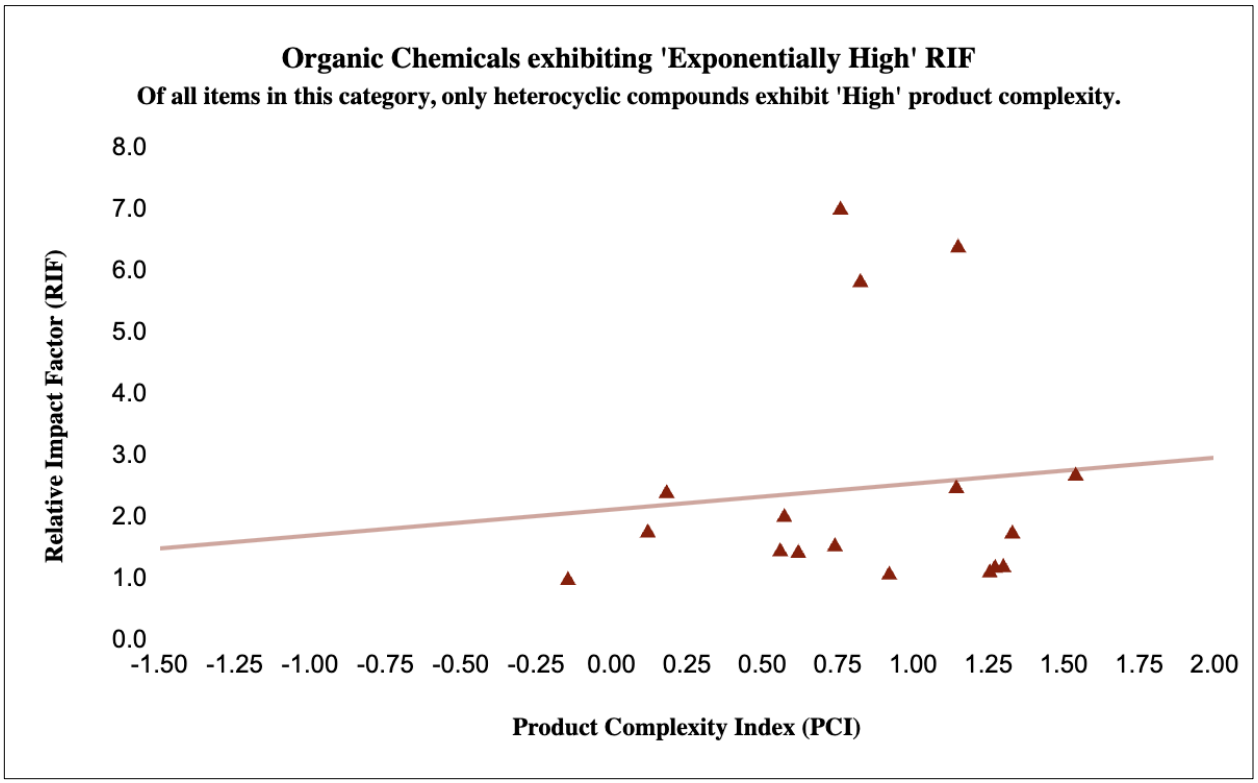


Figure 3: Organic Chemicals exhibiting RIF>=1



The RIF-PCI matrix described in Table 9 represents the distribution of Organic Chemicals.

Table 9: Distribution of Organic Chemicals on the RIF-PCI Scale

Metrics (RIF/PCI)	PCI< 1	Low 1<=PCI<1.25	Moderate 1.25<=PCI<1.5	High 1.5<=PCI<1.75	Very High 1.75<=PCI<2	Extremely High PCI>=2
Substantially High 0.1<=RIF<1	48	30	9	2	1	0
Exponentially High RIF>=1	10	3	3	1	0	0

The following insights become apparent from the above matrix:

- Among the items with an RIF>= 0.1 and PCI> 1, a majority exhibit 'Low' to 'Moderate' product complexity.
- None of the items under Organic Chemicals imported from China with an RIF>= 0.1 have 'Extremely High' product complexity.
- Only four items score either 'High' or 'Very High' on product complexity, indicating relative difficulty in their substitution (medium to long-term) in the event of a disruption.
- In total, there are 17 items across the three dependence categories with 'Exponentially High' RIF. However, only one among them exhibit a 'High' PCI.
- A majority of items with an RIF>= 1 have a PCI< 1. This suggests that their relative ease of substitutability will act as a countervailing factor and thus mitigate the impact of shock in case of disruption.

V. Machinery and Mechanical Appliances

Machinery and Mechanical Appliances classified under category HS84 emerges as India's second-largest import category vis-à-vis China. During the FY 2024, India imported US$ 22.47 billion worth of machinery from China, which constituted around 39% of its total imports in the category.

A scrutiny of India's dependence on China for 'Machinery and Mechanical Appliances' becomes crucial for several reasons. Firstly, machines and machinery form the core of the entire industrial sector. As capital goods, they find wide-ranging applications across the manufacturing industry. These include industrial robots, metal rolling machines, cyclotrons, complex air/gas/water turbines, industrial furnaces, automatic data processing machines, critical machine tools, critical metalworking tools, machines used in metallurgy, pneumatic and hydraulic machines, laser/light/photon beam blasters, derricks, cranes, as well as various complex sorting and grinding machines. These are critical to value addition in the economy and producing finished goods for consumers.

Secondly, the category also contains strategic machinery, such as nuclear reactors, jet engines, broadcasting equipment and cyclotrons, that are key to a nation's infrastructure. Strategic goods include critical machine tools that are instrumental in manufacturing several dual-use components that find applications in the space, defence, and cyber sectors.

Finally, by virtue of being capital goods, a disruption in supply of machinery can trigger a widescale cascading effect. A disruption will likely also have a pronounced incidence effect for the working and labourer class.

Consequently, it is imperative to investigate all items at the HS6-level classification within the 'Machinery and Mechanical Appliances' category in detail.

V.I. Distribution by Dependence Category

The tables that follow segregate these commodities, as per their dependence, into severe, high and moderate, at the HS6-level classification. They list all Machinery and Mechanical Appliances at the HS6-level classification with an RIF>= 0.1, with their PCI scores. The PCI scores for items whose HS4-level classification value is given are marked with an asterisk (*). The tables use the RIF-PCI scale to highlight items of priority within each dependence category. Only items with an RIF >= 0.1 are retained within each dependence category, with the PCI mapped alongside.

Severe Dependence Category

There are 40 items with a percentage dependence greater than or equal to 70 and RIF>= 0.1; these are listed in Table 10.

Table 10: Items under Machinery and Mechanical Appliances in the Severe Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
847130	Portable digital automatic data processing machines, weighing <10kg consisting of CPU, display & keyboard	4175	5450	77	32.0	1.10*
842649	Cranes & lifting frames, self-propelled, not on tyres	331	370	89	3.0	-0.85
842641	Cranes & lifting frames, self-propelled, on tyres	268	325	82	2.2	0.26
844790	Tulle, lace, embroidery, trimmings etc, making machine	241	288	84	2.0	0.54
848640	Machines and apparatus specified in note 9(C) to this chapter	208	239	87	1.8	_
842619	Transporter or bridge cranes	197	234	84	1.7	0.48
841430	Compressors for refrigerating equipment	215	292	74	1.6	1.10
843131	Parts of lifts, skip hoists or escalators	153	186	82	1.3	0.86
845090	Parts of household or laundry-type washing machines	86	112	77	0.7	0.51
846729	Other machines with self-contained electric motor	98	136	72	0.7	1.02*
841460	Ventilating hoods having a maximum width < 120 cm	60	62	97	0.6	0.64
841710	Furnaces/ovens non-electric for ores/pyrites/metals	78	104	75	0.6	0.91
843710	Machines to clean, sort, grade seed, grain, dry legumes	84	113	74	0.6	0.26
844400	Machines to extrude, draw, cut man-made textile fibres	85	116	73	0.6	1.77

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
842482	Agricultural or horticultural mechanical appliances	52	58	90	0.5	0.90*
842833	Continuous action goods conveyor or elevator belt type	65	84	77	0.5	0.66
843229	Scarifiers, cultivators, weeders and hoes	48	49	98	0.5	0.60
844180	Machinery for making up pulp, paper, paperboard nes	61	77	79	0.5	1.07
846799	Hand-held tools nes, parts thereof	64	76	84	0.5	1.22
841960	Machinery for liquefying air or other gases	51	62	82	0.4	0.23
842611	Gantry and overhead travelling cranes on fixed support	45	47	96	0.4	0.62
842790	Trucks with lifting/handling equipment, non-powered	54	77	70	0.4	-0.54
844130	Machines making paper/board boxes etc, except moulded	52	67	78	0.4	1.40
845510	Tube mills	49	64	77	0.4	1.09*
840290	Parts of steam or vapour-generating boilers nes	36	39	92	0.3	0.23
842951	Front-end shovel loaders	42	59	71	0.3	0.58
844720	Flat knitting machines, stitch-bonding machines	40	57	70	0.3	-0.31
844900	Machinery for making felt, nonwovens, including hats	34	45	76	0.3	1.11
845221	Automatic sewing machines, other than book-sewing nes	39	47	83	0.3	0.53
846721	Drills with self-contained electric motor	37	50	74	0.3	1.02*
848049	Moulds for metal or metal carbides, nes	36	50	72	0.3	0.97
841850	Refrigerator/freezer chests/cabinets/showcases	33	47	70	0.2	0.25
842441	Portable sprayers	20	22	91	0.2	0.90*
842449	Other	23	27	85	0.2	0.90*
842620	Tower cranes	19	22	86	0.2	-0.27
843930	Machinery for finishing paper or paperboard	24	29	83	0.2	1.65
844140	Machines for moulding articles in paper pulp, paper etc	27	33	82	0.2	1.05*
845320	Machinery for making or repairing footwear	30	40	75	0.2	0.30*
846722	Saws with self-contained electric motor	17	18	94	0.2	1.02*
846781	Chain saws for working in hand	27	35	77	0.2	0.58

Source: Ministry of Commerce and Industry, Government of India; OEC

High Dependence Category

There are 36 items with a percentage dependence greater than or equal to 50 but less than 70 and RIF>= 0.1; these are listed in Table 11.

Table 11: Items under Machinery and Mechanical Appliances in the High Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
848620	Machines and apparatus for the manufacture of semi-conductor devices or electronic integrated circuits	421	642	66	2.8	-
843149	Parts of cranes, work-trucks, shovels, construction machines	474	890	53	2.5	0.80
848340	Gearing, ball screws, speed changers, torque converters	336	638	53	1.8	1.33
848210	Bearings, ball	291	522	56	1.6	0.85
848079	Moulds for rubber or plastic, nes	186	266	70	1.3	0.60
841869	Refrigerating or freezing equipment nes	146	234	62	0.9	0.81
848310	Transmission shafts and cranks, cam and crank shafts	169	336	50	0.9	1.00
845611	Machine tools for working any material by removal of material operated by laser	124	186	67	0.8	1.63
847160	Input/Output units, with/not containing storage units in the same housing	161	307	52	0.8	1.10*
847480	Machines to agglomerate, shape, mould minerals or fuels	130	209	62	0.8	-0.13
845229	Sewing machines, other than book-sewing machines, nes	108	177	61	0.7	-0.26
847141	Other digital automatic data processing machines comprising in same housing CPU and input and output unit, w/n	112	181	62	0.7	1.10*
845430	Casting machines used in metallurgy, foundries	122	234	52	0.6	1.07
847149	Other digital automatic data processing machines presented in the form of a system	84	121	69	0.6	1.10*
841440	Air compressors mounted on wheeled chassis for towing	78	117	67	0.5	-0.27
843041	Boring or sinking machinery nes, self-propelled	91	153	59	0.5	-1.31
846490	Machine tools nes for stone, ceramics and cold glass	67	97	69	0.5	0.77
847930	Presses for particle, fibre board, etc manufacture	82	124	66	0.5	0.72
841899	Parts of refrigerating or freezing equipment (of Hdg 8418)	66	111	59	0.4	0.55
842810	Lifts and skip hoists	70	116	60	0.4	0.64
843780	Machines to mill or work cereals or dried legumes nes	63	105	60	0.4	-0.45
844339	Other	67	112	60	0.4	1.43*
843120	Parts of fork-lift etc trucks (of Hdg 8427)	38	56	68	0.3	0.77
843351	Combine harvester-threshers	50	73	68	0.3	0.70
846599	Machine tools for wood, cork or hard plastic, etc nes	47	69	68	0.3	0.82

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
846789	Tools for working in hand, non-electric motor nes	47	70	67	0.3	0.69
847050	Cash registers	54	104	52	0.3	0.29
847981	Metal treating machines, electric wire coil-winders	48	78	62	0.3	1.51
848320	Bearing housings etc, incorporating ball/roller bearing	45	74	61	0.3	0.95
841451	Table, window, ceiling fans, electric motor <125 watt	25	39	64	0.2	-0.59
841939	Non-domestic, non-electric dryers nes	42	81	52	0.2	1.24
846229	Machine tools to bend, fold, shear or press metal, nes	40	73	55	0.2	1.08
846420	Grinding/polishing machines for stone, ceramics, glass	24	37	65	0.2	1.48
846711	Tools for working by hand, pneumatic rotary type	30	43	70	0.2	1.61
847420	Machines to crush or grind stone, ores and minerals	40	68	59	0.2	0.14
848291	Balls, needles and rollers for bearings	38	71	54	0.2	0.86

Source: Ministry of Commerce and Industry, Government of India; OEC

Moderate Dependence Category

There are 53 items with a percentage dependence greater than or equal to 30 but less than 50 and RIF>= 0.1; these are listed in Table 12.

Table 12: Items under Machinery and Mechanical Appliances in the Moderate Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
847330	Parts and accessories of data processing equipment nes	921	2425	38	3.5	1.03
847989	Machines and mechanical appliances nes	675	1660	41	2.7	1.60
841480	Air or gas compressors, hoods	414	921	45	1.9	1.17
844630	Shuttle-less looms for weaving fabric >30cm wide	301	650	46	1.4	1.40
841490	Parts of vacuum pumps, compressors, fans, blowers, hoods	293	673	44	1.3	1.21
847780	Rubber or plastic working machines, nes	226	469	48	1.1	1.29
844331	Machines which perform two or more of the functions of printing, copying or facsimile transmission	184	480	38	0.7	1.43*
848071	Moulds, injection & compression for rubber or plastics	161	358	45	0.7	1.40
848390	Parts of power transmission etc, equipment	139	346	40	0.6	1.50
841459	Electric fans, motor > 125 watts	131	359	36	0.5	0.47
845530	Rolls for metal rolling mills	107	221	48	0.5	0.90
840734	Engines, spark-ignition reciprocating, over 1,000 cc	115	306	38	0.4	1.14
841590	Parts for air conditioners	131	394	33	0.4	1.02

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
841780	Industrial furnace, oven, incinerator non-electric nes	74	156	47	0.4	0.36
843139	Parts of lifting/handling machinery nes	111	304	37	0.4	0.94
845590	Parts of metal rolling mills and rolls	108	292	37	0.4	0.76
847710	Injection-moulding machines for rubber or plastic	113	299	38	0.4	1.73
847790	Parts of machines for working rubber or plastic	99	270	37	0.4	1.59
848190	Parts of taps, cocks, valves or similar appliances	139	435	32	0.4	1.40
848299	Bearing parts, nes	83	179	46	0.4	1.11
841290	Parts of hydraulic/pneumatic/other power engines	75	165	45	0.3	0.72
841950	Heat exchange units, non-domestic, non-electric	88	241	37	0.3	1.12
842890	Lifting, handling, loading or unloading machinery nes (other machinery of Hdg 8428)	96	292	33	0.3	1.27
845522	Cold metal rolling mills	62	147	42	0.3	1.09*
848230	Bearings, spherical roller	74	171	43	0.3	1.50
841370	Centrifugal pumps nes	66	213	31	0.2	0.83
841790	Parts of industrial or laboratory furnaces/ovens	57	130	44	0.2	0.47
841990	Parts, laboratory/industrial heating/cooling machines	67	210	32	0.2	0.88
842489	Sprays/powder dispersing machines except agricultural	59	155	38	0.2	1.37
842710	Self-propelled works trucks, electric motor	43	98	44	0.2	1.32
842920	Graders and levellers, self-propelled	52	121	43	0.2	-2.03
843880	Industrial machinery nes for food, drink preparation	46	111	41	0.2	0.45
844520	Textile yarn spinning machines	49	157	31	0.2	1.57
844712	Circular knitting machines, diameter > 165 mm	33	71	46	0.2	1.94
845490	Parts of equipment for metallurgy, foundries	41	91	45	0.2	0.92
845521	Hot, or combination hot-cold metal rolling mills	69	212	33	0.2	0.23
846290	Machine tools, including presses, for working metal for forging, hammering or die forging	41	98	42	0.2	1.50*
846630	Dividing heads/attachments nes for machine tools	52	148	35	0.2	1.29
847340	Parts and accessories of office machines, nes	70	200	35	0.2	0.81
847720	Extruders for working rubber or plastic	61	162	38	0.2	1.08
848220	Bearings, tapered roller, including assemblies	51	148	34	0.2	1.05
848280	Bearings, ball or roller, nes, including combinations	47	111	42	0.2	1.23
842839	Continuous action elevators or conveyors for goods nes	39	109	36	0.1	1.06
843050	Construction equipment, self-propelled nes	29	83	35	0.1	0.03

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
844110	Cutting machines for paper pulp, paper or paperboard	28	57	49	0.1	0.81
844849	Parts & accessories of looms, auxiliary machinery nes	28	57	49	0.1	1.26
845180	Machinery to impregnate textiles, make linoleum, etc	32	93	34	0.1	0.97
845899	Lathes nes for removing metal	22	47	47	0.1	1.65*
846249	Other punching/notching machines (including presses) including combined punching and shearing machines	20	40	50	0.1	-
846262	Mechanical presses	24	57	42	0.1	1.50*
847410	Machines to sort, screen, wash stone, ores & minerals	29	60	48	0.1	0.86
847529	Machines for manufacturing hot working glass or glassware, nes	33	78	42	0.1	1.21
847940	Rope or cable-making machines	22	48	46	0.1	0.74

Source: Ministry of Commerce and Industry, Government of India; OEC

Key Inferences

- Portable automatic data processing machines <10 kg exhibit the highest RIF score, of 32, both within and across the categories. It makes India's dependence a source of potential vulnerability. Digital automatic data processing machines (other than those mentioned in the severe dependence category) again figure in the high dependence category, thereby enhancing their combined significance. Like portable automatic data processing machines (<10 kg), these machines also have a high score on the RIF scale.
- A 'Moderate' PCI score for automatic data processing machines, however, suggests that enough diversification exists in terms of technological capability among countries. Additionally, in this segment, while imports are sourced from China, the manufacturing firms operating there include a range of foreign players. Thus, while an import ban, in this case, is not justified, state intervention to attract such foreign players to manufacture in India is a recommended de-risking strategy.
- Metalworking and machine tools have a 'High' PCI score and, given their strategic significance in a range of manufacturing activities, emerge as a top priority area in India's de-risking strategy, thereby warranting state

intervention in some form. State intervention to encourage domestic capability in the highlighted segments of the machine and metalworking tools is recommended.

- ❖ Machines to extrude, draw and cut man-made fibres exhibit 'High' to 'Very High' PCI score. State intervention of some form can be justified in the textile machines segment.
- ❖ Textiles and knitting machines with relatively high scores on the PCI and RIF scales figure across dependence categories. State intervention to de-risk India's exposure is recommended.
- ❖ Tools with self-contained electric motors also consistently figure in the tables that exhibit RIF and PCI scores above the designated threshold. Thus, these segments also emerge as a priority area within the larger de-risking strategy.
- ❖ Machines for making/finishing paper, pulp, paper boxes, and paperboard have relatively high RIF and PCI, but when a subjective filter is applied, it doesn't appear to be strategic. Thus, government intervention is strongly discouraged.
- ❖ State intervention isn't recommended for items that are not of strategic significance, such as rubber, plastic, glass working machines, vacuum pumps and compressors.

V.II. Distribution on the RIF-PCI Scale

The scatter plots given here represent all the items at the HS6-level classification in the 'Machinery and Mechanical Appliances' category, which exhibit Dependence>=30% and RIF=> 0.1, along with their respective PCI scores. For those items whose PCI scores at the HS6-level classification weren't available, their PCI scores at the HS4-level classification were plotted.

Figure 4: Machinery and Mechanical Appliances exhibiting 0.1 <=RIF<1

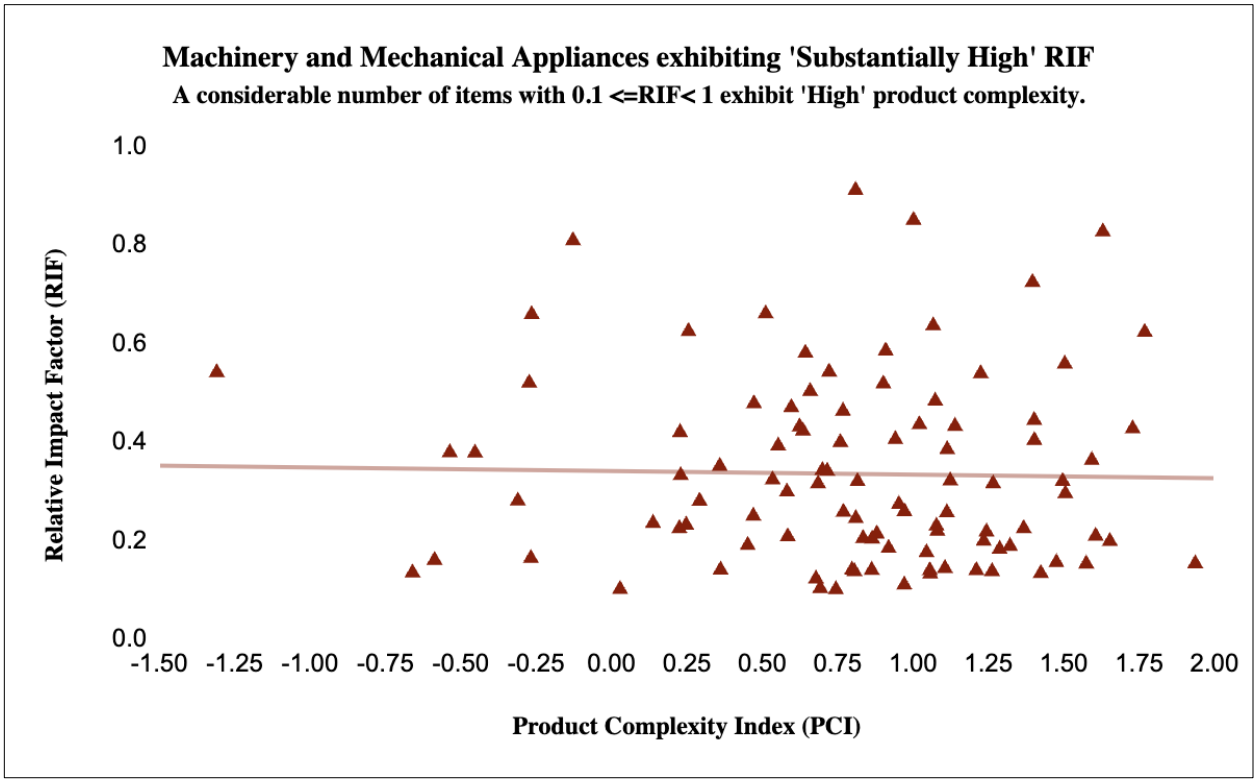
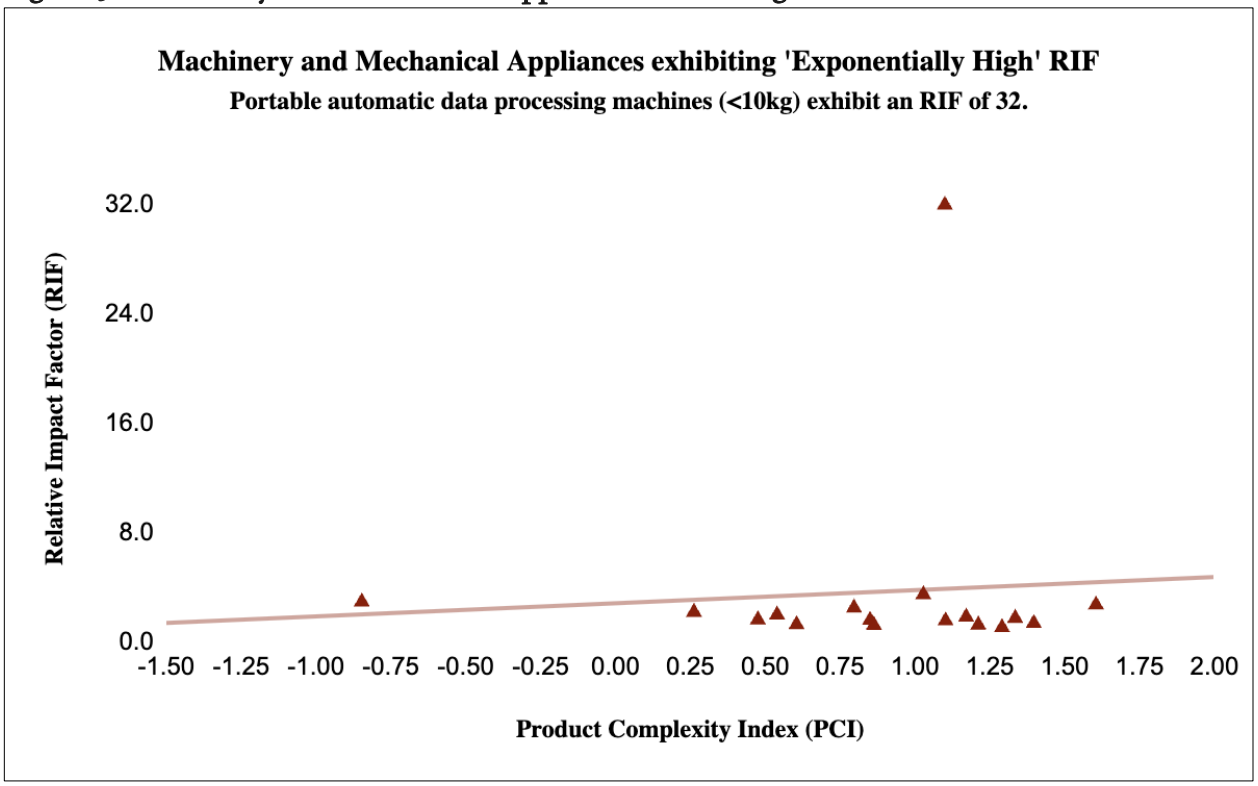


Figure 5: Machinery and Mechanical Appliances exhibiting RIF>=1



Note: PCI Data for HS 848620 and 846249 wasn't available. Thus, their values are not plotted on the map.

The RIF-PCI matrix seen in Table 13 represents the distribution of Machinery and Mechanical Appliances.

Table 13: Distribution of Machinery and Mechanical Appliances on the RIF-PCI Matrix

Metrics (RIF/PCI)	PCI< 1	Low 1<=PCI<1.25	Moderate 1.25<=PCI<1.5	High 1.5<=PCI<1.75	Very High 1.75<=PCI<2	Extremely High PCI>=2
Substantially High 0.1<=RIF<1	62	23	11	12	2	0
Exponentially High RIF>=1	10	5	3	1	0	0

The following insights become apparent from the above matrix:

- Among the items with an RIF>= 0.1 and PCI> 1, the majority exhibit 'Low' product complexity. However, a substantial number of items exhibit 'Moderate' and 'High' product complexity, suggesting possible substitutability in medium-term.
- None of the items exhibit 'Extremely High' product complexity. It suggests that India does not depend on China for items that can trigger a long-term disruption in this category.
- Two items score 'Very High' on product complexity, indicating greater difficulty in their substitution in the event of a disruption.
- In total, there are 19 items across the three dependence categories with 'Exponentially High' RIF. However, half of them exhibit PCI< 1. For such items, the potential high impact of disruption is mitigated by the relative ease of substitutability.

VI. Electrical Machinery and Equipment

The 'Electrical Machinery and Equipment' segment, classified under the HS85, is the largest import category for India vis-à-vis China. In FY 2024, India imported items worth US$ 31.3 billion in this segment, thereby accounting for over 30% of its total imports from China.

The category constitutes important electrical goods such as lasers/photon beams, signalling apparatus, electrons, capacitors, batteries, printed circuits, electric motors and generators, transmitters, receivers and amplifiers, memories, as well as magnets (electrical and permanent), among others. These find application in the broadcasting and telecommunications equipment, and thus are critical to the country's ICT infrastructure.

Furthermore, lithium-ion batteries and solar photovoltaic cells, critical to the country's energy transition and climate goals also belong to this classification of goods. Lastly, India's massive dependence on China for consumer electronics such as TVs, radio, microwave, Flat Panel Displays, vacuum cleaners, etc., also emanates from this category.

VI.I. Distribution by Dependence Category

The tables that follow segregate these commodities, as per their dependence, into severe, high and moderate, at the HS6-level classification. They list all Electrical Machinery and Equipment at HS6-level classification with an RIF>= 0.1, with their PCI scores. The PCI scores for items whose HS4-level classification value is used are marked with an asterisk (*). The table uses the RIF-PCI scale to highlight items of priority within each dependence category. Only items with an RIF equal to greater than 0.1 are retained within each dependence category, along with their PCI scores.

Severe Dependence Category

There are 23 items with a percentage dependence greater than or equal to 70 and RIF>= 0.1; these are listed in Table 14.

Table 14: Items under Electrical Machinery and Equipment in the Severe Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
850760	Lithium ion	2206	2942	75	16.5	1.09*
851713	Smartphones	872	924	94	8.2	1.35*
852491	Flat panel display modules, with or not (w/n) incorporating touch-sensitive screens, with drivers or control circuits, of liquid crystals	1003	1293	78	7.8	0.84*
852499	Flat panel display modules, w/n incorporating touch-sensitive screens of other than liquid crystals or OLED	259	354	73	1.9	0.84*
851890	Parts of non-recording electronic equipment	168	213	79	1.3	0.46
850511	Metal permanent magnets, articles intended as magnets	154	200	77	1.2	0.80
850140	AC motors, single-phase, nes	117	134	87	1.0	0.20
851690	Parts of electro-thermic apparatus, domestic, etc	114	129	88	1.0	0.51
850164	AC generators of an output > 750 kVA	50	53	94	0.5	0.63
851679	Electro-thermic appliances, domestic, nes	52	57	91	0.5	0.66
850860	Other vacuum cleaners	38	40	95	0.4	1.15*
851539	Non-automatic electric plasma and other arc welders	46	59	78	0.4	1.11
851660	Electric cooking, grilling & roasting equipment nes	53	64	83	0.4	0.60
853210	Fixed power capacitors (50/60 hertz circuits)	50	67	75	0.4	0.49
850433	Transformers electric, power capacity 16-500 KVA	23	32	72	0.2	-0.36
850940	Domestic food grinders, mixers, juice extractors	23	24	96	0.2	0.43
852290	Parts and accessories of recorders, except cartridges	33	44	75	0.2	0.38
850172	Photovoltaic DC generators of an output >50W	12	12	100	0.1	0.80*
850231	Other generating sets; wind-powered	11	11	100	0.1	0.50*
850434	Transformers electric, power capacity > 500 KVA, nes	17	22	77	0.1	0.19
850980	Domestic appliances with electric motors, nes	12	14	86	0.1	0.52
851030	Hair-removing appliances	12	14	86	0.1	0.70*
851631	Electric hair dryers	13	16	81	0.1	0.13

Source: Ministry of Commerce, Government of India; OEC

High Dependence Category

There are 29 items with a percentage dependence greater than or equal to 50 but less than 70 and RIF>= 0.1; these are listed in Table 15.

Table 15: Items under Electrical Machinery and Equipment in the High Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
854143	Photovoltaic cells assembled in modules or panels	2851	4354	65	18.7	0.83*
854142	Photovoltaic cells not assembled in modules or made up into panels	1036	1853	56	5.8	0.83*
852990	Parts for radio/TV transmit/receive equipment nes	825	1204	69	5.7	0.32
850440	Static converters, nes	900	1800	50	4.5	1.07
850300	Parts for electric motors and generators	401	667	60	2.4	0.63
850490	Parts of electrical transformers and inductors	374	645	58	2.2	0.59
852852	Other monitors capable of directly connecting to or designed for use with an automatic data processing machine of heading 8471	331	513	65	2.1	0.01*
851830	Headphones, earphones, combinations	289	549	53	1.5	0.24
850790	Parts of electric accumulators, including separators	227	402	56	1.3	1.02
851771	Aerial and aerial reflectors of all kinds of parts suitable for use therewith	199	304	65	1.3	1.35*
851829	Loudspeakers, nes	212	386	55	1.2	-0.18
851822	Multiple loudspeakers mounted in a single enclosure	155	247	63	1.0	0.66
852411	Flat panel display modules, w/n incorporating touch-sensitive screens, without drivers or control circuits of liquid crystals	134	232	58	0.8	0.84*
854690	Electrical insulators, except glass/ceramics	76	112	68	0.5	0.57
850519	Permanent magnets & articles intended as magnets, nes	44	70	63	0.3	1.14
854420	Co-axial cable and other co-axial electric conductors	56	109	51	0.3	-0.64
854519	Carbon and graphite electrodes, except for furnaces	57	104	55	0.3	0.10
850120	Universal AC/DC motors of an output < 37.5 watts	31	45	69	0.2	0.42
851650	Microwave ovens	29	56	52	0.2	0.69
852869	Other projectors	31	54	57	0.2	0.01*
853990	Parts of electric filament or discharge lamps	35	54	65	0.2	0.64
854511	Carbon and graphite furnace electrodes	28	48	58	0.2	0.56
850132	DC motors, DC generators of an output 0.75-75 kW	21	37	57	0.1	0.79
850610	Primary cells and primary batteries of manganese dioxide of an external volume <=300cc	17	26	65	0.1	0.60*

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
850811	Vacuum cleaners, with self-contained electric motor, of a power not exceeding 1,500W and having a dust bag or other receptacle capacity not exceeding 20L	22	34	65	0.1	1.15*
851850	Electric sound amplifier sets	25	45	56	0.1	0.33
853120	Indicator panels incorporating electronic displays	27	52	52	0.1	0.66
853951	LED modules	16	23	70	0.1	0.64*
854470	Optical fibres and cables	19	33	58	0.1	-0.03

Source: Ministry of Commerce, Government of India, OEC

Moderate Dependence Category

There are 33 items with a percentage dependence greater than or equal to 30 but less than 50 and RIF>= 0.1; these are listed in Table 16.

Table 16: Items under Electrical Machinery and Equipment in the Moderate Dependence Category

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
851779	Parts of telephone sets, telephones for cellular networks or for other wireless networks & of other apparatus for the transmission or reception of voice, images or other data,	4553	10993	41	18.9	1.35*
850440	Static converters, nes	900	1800	50	4.5	1.07
854239	Electronic integrated circuits other than processors and controllers, w/n combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits, memories and amplifiers	1249	3824	33	4.1	1.42*
854232	Memories	1106	3533	31	3.5	1.42*
853400	Electronic printed circuits	579	1367	42	2.5	0.84
854233	Amplifiers	251	588	43	1.1	1.42*
850131	DC motors, DC generators of an output < 750 watts	139	283	49	0.7	1.10
853229	Electric capacitors, fixed, nes	214	613	35	0.7	0.50
850110	Electric motors of an output < 37.5 watts	145	337	43	0.6	0.49
850450	Inductors, electric	170	449	38	0.6	0.59
854141	LED	131	275	48	0.6	0.83*
854370	Electrical machines and apparatus having individual functions, not specified or included elsewhere in this chapter, n.e.c. in heading no. 8543	189	615	31	0.6	1.06*
854110	Diodes, except photosensitive and light-emitting	140	406	34	0.5	1.12
854449	Electric conductors, nes < 1000 volts, no connectors	141	383	37	0.5	-0.31
853222	Electric capacitors, fixed, aluminium electrolytic nes	74	152	49	0.4	1.06
853620	Automatic circuit breakers for < 1,000 volts	82	184	45	0.4	0.17

HS6 ID	Description	China ($M)	Total ($M)	D (%)	RIF	PCI
854442	Electric conductors, nes <1000 volts, with connectors	135	418	32	0.4	-0.6*
850431	Transformers electric, power capacity < 1 KVA, nes	65	155	42	0.3	-0.18
851821	Single loudspeakers mounted in an enclosure	57	126	45	0.3	0.09
852859	Other monitors	81	217	37	0.3	0.01*
853340	Variable resistors, rheostats and potentiometers, nes	73	180	41	0.3	0.41
853649	Electrical relays for 60–1,000 volts	77	206	37	0.3	0.41
850720	Lead-acid electric accumulators, except for vehicles	55	124	44	0.2	0.00
851290	Parts of cycle & vehicle light, signal, etc, equipment	66	209	32	0.2	0.49
851580	Electric, laser and ultrasonic welding equipment nes	49	123	40	0.2	1.49
851810	Microphones and stands thereof	45	106	42	0.2	0.09
853590	Electrical apparatus for voltage > 1kV, nes	42	106	40	0.2	0.79
854160	Mounted piezo-electric crystals	53	134	40	0.2	0.91
850153	AC motors, multi-phase, of an output > 75 kW	41	118	35	0.1	0.99
851632	Electro-thermic hairdressing apparatus, nes	23	47	49	0.1	1.09
851840	Audio-frequency electric amplifiers	30	75	40	0.1	0.68
853190	Parts of electric sound & visual signalling apparatus	32	86	37	0.1	0.82
854419	Insulated winding wire, nes	30	65	46	0.1	-0.79

Source: Ministry of Commerce and Industry, Government of India; OEC

Key Inferences

- In general, India's import dependence (in aggregate and percentage terms) on China is highest in 'Electrical Machinery and Equipment' category. This is reflected in a significant number of items with 'Exponentially High' RIF. However, none of the items in the category exhibit a product complexity higher than 'Moderate'.
- While items such as photovoltaic cells, flat panel displays, parts of radio and TVs, permanent magnets, electronic printed circuits, AC motors, etc., exhibit 'Exponentially High' RIF, they display a product complexity of less than 1. It suggests that while most of the production for such items may be concentrated in China at present, it can quickly diffuse to other places.
- Lithium-ion has an 'Exponentially High' RIF score of 16.5, but on the PCI scale, it values just over 1, suggesting that there exists sufficient diversity with respect to technological complexity among nations to produce it if the

market demands it. This suggests that China's dominance in Lithium-ion is not a result of its technological or capability lead over others but a consequence of its competitive prices. However, given lithium-ion's strategic significance in India's clean energy transition, it might be prudent for India to diversify its imports and attract countries with the requisite economic complexity and incentives to produce the same on Indian soil.

- Broadcasting and telecommunications equipment such as smartphones, parts for telephones, apparatus for transmission and receivers, etc., exhibit 'Exponentially High' RIF, indicating massive dependence. However, they display 'Moderate' product complexity, suggesting relative ease in their substitutability. Nonetheless, their massive RIF suggests a possibility for a huge shock, even if it is short-lived. Furthermore, given their significance in certain strategic sectors, there is a need for a de-risking strategy in the deployment of these equipment in sensitive areas. A detailed screening of items for backdoors before deployment in the security apparatus shall be mandated.
- Integrated Circuits, memories, and amplifiers also exhibit 'Moderate' product complexity but 'Exponentially High' RIF, indicating massive supply shock in the short to medium-term.
- Processors (HS 854231) is absent from the list despite exhibiting an RIF of 8.7 as India's percentage dependence on China in this category is less than 30 (26%).

VI.II. Distribution on the RIF-PCI Scale

The scatter plots given here represent all the items at the HS6-level classification in the 'Electrical Machinery and Equipment' category, which exhibit Dependence>= 30% and RIF=> 0.1, along with their respective PCI scores. For those items whose PCI scores at the HS6-level classification weren't available, their PCI scores at the HS4-level classification were plotted.

Figure 6: Electrical Machinery and Equipment exhibiting 0.1 <=RIF<1

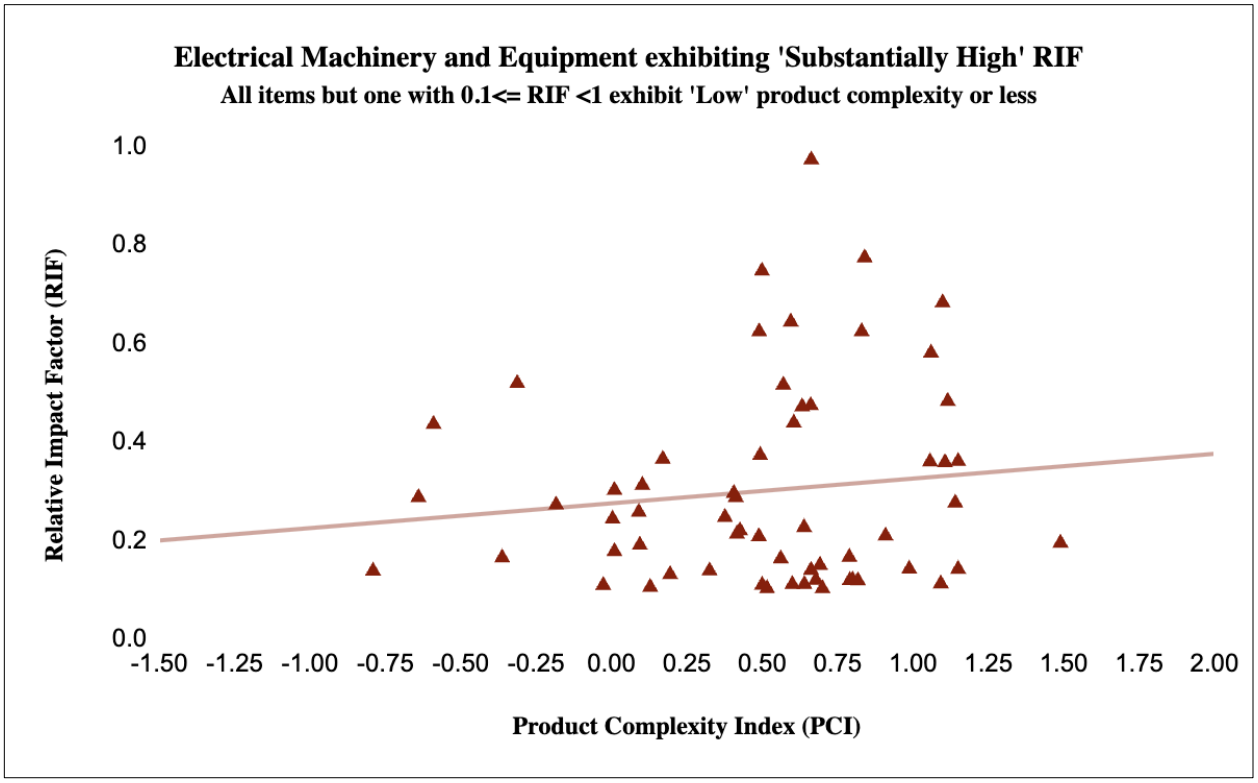
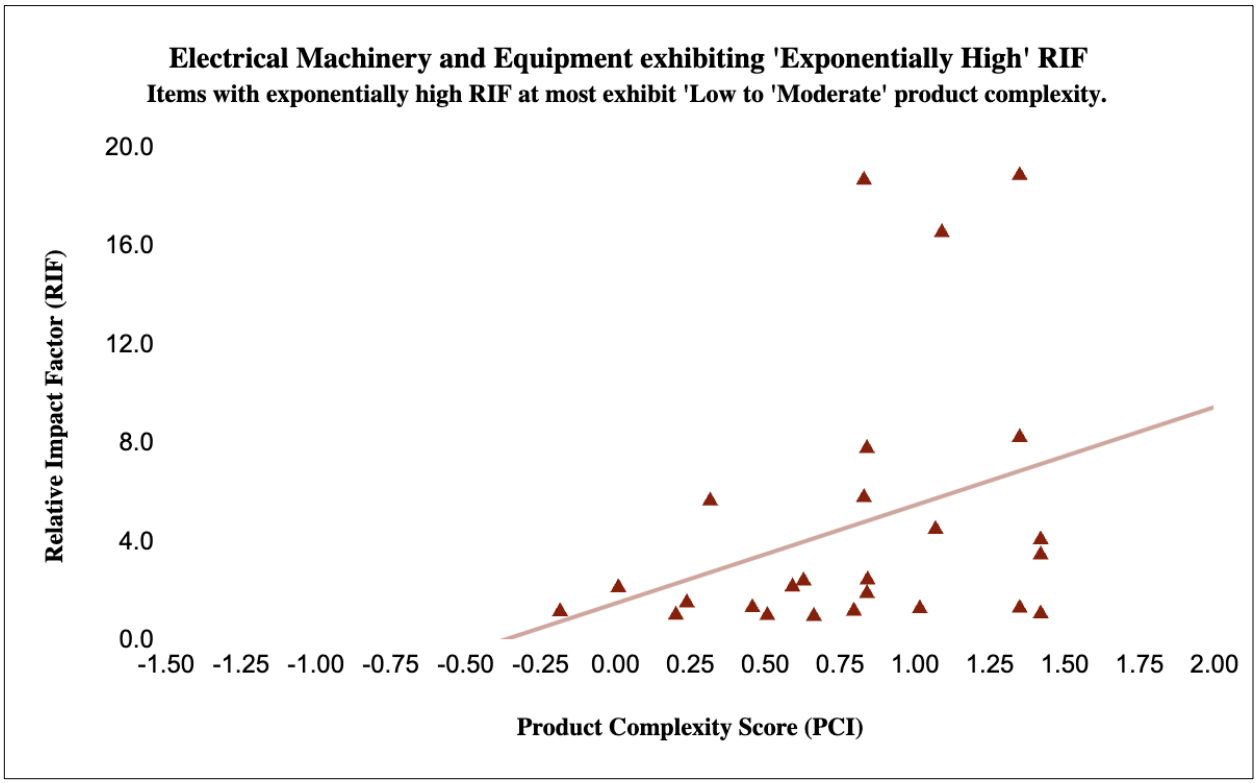


Figure 7: Electrical Machinery and Equipment exhibiting RIF>=1



The RIF-PCI matrix as shown in Table 17 represents the distribution of Electrical Machinery and Equipment.

Table 17: Distribution of Electrical Machinery and Equipment on the RIF-PCI Matrix

Metrics (RIF/PCI)	PCI< 1	Low 1<=PCI<1.25	Moderate 1.25<=PCI<1.5	High 1.5<=PCI<1.75	Very High 1.75<=PCI<2	Extremely High PCI>=2
Substantially High 0.1 <=RIF< 1	49	9	1	0	0	0
Exponentially High RIF >= 1	17	3	6	0	0	0

The following insights become apparent from the above matrix:

- A significant number of items with RIF>=0.1, exhibit a product complexity of less than one.
- Among the items with an RIF>= 0.1 and PCI> 1, the majority exhibit 'Low' to 'Moderate' product complexity.
- None of the items exhibit 'High', 'Very High' or 'Extremely High' product complexity.
- More items (26) under the Electrical Appliances and Equipment category exhibit a very high RIF score (greater than 1) compared to those under Organic Chemicals and Machinery and Mechanical Appliances. However, around two-thirds of them have a PCI< 1, suggesting relative ease in their substitutability in the event of a disruption.
- In general, Electrical Machinery and Equipment exhibit high RIF but low product complexity.

VII. Assessing India's Vulnerabilities

This study examines India's strategic vulnerabilities by employing the SCV Framework and the RIF-PCI scale across three categories: Organic Chemicals, Machinery and Mechanical Appliances, and Electrical Machinery and Equipment. These three categories together accounted for more than two-thirds (~66%) of India's total imports from China in FY 2024.

The study eliminated any item within the abovementioned three categories where the percentage import dependence on China was less than 30. For the purpose of this study, it was assumed that sufficient diversification existed for the eliminated items and thus did not require state attention.

The study also eliminated items with an RIF< 0.1. The RIF was calculated to record the factor by which the scale of impact would vary for each item based on the aggregate import value and percentage import dependence. This allowed the study to focus on the most urgent areas requiring attention.

This study found that across the three categories, for items with an RIF>= 0.1, the majority were concentrated in the 0.1–1 range, showing a 'Substantially High' RIF. Yet, they also contained a considerable number of items with an 'Exponentially High' RIF: Organic Chemicals (17), Machinery and Mechanical Appliances (19) and Electrical Machinery and Equipment (25).

However, none of the items across the three categories exhibited an 'Extremely High' product complexity (PCI>= 2). This indicates that India's import dependence on China does not amount to a critical vulnerability in any case. Most items across the three categories exhibited a product complexity of less than one. Of those with a PCI value higher than 1, a majority exhibited either 'Low' or 'Moderate' product complexity (i.e., 1 <=PCI< 1.5). This indicates that in all such cases, while supplies would be substitutable with relative ease in short to medium-term, there is a likelihood of an immediate shock, thereby rendering India strategically vulnerable for a brief period.

The Machinery and Mechanical Appliances category harboured the highest number of items (15) with 'High' or 'Very High' product complexity (i.e., 1.5 <=PCI< 2), followed by Organic Chemicals (4). Electrical Machinery and Equipment did not contain any item exhibiting product complexity greater than 1.5 on the PCI scale even though it housed the greatest number of items with an 'Exponentially High' impact factor (RIF>= 1). Thus, compared to Organic Chemicals and Machinery and Mechanical Appliances, Electrical Machinery and Equipment displayed the least product complexity. Nevertheless, it needs to be stressed that of all the items with an RIF>= 0.1, Electrical Machinery and Equipment have the maximum average RIF (1.59) compared to Organic Chemicals (0.65) and Machinery and Mechanical Appliances (0.74).

VII.I. Distribution on the RIF-PCI Scale

The RIF-PCI matrix as shown in Table 18 depicts the distribution of all the items analysed (RIF>= 0.1) across the three categories, Organic Chemicals, Machinery and Mechanical Appliances, and Electrical Machinery and Equipment.

Table 18: Cumulative Distribution of All Items in the RIF-PCI Matrix

Metrics (RIF/PCI)	PCI< 1	Low 1<=PCI<1.25	Moderate 1.25<=PCI<1.5	High 1.5<=PCI<1.75	Very High 1.75<=PCI<2	Extremely High PCI>=2
Substantially High 0.1 <=RIF< 1	159	62	21	14	3	0
Exponentially High RIF >= 1	37	11	12	2	0	0

From the matrix in Table 17, it is evident that a plethora of items at the HS6-level classification within Organic Chemicals, Machinery and Mechanical Appliances, and Electrical Machinery and Equipment exhibit RIF>= 0.1, indicating a high potential for immediate shock in case of disruption in supply.

However, attention should be focused on the fact that that none of the items with an RIF>= 0.1 exhibit 'Extremely High' product complexity (PCI>= 2). Further, only three items across the three categories exhibit 'Very High' product complexity. Finally, 16 items across the three categories exhibit 'High' product complexity.

However, most items with an RIF>= 0.1 and PCI> 1 exhibit 'Low' to 'Moderate' product complexity. This suggests that while a disruption in the supply of such items can trigger a huge shock, it will be short-lived because of the existing diversification and easy substitutability. Another inference that one can draw from the distribution of items in the matrix is that India's import dependence on China is not mainly a result of China's comparative advantage but competitive advantage in terms of prices.

Nevertheless, there are items where immediate state attention within India's larger de-risking strategy can be justified. These include heterocyclic compounds and carboxylic acid within Organic Chemicals, as well as machine tools, metalworking tools, and textiles and knitting machines within Machinery and Mechanical Appliances.

VIII. Conclusion

If 'Significantly High' RIF for items imported from China renders India susceptible to immediate and huge shock, and thus vulnerable, their respective 'Low' to 'Moderate' product complexity renders China equally vulnerable. As almost all of China's exports to India are relatively easily substitutable, Beijing's leverage over New Delhi is rather limited. Thus, one can argue that the nature of dependence equips India with leverage as well.

It is to be emphasised that for China to extract any advantage of strategic value through economic coercion, the scale and impact of such a measure must be significant. This would require China to target multiple items that can inflict maximum shock or damage to India. But there exists a greater likelihood that any such incident would be a one-off interaction, as it is likely to push India towards forced diversification, thereby expending China's leverage forever.

IX. References

[1] Ministry of Commerce and Industry, Government of India, https://tradestat.commerce.gov.in/eidb/Default.asp

[2] Ajay Srivastava, "India must recalibrate its FTA strategy," The Hindu Business Line, November 25, 2024, https://www.thehindubusinessline.com/opinion/india-must-recalibrate-its-fta-strategy/article68911101.ece

[3] "IEEMA calls for ban on Chinese imports," EMA Magazine, https://www.eprmagazine.com/epr-personality/ieema-calls-for-ban-on-chinese-imports/

[4] "At 79%, China has most cases of dumping cheap products in India: Data," Hindustan Times, December 16, 2024,

https://www.hindustantimes.com/india-news/at-79-china-has-most-cases-of-dumping-cheap-products-in-india-data-101734288507423.html#:~:text=New%20Delhi%20China%20topped%20a,metals%2C%20fibres%20and%20plastic%20sectors.

[5] Vijay Gokhale, "Himalayan Détente," Times of India, October 30, 2024, https://timesofindia.indiatimes.com/blogs/toi-edit-page/himalayan-detente/; Ashok Kantha, "Weighing in on business as usual with China," The Hindu, September 24, 2024, https://www.thehindu.com/opinion/lead/weighing-in-on-business-as-usual-with-china/article68674839.ece

[6] Ben Norton, "China is 'world's sole manufacturing superpower', with 35% of global output," Geopolitical Economy, January 31, 2024, https://geopoliticaleconomy.com/2024/01/31/china-world-manufacturing-superpower-production/; Arendse Huld, "China Manufacturing Tracker: 2024-25," China Briefing, https://www.china-briefing.com/news/china-manufacturing-industry-tracker-2024-25/#:~:text=In%202023%2C%20the%20country%20contributed,consumer%20electronics%20to%20heavy%20machinery.

[7] Harrell, Peter, Elizabeth Rosenberg, and Edoardo Saravalle. "Annex: Case Studies of Recent Instances of Chinese Economic Coercion over the Last Decade." *CHINA'S USE OF COERCIVE ECONOMIC MEASURES*. Center for a New American Security, 2018. http://www.jstor.org/stable/resrep20429.8.

[8] Applying domestic capability as a determining factor to impose countervailing duties is adopted from Pranay Kotasthane's work. See, "A Framework for India's Approach Towards Chinese Firms," Anticipating the Unintended (267), August 11, 2024, https://publicpolicy.substack.com/p/267-bayesian-updating?open=false#%C2%A7india-policy-watch-a-framework-for-indias-approach-towards-chinese-firms

[9] Ibid.

[10] Ministry of Commerce and Industry, Government of India, https://dashboard.commerce.gov.in/commercedashboard.aspx

[11] International Trade Administration, "Understanding HS Codes and Schedule B," Accessed on December 30, 2024, https://www.trade.gov/harmonized-system-hs-codes

[12] Ben Norton, "China is 'world's sole manufacturing superpower', with 35% of global output," Geopolitical Economy, January 31, 2024, https://geopoliticaleconomy.com/2024/01/31/china-world-manufacturing-superpower-production/; Arendse Huld, "China Manufacturing Tracker: 2024-25," China Briefing, https://www.china-briefing.com/news/china-manufacturing-industry-tracker-2024-25/#:~:text=In%202023%2C%20the%20country%20contributed,consumer%20electronics%20to%20heavy%20machinery.

[13] Amit Kumar, "Defining Dependence-induced Vulnerabilities in an Asymmetrical Trade Interdependence: A Conceptual Framework," Takshashila Discussion Document No. 2023-11, July 2023, The Takshashila Institution.

[14] C.A. Hidalgo, R. Hausmann, The building blocks of economic complexity, *Proc. Natl. Acad. Sci. U.S.A.*106 (26) 10570-10575, https://doi.org/10.1073/pnas.0900943106 2009).

[15] The Atlas of Economic Complexity Glossary, https://atlas.hks.harvard.edu/glossary

[16] The Atlas of Economic Complexity, https://atlas.hks.harvard.edu/rankings/product

[17] For Harvard Atlas of Economic Complexity database, See https://atlas.hks.harvard.edu/rankings/product; For OEC database, see https://oec.world/en/rankings/pci/hs6/hs96?tab=ranking

[18] Ministry of Commerce and Industry, Government of India, https://tradestat.commerce.gov.in/eidb/Default.asp

[19] Department of Pharmaceuticals, Ministry of Chemicals & Fertilizers (Government of India), "Survey for Novel/ Innovative and Cost-effective Technologies for Route of Synthesis to Decrease the Cost of Production of APIs which are currently being Imported to Reduce Import Dependency," March 2023, https://pharmaceuticals.gov.in/sites/default/files/Final%20Report-Survey%20of%20Novel%20Technologies%20for%20Productoion%20of%20APIs.pdf

[20] Amendment to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), World Trade Organisation, https://www.wto.org/english/tratop_e/trips_e/tripsfacsheet_e.htm

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