Agricultural trade data processing

July 9, 2015

Contents

Last update: 2015-08-12 10:42:52

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	246	6505901540	1	1	1	11	330
2011	842	699	2933296000	1	10014	10014	8	85331
2011	842	380	2916311190	1	5040	5040	8	18540
2011	842	380	7304592055	1	6618	6618	8	17676
2011	842	724	8529909900	1	-	-	1	1142484
2011	842	484	7116203500	1	-	-	1	151306
2011	842	156	8708995800	1	12055084	2908294	5	60347978

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

year	reporter	partner	hs	flow	weight	qty	qunit	value
2011	842	32	6506996000	1	19	15	11	4801
2011	842	56	5309293020	1	327	1266	2	14697
2011	842	51	6202134020	1	12	3	11	1815

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 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

[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

[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
0202.20.80	- - 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
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]

[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

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

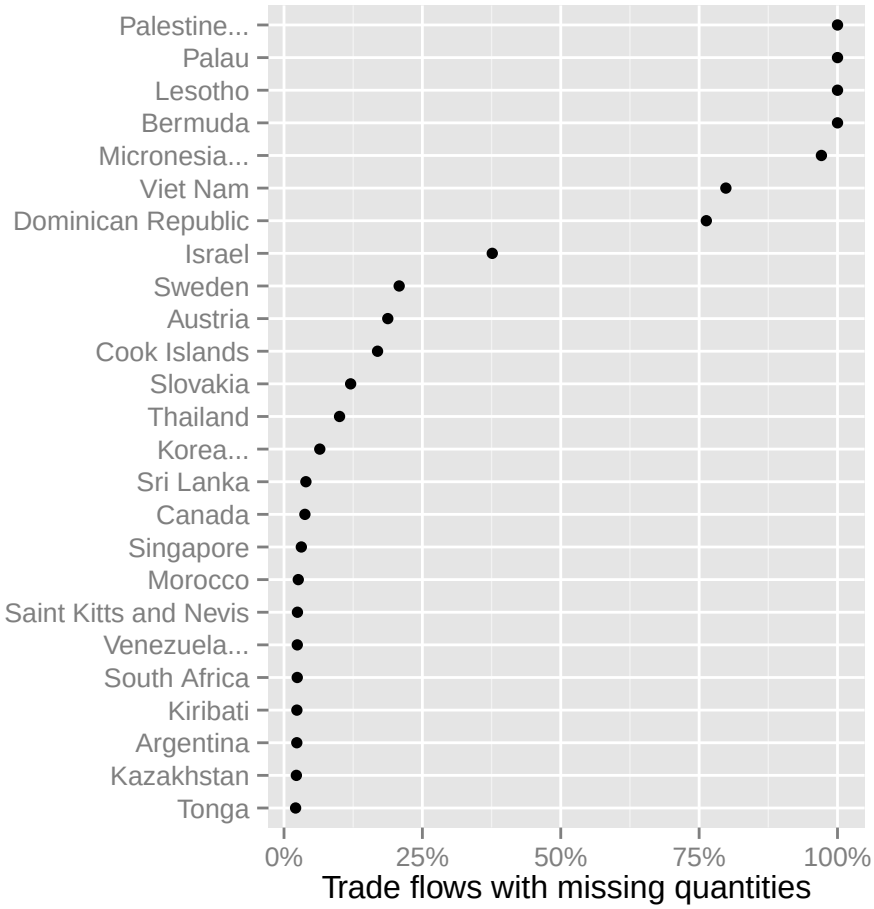
There are cases when a country reports itself as a partner to exports or imports. Such situations can occur due to mistakes or when an entrepôt exists.

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.

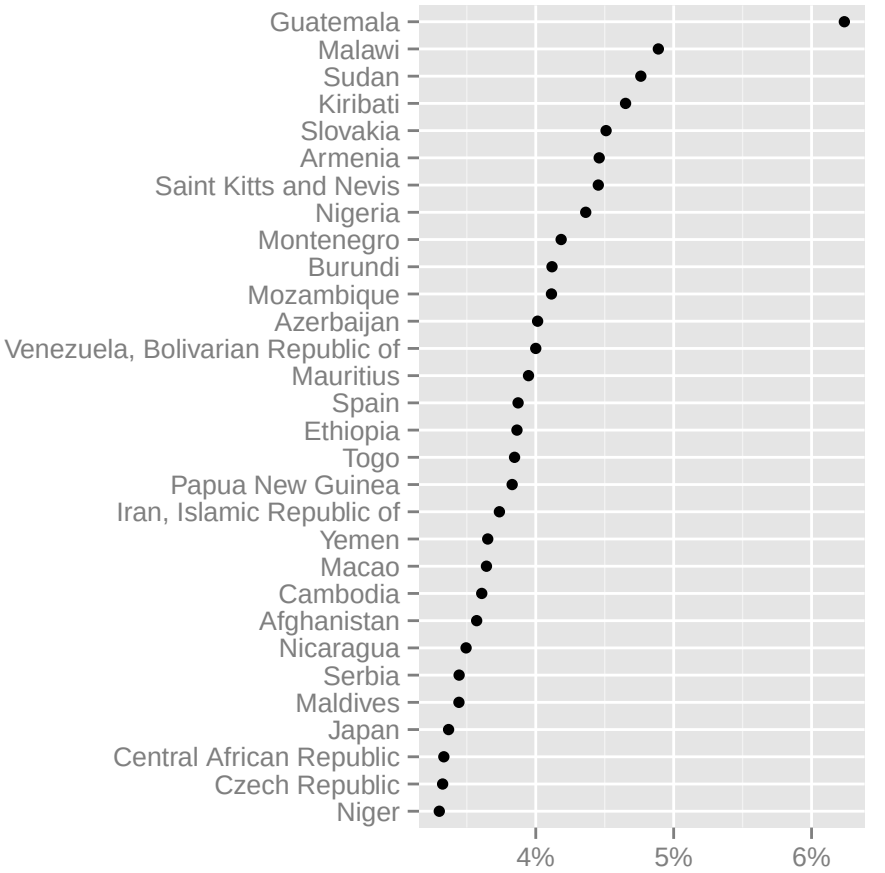


Detection of outliers

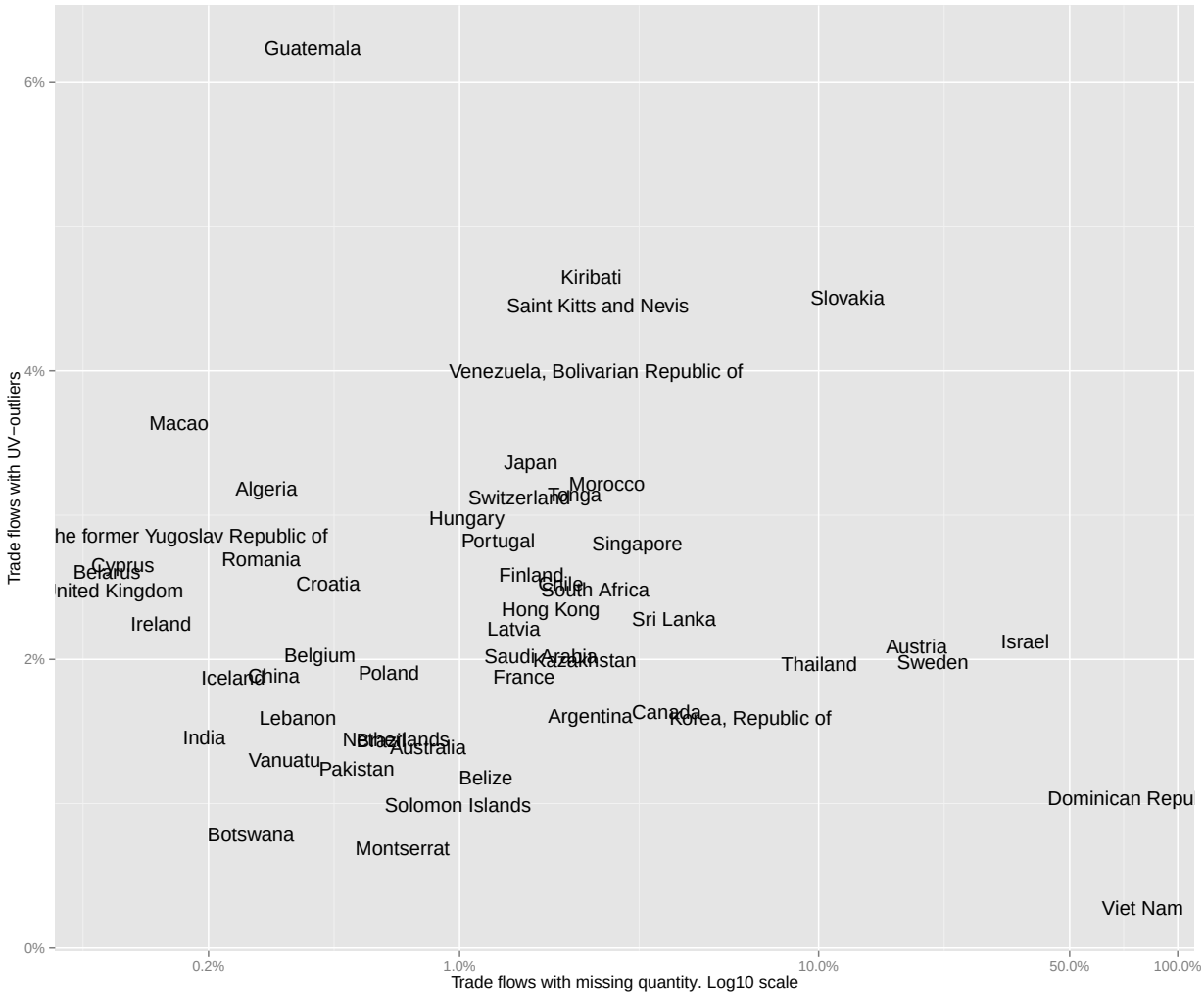
We define outliers as observations located outside the range:

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

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 $k = 1.5$.


Guatemala
Malawi
Sudan
Kiribati
Slovakia
Armenia
Saint Kitts and Nevis
Nigeria
Montenegro
Burundi
Mozambique
Azerbaijan
Venezuela, Bolivarian Republic of
Mauritius
Spain
Ethiopia
Togo
Papua New Guinea
Iran, Islamic Republic of
Yemen
Macao
Cambodia
Afghanistan
Nicaragua
Serbia
Maldives
Japan
Central African Republic
Czech Republic
Niger
4%
5%
6%
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 outlying unit values

Reporter	Partner	Flow	Commodity	Weight	Value	UV	UV_me
United States	Thailand	Import	1513110000	1698	27956	16.46	2.82
United States	United Kingdom	Import	1005100010	23	2937	127.7	3.84
United States	Japan	Import	1008200000	327	2479	7.58	1.88
United States	Malaysia	Import	1515906000	2	4061	2030	22.26
United States	France	Import	1510004000	279	3517	12.61	2.45
United States	Germany	Import	1506000000	643	1973457	3069	145
United States	France	Import	1514190000	311	59170	190.3	2.72
United States	Japan	Import	1514999020	431	9193	21.33	3.71

Reporter	Partner	Flow	Commodity	Weight	Value	UV	UV_me
United States	Japan	Import	1008100000	810	7833	9.67	1.24
United States	Canada	Import	1006309015	5634	66825	11.86	1.54

Imputing using reporter median unit values

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

$$Weight = \frac{Weight}{UV_{reporter}}$$

Table 6: Example trade flows with corrected weight

Reporter	Parnter	Flow	HS-code	Weight, kg	Corrected, kg	Difference, kg
United States	Thailand	Import	1513110000	1698	9913	-8215
United States	United Kingdom	Import	1005100010	23	765	-742
United States	Japan	Import	1008200000	327	1319	-992
United States	Malaysia	Import	1515906000	2	182	-180
United States	France	Import	1510004000	279	1436	-1157
United States	Germany	Import	1506000000	643	13609	-12966
United States	France	Import	1514190000	311	21754	-21443
United States	Japan	Import	1514999020	431	2478	-2047
United States	Japan	Import	1008100000	810	6317	-5507
United States	Canada	Import	1006309015	5634	43393	-37759

Detection of wrongly coded trade flows

Another approach to impute missing or outlying quantities of a reporter is to use mirror data from trade partner. Let's check are there any such trade flows related to wheat among reported by the US.

Year	Trade partner	Flow	HS-code	Weight, kg	Value, $US	Unit Value	UV median
2011	Japan	Import	1001902096	61	46362	760	1.466

Outlier detection algorithm shows, that the price (unit value) in this trade flow differs too much from the median price of trade flows of this commodity, reported by the US: 760 $US per kg versus 1.5 $US per kg.

The commodity code *1001.90.20.96* is country-specific and is used only by the US. It is not listed in the recent Harmonized Tariff Schedule of the United States[10]. It means this HS-subheading was removed from Harmonized Tariff Schedule and had not been used any more. Panjiva website reports last use of the code was fixed in 2011 and gives description of it[11]. *1001.90.20.96* stands for wheat and meslin not mentioned in any other subheadings of *1001.90.20*.

We want to check characteristics of this trade flow from a partner's side. But Japan didn't report any export of wheat-related commodities to the US in 2011. We expand our search to all trade flows from Japan to the US with nearly the same quantity and value. We find suitable trade flow what was not reported by the US.

[10] http://hts.usitc.gov/?query=wheat Harmonized Tariff Schedule (2015 HTSA Revision 1 Edition)

[11] https://panjiva.com/trendspotting/imports/United-States/1001.90.20.96/Cereals-Wheat-and-meslin-Other-Other-Other-Other/1368 Trend report HTS Code 1001.90.20.96

Year	Trade partner	Flow	HS-code	Weight, kg	Value, $US	Unit Value	UV median
2011	United States	Export	041000000	70	36483	521.2	521.2

Code *0410.00.000* stands for Edible products of animal origin (not especially specified) [12]. Probably, imported shipment was not properly coded in the US. We can check in data from Japan existence of similar trade flows to other countries.

Year	Trade partner	Weight, kg	Value, $US	Unit Value	UV median
2011	United States	70	36483	521.2	521.2
2011	Other Asia	50	26185	523.7	521.2
2011	Netherlands	150	50863	339.1	521.2

Japan reported export of similar commodity to three distanations. All of these trade flows are not outliers. It supports the hypothesis, that the mistake was done on the part of the US.

Source: local data frame [22 x 18]

year reporter partner hs flow weight qty qunit value hs2 hs4 hs6 reporter_name 1 2011 156 392 041000 Export 545170 545170 8 17662864.00 04 0410 041000 China 2 2011 156 392 041000 Import 193 193 8 2974.00 04 0410 041000 China 3 2011 32 392 04100000 Export 72000 72000 8 136800.00 04 0410 041000 Argentina 4 2011 344 392 04100010 Re-Import 27 27 8 48345.58 04 0410 041000 Hong Kong 5 2011 344 392 04100090 Re-Import 1402 1402 8 107529.07 04 0410 041000 Hong Kong 6 2011 360 392 0410009000 Export 585 585 8 13313.00 04 0410 041000 Indonesia 7 2011 360 392 0410001000 Export 155 155 8 57020.00 04 0410 041000 Indonesia 8 2011 36 392 041000 Export 1933 1933 8 396757.57 04 0410 041000 Australia 9 2011 410 392 041000 Import 12 12 8 7438.00 04 0410 041000 Korea, Republic of 10 2011 410 392 041000 Export 40360 40360 8 354192.00 04 0410 041000 Korea, Republic of .. .. Variables not shown: partner_name (chr), no_quant (lgl), uv (dbl), uv_reporter (dbl), out_range (lgl)

Imputing using data from trade partner (mirroring)

Year	Trade partner	Flow	HS-code	Weight, kg	Value, $US	Unit Value	UV median
2011	Japan	Import	1008100000	810	7833	9.67	1.241
2011	Japan	Import	1008200000	327	2479	7.581	1.882

[12] http://www.customs.go.jp/yusyutu/2011/data/e201101j_04.htm