

IFs Dyadic Trade Data

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IFs dyadic database provides following sets of trade related tables for each sector (agriculture, energy, manufacturing, materials, ICT, and services), as well as for the overall sectors (goods & total).

- Exports & Imports in constant \$2017
- Trade Complementarity Index (TCI)
- Tariff Revenues
- Weighted Tariff

There are 34 tables in total. Because there are no TCI & weighted tariff tables for the service sector. Raw data of trade and tariffs are originally provided by the World Bank's World Integrated Trade Solution (WITS) and the United Nations Comtrade database. However, in order to get a harmonized bilateral trade data, we directly gather trade values from the Centre d'Etudes Prospectives et d'Informations Internationales' BACI database. For more details on BACI's approach regarding their harmonization process, please refer to their methodology note [here](#). However, trade data for the services sector are still collected from the UN Comtrade, as well as tariffs.



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Product Concordance

Trade values are normally provided at commodity level using 6-digit HS nomenclature, an international standard reported under the UN Comtrade. Details on the nomenclature can be found [here](#). Note that the Harmonized System (HS) codes are constantly updated

throughout years, and currently we rely on converting all the data under one HS system, which is HS92, also known as HS0. The concordance can be done using the official mapping system, accessible through World Bank WITS' product concordance page.

In IFs, we only present economic activities under IFs sectors (agriculture, energy, manufacturing, materials, ICT, and services) as well as GTAP sectors. Hence, during the data processing steps, 6-digit commodity level values are aggregated into GTAP sectors first, and then IFs sectors. The concordance table between HS codes and GTAP sectors can be found under WITS' product concordance page. The mapping table between GTAP sectors and IFs sectors can be found in the IFs system, under the table GTAPSectorConversion in the DATA/IFs.db file.

Data Sources

The data collection process for each data source is detailed below.

BACI

Data from BACI can be freely accessed from their official website. All years of data needed for IFs (1995 - now) can be downloaded under HS92 system. You will receive a zipped file with trade data by year, country and product codes, as well as a text note explaining the structure of data. Trade data by year are stored under the .csv format, with trade flows at the year - exporter - importer - product level. Products are under the Harmonized System 6-digit nomenclature, values are in thousand USD, and quantities are in metric tons. Note that trade flows from BACI only cover the goods sector in IFs, i.e., excluding services from the total trade.

UN Comtrade

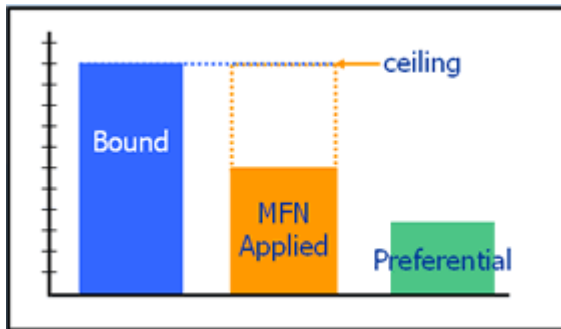
Trade flows in services are downloaded from the UN Comtrade database. The database requires a log-in, which can be done directly with your social account (Google for instance). If you are familiar with querying the API, you can also directly query the data using their API service. Again, data accessing through API also requires a log-in.

Unlike trade flows of goods, IFs do not disaggregate service trade into smaller sectors, the data downloading and processing steps are fairly straightforward for service trade. However, to mimic the harmonization process from BACI, we need to ensure that exports and imports from the same country-pair are mirrored.

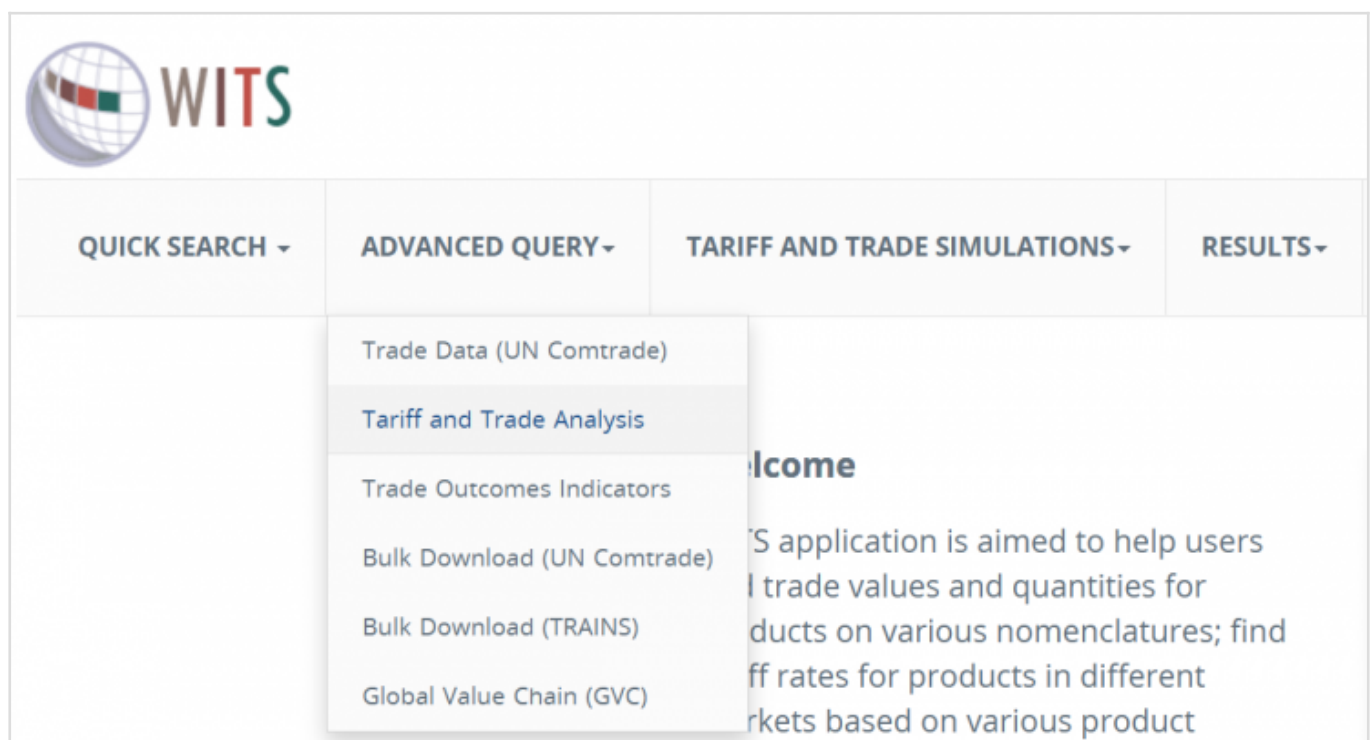
WITS

WITS is a powerful tool that provides access to international merchandise trade, tariff and non-tariff measures (NTM) data. As of now, we rely on WITS for collecting tariff data. WITS only provides three types of tariffs- the bond rate (highest), MFN, and preferential rate (lowest). See the graph illustrated below, according to the data manual of WITS. In addition, it provides the so called “effective applied tariff”, which is being used for our dyadic data. Its definition is “If a preferential tariff exists, it will be used as the effectively applied tariff. Otherwise, the MFN applied tariff will be used.”

There are several limitations worth noting for the WITS data. First, its trade data are directly from UN Comtrade, which lacks the harmonization process implemented by BACI. Hence, currently, IFs solely rely on BACI for trade information (imports and exports). Secondly, there are imperfections in tariff data from WITS where certain categories of commodities have unrealistic tariff values. In addition, there are missing values (unreported values) in tariffs. Lastly, any special tariff barriers, such as additional tariffs under US-China trade war, are not recorded. Adding these exceptional tariff rates into our IFs database will require additional manual labor unless a global data source appears. It is suggested that users can use scenarios to simulate such tariffs.



To query and download tariff data from WITS, a registration is required. Once logged in, you will be able to access tariff data for free. Note that a paid subscription from UN Comtrade is required to use the bulk download option, hence, you will have to query the data multiple times in order to get the full coverage. In order to query the data, select ADVANCED QUERY from the drop-down menu and click on Tariff and Trade Analysis. You will be directed to the Tariff and Trade Analysis interface where you can create data queries on your own. Make sure you pick TRAINS as your data source.



A data query for tariff information should have following inputs selected-

- *All countries All -- All from Predefined Country Groups as Reporters (Importers) and Partners (Exporters), as well as the enablement of Country Group Breakdown;*

- *ALL3 -- Sub-Heading (all 6-digit HS codes)* under the *Clusters* menu for the *Products*. Ensure that *HS - Combined* is used as the nomenclature;
- *Include Effective Applied rates* as the duty type, with *UNCTAD* as the computing method for average;
- It is highly recommended that you download one year of data at a time, because WITS sets an internal upper limit for the total number of rows a resultant data query can carry (49,999,999 rows).

Each data query will take WITS some time to process, and you can download each data table in your desired format, as in .csv files. In the data processing steps, you will need to merge tariff data from WITS and trade data from BACI to calculate tariff revenue and weighted tariff.

Data Processing

We process all trade related tables through Python scripts, which can be found on our GitHub repository. Here, we only describe the general process. Users are encouraged to read the GitHub repo if you want to understand, replicate, or even improve our data processing procedure. As stated at the beginning of this page, IFs provide four sets of trade related dyadic data tables.

Exports & Imports

There are 16 tables in total, with 8 tables for each trade flow. Within each trade flow (exports or imports), trade values are separated into sub-sectors,

**Failed to parse (SVG (MathML can be enabled via browser plugin): Invalid response ("Math extension cannot connect to Restbase.") from server "https://wikimedia.org/api/rest_v1/"):
$$\text{Total} = \text{Goods} + \text{Services}$$
 ,** where

Trade values from BACI are recorded at 6-digit HS code level. To aggregate trade values into IFs sectors, simply use the concordance table provided in the GitHub repo. Note that the mapping table from HS code to GTAP is directly provided by WITS, but the mapping table between GTAP to IFs can be altered if needed. In addition to aggregation, following data manipulation steps are also done,

- Trade values in BACI are in current USD. We use USD deflator of the United States provided by the World Bank to convert all trade values to constant 2017 USD. It is debatable whether this is the best or even the correct approach, because GDP conversion is itself a complicated process.
- Some historical data were reported by economic organizations instead of individual countries, e.g., South African Customs Union (SACU), we use each member's economic size, i.e., GDP, to proportionally distribute their trade values.

Trade Complementarity Index

TCI measures how well a country's exports match another country's imports. Its definition is *The sum of the absolute value of the difference between the import category shares and the export shares of the countries under study, divided by two*. The index is converted to percentage form. Its range of values takes a value between 0 and 100, with zero indicating no overlap and 100 indicating a perfect match in the import/export pattern. The graph below shows an example of TCI calculation,

Complementarity – Technical Notes

Mathematical definition:

$$\left(1 - \left(\sum_w \left| \frac{\sum_i m_{iwd}}{\sum_w M_{wd}} - \frac{\sum_i x_{isw}}{\sum_w X_{sw}} \right| \right) \div 2\right) \times 100$$

Where **d** is the importing country of interest, **s** is the exporting country of interest, **w** is the set of all countries in the world, **i** is the set of industries, **x** is the commodity export flow, **X** is the total export flow, **m** the commodity import flow, and **M** the total import flow. In words, we take the sum of the absolute value of the difference between the sectoral import shares of one country and the sectoral export shares of the other. Dividing by 2 converts this to a number between 0 and 1, with zero indicating all shares matched and 1 indicating none did. Subtracting from one reverses the sign, and multiplying by 100 puts the measure in percentage terms.

Data sources: The United Nations Commodity Trade database (COMTRADE), the World Trade Database (WTD) maintained by Statistics Canada, and the GTAP database from Purdue University.

	India	Sri Lanka	ROW	Total
Primary Products	4569	936	632553	638058
Food Products	4554	116	311024	315694
Textiles and Apparel	15103	2661	425038	442802
Other Manufactures	29271	1070	4467019	4497360
Total	53497	4783	5835634	5893914

Exports by Category for Selected Economies (2002)

	India	Sri Lanka	ROW	Total
Primary Products	6057	729	631272	638058
Food Products	2203	513	312978	315694
Textiles and Apparel	1282	1178	440342	442802
Other Manufactures	35814	2995	4458551	4497360
Total	45356	5415	5843143	5893914

Imports by Category for Selected Economies (2002)

Sample calculation: Start with the share of primary products in Sri Lanka's imports. This is \$729/5415=0.134. India's export share in this category is \$4569/53497=0.085. Taking the absolute value of the difference we have 0.049. Repeating this for the other categories and summing the results we have 0.13. Halving and subtracting from one we have 0.935, or 93.5 per cent. This is India's complementarity with Sri Lanka in 2002. Note the aggregation bias.

Since we have trade values down to the commodity level, we calculate the TCI indices for all the sub-sectors under Goods (agriculture, energy, ICT, materials, and manufacturing), as well as the TCI for overall Goods. Hence, there are 6 TCI tables in total in the IFs dyadic database. Note that IFs do not have TCI for the services sector because we currently do not have sub-sectoral data for services. As you can see from the example above, calculating TCI can take a substantial amount of time, depending on the processing power and RAM capacity your device has. In the calculation of TCI, you will still need to separate trade values for those economic organizations, but there is no need for currency conversion.

Tariff Revenues & Weighted Tariff

There are 12 bilateral tables for tariff revenues and weighted tariffs, with 2 tables for each goods sector (goods, agriculture, energy, ICT, materials, and manufacturing). First, we calculate tariff revenues for each commodity (at 6-digit HS code level) after merging trade data from BACI and tariff data from WITS. Then, we aggregate tariff revenues for each country pair for each sector, and divide them by their corresponding trade values. Again, trade values for each economic organization are proportionally broken down to country level before this process, and you do need currency conversion because trade revenues need to match IFs' unit, which is now in constant 2017 USD.

For tariff data from WITS, you also need to deal with economic organisations, such as the European Union. However, unlike trade values, we simply assign those unions' rates to their member states. During this process, you need to be aware of membership changes throughout the years. Missing values in WITS also need to be imputed. For a commodity traded between a country pair that is recorded under BACI but not presented by WITS. We look for the average effective applied tariff rate the same importer charged to the rest of world for that commodity. If the first imputation method fails, we look for the average effective applied tariff rate charged by the rest of world for that commodity. If both imputation methods fail, we implement 0 tariff for that commodity.

Dyadic Trade Tables in IFs

All trade related tables are listed below,

Table	Definition	Units	Years
SeriesExportsTotal	Exports from actor to partner; BACI goods and COMTRADE services	USD (constant 2017)	2000-2022
SeriesImportsTotal	Imports from partner to actor ; BACI goods and COMTRADE services	USD (constant 2017)	2000-2022
SeriesExportsAg	Exports from actor to partner, agriculture	USD (constant 2017)	1995-2022
SeriesImportsAg	Imports by actor from partner, agriculture	USD (constant 2017)	1995-2022
SeriesExportsEn	Exports from actor to partner, energy	USD (constant 2017)	1995-2022
SeriesImportsEn	Imports by actor from partner, energy	USD (constant 2017)	1995-2022
SeriesExportsICT	Exports from actor to partner, ICT	USD (constant 2017)	1995-2022
SeriesImportsICT	Imports by actor from partner, ICT	USD (constant 2017)	1995-2022
SeriesExportsMan	Exports from actor to partner, manufacturing	USD (constant 2017)	1995-2022
SeriesImportsMan	Imports by actor from partner, manufacturing	USD (constant 2017)	1995-2022
SeriesExportsMat	Exports from actor to partner, materials	USD (constant 2017)	1995-2022
SeriesImportsMat	Imports by actor from partner, materials	USD (constant 2017)	1995-2022
SeriesExportsServ	Exports from actor to partner, services	USD (constant 2017)	2000-2023
SeriesImportsServ	Imports by actor from partner, services	USD (constant 2017)	2000-2023
SeriesWtTariffGoods	Trade weighted tariff partner imposed on importing from actor in all goods (no services)	Percentage	1995-2022
SeriesWtTariffEner	Trade weighted tariff partner imposed on importing from actor in energy	Percentage	1995-2022
SeriesWtTariffAgri	Trade weighted tariff partner imposed on importing from actor in agriculture	Percentage	1995-2022
SeriesWtTariffMate	Trade weighted tariff partner imposed on importing from actor in materials	Percentage	1995-2022
SeriesWtTariffManu	Trade weighted tariff partner imposed on importing from actor in manufacturing	Percentage	1995-2022
SeriesWtTariffICT	Trade weighted tariff partner imposed on importing from actor in ICT	Percentage	1995-2022
SeriesTariffRevGoods	Tariff revenue received by partner importing from actor in all goods (no services)	USD (constant 2017)	1995-2022
SeriesTariffRevAgri	Tariff revenue received by partner importing from actor in agri	USD (constant 2017)	1995-2022
SeriesTariffRevMate	Tariff revenue received by partner importing from actor in mate	USD (constant 2017)	1995-2022
SeriesTariffRevManu	Tariff revenue received by partner importing from actor in manu	USD (constant 2017)	1995-2022
SeriesTariffRevICT	Tariff revenue received by partner importing from actor in ICT	USD (constant 2017)	1995-2022
SeriesTariffRevEner	Tariff revenue received by partner importing from actor in ener	USD (constant 2017)	1995-2022
SeriesImportsGoods	Imports by actor from partner, all goods (no services)	USD (constant 2017)	1995-2022
SeriesExportsGoods	Exports from actor to partner, all goods (no services)	USD (constant 2017)	1995-2022
SeriesTCIAgri	Trade complementarity between actor's exports and partner's imports in agri	Index	1995-2022
SeriesTCIEner	Trade complementarity between actor's exports and partner's imports in ener	Index	1995-2022
SeriesTCIMate	Trade complementarity between actor's exports and partner's imports in mate	Index	1995-2022
SeriesTCIManu	Trade complementarity between actor's exports and partner's imports in manu	Index	1995-2022
SeriesTCIICT	Trade complementarity between actor's exports and partner's imports in ICT	Index	1995-2022
SeriesTCIGoods	Trade complementarity between actor's exports and partner's imports in all goods (no services)	Index	1995-2022

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