

Which gain is larger? Bilateral trade agreement with US vs WTO accession: The case of Vietnam

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1 Introduction

Feenstra (1994) derives the exact price index, and computes the welfare gain of the newly available goods through imports. Building on Feenstra (1994), Broda and Weinstein (2006) computes the elasticities of substitutions of about 3000 product groups and estimates the nationwide welfare gain that the US enjoyed through trade liberalization in the past 30 years. However, the estimations by Broda and Weinstein (2006) is welfare gain through only one channel, a variety gains channel. Feenstra and Weinstein (2010) did a detailed study on the welfare impact of many channels. In contrast to that, Arkolakis et al. (2012) computes the total size of the gains from trade, not the channels. They show that the welfare gain can be computed only with two aggregate variables: domestic expenditure share (one minus import penetration ratio) and trade elasticity. Arkolakis et al shows the formula can be applied to several widely used trade models such as Armington, Krugman (1980), Eaton and Kortum (2002) and Melitz (2003) and extensions. However, the gains from trade calculated in Arkolakis et al (2012) is an aggregate measure, showing a rough reference of the US. This is due to their usage of the import penetration ratio of the US as a whole and the average elasticity of substitution. Ossa (2015) develops a multi-industry version of their method and shows cross-industry heterogeneity in the trade elasticities has the potential to greatly magnify the gains from trade. In his article, Ossa (2015) argues "...while imports in the average industry do not matter too much, imports in some industries are critical to the functioning of the economy". Following his work, Lai et al. (2016) examine the industry-level welfare gain from Chinese WTO accession in 2002. They find surprisingly that the gains to the import sector are larger than the gains to the export sector. Overall, they argue sectors with larger intermediate input shares from import-competing industries and with domestic demands less sensitive to changes in trade costs have higher welfare gains from trade liberalization. I follow their steps to compare and

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contrast the industry-level gains from Vietnamese bilateral trade agreement (BTA) with US in 2001 to/versus gains from Vietnamese WTO accession in 2007 using the input-output data of OECD and YNU-GIO¹ database.

The signing of the BTA between the United States and Vietnam was in 2000 and came into force on December 10, 2001. It was a significant milestone for Vietnamese economy. The BTA opened up the largest market in the world to Vietnamese exports and provided for "normal trade relations" (NTR) status of Vietnamese goods in the U.S. market. It was expected that access to the U.S. market would allow Vietnam to hasten its transformation into a manufacturing-based, export-oriented economy. Furthermore, it would attract foreign investment, not only from the U.S., but also from Europe, Asia and other regions. On January 11, 2007, Vietnam officially became the 150th member of WTO. The country's accession to the WTO was intended to provide an important boost to the economy, as it ensured that the liberalizing reforms continue and created options for trade expansion. However, the WTO accession also brought serious challenges, requiring the economy to open up to increasing foreign competition. Overall, these two significant milestones are rare in one economy, and it is interesting to calculate which milestone has larger gain to the economy, BTA or WTO accession.

2 Data

Since the paper is an industrial level analysis, input-output data were used. The main database is OECD IO-2015 database. It covers the period of 1995-2011. As a robustness check, alternative data from YNU-GIO was used. The data covers 1997-2012. Using these data, I am focusing more on the manufacturing industries. Table 1 shows industrial classification codes of 16 manufacturing industries and agriculture and mining as a whole. Tariff data of 2-digit, ISIC-Rev. 3 data were taken from WITS-TRAINS database.

¹ See Sato and Shrestha (2014) and Shrestha and Sato (2015) for data construction and other necessary information.

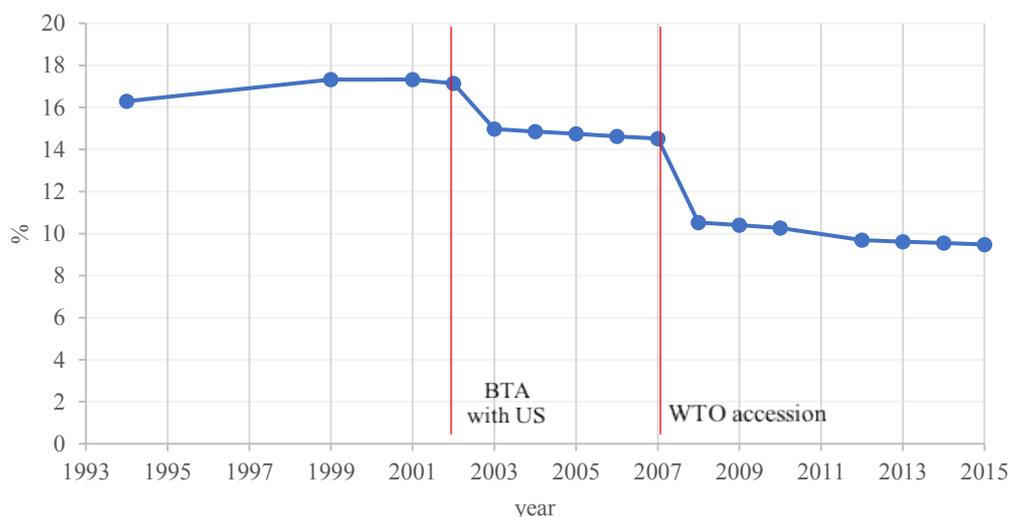
Table 1 *Industrial classification codes*

Industry name	YNU-GIO code	ISIC code	OECD code
<i>Agriculture and mining industries</i>			
Agriculture, hunting, forestry and fishing	Y01	01+02+05	C01T05
Mining and quarrying	Y02	10+11+12+13+14	C10T14
<i>Manufacturing industries</i>			
Food products, beverages and tobacco	Y03	15+16	C15T16
Textiles, textile products, leather and footwear	Y04	17+18+19	C17T19
Wood and products of wood and cork	Y05	20	C20
Pulp, paper, paper products, printing and publishing	Y06	21+22	C21T22
Coke, refined petroleum products and nuclear fuel	Y07	23	C23
Chemicals and pharmaceuticals	Y08	24	C24
Rubber and plastic products	Y09	25	C25
Other non-metallic mineral products	Y10	26	C26
Basic metals	Y11	27	C27
Fabricated metal products, except machinery and equipment	Y12	28	C28
Machinery and equipment	Y13	29	C29
Office, accounting and computing machinery	Y14	30	C30T33X
Electrical machinery and apparatus	Y15	31	C31
Radio, television and communication equipment	Y16	32	
Medical, precision and optical instruments	Y17	33	C30T33X
Motor vehicles, trailers and semi-trailers	Y18	34	C34
Other transport equipment	Y19	35	C35
Other manufacturing; recycling (include Furniture)	Y20	36	C36T37

3 Stylized facts

Figure 1 shows the ad valorem equivalent tariff rates of Vietnam from 1994 to 2015. The tariff rates fell from 17% to 15% in 2003, and again to 11% in 2008. Figure 2 shows the industry-level tariff rates in 2001, 2008 and 2015 respectively. Levels of tariff vary significantly across manufacturing industries. For example, following the WTO accession, in 2008, the rate was as high as 45% in food and tobacco industries (Y03) and as low as 2% in petroleum products (Y07), metals (Y11) and medical instruments (Y17) industries. Tariff rates fell over time in all industries except food products, beverages and tobacco (Y03) and petroleum products (Y07).

Figure 1 *Average tariff of Vietnam*²



² Simple average of the effectively applied rates across all products of the 2-digit ISIC Revision-3 industry data from WITS TRAINS database.

Figure 2 *Tariff rates by industries*

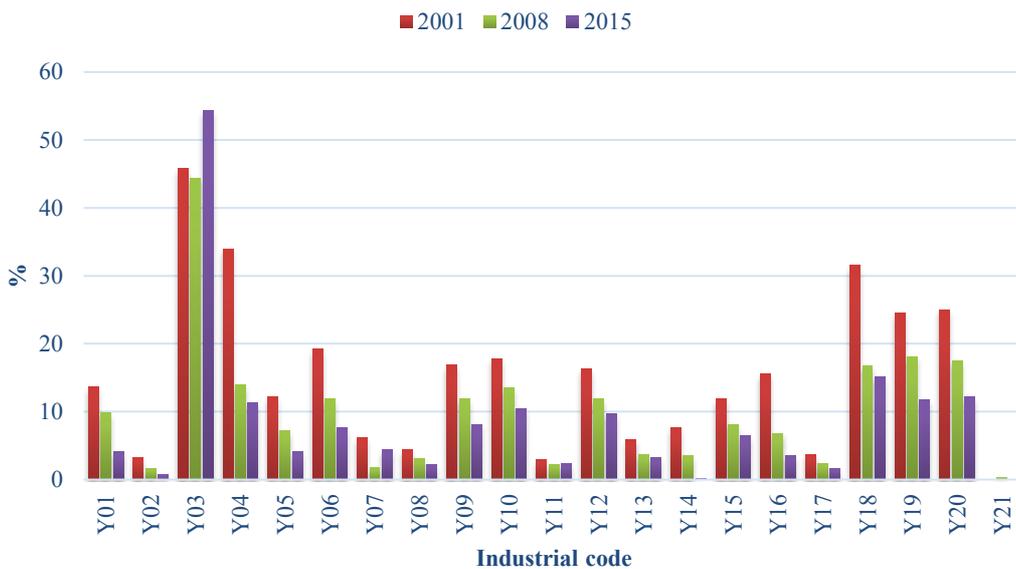
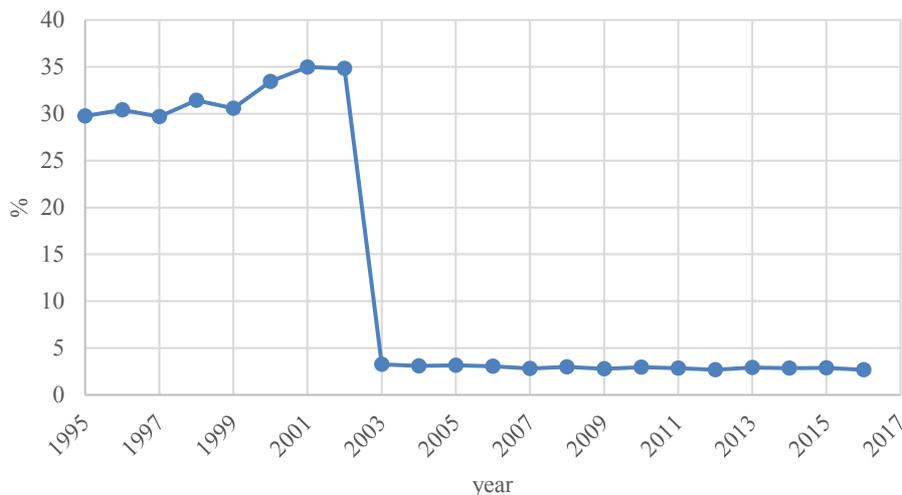


Figure 3 shows average US tariff on Vietnamese products from 1995 to 2016. The U.S.-Vietnam BTA came into force in December 2001. US reduced its average tariff rates on Vietnamese imports from around 35% to around 3%. In an executive summary of *Assessment of the Five-Year Impact of the U.S.-Vietnam Bilateral Trade Agreement*, they mentioned that "Literally overnight this move effectively opened up the largest and most receptive market in the world to Vietnamese exports."

Figure 3 *Average US tariff on Vietnamese products*



Full bilateral economic normalization was completed in December 2006 when President Bush extended permanent normal trade relations (PNTR) to Vietnam. The United States

revoked the U.S.-Vietnam Textile Agreement, which had imposed quotas on Vietnamese apparel exports, when Vietnam formally entered the WTO. In June 2007, just months after Vietnam’s WTO accession, the two countries signed a bilateral Trade and Investment Framework Agreement (TIFA).

Figure 4 *US tariff by industries*

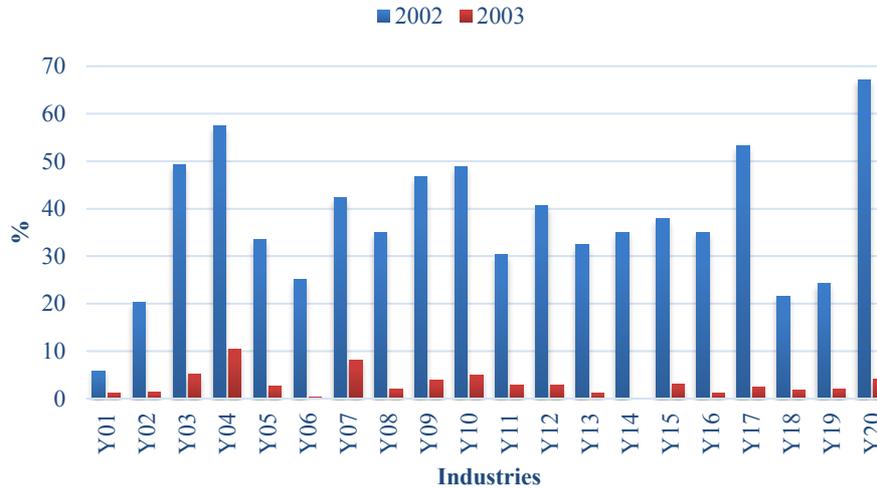


Figure 4 shows the industrial US tariffs on Vietnamese products. Tariff rates are different across industries, however almost all industries’ tariffs were reduced under 3%, except textile and textile products (Y04) which is 10% and petroleum products (Y07) 8%. food, beverages and tobacco (Y03) was 49% and came down to 5%.

4 Theory and empirical strategy

The assumptions and the basic framework of the model is the same as Arkolakis et al. (2012). On the supply side the basic model is the simplest trade model - the Armington model, which is based on the simplifying assumption that goods are “differentiated by country of origin”. There are N countries, each producing differentiated good using only production factor, labor. On the demand side, Dixit-Stiglitz (1977) preferences or so-called “love of variety” preferences are assumed, implying that consumers prefer to diversify their consumption. Under these assumptions, change in real income associated with any foreign shock is (Arkolakis et al., 2012),

$$\widehat{W} = \widehat{\lambda}^{\frac{1}{\varepsilon}} \quad (1)$$

where $\widehat{W} \stackrel{\text{def}}{=} \frac{W'}{W}$ is the change in real income (welfare change), $\widehat{\lambda} \stackrel{\text{def}}{=} \frac{\lambda'}{\lambda}$ is the change in domestic expenditure share (one minus import penetration ratio, i.e. $1 - \pi_i$) and ε is the trade elasticity,

which is equal to $1-\sigma$ (σ is the elasticity of substitution). Foreign shock can be in the form of for example, increase in foreign labor supply or trade cost or tariff reduction etc. It is a common estimator of the gains from trade for several quantitative trade models as I mentioned before, such as Armington, Krugman (1980), Eaton and Kortum (2002), Melitz (2003). Moreover, if we are interested in knowing how much we gained from trade liberalization, the formula takes the following form because under autarky the domestic expenditure share is equal to one. The change in real income when moving from observed equilibrium to autarky is,

$$\widehat{W} = 1 - \lambda^{-\frac{1}{\varepsilon}} \quad (2)$$

If there is no trade, we spend our income on domestic goods only. Therefore, the domestic expenditure share is one.³

Lai et al. (2016) examines the industry-level gains from Chinese accession to the WTO in 2002. They found that gains from trade vary greatly across industries, from a modest gain of 0.105% to sizeable gain of 15.66%. Their main conclusion is that gains to the import sector are larger than the gains to the export sector and gains from trade in all but one (office) industry were primarily driven by enhanced import activity rather than export expansion. These are quite interesting results, considering the huge trade expansion of China. We can find countless Chinese exported goods almost everywhere around the world. That might make us think that they gained through exports a lot, however for Chinese economy the import channel is crucial, as mentioned by Ossa (2015).

I follow Lai et al (2016) and study the Vietnamese economy. The economy had a slow but consistent transformation from central planning into market-oriented. I take 2002 as a benchmark for BTA and 2007 for WTO accession. As a first step, import penetration ratios (π_i) of 18 industries (16 manufacturing industries and agriculture and mining) for each year between 1995-2011 are calculated. Then, the trade elasticities for the respective industries are estimated. Finally, the gains from trade (change in real income) in all industries are calculated as in equation 2. After the calculation, the two benchmarks with respect to their welfare impacts are compared. Overall, the paper provides reference number for the welfare impact of trade in Vietnam and in Vietnamese manufacturing industries.

³ More detailed explanation and the derivation of the formula is available in Arkolakis et al (2012).

5 Results

I am following Lai et al. (2016)'s steps. First, I calculated the import penetration ratio for 18 industries using the OECD and YNU-GIO data. Import penetration ratio in each industry is the ratio of imports to domestic expenditure (sectoral output plus imports minus exports). It tells us to what degree domestic demand is satisfied with imports and is calculated with the following formula,

$$\pi_i = \frac{M_i}{(Y_i + M_i - X_i)} \quad (3)$$

where π_i is the import penetration ratio, Y_i is a gross output and M_i , X_i are gross imports and exports of sector i . Table 2 reports the import penetration ratios for the selected years using the OECD data. Most of the industries have the import penetration ratios rose throughout the period which means those industries were liberalizing and more domestic demands were satisfied with imports.

As a next step, I estimated the trade elasticities by using the Vietnamese trade data. The trade elasticities are equal to one minus elasticities of substitution which can be estimated using the Broda and Weinstein (2006) methodology. Table 3 reports the trade elasticities. There are two different elasticities available in the table, ones in the third column are estimated from the full sample and ones in the fourth column are estimated from the subsample. The data coverage for the subsample estimation is 1995-2001. Since the benchmark year for the BTA is 2002, I chose the subsample to cover the years before the BTA went into force. Elasticities estimated using the subsample are intuitively better suited for our analysis because we want to know the effect of the BTA.

Finally, the welfare gain is calculated using the import penetration ratios and the subsample trade elasticities. The results of the calculation using equation 2 are reported in table 4. The results are percentage change in real income. The table shows gains earned in one, two, three and four years after the benchmark years. The benchmark years are 2002 and 2007 respectively for the BTA and WTO.

Our objective is to compare and contrast the gains from BTA with US and WTO accession and to find out which gain is larger. However, the industrial gains differ significantly. For the gains earned in the first year, despite the Global Crisis, machinery, basic metals and mining industries gained significantly. After a year from benchmark years, nine industries gained more in BTA and also nine industries gained less than WTO accession. However, the average of all

18 industries are higher in WTO. The difference between average of BTA and WTO is - 2.46%. Meaning that, on average industries gained more after the WTO accession.

However, for the second year, eleven industries including petroleum and basic metals industries have positive and larger gains after the BTA than WTO. Although the average gain is smaller with 0.58% after BTA, while it is 1.29% after the WTO accession, the median is higher after BTA, than WTO accession.

In the three-year and four-year margins, thirteen industries have positive and higher gains in WTO than BTA. Textile, machinery and electrical industries are the most gained ones after three years of WTO, on the other hand, mining industry is the most gained one after BTA. The average gains after three years from the benchmark years, the WTO is larger than BTA.

Now, if we look at the respective industries, textile, machinery and electrical industries have significant roles in the welfare effect from trade in Vietnam and these industries gained after WTO accession. Textile industry has gained the most after 2008. The Multi-Fiber Arrangement (MFA) expired in January 2005 and after the expiration, textile industry in Vietnam faced a downturn for a year or two and started to recover from 2007. This development in the textile industry is not the result of the WTO accession. Therefore, the huge percentage changes in the textile industry after 2008 cannot define or explain the true welfare gain acquired after WTO accession. Not all industries gained after the WTO, petroleum and motor vehicle industries lost significantly after the WTO.

Table 2 *Import penetration ratios (π_i)*

		OECD database				
Industry name	OECD code	1995	1998	2002	2007	2011
<i>Agriculture</i>	C01T05	0.01	0.01	0.03	0.09	0.06
<i>Mining</i>	C10T14	0.08	0.06	0.10	0.06	0.21
Food and tobacco	C15T16	0.19	0.17	0.11	0.13	0.17
Textile	C17T19	0.37	0.48	0.86	0.68	1.51
Wood	C20	0.15	0.31	0.25	0.31	0.37
Paper	C21T22	0.20	0.21	0.26	0.27	0.27
Petroleum	C23	1.03	1.09	1.02	1.06	0.72
Chemicals	C24	0.53	0.56	0.59	0.54	0.66
Rubber	C25	0.29	0.32	0.26	0.28	0.33
Minerals	C26	0.13	0.09	0.07	0.08	0.09
Basic metals	C27	0.40	0.46	0.60	0.69	0.76
Metal products	C28	0.43	0.40	0.21	0.27	0.29
Machinery	C29	0.82	0.82	0.86	0.87	1.07
Office	C30T33X	0.39	0.48	0.61	0.71	0.80
Electrical	C31	0.49	0.61	0.39	0.45	0.70
Motor vehicles	C34	0.66	0.55	0.35	0.64	0.42
Other transport	C35	0.49	0.38	0.28	0.23	0.20
Other	C36T37	0.50	0.59	0.23	0.20	0.19

6 Conclusion

In the paper welfare gains from the two most significant milestones of trade liberalization in Vietnam are compared. The BTA with US went into force in December 2001 and Vietnam became the WTO member in January 2007. Following the Arkolakis et al (2016), two aggregate variables, domestic expenditure share (one minus import penetration ratio) and trade elasticities are computed using the OECD input-output data of 1995-2011. Comparing the overall results of the 16 manufacturing industries and agriculture and mining industries, the welfare gained after the WTO accession is larger than the gains earned after the BTA with US. However, the real income change in respective industries vary significantly.

Table 3 Trade elasticities (ϵ_i)

Industry name	OECD code	Trade elasticity (ϵ)	
		Full sample (1995-2016)	Subsample (1995-2001)
<i>Agriculture</i>	C01T05	-3.26	-1.69
<i>Mining</i>	C10T14	-2.68	-3.75
Food and tobacco	C15T16	-3.42	-2.90
Textile	C17T19	-2.35	-3.96
Wood	C20	-2.18	-0.68
Paper	C21T22	-4.34	-3.22
Petroleum	C23	-5.08	-2.11
Chemicals	C24	-1.16	-0.93
Rubber	C25	-2.45	-2.02
Minerals	C26	-3.23	-2.80
Basic metals	C27	-1.36	-1.81
Metal products	C28	-2.51	-2.37
Machinery	C29	-1.27	-2.09
Office	C30T33X	-2.27	-4.70
Electrical	C31	-2.44	-2.50
Motor vehicles	C34	-12.28	-3.55
Other transport	C35	-54.52	-7.51
Other	C36T37	-16.33	-5.49
Mean		-6.37	-3.09

Table 4 Welfare gain (\widehat{W}_i) using OECD data

Industry name	Gains in 1 year			Gains in 2 years			Gains in 3 years			Gains in 4 years		
	<i>BTA</i> $\Delta(02 \text{ to } 03)$	<i>WTO</i> $\Delta(07 \text{ to } 08)$	<i>BTA-WTO</i>	<i>BTA</i> $\Delta(02 \text{ to } 04)$	<i>WTO</i> $\Delta(07 \text{ to } 09)$	<i>BTA-WTO</i>	<i>BTA</i> $\Delta(02 \text{ to } 05)$	<i>WTO</i> $\Delta(07 \text{ to } 10)$	<i>BTA-WTO</i>	<i>BTA</i> $\Delta(02 \text{ to } 06)$	<i>WTO</i> $\Delta(07 \text{ to } 11)$	<i>BTA-WTO</i>
Agriculture	0.21	-3.22	3.43	0.39	-1.31	1.70	0.50	-2.14	2.64	0.86	-1.88	2.74
Mining	-0.96	8.50	-9.46	1.34	1.91	-0.57	23.99	-0.19	24.18	18.88	4.38	14.50
Food and tobacco	0.15	0.72	-0.57	0.22	0.24	-0.02	-0.38	1.37	-1.75	-0.21	1.52	-1.73
Textile	2.82	7.17	-4.35	2.02	30.67	-28.65	-18.72	145.48	-164.20	-23.49	159.50	-182.98
Wood	-0.42	-1.74	1.32	3.21	-0.27	3.49	-0.01	4.22	-4.24	6.48	6.83	-0.35
Paper	0.35	-0.19	0.54	0.17	1.44	-1.26	-1.00	0.99	-1.98	-0.56	0.12	-0.68
Petroleum	1.99	-2.67	4.65	1.89	-55.05	56.94	3.07	-87.59	90.66	5.99	-80.75	86.75
Chemicals	0.62	1.94	-1.32	-1.04	-11.10	10.06	-7.21	9.33	-16.54	-8.21	11.85	-20.06
Rubber	-0.36	-0.20	-0.16	-0.77	-3.18	2.41	-1.64	2.03	-3.67	-1.26	2.77	-4.04
Minerals	0.12	0.13	0.00	0.43	-0.03	0.46	0.41	0.50	-0.09	0.09	0.45	-0.36
Basic metals	-0.07	11.01	-11.08	3.53	2.19	1.34	2.51	4.34	-1.83	6.90	6.72	0.19
Metal products	1.40	-2.39	3.80	-0.60	-1.50	0.89	-1.73	-0.27	-1.46	-1.23	1.17	-2.39
Machinery	-1.73	48.01	-49.74	-5.93	59.71	-65.64	-9.08	64.48	-73.56	-1.46	66.44	-67.89
Office	0.83	-1.76	2.60	3.38	2.99	0.39	-1.95	-4.33	2.38	3.05	5.68	-2.63
Electrical	7.62	4.51	3.11	5.05	9.40	-4.35	-2.85	17.46	-20.31	-3.35	16.92	-20.27
Motor vehicles	-0.41	-11.49	11.08	-1.19	-11.26	10.07	-2.55	-10.35	7.80	-2.84	-10.99	8.15
Other transport	1.58	0.02	1.56	0.05	-1.15	1.20	-2.59	-0.26	-2.33	-3.01	-0.54	-2.47
Other	-0.99	-1.31	0.32	-1.73	-0.41	-1.32	-2.25	0.47	-2.72	-2.42	-0.35	-2.06
Average	0.71	3.17	-2.46	0.58	1.29	-0.71	-1.19	8.09	-9.28	-0.32	10.55	-10.87
Median	0.18	-0.09	0.43	0.30	-0.15	0.68	-1.69	0.74	-1.91	-0.89	2.15	-1.90

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