ТОЛЬ СТАТИСТИКИЙН ДҮН ШИНЖИЛГЭЭНИЙ ТУСЛАМЖТАЙ ӨРСДЭЛ ТООЦОХ БОЛОМЖ: МОНГОЛЫН ЖИШЭЭ

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Хураангуй: Гадаад худалдааны өсөн нэмэгдэх урсгал нь улсын хилээр нэвтрэх зорчигч, бараа, тээвэрийн хэрэгсэлд тавих гаалийн хяналтын үйл ажиллагааг хялбаршуулах хэрэгцээ шаардлагыг бий болгож байна. Иймд өрсдэл тооцох арга зүйд суурилсан гаалийн хяналтыг нэвтрүүлэх замаар гаалийн байгууллагын гүйцэтгэлийг нэмэгдүүлж, гадаад худалдааг хөнгөвчлөх боломжийг бүрдүүлж байна. Орчин үед гаалийн байгууллагууд худалдааны аюулгүй байдлыг хангахад гол анхаарлаа хандуулж байгаа боловч, төсвийн орлогыг алдагдалгүй бүрдүүлэх үүрэг тэдний үйл ажиллагааны анхаарлын төвд байсаар байна.
Толь статистикийн дүн шинжилгээ нь худалдааны луйврыг илрүүлэх арга хэрэгслийн нэг билээ. Энэ төрлийн дүн шинжилгээ нь гаалийн байгууллагад худалдааны луйврыг илрүүлэх, өндөр өрсдэл бүхий ачилтыг онилох, бүрдүүлэлтийн дараах шалгалтад хамрагдах гаалийн харилцаанд оролцогчдыг сонгох боломжийг олгох юм. Энэхүү өгүүлэлд Толь статистикийн дүн шинжилгээний тусламжтай гаалийн хяналтын өрсдэлийг тооцох боломжийг Монголын гадаад худалдааны мэдээлэлд үндэслэн авч үзлээ.

Түлхүүр үгс: Толь статистикийн дүн шинжилгээ, өрсдэлийн зэрэглэл, хазайлт, хэлбэлзэл, өрсдэлийн матриц.

Abstract: The rapid growth of international trade limits the opportunity to control cross-border movements of goods, passengers and transport and imposes restrictions on the inspection of such movements. In the international trade environment, Customs plays a primary role in the cross-border movement process. It is imperative, therefore, to introduce risk management strategies and practices that provide a more effective approach to the planning and implementation of customs control, including risk assessment. Recently, customs administrations have had a greater focus on security issues, although revenue collection is also a high priority. Mirror analysis is a tool that can be used to identify commercial fraud risk. This type of analysis allows Customs to target commercial fraud attempts and is useful in targeting high-risk shipments and selecting companies for post-clearance audit. This paper uses mirror analysis for assessing control risks for Mongolian Customs.

Keywords: Mirror statistical analysis, risk, deviations, risk level matrix

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Introduction

The main purpose of this research is to examine ways of using mirror analysis for assessing control risks for Mongolian Customs. The methodology used in this study relied on data available at the international level (WTO International Trade Centre).

This paper comprises five sections. The first section describes the methodological framework of conducting mirror statistical analysis; the second section provides background on Mongolian foreign trade and current issues; the third outlines the three stages of mirror statistical analysis for assessing customs control risk of Mongolian Customs and proposes risk profiles for high-risk goods; and the final section presents the principal findings and recommendations.

In exercising control, customs administrations interact with different stakeholders and deal with different risk areas, such as national security, revenue and economic prosperity. The traditional customs procedure of examining documents and undertaking physical border controls, aimed at detecting illegal trade, is a costly and time-consuming process. Customs administrations need to focus on the cost and efficiency of their own activities. Using risk-based customs control can produce effective and efficient results for both Customs and traders. Therefore, targeted high-risk selection is a more useful method than the random check selection method.

The World Customs Organization (WCO) has adopted tools and instruments[2], including international conventions, for risk management.

The GATT agreement Article VIII recognises the need to minimise 'the incidence and complexity of import and export formalities … [by] decreasing and simplifying import and export documentation requirements' (WTO, 1994). The WTO Trade Facilitation Agreement Article 7.4 also includes measures for risk management[3] in Customs (WTO, 2014).

Other international organisations are also focusing on improving the facilitation international trade, including the World Bank through its *Doing business (Trading across border)* report. This report includes best practices of countries in the area of

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[2] The International Convention on the Simplification and Harmonization of Customs procedures (1999); Guideline on Customs Control (1999); Risk management guideline (2004); SAFE Framework of Standards to Secure and Facilitate Global Trade (2005); The Global Information and Intelligence Strategy (WCO, 2005); Customs in the 21st century (2008); Risk Management Compendium (2011); Guidelines for Post Clearance Audit (2012); Implementation Guidance on Post Clearance Audit (2016); Commercial Fraud Manual (2004–2016);

[3] 4.1 Each Member shall, to the extent possible, adopt or maintain a risk management system for Customs control. 4.2 Each Member shall design and apply risk management in … 4.3 Each Member shall concentrate Customs control and… on high-risk consignments and expedite the release of low-risk consignments... 4.4 … risk management on an assessment of risk through appropriate selectivity criteria... (WTO, WTO Agreement on Trade Facilitation, 2014).

international trade facilitation.

Methodology

The word 'mirror' can be defined as a reflecting surface, which was originally of polished metal but now usually of glass with a silvery, metallic or amalgam backing. Mirror analysis refers to a system where exportation from country 'X' is matched with country 'Y' importation, like a mirror. Mirror analysis is useful for developing intelligence for targeting high-risk shipments.

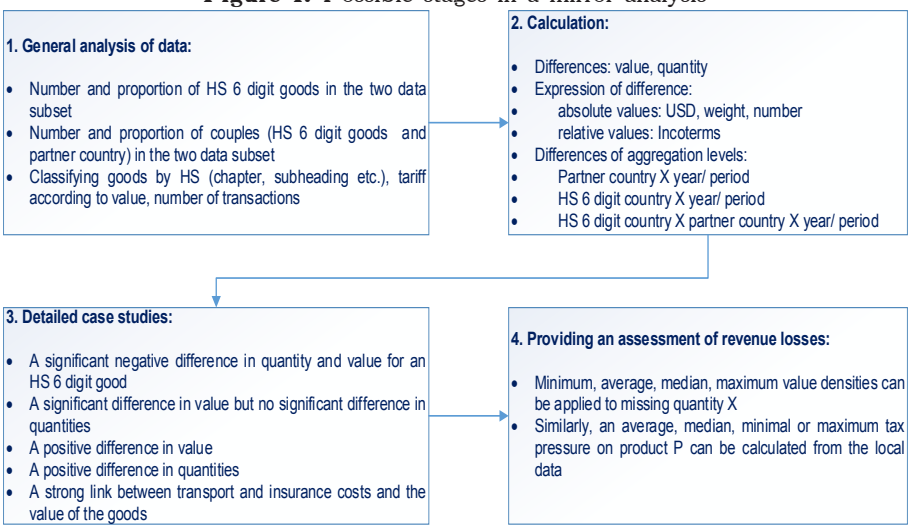
There are a number of definitions of mirror analysis: mirror data are bilateral data where each quantity is reported twice (tenCate, 2017); bilateral comparisons of two basic measures of a trade flow; and a traditional tool for detecting the causes of asymmetries in statistics (Eurostat, 1998). Mirror analysis used in this study involves comparing mirror imports (or exports) of a country with exports (or imports) reported to this country by its partner countries to detect gaps in terms of quantities, weight or value that may unveil fraudulent flows or practices (Cantens, 2015).

Mirror analysis is guided by big data to filter high-risk transactions in order to detect commercial fraud risk. There are various categories of commercial fraud. According to the *WCO commercial fraud manual for senior customs officials* (WCO, 2006), commercial fraud can be categorised as 'revenue, non-revenue or both'. False declarations of quality or quantity, misdescriptions, and misclassification frauds are related to both revenue fraud and non-revenue risks, while valuation fraud is related only to revenue-loss risks.

A number of customs unions and regional communities use an integrated clearance database with specific criteria so that they can identify high-risk shipments by details such as transport number, HS code, shipping line, exporter, importer name and country of origin. The benefit of mirror analysis is that it makes it easier for customs administrations to identify commercial fraud risks.

The WCO Research paper No. 35, *Mirror analysis and revenue fraud* (Cantens, 2015) explains theoretical aspects of mirror analysis and the associated methodological debate. Figure 1 outlines a number of options for conducting mirror statistical analysis.

Figure 1. Possible stages in a mirror analysis



Source: Cantens, Mirror Analysis and Revenue Fraud, 2015, pp. 11–14.

Figure 1 provides guidance for conducting mirror analysis and the research paper explains the detailed procedure of analysis, in particularly data collection and delivery processes. In this case study of Mongolian foreign trade mirror analysis, the methodology was based on Cantens (2015).

Another issue of mirror analysis is processing big data using econometric models. Eurostat has defined the formula to apply when mirror analysis is used for identifying possible deviations (which are expressed in percentages, between the values of the country initiating the mirror analysis and the value of the partner country; Eurostat, 1998) and asymmetries (which occur when the declaration of the importer in country A is not consistent with the declaration of the exporter in country B; Eurostat, 1998) (Montenegro, 2011):

$$\text{Asymmetry} = OF_{AB} - mIF_{AB} \qquad (1)$$

$$\text{Deviation } A_B = \text{ABS}\ \frac{OF_{AB} - mIF_{AB}}{(OF_{AB} + mIF_{AB})/2} \qquad (2)$$

DA_B: The difference expressed in percentage after the calculation
OF_{AB}: Outbound flow going from country A to country B
mIF_{AB}: Mirror inbound flow
ABS represents the absolute value

Asymmetry represents the difference between mirror values.

The deviation is possible between 0—200 percent, depending on the methodology used by the country for analysis. If there is no deviation it means that there is no difference in the data between two countries. Deviation over 30 percent requires additional analysis on specific goods. In accordance with the defined rules of mirror analysis, three levels of deviations exist, as set out in Table 1.

Table 1. Risk levels of deviation of mirror statistical analysis

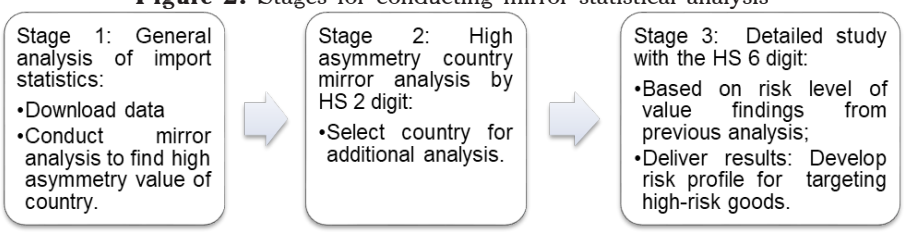
Range of percentage	Rate of deviation	Measurement
0—15	Low	
15—50	Medium	Over 30% needs additional deviation analysis
Over 50	High	Indicating irregularities or very serious imbalances in the external trade

Source: Eurostat, 2012—2013

Deviation can be either positive or negative and can be used to estimate if a country is declaring a higher or lower level of flows compared with the mirror flows declared by its partner countries.

Traditional customs processes involve checking all shipments at the border while modern customs processes use risk-based controls. Checking all shipments at the border is not possible due to the size of the international trade environment, and so customs administrations have signed memorandums of understanding (MOUs) with their main trading partners, covering exchange of information, introducing joint controls, simplifying documents and working with an integrated database system. Figure 2 sets out the stages for mirror analysis in this study.

Figure 2. Stages for conducting mirror statistical analysis



Above mentioned figure described stages for mirror statistical analysis in this study. As mentioned previously mirror statistical analysis is a not a one-stage procedure. First, it is necessary to identify high asymmetry import partners from the

big trade data. Although administrations know their main import partner countries, when assessing high-risk shipments, Customs needs to analyse each import database for different time periods. Conducting mirror statistical analysis needs to identify factors relating to:

- time lag[4];
- customs valuation (FOB for exports and CIF for imports);
- trade threshold (*di-minimis*)[5];
- goods classification;
- simplified procedures (goods and partners);
- exchange rate of currency; and
- customs territory.

These factors are depending on the national policy of international trade, as well as the policies of neighbouring countries and key trading partners. For example, the Russian Federation is a one of the main trading partners of Mongolia. According to the Customs law of the Russian Federation, the export clearance procedures of petroleum differ from those for general goods, which leads to huge asymmetric mirror statistical result for petroleum imports into Mongolia.

CIF/FOB ratios*:* International trade practice leads to imports being reported at the CIF level and exports being reported at the FOB level. To understand FOB Pricing, one must understand what FOB means. FOB is the short form for Free on Board (or Freight on Board) and translates to sellers including the cost of the product being delivered to the nearest port in the purchase price[6]. CIF stands for Cost, Insurance and Freight — it's a legal incoterm term which is used in international shipping for the delivery of goods to a port. In this case, the seller must pay for the delivery of goods, and their export, including insurance, and has responsibility of the goods right up until they're loaded on the ship (ICC, 2017). The 'matched partner' CIF/FOB ratio technique consists of comparing the

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[4] Time lag: Landlocked countries have higher trade and time than other countries. The average import time for Mongolia is approximately 47 days (World Bank, 2014, 2017). Therefore, exports from October to December will be registered in Mongolia's import data for the next financial year (January—February). Implementing the Authorized Economic Operator program, in particular freight forward operators, should assist in eliminating delays for connecting ports until Mongolian border crossing points.

[5] Trade threshold (low-value transactions): Trade threshold is one of the factors explained by mirror asymmetries. A number of customs administrations introduced de minimis thresholds for Customs clearance. A majority of customs administrations indicated that a simplified declaration and clearance process is provided for goods below the de minimis thresholds (WCO, 2017). In the case of Mongolia, Customs introduced simplified procedures cargos below the de minimis threshold (USD ~420), but this procedure is not included in the foreign trade statistics. The de minimis thresholds rates of Mongolian import partner countries differ and depend on national policies and international trade strategies. For example, the US de minimis threshold is USD 800, while for other countries it is approximately USD 50~200 (see Appendix 1).

[6] However, buyer is liable to pay for the shipping costs from that port, and also any other fees associated with transporting the goods to their desired destination.

valuation of the same flow reported by both the importer and the exporter (Carrere & Grigoriu, 2014). This study used Carrere and Grigoriu's theoretical definition of the CIF/FOB ratio.

According to their study so-called CIF/FOB ratio of a trade flow for a product 'k' imported by a country 'i' from a country 'j' could be defined as following:

$$R_{ijkt}^{CIF/FOB} = \frac{P_{ijk}^{M} Q_{ijk}^{M}}{P_{ijk}^{X} Q_{ijk}^{X}} \qquad (3)$$

- P - price;
- Q - quantity;
- $P_{ijk}^{M} Q_{ijk}^{M}$ - value of the import flows of product 'k' from 'j' to 'i' as reported by the importing country 'i';
- $P_{ijk}^{X} Q_{ijk}^{X}$ - value of the import flows of product 'k' from 'j' to 'i' as reported by the exporting country 'j'.

In this study data was taken from open sources and for this reason it is not possible to calculate the unit price of goods. However, at the national level, Customs can use bilateral agreements to assess the CIF/FOB ratios for a specific product.

Mongolia

Mongolia is a landlocked country that has poor industrial development and is highly dependent on external trade. Since the 1990s, the Mongolian government has been implementing policies to liberalise the economy and facilitate foreign trade and investment to accelerate the country's economic growth. Mongolian foreign trade volumes have been increasing year by year (Mongolia, 1998–2000).

From 2014 to 2016, Mongolia traded with 155 countries. In 2016, foreign trade turnover stood at USD 8.27 billion (exports USD 4.91 billion and imports USD 3.36 billion). In 2016 the total foreign trade turnover decreased by 2.36 per cent (USD 0.19 billion) from that of the previous year. The decrease in the trade turnover resulted from the 13.09 per cent decrease in imports and a 5.13 per cent increase in exports.

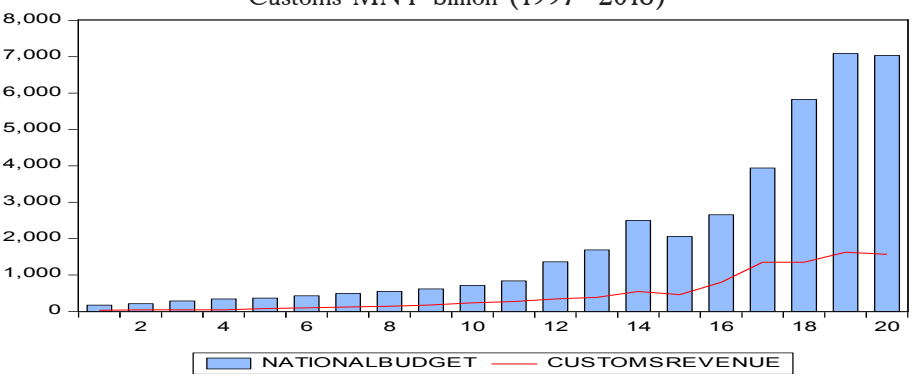
The volume of border crossing movements and the efficiency of customs control is directly linked to the amount of revenue collected. Before its transition to a market economy (1990), Mongolian Customs contributed more than 50 per cent of the government budget, while statistics from the last two decades shows that more than 31 per cent of government budget was collected by Customs, demonstrating that revenue collection is still an important activity for Mongolian Customs.

Mongolian Customs' import tariff infrastructure comprises four types of taxes: customs, excise, road and value added tax (VAT). Apart from duty exemption

procedures, the VAT rate is 10 per cent of the customs value and other taxes. Excise and road taxes are applied to only a small number of goods, and customs tariff rates vary (0%, 1%, 3%, 5%, 15% and 25%).

Figure 3 presents the Mongolian Government budget and amount of revenue collection by Customs from 1997 to 2006.

Figure 3. Mongolian government budget and volume of revenue collection by Customs MNT billion (1997–2016)



Source: Ministry of Finance, Mongolia (National budget report, 1997–2016)

Customs collects revenue from imported goods and the tax authority collects approximately 19 different taxes that are based on various national tax legislations. Some goods are assessed for export tax, such as camel wool and timber.

Imports from six countries share the biggest percentage of Mongolian imports, compared to other trading partner (~155) countries. Of the six countries, China and the Russian Federation are Mongolia's main import partners and, together, make up approximately 62.7 per cent of imports into Mongolia, meaning that Mongolia is highly dependent on those two neighbouring countries.

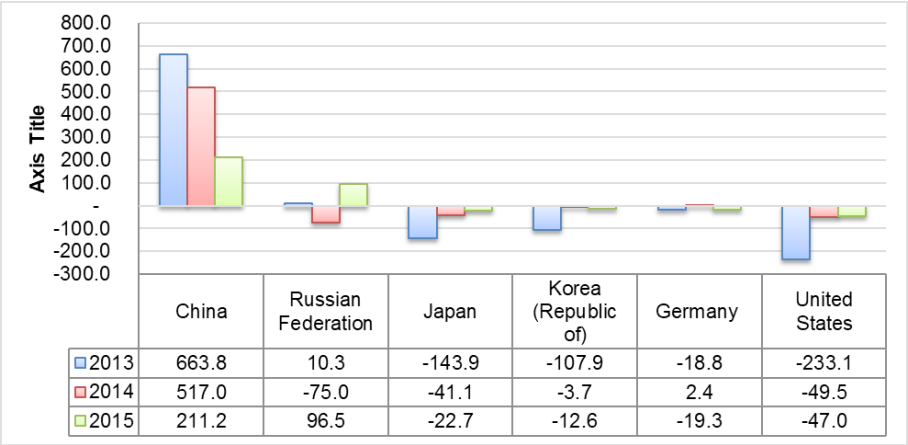
Mirror statistical analysis for Mongolian import partner countries

This analysis examines Mongolia's import statistics (2013–2015) and compares them with the export figures of its main trading partners. A number of researchers that use mirror statistics for trade analysis use trade data from the United Nations (UN) COMTRADE database (https://comtrade.un.org/). This study utilises the trade data from the WTO International Trade Centre: Trade statistic database (WTO, 2017). There is little difference between the data from these two databases, but there are differences in methodology and downloading procedures. The trade data and calculation of asymmetries and CIF/FOB ratio (formulas 1 and 3 of this

study) are shown in Appendix 1.

Stage 1. Asymmetry calculation utilising formula 1, which is outlined in the previous section of this paper and estimations shown in Figure 4.

Figure 4. Comparative asymmetries: Mongolia's imports from six countries (mill. USD)



	China	Russian Federation	Japan	Korea (Republic of)	Germany	United States
2013	663.8	10.3	-143.9	-107.9	-18.8	-233.1
2014	517.0	-75.0	-41.1	-3.7	2.4	-49.5
2015	211.2	96.5	-22.7	-12.6	-19.3	-47.0

Source: Author's calculation based on trading partner countries export between Mongolian imports between 2013 and 2015 (Value: mill. USD.) (WTO, International Trade Centre, 2017)

The difference (asymmetry) between Mongolian imports from China and Chinese exports to Mongolia is estimated to be USD 211–664 million. The average customs tariff rate and VAT of Mongolia is calculated at 15.5 per cent of the customs value. Further analysis was conducted to identify high-risk transactions. The asymmetrical difference between Mongolia and China decreased by USD 306 million in 2015 compared with 2014, while in the other five import partner countries, there was both positive and negative asymmetry each year, but at a lower level than for China.

Table 2 provides deviation estimations of mirror analysis in 2013, utilising formula 2.

Table 2. Deviations between imports of Mongolia and exports of 'X' countries in 2013

Mirror analysis: Country 'X' exports to Mongolia with Mongolian import from country 'X'	
'X' export to MN and MN import from 'X'	Calculation based on year 2013
DCN_{MN}: China and Mongolia	$DCN_{MN} = \frac{Ex_{CN} - Im_{MN}}{(Ex_{CN} + Im_{MN})/2} = \frac{2449.5 - 1785.7}{(2449.5 + 1785.7)/2} = 31.3\%$
DRU_{MN}: Russian Federation and Mongolia	$DRU_{MN} = \frac{Ex_{RU} - Im_{MN}}{(Ex_{RU} + Im_{MN})/2} = \frac{1572.1 - 1561.8}{(1572.1 + 1561.8)/2} = 0.7\%$
DJP_{MN}: Japan and Mongolia	$DJP_{MN} = \frac{Ex_{JP} - Im_{MN}}{(Ex_{JP} + Im_{MN})/2} = \frac{300.3 - 444.2}{(300.3 + 444.2)/2} = (38.7)\%$
DKR_{MN}: Korea (Republic of) and Mongolia	$DKR_{MN} = \frac{Ex_{KR} - Im_{MN}}{(Ex_{KR} + Im_{MN})/2} = \frac{399.5 - 507.4}{(399.5 + 507.4)/2} = (23.8)\%$
DDE_{MN}: German and Mongolia	$DDE_{MN} = \frac{Ex_{DE} - Im_{MN}}{(Ex_{DE} + Im_{MN})/2} = \frac{233.4 - 252.2}{(233.4 + 252.2)/2} = (7.7)\%$
DUS_{MN}: United States and Mongolia	$DUS_{MN} = \frac{Ex_{US} - Im_{MN}}{(Ex_{US} + Im_{MN})/2} = \frac{279.6 - 512.7}{(279.6 + 512.7)/2} = (25.8)\%$

Author's calculation (Formula 2) based on trading partner countries export between Mongolian imports in 2013 (Value: mill. USD) (WTO, International Trade Centre, 2017)

Table 1 depicts a risk levels of deviation of mirror statistical analysis by Eurostat study methodology. Table 2 has shown the calculation of the risk levels of deviations in 2013 import and the deviations of the years during 2014 and 2015 had been calculated in a same method, yet has not been included in the above table. Nevertheless, Table 3 shows us the risk level of deviation of the year 2013, 2014 and 2015.

Table 3. Devation and risk level matrix (Mongolia import with the main import partner countries, between 2013-2015)

Country	2013		2014		2015	
	D (%)	Risk level	D (%)	Risk level	D (%)	Risk level
China	31.3	Medium	26.40	Medium	14.41	Medium
Russian Federation	0.7	Low	(5.0)	Low	9.0	Low
Japan	(38.7)	Medium	(11.8)	Low	(8.6)	Low

Korea (Republic of)	(23.8)	Medium	(1.1)	Low	(5.0)	Low
German	(7.7)	Low	1.6	Low	(16.9)	Medium
United States	(58.8)	High	(25.8)	Medium	(50.6)	High

Source: Calculation based on trading partner countries export between Mongolian imports in 2013–2015 (Value: mill. USD) (WTO, International Trade Centre, 2017); Country abbreviations based on ISO 3166.

The risk level of deviation depicts that the Chinese exports to Mongolia are assessed as medium and the Russian Federation exports to Mongolia would be low with both years. In the case of Japanese and Korean exports to Mongolia risk level of deviation assessed in 2013 were medium, whereas in 2014 and 2015 the risk level was low. Moreover, in German exports to Mongolia risk level of deviation assessed in 2013 and 2014 was at low and in 2015 it was high. The risk level of deviation assessed in 2013 and 2015 of the USA exports to Mongolia was high, yet in 2013 it was medium.

As mentioned, mirror analysis needs adjustments from time to time for low-value transactions and CIF/FOB ratios.

Table 4 illustrates the CIF/FOB ratio between trade partners 2013–2015.

Table 4. The CIF/FOB ratio (2013–2015) and risk level* matrix

Trade between	2013		2014		2015	
	Ratio	Risk level	Ratio	Risk level	Ratio	Risk level
Ex^{**}_{CN} and Im^{***}_{MN}	0.73	High	0.77	High	0.87	High
Ex_{RU} and Im_{MN}	0.99	Low	1.05	Low	0.91	Low
Ex_{JP} and Im_{MN}	1.48	High	1.13	Medium	1.09	Low
Ex_{KR} and Im_{MN}	1.27	Medium	1.01	Low	1.05	Low
Ex_{DE} and Im_{MN}	1.08	Low	0.98	Low	1.18	Medium
Ex_{US} and Im_{MN}	1.83	High	1.3	High	1.68	High

**Low 0–10%, medium 11–30%, and high <30%;*
***Ex: Export*
****Im: Import*

The International Financial Statistics data[7] are similarly unreliable, as the IMF relies heavily on a 10% imputation rule (David Hummels; Volodymyr Lugovskyy, 2003).

[7] The International Financial Statistics (IFS) contain trade data that are aggregated over all commodities and partners for a particular importer.

Therefore 0—10 percent were assessed at the low-risk level. If CIF/FOB ratio is above 10 percent, it should be assessed at medium and high-risk levels. If the valuation ratio exceeds the accepted level of percentage, Customs needs to do additional analysis. Analysis shows that imports from German, Korea and the Russian Federation are assessed at the low-range ratio, Japan was assessed at the high-risk level in 2013, medium-risk level in 2014 and low-risk level in 2015. CIF/FOB ratio of United States and China is assessed at the high-risk level.

This is a general finding of the mirror data analysis of the import trade with six of Mongolia's trade partners. Mongolia is a landlocked country; therefore, the average import time is 47 days (WB, 2014, 2017). Imports from China, however, often take longer, while imports from Russia may be faster, depending on the location of the border point (e.g. Irkutsk and Ulan-Ude).

Since 2010, Mongolian Customs has signed bilateral agreements with the Russian Federation and China Customs Administrations for conducting annual joint statistical analysis. Through this cooperation they targeted high-risk shipments and tried to enhance compliance level of traders.

However, the time difference between trading countries, freight costs, customs valuation, clearance policy and trade thresholds of different countries is major reason for differences between the exporting and importing data.

Stage 2. Asymmetry of 2015 China exports to Mongolia was estimated as 211 million USD, but the deviation was calculated as 14 percent (medium-risk). In practice 211 million USD asymmetry would not be qualifies as medium risk level.

The asymmetry amount of China is greater than United States. From this point of view the second stage of mirror analysis covers Mongolian imports from China, with China's exports to Mongolia.

Also as mentioned previously China is a main trading partner of Mongolia; the last three years have shown high asymmetry between bilateral trade; and asymmetry and deviation of registered six-digit HS code goods is relatively higher than bilateral trade between the other five major import partner countries.

Table 5. Mirror analysis: Mongolia's import from China, by HS chapters (2015)

Indicators	Asymmetry (mill. USD)		Asymmetry (HS chapters)	
	(−)*	(+)**	(−)*	(+)**
Additional analyse	−151.97	364.4	HS (27) chapters: 07; 08; 21; 23; 24; 25; 28; 32; 33; 36; 38; 42; 44; 48; 64; 68; 69; 70; 72; 73; 84; 85; 86; 90; 94; 95; 96	HS (17) chapters: 02; 19; 20; 27; 29; 39; 49; 51; 54; 55; 57; 59; 61; 62; 63; 87; 99.
Deviation is a high risk: asymmetry is low	−2.19	1.5	HS (14) chapters: 41; 45; 53; 58; 65; 66; 67; 71; 74; 75; 80; 91; 92; 97.	HS (8) chapters: 01; 12; 18; 37; 39; 50; 60; 78
Deviation is a medium risk: asymmetry is low	−1.41	1.7	HS (8) chapters: 03; 16; 34; 46; 47; 56; 81; 83.	HS (4) chapters: 13; 22; 35; 82.
No analyse	−1.3	0.5	HS (6) chapters: 11; 17; 30; 40; 43; 76	HS (12) chapters: 04; 06; 09; 10; 14; 15; 26; 31; 52; 79; 88; 89.
Total	−156.88	368.1		

Source: Calculation based on Chine export to Mongolia and Mongolian import from China, in 2015 (Value: mill. USD) (WTO, International Trade Centre, 2017)

** Mongolian imported value exceeded from China exported value to Mongolia (55 HS Chapters);*

*** China's exported value to Mongolia exceeded from Mongolian imported value (41 HS Chapters).*

The second stage of mirror statistical analysis conducted Mongolian imports from China in 2015 and covered by 96 HS chapters.

The main goal of mirror statistical analysis is identifying high-risk goods. Therefore, Table 5 categorized the risk level of goods by HS 2 digit for the purpose of further analysis and categorization based on the asymmetry and risk level of deviation. Followed by this categorization, goods under the '02; 19; 20; 27; 29; 39; 49; 51; 54; 55; 57; 59; 61; 62; 63; 87; 99' HS chapters, China's exported value exceeded from the Mongolian imported value. Goods under the '07; 08;

21; 23; 24; 25; 28; 32; 33; 36; 38; 42; 44; 48; 64; 68; 69; 70; 72; 73; 84; 85; 86; 90; 94; 95; 96' HS chapters, the Mongolian imported value from China exceeded from China's exports to Mongolia, thus both of those cases are required to be assessed further.

Stage 3. The purpose of this paper is to describe how mirror analysis can help Customs to assess control risks. Econometric analysis has many advantages for implementing risk-based Customs control. This study analysed general trade data to identify specific risk areas. The analysis shows a number of asymmetries between Mongolia's import and its trading partners.

In this stage, the goods chosen are classified under the HS Chapter 73 (articles of iron or steel) and 61 (articles of apparel and clothing accessories, knitted or crocheted). In 2015, those two chapters together represented 24.5 percent of exports from China and 9.5 percent of imports into Mongolia. Using Formula 1 and 3, the asymmetry and CIF/FOB ratio of those selected chapters was calculated.

Table 6. Mirror analysis: Mongolian import from China, the HS 61 and 73 chapters (2015)

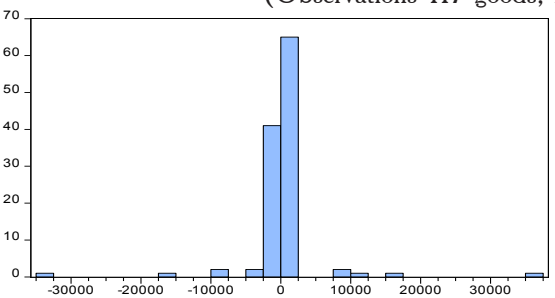
Value and Quantity	$Ex_{CN\ to\ MN}$	$Im_{MN\ from\ CN}$	Asymmetry	CIF/FOB ratio
	Chapter 73 (HS 6 digit 117 goods)			
Value (mill. USD)	145.78	147.63	1.85	1.01269
Quantity (thous. Tons)	164.01	138.78	−25.23	0.846168
	Chapter 61* (HS 6 digit 82 goods)			
Value (mill. USD)	240.21	2.31	−237.9	0.009617

**Measurement of goods classified by under the HS Chapter 61 is different and not possible to calculate analysis by quantity of goods.*

Mirror analysis for HS Chapter 73 shows that there is a no risk from the traded value amount. But calculation of quantity asymmetry shows that 25.2 thousand tons of exported goods have not been declared for import clearance. The study conducted descriptive analysis of 117 goods[8] classified by under this chapter.

[8] Subheading/HS 6 digit.

Figure 5. Descriptive statistical analysis of HS Chapter 73 (Observations 117 goods, in 2015)



Series: ASSYMETRIES__THOUS__USD_
Sample 1 117
Observations 117

Mean	17.61538
Median	16.00000
Maximum	36383.00
Minimum	-33614.00
Std. Dev.	5488.784
Skewness	0.587569
Kurtosis	30.79675
Jarque-Bera	3773.445
Probability	0.000000

Among the 117 observations maximum asymmetry is estimated to be 36.38 million USD and minimum asymmetry is estimated to be negative 33.61 million USD (Appendix 3. Tabulation of HS 73 asymmetries thousand USD).

Table 7. The CIF/FOB ratio, asymmetry (2015) and risk level matrix (goods under the HS Chapter 73)

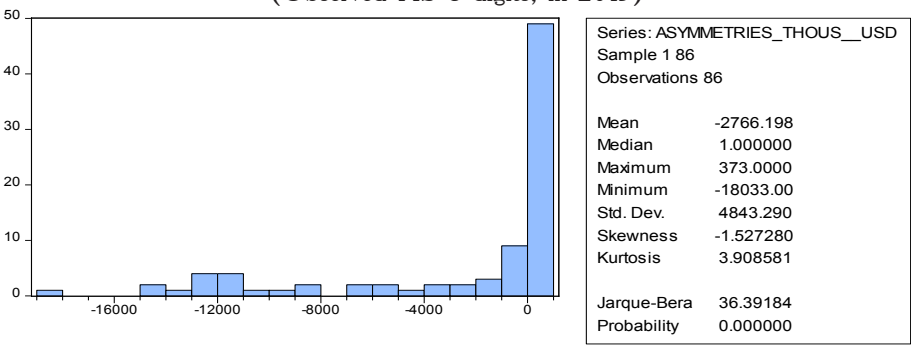
HS 6 digit	CIF/FOB Value	Asymmetry (thous. USD)	Risk level	Explanation
5	0–10%	506	Low	CIF/FOB value ratio is accepted level but quantities exceeded from export (high risk)
8	10–30%	836	Medium	CIF/FOB value ratio is accepted level but asymmetries of quantities are high risk
43	<30%	80 602	High	
15		9 091	High	Not reported in China export
9		(1 659)	High	Not reported in Mongolian import
39	>0%	(87 527)	High	Export exceeded from import

General mirror analysis (value) of HS chapter 73 shows that there is a no risk trade between China to Mongolia under this chapter, but exported quantities are exceeded from imports. In addition, Table 7 shows that the risk level analysis of goods by subheading, and even low and medium - risk level of goods (based on asymmetry and CIF/FOB ratio) exported quantities were exceeded. For instance, nine goods were not reported into the Mongolian import and 15 goods were not covered in the China's export data. There might be illegal movement of goods or commercial fraud (such as, misclassification or false declarations of quality/quantity

for those registered goods) behind this activity.

Mirror statistical analysis for HS Chapter 61 shows that there is a high asymmetry for trade value. China's exports (HS Chapter 61) to Mongolia were reported to be 240.21 million USD, but Mongolian imports from China were recorded to be only 2.31 million USD. This is a high asymmetry and also CIF/FOB ratio calculated high-risk level (Please see the Table 6). Followed by this analysis, next stage of this study conducted descriptive statistical analysis of goods classified by HS Chapter 61 (86 samples).

Figure 6. Descriptive statistical analysis of HS Chapter 61 (Observed HS 6 digits, in 2015)



Observation number is 86, maximum asymmetry estimated 0.37 thousand USD and minimum asymmetry estimated negative value 18.03 million USD (Appendix 4. Tabulation of HS 61 asymmetries thous. USD)

Table 8. The CIF/FOB ratio, asymmetry (2015) and risk level matrix (goods under the HS Chapter 61)

HS 6 digits	CIF/FOB Value	Asymmetry (thous. USD)	Risk level
37	<30%	−239 150	High
49	<30%	1 257	High

The third stage of mirror statistical analysis of the HS Chapter 61 presents a different picture compared with the HS Chapter 73 mirror statistical analysis.

In this study we could not say a clear finding, further analysis needs to conduct under this study outcome. Sometimes there could be false classification either in the export and the import. Moreover, general mirror analysis (value) of HS Chapters 73 presents that there is a low asymmetry and low-risk level deviation, yet additional

analysis by total quantity of goods shows that exported quantities are exceeded in the imports. Mirror analysis is a one of the possible ways for targeting high risk goods for cross border international trade movement, in addition it plays a major role for implementing risk management at the national level. As it could be seen from this study, there is an additional analysis needs to be done at the national level.

In this regard, identifying reason of asymmetry including classification, customs valuation, tariff and rules of origin etc., trading countries Customs administrations should sign the Memorandum of understanding or similar documents for conducting mirror statistical analysis at the national level.

Conclusion

The study introduced a methodological framework of conducting mirror statistical analysis. Under this framework there are three stages of analysis introduced. This study used data from open sources, therefore, there could be unknown errors in trade flows. The findings of this study are as follows:

- The first stage of the mirror statistical analysis conducted a general mirror analysis for six countries, calculated asymmetries, deviations and CIF/FOB ratios for each country and assessed the risk level for those indicators. Among of six countries China and the United States were assessed at the high-risk level deviation. In the case of the United States, the geographical location is far from Mongolia, therefore time lag will affecting the asymmetries, such as the exports from the United States to Mongolia between October and December would be registering in the next year between January and March.
- Most discrepancies between China's exports to Mongolia's was shown in HS Chapter 61 and 73 between 2013 and 2015. The study selected data from 2015. The number of non-registered exported goods by subheading under the HS Chapter 61 and 73 were found.
- Mirror analysis of HS Chapter 73: Nine goods were not reported into the Mongolian import and 15 goods were not covered in the China's export data. There might be illegal movement of goods or commercial fraud (such as, misclassification or false declarations of quality/quantity for those registered goods) behind this activity.
- Mirror analysis HS Chapter 61: There are 86 goods under this chapter which were traded between China and Mongolia. Total trade value assessed as a high asymmetry and also CIF/FOB ratio calculated high-risk level. Some of the goods of HS Chapter 61 could get classified by HS chapter 62 goods, while being reported. Additionally, China export value of HS

Chapter 62 is less in Mongolian import.

- Trade covered by under the HS Chapter 61 and 73 are needs to additional analysis must be conduct at the national level with the internal customs clearance data base under the two Customs administrations cooperation. In addition, customs should develop risk profile for targeting high risk goods

In the case of Mongolia, time lag is one the main reason for discrepancies. Average import time is 47 days, yet unofficial discussions with Mongolian freight forward company representatives says that, in practice, imports from European countries (except Russian Federation), the United States and Asia (except from China) takes 50—70 days in general import.

Transaction value is a one of the main reasons for discrepancies, particularly the use of different methods for calculating the statistical value of outbound (FOB value) and inbound (CIF value).

Furthermore:

The study shows that mirror analysis one of the tools for assessing Customs control risks. Mirror analysis assesses both revenue and non-revenue risks. The findings of this study shows that there are many types of commercial frauds at the international trade movement such as misclassification, misdescription, over or under valuation, and false declarations of quality/quantity.

The study introduced a systematic approach of mirror statistical analysis for implementing risk-based customs control in not only in Mongolian Customs, but also for the other Customs administrations around the globe. It recommends the following activities for further studies:

- Improve cooperation and collaboration among trading partner countries' customs administrations, particularly China, to eliminate the risk of misclassification of goods;
- Introduce high-level techniques for conducting mirror analysis, using this methodological framework, as well as use big data analysis;
- Increase the number of capable analysts at the national level.

An intelligence-based risk management system requires effective and efficient data analysis. Therefore, increasing capacity of implementing this process requires highly capable big data analysts. In this study, Microsoft Excel and EViews software were used. These programs are effective for analysing small amounts of data, but an automated program with weighting score for risk analysis would be most useful to improve mirror analysis quality and eliminating mechanical operation for analyse process. Therefore, Mongolian Customs needs to develop more effective data management system, in line with the modern information technology.

References

[1] Cantens, T. (2015, April). Mirror Analysis and Revenue Fraud. *WCO Reserach Paper No35*.

[2] Celine Carrere; Christopher Grigoriou. (2014). *Can Mirror Data Help to Capture Informal International Trade?* . New York and Geneva: United Nations.

[3] David Hummels; Volodymyr Lugovskyy. (2003). *Usable Data? Matched Partner Trade Statistics as a Measure of International Transportation Costs*. Purdue University.

[4] Eurostat. (1998). *Statistics on the trading of goods - User guide* . Luxembourg: Office for Official Publications of the European Communities.

[5] EUROSTAT. (2017, 05 10). *International trade statistics - background* . Retrieved from EUROSTAT : http://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_statistics_-_background#Asymmetries

[6] Finance, M. o. (1997-2016). *National budget report*. Ulaanbaatar.

[7] General Customs Administration of Mongolia. (2004-2016). *Foreign trade statistic bulletn*. Ulaanbaatar: GCAM.

[8] ICC. (2017, 05 23). *Incoterms 2010*. Retrieved from International Chamber of Commerce: https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-rules-2010/

[9] Mongolia, N. S. (1998-2000). *Statistical year book of Mongolia*. Ulaanbaatar: National Statics Office of Mongolia.

[10] Montenegro, S. O. (2011). *Mirror analysis of external trade of Montenegro*. Podgorica: External Trade Statistics Section.

[11] tenCate, A. (2017, 05 21). *The harmonization of mirror data using simultaneously estimated accuracies*. Retrieved from Collaboration in Research and Methodology for Official Statistics: https://ec.europa.eu/eurostat/cros/content/harmonisation-mirror-data-using-simultaneously-estimated-accuracies-arie-ten-cate_en

[12] TS.Oyunbileg, B.Bayarmaa. (2012). Mirror statistic and information exchange. *General Customs Administration of Mongolia*, (p. 97). Ulaanbaatar.

[13] Union, E. (2017, 05 21). Compilers guide on European statistics on international trade in goods. In Eurostat, *Glossary* (pp. 271-273). Luxemburg: Publications Office of the Eu.

[14] WB. (2014 and 2017). *Doing Business: Trading Across Border*. WB publication.

[15] WCO. (2006). *WCO Commercial Fraud Manual for Senior Customs*

Officials . Brussels: WCO Publication unit.
[16] WCO. (2016). *Implementation Guidance on Post Clearance Audit*. Brussels: WCO Publication Unit.
[17] WCO. (2017). *WCO Study Report on Cross-Border E-Commerce*. Brussels: WCO Publication Unit.
[18] WTO. (2014). *WTO Agreement on Trade Facilitation*. WTO.
[19] WTO. (2017, 03 25). *International Trade Centre*. Retrieved from Trade statistic database: http://www.trademap.org/tradestat/Product_SelCountry_TS.aspx?nvpm=1|496||||TOTAL|||2|1|1|1|2|1|1|1|

Appendix 1. Mongolian imports from partner countries

Mongolia (MN)' s import and China (CN)' s export			
	2013	2014	2015
Import: MN from CN	1,785.79	1,699.40	1,360.70
Export: CN to MN	2,449.59	2,216.40	1,571.90
Assymetry	663.80	517.00	211.20
CIF/FOB ratio	0.73	0.77	0.87
Mongolia (MN)' s import and Russian Federation (RU)' s export			
Import: MN from RU	1561.8	1535.4	1020.7
Export: RU to MN	1572.1	1460.4	1117.2
Assymetry	10.30	−75.00	96.50
CIF/FOB ratio	0.99	1.05	0.91
Mongolia (MN)' s import and Japan (JP)' s export			
Import: MN from JP	444.2	367.5	274.6
Export: JP to MN	300.3	326.4	251.9
Assymetry	−143.90	−41.10	−22.70
CIF/FOB ratio	1.48	1.13	1.09
Mongolia (MN)' s import and Korea (KR)' s export			
Import: MN from KR	507.4	350.6	258.7
Export: KR to MN	399.5	346.9	246.1
Assymetry	−107.90	−3.70	−12.60
CIF/FOB ratio	1.27	1.01	1.05
Mongolia (MN)' s import and German (DE)' s export			
Import: MN from DE	252.2	156	124.4
Export: DE to MN	233.4	158.4	105.1
Assymetry	−18.80	2.40	−19.30
CIF/FOB ratio	1.08	0.98	1.18
Mongolia (MN)' s import and United States (US)' s export			
Import: MN from US	512.7	217	116.4
Export: US to MN	279.6	167.5	69.4
Assymetry	−233.10	−49.50	−47.00
CIF/FOB ratio	1.83	1.3	1.68

Appendix 2. De Minimis thresholds (China, Russian Federation, Japan, German and the US)

Customs duty	Taxes (VAT/ GST)	Gift	Commercial Samples	Simplified declaration
Mongolia				
420 USD*	N/A	N/A	N/A	N/A
China				
No customs duty will be collected for import goods that fall into the category of 'cross-border e-commerce retail goods'	For import goods that fall into the category of cross-border e-commerce retail goods, VAT and GST will be collected with a lower rate	Cross-border e-commerce retail goods do not include gifts	Cross-border e-commerce retail goods don't include commercial samples	Manifest clearance
Russian Federation				
200 EUR	N/A	N/A	N/A	N/A
Japan				
10,000 JPY	10,000 JPY	10,000 JPY	If soliciting orders will be exempted from Customs duty.	Consignments below de minimis
Korea (Republic of)				
150 USD				
German				
150 EUR / 45 EUR	<22 EUR	45 EUR	N/A	Consignments below de minimis
United States				
De minimis $800	N/A	$100 or $200 if from insular possession	N/A	N/A

Source: WCO Study Report on Cross-Border E-Commerce, 2017[9]

[9] 'Cross-border e-commerce retail goods' should be no more than 2000 RMB per person each time and no more than 20000 RMB per person each year; For personal use: 1000 EUR in one calendar month to one consignee, total weight not exceeding 31 kg; set in the U.S. Trade Enforcement and Trade Facilitation Act of 2015.

Appendix 3. Tabulation of goods under the HS Chapter 73
(asymmetry thous. USD)

Date: 06/13/17 Time: 17:11
Sample: 1 117
Included observations: 117
Number of categories: 22

Value	Count	Per cent	Cumulative count	Cumulative per cent
[−33650, −33600)	1	0.9	1	0.9
[−15950, −15900)	1	0.9	2	1.7
[−9850, −9500)	2	1.7	4	3.4
[−4800, −4300)	2	1.7	6	5.1
[−1550, −1300)	2	1.7	8	6.8
[−950, −900)	2	1.7	10	8.5
[−750, −600)	4	3.4	14	12.0
[−450, −300)	6	5.1	20	17.1
[−300, −150)	3	2.6	23	19.7
[−150, −50)	8	6.8	31	26.5
[−50, 0)	16	13.7	47	40.2
[0, 50)	28	23.9	75	64.1
[50, 100)	13	11.1	88	75.2
[100, 200)	8	6.8	96	82.1
[200, 350)	6	5.1	102	87.2
[350, 500)	4	3.4	106	90.6
[500, 650)	3	2.6	109	93.2
[700, 850)	3	2.6	112	95.7
[7850, 9950)	2	1.7	114	97.4
[10150, 10200)	1	0.9	115	98.3
[16800,16850)	1	0.9	116	99.1
[36350,36400)	1	0.9	117	100.0
Total	117	100.0	117	100.0

Appendix 4. Tabulation of goods under the HS Chapter 61
(asymmetry thous. USD)

Date: 06/13/17 Time: 16:00
Sample: 1 86
Included observations: 86
Number of categories: 15

Value	Count	Percent	Cumulative Count	Cumulative Percent
[−18050, −18000)	1	1.2	1	1.2
[−14850, −13750)	3	3.5	4	4.7
[−13000, −12000)	4	4.7	8	9.3
[−11900, −10300)	5	5.8	13	15.1
[−9200, −8400)	3	3.5	16	18.6
[−6500, −5550)	4	4.7	20	23.3
[−4150, −3700)	3	3.5	23	26.7
[−2850, −1950)	3	3.5	26	30.2
[−1250, −1150)	2	2.3	28	32.6
[−150, −50)	2	2.3	30	34.9
[−50, 0)	7	8.1	37	43.0
[0, 50)	42	48.8	79	91.9
[50, 100)	5	5.8	84	97.7
[100, 150)	1	1.2	85	98.8
[350, 400)	1	1.2	86	100.0
Total	86	100.0	86	100.0