Task Force 1
Macroeconomics, Trade, and Livelihoods: Policy Coherence and International Coordination

REDUCING DATA ASYMMETRY TO STRENGTHEN SUPPLY CHAINS

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Abstract

This Policy Brief proposes that G20 countries must cooperate to mitigate asymmetry in crucial supply chain-related information among stakeholders across the value chain in order to address data asymmetry-induced disruptions. The G20 is best suited to create such a framework, given that they constitute 20 of the world's largest economies and will have to directly confront the challenges of supply chain disruptions. Through its Data Gaps Initiatives 1.0, 2.0, and 3.0, the G20 has already gained first-hand experience in securely mitigating such asymmetry in areas such as the financial sector, climate change, income and wealth distribution, and data sharing.[1] This Policy Brief suggests that, in the fourth Data Gaps Initiative, the G20 should consider introducing another imperative: supply chain resilience through accountable, efficient, and transparent data sharing.

The Challenge

1

In 2021, when the COVID-19 pandemic was at its peak, the global economy went into a state of flux as supply chains were disrupted by a lack of coordinated efforts to understand lockdown-induced fluctuations in demand and supply. This was most stark in the shortage of semiconductor chips that are crucial to the manufacture of commodities from electronic gadgets like mobile phones to artificial intelligence and defence equipment. There were complex reasons for the supply chain disruption, of which the most prominent ones were the following:

i. There was intense fluctuation in the demand for chips. First, there was a rise in demand for gadgets required to work from home, like personal computers and laptops. At the same time, there was a fall in demand from smartphone and automobile manufacturers that were coping with slowed growth due to an overall reduction in consumers' incomes.

ii. Work-from-home led to a sudden shift away from factory-intensive work, which disrupted the functioning of workforces in the chips industry. The extended quarantine times also negatively impacted the production rate.

iii. The supply of chips was interrupted by intensive, long-term lockdowns of borders as well as the using up of the transport capacity for COVID-related exports. Ships and cargo planes faced pressures due to overutilisation for the transport of vaccines, masks, and medicines, which also resulted in frequent engine failures, while ships at dockyards struggled to enter borders.

In all these cases, better communication between various actors within the supply chain, from manufacturers to suppliers, and private sellers to governments, as well as cooperation towards accessibility and transparency could have used a more formalised mode of communication and exchange of information. For example, had there been a comprehensive repository on where chips were readily available and by when export endeavours could succeed, or had there been inter-governmental cooperation on logistical assistance for transport, coping with the abovementioned COVID-induced disruptions would have been dealt with more effectively.

Supply chains are complex networks of entities involved in the practices and processes that generate value for

the individual consumer and the larger economy. These entities are identified as either 'upstream', i.e., those involved in the pre-manufactured product stage of the supply chain (including the raw material provision and manufacturing itself) or 'downstream', i.e., those in packaging and distribution to the end-consumer.[2]

With the existence of such a diverse set of actors in the distributed supply chain, data regarding demand and consumption, availability of raw materials, or actual versus projected availability of product supply is lost due to poor coordination and the self-interests of relevant actors.

It is clear from the impacts of the COVID-19 pandemic on international supply chains that if all stakeholders in such supply chains do not possess the adequate amount of information required to fully optimise production, output, and consumption processes, and there exists data or information asymmetry between them, significant lapses will have a massive fallout for national and global economies and livelihoods.

The nature of the 'data' and 'asymmetry'

In a supply chain, varying types of relevant data include:[3]

- Sales and demand data—Inclusive of customer data, they help understand the demand for products and services, customer preferences, buying habits, and behaviour, allowing stakeholders to forecast future demand and optimise inventory levels accordingly;
- Supplier data—Information about suppliers' lead times, quality ratings, and pricing that help stakeholders select their optimal suppliers and negotiate favourable terms;
- Inventory data—They help stakeholders understand their current inventory levels and track the movement of products throughout the supply chain;
- Transportation data—Information about routes, shipping times, and costs that help stakeholders optimise their shipping and delivery processes; and
- Financial data—This includes information about costs and

cash flow, which are necessary for stakeholders to manage their finances and make informed decisions about investments and growth.

Given the wide variety of data available, analysts[4] recognise numerous types of information asymmetries within supply chains. These include cost information asymmetry, demand information asymmetry, capacity information asymmetry, quality information asymmetry, disruption information asymmetry, attribute information asymmetry, inventory information asymmetry, price information asymmetry, effort-level information asymmetry, and objective function information asymmetry, of which cost and demand information asymmetries are studied most frequently.

Upstream actors such as manufacturers possess real-time data on delays in production due to the various disruptive factors described above. Similarly, downstream actors such as sellers and even governments would have real-time data on fluctuations in demand and delays in delivery. However, this data is not shared among various stakeholders.

This Brief identifies two main reasons why these stakeholders may not be able to share such data (willingly or unwillingly):

i. **It is more profitable to sell data than to divulge it willingly.** Simply put, various actors, especially middlemen (like consultancy firms) holding information that may be crucial to other actors in a decentralised supply chain would rather sell it as a service[5] than enable their clients (manufacturers, suppliers, and exporters) to store it in a widely accessible repository. Moreover, industry coalitions in chips, such as the Washington-based Semiconductor Industry Association (SIA), hold on to forecasting and other critical data and publish it in the form of yearly reports that are sold (the 2022 Report, for example, costs US$375[6] for non-members to access). Similarly, Bloomberg has created an extensive supply chain database,[7] which is advertised as a 'product'. **All of these are imperatives of comparative advantage and weaponisation of information.**

ii. **Information collection processes are erroneous, and digitisation helps.** Analysts suggest[8] that upstream supply chain actors can collect real-time data on production by integrating new and emerging technologies into their assembly lines. However, at the source, processes of collection can be incoherent, complex, and lacking willful effort. Here, we see from Dell's example[9] that its digitised supply chain has helped deal with the semiconductor shortage. Supply and demand scenarios are simulated in their digital model, allowing them to make decisions to either prioritise or cut down on certain Stock Keeping Units (SKUs) when supply is running low. More companies[10] are turning to digitisation with the aim of increasing their supply chain agility in order to respond quickly to demand and supply volatility, and the wide varieties of tech they deploy today include sensors, alphanumerical codes, bar codes, Radio Frequency Identification (RFID) tags, and Geographic Information Systems (GIS).

The G20's Role

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G20 nations are the world's biggest economies, and supply chain resilience has to inevitably become the backbone of any future negotiations on global economic recovery. As supply chains are disrupted by crises like the COVID-19 pandemic, the burden of a range of issues—from consumer satisfaction to saving manufacturers, retailers, and exporters from debt—falls on policymakers in some way. In such a scenario, if governments of G20 nations can enable transparent and accessible sharing of information by industry actors, they can strengthen their own policy outcomes.

National and global economic considerations surround the protection and conservation of national exporters and shipment capacities and hinder supply. Freeing up the most commonly taken trade routes, which become overcrowded and blocked, especially during global economic crises, exacerbate shipment delays and supply disruptions. Against the backdrop of the COVID-19 pandemic, popular supply routes linking Asia with North America and Europe became overcrowded and result in delayed exports, especially those of masks and medicines. Because of a lack of formalised methods of data sharing across borders, on the one hand, Australia and China witnessed[11] empty containers piling up on their ports, while ports in India and the US were falling short of containers due to heavy supply requests.

Recommendations to the G20

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This Brief envisions a data governance model to create a mutually beneficial situation for governments and the private sector. The two key aspects of the envisioned data governance model entail data collection and data science.

Data collection

Between governments and private entities, the government is best equipped with the function of data collection in a cost-effective manner because of its ability to coordinate between various supply chain actors that may not be in sync with each other. The most potent tool at the government's disposal is taxation. The fact that governments collect taxes at multiple levels of the value chain allows them to create a robust and integrated data infrastructure at relatively minimal costs compared to private entities that engage in supply chain-related data collection. Besides, governments also act as gatekeepers for various clearances of goods and services across domestic and international borders.

The issue at present is that governments across the world in general do not leverage this capability to collect data and apply it for public means. The gap thus created allows private entities to step in and address the data asymmetry, albeit at increased economic cost. However, because governments have the power to make policy and influence industry, they can mandate the collection of data at all source points. Moreover, the source of datasets on supply chains already includes government records, in addition to other private players in the supply chain. However, because data is not properly maintained nor accessible, data collection becomes a costly affair for private entities. This inefficiency could be removed if governments leverage their tax records and mandate all actors involved in supply chains to collect their inventory data at source points and share it with the government so that such data can be stored at a single source.

The process of governments creating a parallel framework for data collection cannot solely be conducted during or after trigger events and must be a continuous exercise in order for them to make crucial information readily available at all times and have the time and understanding to react to unusual disruptions. At the same time, the focus of data that must necessarily be

collected may not include all five types of datasets highlighted previously. Instead, demand and supply, suppliers, and transport data should be the key focus of such an exercise.

In the past, the G20 has collaborated with the International Monetary Fund through its Data Gaps Initiatives to study and work through deficiencies in information linkages. As part of DGI-4, G20 countries may even resolve to create a single source of data entry for all supply chain actors as part of the G20 Secretariat. A digital dashboard, accessible for a nominal fee, will perhaps best serve this purpose and can be maintained by the International Financial Architecture (IFA) Working Group under the G20 Secretariat's Finance Track.

It is also recommended that the G20 governments encourage the integration of IoT and blockchain within sites of manufacturing and production to allow for real-time information collection at the source. These technologies make a strong case for bringing about supply chain transparency, because:

- The Internet of Things (IoT) is making inventory management more intelligent, optimising key warehousing processes and lowering labour costs to improve operations. IoT tags or devices can be attached to reusable assets like inventory storage totes and pallets, guiding the warehouse picker to their storage locations.
- Similarly, IoT can provide advantages for transportation activities in supply chains. A 'smart' Transportation Management System (TMS) can be created using IoT-enabled solutions. These solutions use IoT devices to transform transportation processes and make them more efficient and flexible. For example, a GPS can be used to position refrigerated trucks from remote distribution centers, optimise routing and delivery time, and maintain product quality.[12]
- The use of IoT not only automates activities like picking and packing, but also increases efficiency by reducing the manual effort required to locate products and materials in warehouses, as well as during transport, by improving

delivery time predictions and fleet availability. Furthermore, cost savings and error reductions can be achieved by automating inventory receiving and order dispatch processes.[13]

- Blockchain can provide a shared, tamper-proof ledger of transactions, making it easier to track and trace goods as they move through the supply chain. This can improve transparency and accountability and reduce the risk of fraud or errors.
- Moreover, blockchain can automate many of the processes involved in data sharing, such as verifying transactions and updating records. This can reduce the time and effort required to share data and improve the speed and efficiency of supply chain operations.[14]
- Finally, by providing a transparent and secure platform for data sharing, blockchain can help build trust between supply chain partners. This can lead to more effective collaboration and a better overall supply chain ecosystem.
- The Indian government has already integrated technology systems such as ISRO-based geospatial intelligence in coordinating efforts for multi-modal connectivity under the Prime Minister Gati Shakti National Master Plan.[15] Elements of IoT integration in supply chain 'smart systems' can similarly use geospatial tools like GPS and RFID to optimise inventory and transport data. Moreover, the Tamil Nadu government's Centre of Excellence in Emerging Technologies (CEET) uses blockchain to maintain a tamper-proof ledger of registration documents.[16] Such technology can also be integrated by private firms and G20 countries in a synchronised format to synergise and make consistent data storage processes.

Data science

Insofar as private entities are concerned, they must be encouraged to specialise primarily in data science, which includes data interpretation and offering consultancy services. Once private entities and consultancy firms are relieved of their duties of data collection, the overall supply chain will become more efficient and transparent and create greater scope for improved functional specialisation. It will hence bring down consultancy fees by removing the costs associated with data collection. The anticipated loss of

revenue for these large consultancies could be offset by their increased consumer bases, which will likely expand as their consultancy fees drop (after being relieved of data collection). This shall in no way mean that private entities are barred from maintaining their own data bank.

The consultancy firms could then enlarge their consumer base and make significant profits based on the endeavour of analysing data trends and predicting demand or supply fluctuations. Moreover, the availability of data as a G20 (and hence, a public) good will allow several small and medium sized consultancy firms to emerge that could not have otherwise competed with major and established consultancy firms due to huge costs associated with data collection, even though they may possess skillsets related to data interpretation and consultancy. Here, too, governments will have a role to play; firstly, they shall have to publicise new opportunities for small- and medium-level data scientists and consultants to expand the market for their expertise without the responsibility of also engaging in data collection. Secondly, they can provide incentives for data interpretation and consultancy businesses specifically catering to the supply chain actors that are worst affected by disruptions, i.e., the micro, small and medium enterprises.

Where the two entities converge

How can private entities support governmental data collection endeavours? Once G20 governments identify 'hidden' or 'nexus' suppliers, as in the case of the Taiwan Semiconductor Manufacturing Company, such nodes in the supply chain can be leveraged to understand how collected data is processed and used for prediction and supply chain efficiency. These nodes possess massive amounts of information about future fluctuations in supply chains and other critical market information that can "provide early signs of changes in economic conditions and, as a result, supply and demand."[17] Not only can governments collaborate with and learn from such nexus suppliers, they can eventually also enable them to sell their collected data to governments instead of weaponising it in times of crisis. It is these nodes that ultimately need to follow up on the government's push for making data transparent and data collection processes efficient.

Conclusion

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Data asymmetry uniformly impacts industries across all countries, especially G20 countries, because of their massive economic size and trade activity, and there exists a meeting point to address this issue, keeping aside strategic differences.

In the past, countries with fundamental differences have cooperated on issues of mutual interest, albeit with some difficulties. The same could be achieved in the domain of supply chains.

Endnotes

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