Agricultural trade data processing

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Raw trade data

FAO receives data on trade flows from United Nations Statistical Division. The division runs Commodity Trade Statistics Database UN Comtrade "It stores standardised official annual trade statistics reported by countries and reflecting international merchandise flows detailed by commodity and partner country with coverage reaching up to 99 percent of world merchandise trade[1]".

One can freely download this standardised statistics from the open data base. Statistical Division of FAO gets unstandardised data.

Table 1: Random sample of import trade flows of 2011 year, reported by the US

year	reporter	partner	hs	flow	weight	qty	qunit	value
2011	842	56	1806203600	1	235	21660	8	103655
2011	842	764	8448399000	1	NA	NA	1	11734
2011	842	56	9031497000	1	NA	166	5	1101105
2011	842	826	8483208040	1	NA	2894	5	105922
2011	842	528	5903201500	1	614	591	2	18268
2011	842	56	8525503015	1	NA	88879	5	5690618
2011	842	558	6107120020	1	10204	5901	11	447504
2011	842	554	6110202020	1	76	25	11	14709
2011	842	152	2002908040	1	185762	185762	8	103239
2011	842	276	5210314040	1	303	3072	2	3878

This is an example of unstandardised data on trade inflows in 2011, reported by the United States. Reporters and trade partners are represented with three-digit numerical codes used by the Statistics Division of the United Nations. Trade commodities are classified with extended Harmonized Commodity Description and Coding System (HS)[2] maintained by the World Customs Organization[3].

Weight is measured in kilograms and value in US dollars. Quantity (qty column) is an optional alternative for weight. It could be measured in different units (qunit column). See full list of possible units and their descriptions in Annex I of Quantity and Weight Data in UN Comtrade[4].

Country-specific HS commodity codes

Harmonized system classification is declared by WCO up to 6 digits. A country may extend HS to more detailed level to better respond to local circumstances. Let's compare differencies in codes under subheading

[1] http://unstats.un.org/unsd/comtrade_announcement.htm Comtrade Announcement

[2] http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx What is the Harmonized System (HS)?

[3] http://www.wcoomd.org/en.aspx World Customs Organization

[4] http://unstats.un.org/unsd/tradekb/Knowledgebase/Quantity-and-Weight-Data-in-UN-Comtrade Quantity and Weight Data in UN Comtrade

0202 Meat of bovine animals, frozen between the US and Brazil[5].

Table 2: Extension of HS codes by the US

hs	Description
02	CHAPTER 2 MEAT AND EDIBLE MEAT OFFAL
0202	Meat of bovine animals, frozen:
0202.10	- Carcases and half-carcases:
0202.10.05	- - Described in general note 15 of the tariff schedule . . . :
0202.10.05.10	- - - Veal
0202.10.05.90	- - - Other
0202.10.10	- - Described in additional U.S. note 3 to this chapter . . . :
0202.10.10.10	- - - Veal
0202.10.10.90	- - - Other
0202.10.50	- - Other:
0202.10.50.10	- - - Veal
0202.10.50.90	- - - Other
0202.20	- Other cuts with bone in:
	- - Described in general note 15 of the tariff schedule . . . :
	- - - Processed:
0202.20.02	- - - - High-quality beef cuts
0202.20.04	- - - - Other
0202.20.06	- - - Other
	- - Described in additional U.S. note 3 to this chapter . . . :
	- - - Processed:
0202.20.10	- - - - High-quality beef cuts
0202.20.30	- - - - Other
0202.20.50	- - - Other
0202.20.80	- - Other
0202.30	- Boneless:
	- - Described in general note 15 of the tariff schedule . . . :
	- - - Processed:
0202.30.02	- - - - High-quality beef cuts
0202.30.04	- - - - Other
0202.30.06	- - - Other
	- - Described in additional U.S. note 3 to this chapter . . . :
	- - - Processed:
0202.30.10	- - - - High-quality beef cuts
0202.30.30	- - - - Other
0202.30.50	- - - Other
0202.30.80	- - Other

Table 3: Extension of HS codes by Brazil

hs	Description
02	CHAPTER 2 MEAT AND EDIBLE MEAT OFFAL
0202	Meat of bovine animals, frozen:
0202.10	- Carcases and half-carcases
0202.20	- Other cuts with bone in:
0202.20.10	- - Forequarters

[5] http://madb.europa.eu Descriptions of country-specific HS-codes are provided by Market Access Database and copyrighted by Mendel Verlag, Germany.

hs	Description
0202.20.20	- - Hindquarters
0202.20.90	- - Other
0202.30	- Boneless

The set of HS-codes from the US is wider, than Brazilian one. For boneless meat Brazil doesn't extend standard code 0202.30, when the US use here seven additional codes.

Country codes

Codes of reporters

Area codes of reporters are standardized by the Statistical Department. The SD follows *in general* the United Nations Standard Country or Area Codes for Statistical Use[6]. The code scheme used by the SD[7] is slightly modified from the official one[8]. For example the official scheme offers code 840 for the US, when the modified version uses 842.

Codes of partners

Partners' codes in Tariffline data are not standardised and presented as they were reported by countries. Reporters can use as standard version of codes, so the version of the Statistical Department. For example, in Tariffline data there are 27 country codes which are not presented in official scheme and 40 codes not covered by the modified version.[9]

Initial validation of trade data

At prevalidation step we are to make a decision should we accept data from a specific country for the further processing or not. A country could provide data of good quality for one part of commodities and inadequate level of quality for another part. We want to estimate quality differences between commodities of a country.

Quality of data is estimated by following indicators:

- Share per cent of missing quantities
- Share per cent of unit value outliers

Self-trade

There are cases when a country reports itself as a partner to exports or imports. Such situations can occur due to mistakes or when an entrepôt exists.

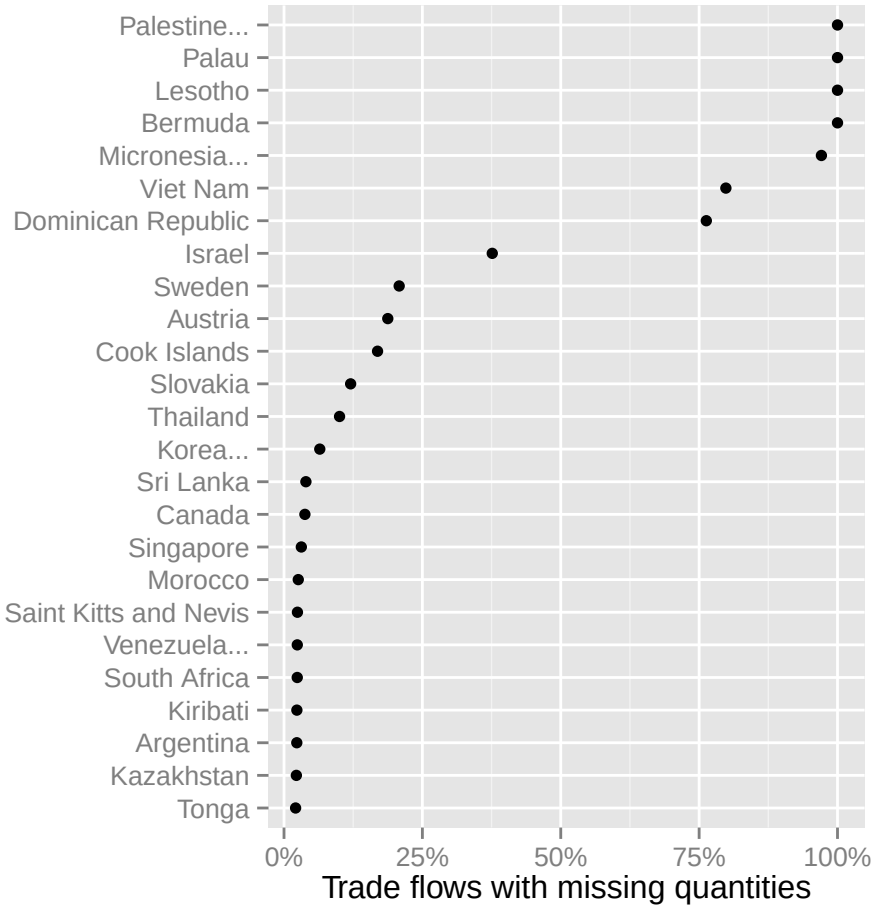
[6] http://comtrade.un.org/pb/ The United Nations Statistics Division (2015). The 2014 International Trade Statistics Yearbook, Volume I - Trade by Country, xix.
[7] http://comtrade.un.org/data/doc/api/ The UN Comtrade data extraction API
[8] http://unstats.un.org/unsd/methods/m49/m49alpha.htm Countries or areas, codes and abbreviations
[9] http://rpubs.com/malexan/m49 Matrunich A. (2015). M49 country codes in Tariffline

Table 4: Self-trade of commodities from 2nd, 10th and 15th HS chapters in 2011

Reporter	Flow	Total
France	Import	163
Canada	Import	56
Portugal	Import	50
Slovakia	Import	50
New Zealand	Import	31
South Africa	Import	27
United Kingdom	Import	17
Slovenia	Import	16
Estonia	Import	12
Thailand	Import	12
China	Import	7
Greenland	Import	3
Ethiopia	Import	2
Papua New Guinea	Import	2
Saint Kitts and Nevis	Import	2
Indonesia	Import	1
Malaysia	Import	1
Palau	Import	1

Missing quantity

We identify which reporters provide data of insufficient quality. Firstly for every reporter proportion of trade flows with missing quantity is calculated.

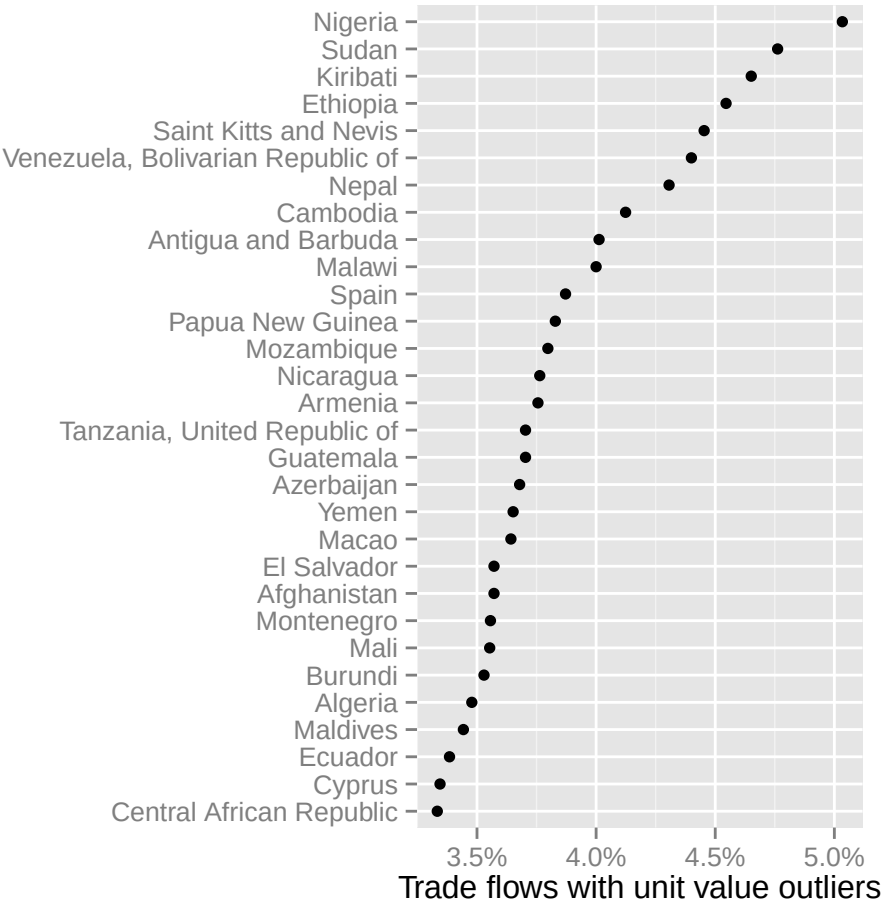


Detection of outliers

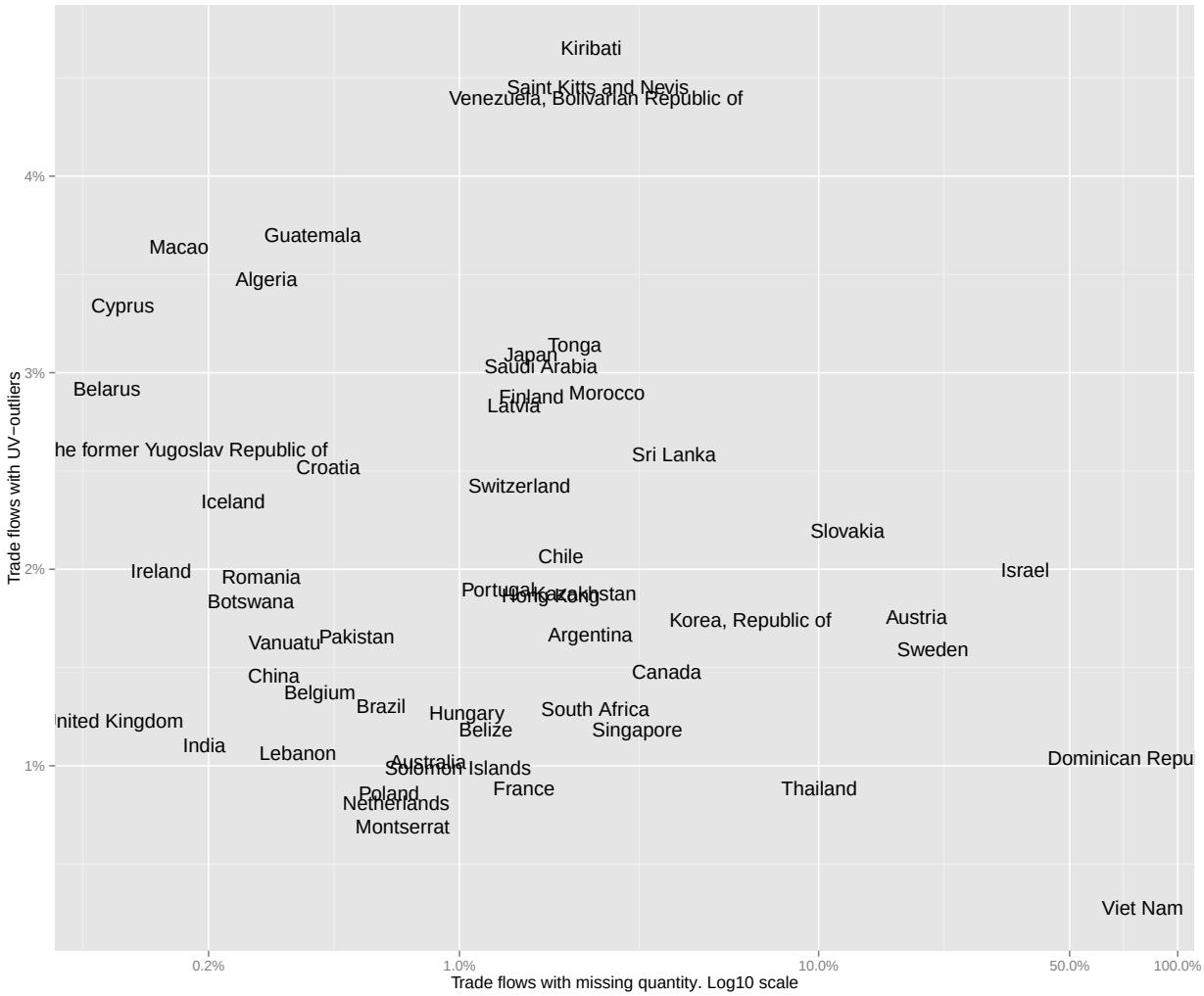
We define outliers as observations located outside the range:

$$[Q_1 - k(Q_3 - Q_1), Q_3 + k(Q_3 - Q_1)]$$

where Q_1 and Q_3 are the lower and upper quartiles respectively, and k is a non negative constant. In this paper we use k equals 1.5.


Nigeria
Sudan
Kiribati
Ethiopia
Saint Kitts and Nevis
Venezuela, Bolivarian Republic of
Nepal
Cambodia
Antigua and Barbuda
Malawi
Spain
Papua New Guinea
Mozambique
Nicaragua
Armenia
Tanzania, United Republic of
Guatemala
Azerbaijan
Yemen
Macao
El Salvador
Afghanistan
Montenegro
Mali
Burundi
Algeria
Maldives
Ecuador
Cyprus
Central African Republic
3.5%
4.0%
4.5%
5.0%
Trade flows with unit value outliers

Missing quantites and outliers combined



Imputing of missing quantities and replacement of outliers

In data reported by USA for 2011 year in HS chapters 2, 10 and 15 there are 0 trade flows with missing quantity and 33 trade flows with UV-outliers.

Table 5: Example trade flows with outlied unit values

Reporter	Partner	Flow	Commodity	Weight	Value	UV	UV_me
United States	Germany	Import	1505009000	105784	2191650	20.72	7.15
United States	Netherlands	Import	1504204000	160571	4932146	30.72	5.83
United States	Japan	Import	1008100000	810	7833	9.67	1.24
United States	Thailand	Import	1513110000	1698	27956	16.46	2.82
United States	Uruguay	Export	0201100010	278	4384	15.77	3.88
United States	Spain	Import	1512110040	1140	6376	5.59	0.92
United States	Mexico	Import	0202305000	12989	112727	8.68	4.49
United States	Italy	Import	1515300000	34	2334	68.65	4.57

Reporter	Partner	Flow	Commodity	Weight	Value	UV	UV_me
United States	United Kingdom	Import	1521100040	84	6181	73.58	6.89
United States	Japan	Import	1008200000	327	2479	7.58	1.88

Imputing using reporter median unit values

Now we correct weight of this outlied trade flows with help of median reporter unit value for a given commodity.

Table 6: Example trade flows with corrected weight

Reporter	Partner	Flow	Commodity	Weight	Weight_corr	Weight_diff
United States	Germany	Import	1505009000	105784	306524	-200740
United States	Netherlands	Import	1504204000	160571	845994	-685423
United States	Japan	Import	1008100000	810	6317	-5507
United States	Thailand	Import	1513110000	1698	9913	-8215
United States	Uruguay	Export	0201100010	278	1130	-852
United States	Spain	Import	1512110040	1140	6930	-5790
United States	Mexico	Import	0202305000	12989	25106	-12117
United States	Italy	Import	1515300000	34	511	-477
United States	United Kingdom	Import	1521100040	84	897	-813
United States	Japan	Import	1008200000	327	1319	-992

Imputing using data from trade partner (mirroring)