Trade Mispricing and Misreporting

A study of China's Foreign Trade 1998-2009

Darja Olsevskaja

Thesis for Master of Philosophy in Economics

Department of Economics

UNIVERSITY OF OSLO

February 2013

Trade Mispricing and Misreporting:

A Study of China's Foreign Trade 1998-2009

2013

Trade Mispricing and Misreporting: A Study of China's Foreign Trade 1998-2009

Darja Olsevskaja

http://www.duo.uio.no

Publisher: Reprosentralen, University of Oslo

Abstract

According to common sense, China's exports to Norway should be the same as Norway's imports from China. However, if we look at the data reported by China and Norway, we find a huge gap. Comparing reported exports and imports, we have what is called mirror data on international trade. Looking at such data for many countries, we find a shocking dispersion of values. In this thesis, we review the theoretical and empirical literature relevant for the analysis of mirror data, and we undertake an empirical study of mirror data on China's trade with 147 countries in the world during 1998-2009. We use a new approach of decomposing the bilateral value of the CIF-FOB ratio into a CIF-FOB price index and a quantity ratio for each trade partner. The main finding of the paper is that price effect, which is related to trade mispricing, is an important factor explaining mirror data variation in case of Chinese exports. While quantity effect, which is related to misreporting of origin, explains the larger part of variation in mirror data for Chinese imports.

Acknowledgements

I would like to thank sincerely my supervisor, Senior Researcher at NUPI Arne Melchior for his guidance, patience, encouragement during all the process of writing my master thesis and last but not least for giving me this interesting topic and inspiration. Thanks also to Christian Ruff for his help and advices working with STATA. Finally, I want to thank my family and friends for all their support and understanding. All shortcomings and mistakes in the thesis are entirely mine.

Darja Olsevskaja
Oslo, February 2013

TABLE OF CONTENT

1 Introduction

The trade data for country A for its export to country B is expected to match the import data for country B for its imports from country A. However, in mirror data for the international trade one often finds huge deviations. Review of the statistics on China's exports to Norway in 2009 illustrates the above claim. According to China's export statistics, the trade value reaches 2.675.352.574 USD. According to the statistics of Norway, however, this trade is valued 5.349.100.643 USD (UN COMTRADE database)! In this research an empirical study of mirror data on China's trade with 147 countries during the period 1998-2009 is undertaken in addition to the review of the theoretical and empirical literature relevant for the analysis of mirror data.

It is commonly observed that the value of imports is larger than the value of exports. This is natural due to the fact that transport costs are added on the way; exports are reported according to free on board (FOB) basis, while imports according to cost-insurance-freight (CIF). Transport costs could explain some of the gap but hardly cases where the CIF-FOB margin is 50, 100 or 200%. In research, a number of other explanations have been suggested:

- Price manipulation.
- Transaction costs added by intermediates.
- Data error due to misreporting, deliberately or by accident.

In Chapter 2, we review these and other potential explanations.

The People's Republic of China (PRC) is one of the leading economies in the world. The number of multinationals in China is constantly growing which is an important driver for continuous economic growth. A study of multinational companies makes an important part of the international trade research. More than a half of the global trade nowadays consists of the internal transactions within multinational companies. China is the biggest FDI recipient in the developing world (UNCTAD 2011). Growing interest of MNCs in Chinese market opens new areas for research, as MNCs change the pattern of international trade. Intra-firm trade has become more and more important making quite a big share of all international trade in the world (Rainer and Miroudot 2011). At the same time it is being argued that the role of Hong Kong as a transit port for Chinese goods is diminishing (Feenstra et al. (2004)). With the help of our dataset we will shed light on the role of MNCs in Chinese trade as well as intermediate trade.

This research is confined to Chinese bilateral trade data paying special attention to MNCs, intra-firm trade and intermediate trade. The following estimates are used in econometric analysis: inward FDI as an indicator for MNC's activity, tariffs and exchange rate. With the help of econometric analysis it is going to be checked if FDI have any effect on CIF-FOB ratio. We assume that CIF-FOB ratio carries more information than it was traditionally assumed. We are also partly using multiple mirror technique to compare bilateral trade data. The goal of the research is to investigate if the transformed CIF-FOB ratio contains more information than transport costs only and if it explains any trade mispricing with help of econometric analysis and theoretical framework on transfer pricing.

The paper is structured as follows. Chapter 2 discusses the previous theoretical and empirical researches related to bilateral trade data. Chapter 3 describes data, model and methodology used and four hypotheses are developed. Chapter 4 reports empirical results and their implications. Chapter 5 presents the conclusions.

2 Literature review

This chapter provides an overview of the existing academic literature on trade valuation, with particular emphasis on the aspects relevant to the use and interpretation of the mirror data. It has been previously noted that trade data registered between two trade partner countries often differs from each other. There are a number of potential reasons explaining the existence of such large discrepancies.

Per definition, the import value should be higher than the export value due to the fact that exports are reported according to the free on board (FOB) basis and imports according to the cost, insurance and freight (CIF). However, this is hardly enough to explain gaps of the magnitude shown above. Another explanation is simply a data error. Especially if the goods are shipped indirectly via third countries, it is possible that the country of origin and of destination may be mixed up. According to Guo et al. (2009) more than 40 % of the total exports in the Netherlands are often not correctly registered. A third possibility is that there are costs added on the way beyond transport costs. For example, a multinational may ship the goods via trade intermediates and so increase the price when goods are passed onto the final destination. Another possibility is that trade quantities or values are reported erroneously deliberately by the firms. This can occur for different purposes, such as tax avoidance (trade mispricing in order to shift income to another country), underpricing or misreporting of trade to avoid tariffs, or manipulations of exchange rates. Illegal activities such as money laundering and smuggling may be the reason for trade mispricing or false reporting. There is much empirical and theoretical literature exploring these areas. In this chapter this literature is reviewed with a special emphasis on China.

The magnitude of statistical discrepancies suggests that, whatever the reason for them, it is an important issue. In some cases, different valuations for imports and exports may have significant effects on the balance of payments and be important for the national accounts.

2.1 Trade mispricing

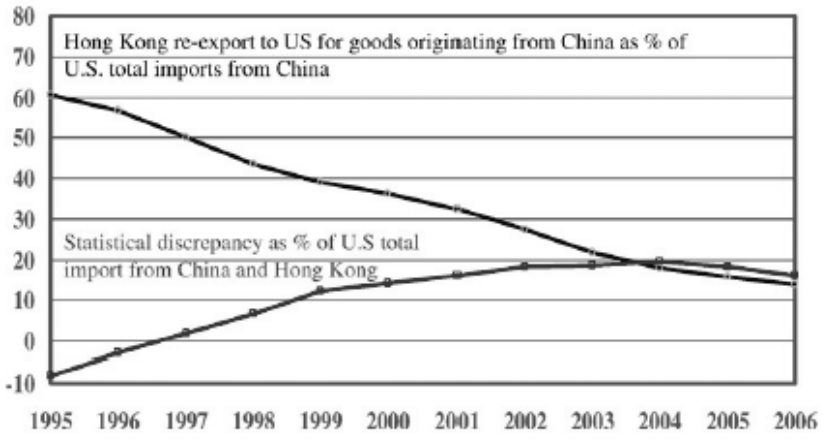
The growing internationalization of the trade can be misused in different ways, with trade mispricing being one of the common. It can be used in different purposes, one of them being the previously-mentioned income shifting in order to avoid tax or tariffs, mispricing in order to get subsidies and several others. Moreover, both the MNCs and the usual firms may be

involved in these activities. FATF (2006) provides a case study of trade-based money laundering and shows that international trade is an important channel for criminal machinations. Criminal money laundering cases are different from trade mispricing and cannot be reflected in bilateral trade data.

... trade-based money laundering is defined as the process of disguising the proceeds of crime and moving value through the use of trade transactions in an attempt to legitimize their illicit origins. (FATF 2006)

Tax avoidance and evasion are discussed widely in the academic literature, which mainly focuses on the role of different tax rates and tariffs. An opportunity to earn profit by shifting income to countries with different tax rates creates a trade-off between higher profits and penalties for mispricing (Choe and Hyde, 2007). Fisman et al. (2001) analysing the gap in values in China's imports and Hong Kong's exports make a conclusion that mispricing of the imports is widely used in order to shift income. Using an evasion gap in reporting imports between China and Hong Kong is a new approach and allows the authors to conclude that a 1% increase in the tax rate (tariff plus VAT (value added tax)) leads to a 3% increase in the evasion gap. Another important implication of this paper is that trade mispricing in order to avoid VAT and tariffs is not influenced by whether the trade is direct or indirect (in case of China it is indirect trade through Hong Kong). The VAT and tariffs are constant for the same type of product.

Figure 1: The declining role of Hong Kong in U.S.–China merchandise trade and the widening discrepancy in trade statistics. Source: Ferrantino and Wang (2008)



Ferrantino et al. (2009) shows a case study of data over-reporting to the Chinese authorities and under-reporting for the U.S. authorities. The results show that the exports to China are being under-reported in order to avoid the VAT payment and corporate income tax (CIT). In addition, some evidence of transfer pricing and money laundering appears. It is important to notice that a big share of exports from China to the United States is from the firms with FDI in China. Moreover, the author states that the intermediate role of Hong Kong is decreasing and misreporting of the trade between China and the United States is increasing. Ferrantino and Wang (2008) present some evidence of the decreasing role of Hong Kong as intermediate (Figure 1). It is interesting that while the re-export from China through Hong Kong is diminishing, statistical discrepancy is rising. This implies that last years re-export through the third countries is no longer the most important issue, however other trade mispricing problems and data errors are becoming more common.

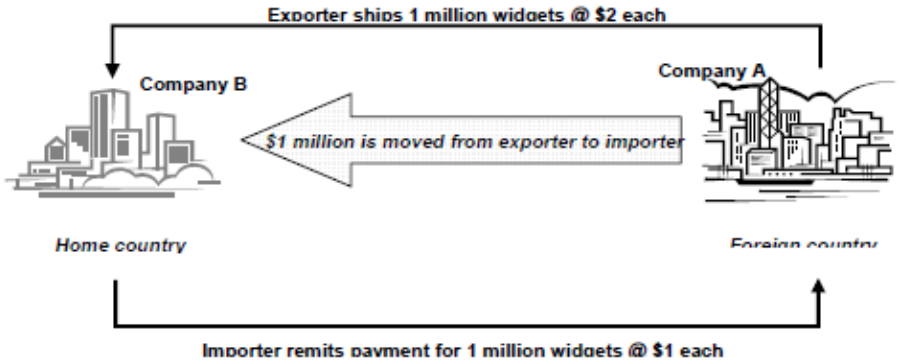
Tax avoidance and evasion as well as trade mispricing can be applied not only to MNCs. We will now concentrate on the MNCs activity, which could contribute to trade mispricing. Sun (2007) investigates the role of FDI for the foreign trade in China from both macro- and micro perspective, paying special attention to the MNCs' activity and the intra-firm trade in micro approach. The conclusion is that there is a high propensity towards the transfer pricing. Moreover, the export-oriented FDIs may be used more often in order to shift income from one country to another for MNCs due to a free-tariff regime. The author provides a case study analysing trade between China and Hong Kong, as Hong Kong is one of the main trade partners and FDI sources. The results show that Chinese exports to Hong Kong are underpriced by 10-15% and Chinese imports from Hong Kong overpriced by 9-16%.

In addition to tax avoidance, tax evasion, capital flight and money laundering, employing techniques is another way to legalize illegal profits. Researchers investigating money laundering through trade use statistical methods to find discrepancies in the trade data (FATF 2006). More evidence is available on transfer pricing with the overall trend for export being underpriced and for import being overpriced. The mechanism used here is that the firm trading with its affiliate in other countries and uses transfer pricing to overprice the goods it imports or underprices the goods it exports in order to shift the income from a high-tax country to a low-tax country. Figure 2 presents an example of the illegal underpricing of export by Country A.

Figure 2. Source: FATF, 2006

Over- and Under-Invoicing of Goods – An Example

Company A (a foreign exporter) ships 1 million widgets worth $2 each, but invoices Company B (a colluding domestic importer) for 1 million widgets at a price of only $1 each. Company B pays Company A for the goods by sending a wire transfer for $1 million. Company B then sells the widgets on the open market for $2 million and deposits the extra $1 million (the difference between the invoiced price and the "fair market" value) into a bank account to be disbursed according to Company A's instructions.



Alternatively, Company C (a domestic exporter) ships 1 million widgets worth $2 each, but invoices Company D (a colluding foreign importer) for 1 million widgets at a price of $3 each. Company D pays Company C for the goods by sending a wire transfer for $3 million. Company C then pays $2 million to its suppliers and deposits the remaining $1 million (the difference between the invoiced price and the "fair market" price) into a bank account to be disbursed according to Company D's instructions.

Trade mispricing is difficult to measure, as different activities, such as overpricing of import and underpricing of export may offset each other, what makes them impossible to identify. Recently mirror data was used to quantify illicit flows (e.g. Bartelsman and Beetsma (2003), Ferrantino et al. (2008), Hamanaka (2012)). Nitsch (2012) critically describes methods used for the valuation of illicit flows and concludes that the aggregate trade data may not show important variation and may provide erroneous results. The author provides a brief analysis of trade asymmetries at the commodity level. Using export and import data at the 4-digit level from UN COMTRADE the author finds that most cases where one trade flow exceeds the corresponding flow is usually a single product category, such as "petroleum oils, crude". The author also identifies countries, which systematically misprice trade. The study reveals a considerable correlation of the exporter-specific average trade gaps. Nitsch (2012) argues that the evidence of data asymmetry for trade mispricing is questionable. The author makes three important remarks:

- Trade asymmetries ≠ mispricing

  Trade data must be at least adjusted for the differences in valuation. Nitsch (2012) suggests two approaches in this case. The first approach focuses on the FOB export values, which exceed the CIF import values (this component contains transportation

costs), as this may be an indicator for trade mispricing. However, this approach has been criticized as capital outflows in the opposite direction may cancel this effect. The second approach uses estimator for the CIF-FOB ratio, which is equal to 1.1. When CIF-FOB ratios exceed this estimator it may be considered to be suggestive of trade mispricing. However, Nitsch (2012) points out that such fixed estimators, which do not change over time or between partners is somewhat challenging.

- Mispricing ≠ illicit flows

Trade mispricing may have different motives. In case of trade mispricing in order to avoid tax/tariff, the definition of illicit capital flows is not relevant.

- Illicit flows ≠ trade asymmetries

The opposite effects of trade mispricing may cancel each other.

"…if a shipment is underinvoced in the exporting country to move capital unrecorded out of the country, and the shipment carries the same mispriced invoice in the importing country to evade import tariffs, no discrepancy in mirror trade statistics will occur." (Nitsch 2012, p.320)

Kar and Freitas (2012) state that trade misinvoicing is the major channel for the transfer of illicit capital from China. It is important to understand the difference between trade mispricing, trade asymmetry and illicit flows and that all these factors may interact. For that reason the effect will not be visible in the aggregate level CIF-FOB ratio. All this affirms the importance of product level analysis in researching bilateral trade. However, this research aims to apply a new approach, where two different ratios are composed from the aggregate CIF-FOB level and they reflect price and quantity.

2.2 Motives for transfer pricing

In their paper Manova and Zhang (2009) emphasize that a big part of the Chinese trade is performed by several multinationals that trade with a large number of countries. As the role of the MNCs was increasing in the international trade, more researches appeared in this area. Some of these studies reflected on a growing interest in an intra-firm trade and transfer pricing (e.g. Clausing (2000)).

If trade occurs between related parties (that is, between affiliated units of an MNE), the transactions are referred to as intra-firm trade. (Eden 2012, p.206)

The pattern of international trade is changing and intra-firm trade attracts more and more attention becoming an important field of research. The importance of intra-firm trade was clear already in the late 1970's, as the share of intra-firm trade was considerable even at that time (Helleiner 1978). Intra-firm trade in 2009 accounted for 48 % of US imports and 30 % of US export (Lanz and Miroudot 2011). Considering MNCs in China, it is important to understand the role of the MNCs on economic growth, as many developing countries are dependent on FDI from the multinationals in order to maintain economic growth. Foreign-funded enterprises were responsible for the 55% of total exports in 2009 in China (Author`s calculations).

MNCs constantly adapt their strategies to get higher profit and explore the comparative advantages of the country they are situated in. Whether a particular company chooses intra-firm trade or arm's length depends on industry, product and country. According to Lanz and Miroudot (2011) emerging countries trade less intra-firm than do OECD countries. The authors suggest that Dunning's four types of FDIs imply different types of intra-firm trade.

1. Resource-seeking FDI: implies intra-firm trade of processed raw material, natural resources or human resources that are shipped to affiliates.
2. Market-seeking FDI: does not imply intra-firm trade, though, may imply intra-firm imports.
3. Efficiency-seeking FDI: processed inputs are shipped to affiliates.
4. Strategic asset-seeking FDI: does not imply intra-firm trade, but transfers of knowledge may be a part of intra-firm trade in services.

This means that for our research efficiency-seeking FDI is not relevant, while market-seeking FDI is not relevant in case of export. As FDI to China is export-led, we can expect the biggest part of FDI to China to indicate intra-firm trade.

2.2.1 Tax rates and tariffs

According to Urquidi (2008) the main drivers for the trade between unrelated companies are market forces. However, in case of MNCs the situation is different, as financial and commercial relationships between related companies is not affected by market forces in the same way. Intra-firm trade is one of the ways of trade mispricing in order to shift revenues. Bernard et al. (2006) finds evidence that prices U.S. exporters set for their intra-firm trade differ from the prices for the same good traded on arm's length. The authors also

find that the difference between these prices is higher when a corporate tax appears to be low and when tariffs are higher. Factors affecting the gap between internal and external prices are corporate tax and import tariffs, being negatively associated with corporate tax and positively with import tariffs. The authors state that transfer pricing in such cases may have negative impact on national accounts of the host country, as exports values may be significantly underestimated.

Prices used for intra-firm trade are one of the channels for income shifting (Bartelsman and Beetsma 2003). Two main ways of income shifting by multinationals are described by Bartelsman and Beetsma (2003). First is income shifting from high-tax countries to low-tax countries and the other one is income shifting through transfer pricing. The authors base their analysis on sectoral data mainly from manufacturing sector, where the dominance of multinationals is the highest, and consequently get results that income shifting is significant.

Clausing (2000) investigates the influence of taxes on intra-firm trade and the role of transfer pricing. Using data for the U.S. companies and their foreign affiliates in the period from 1982 to1994 the author finds clear evidence for close relationships between intra-firm trade and transfer pricing. The results are the following: intra-firm trade is lower with the low-tax countries, what implies that the U.S. exports to the low-tax countries are underpriced and imports from the low-tax countries are overpriced. The author concludes that intra-firm trade is different from arm's length trade and tax may influence transfer pricing. The main implication of the paper is that there is clear evidence of a relationship between tax and intra-firm trade, which means that the tax affects the price setting of MNCs.

FDI and intra-firm trade are closely related to each other. There is empirical evidence that FDIs and intra-firm trade expand in the same way. The report generated by European Commission states that FDIs increased from 60 billion U.S. dollars in the 1980s to 140 billion U.S. dollars in 1993 and FDI flows appear to complement world trade, 40 % of which is intra-firm trade. According to Konrad and Lommerud (2001) this is the evidence of the importance of intra-firm trade to developing countries which are trying to attract FDI. The hold-up problem[1] is analyzed in the paper and a different view towards transfer pricing is

[1] After FDI is made host country has incentive to confiscate profits of multinational firms, what leaves no incentives for the multinationals' subsequent investments.

expressed. The authors argue that intra-firm trade actually plays an important role for FDI, especially when there is a confiscatory taxation. Intra-firm trade allows overcoming the principal-agent problem of asymmetric information about the opportunity cost between the governments and the multinationals. In other words, intra-firm trade may protect MNCs' revenue from confiscatory taxation, so that the income may be shifted and the host country will not be aware of true opportunity cost of goods traded between the affiliates. However, there are regulations that limit transfer pricing. For example, Organisation for Economic Co-operation and Development (OECD) provides information on transfer pricing profiles and practices in different countries[2].

MNCs may manipulate the prices of traded goods in order to shift income between countries with different tax rates, as observed in the analysis of intra-firm trade. Transfer pricing is becoming an important issue as the magnitude of multinational firms' activities is increasing. The primary role of transfer pricing is to allocate profits between the related parties and to avoid double taxation for MNCs. According to Eden (2012) firm level studies of Chinese tax data provides strong evidence for transfer pricing in order to benefit from tax. Choe and Hyde (2007) argue that the price for intra-trade cannot be the same as using arm's length pricing. The authors state that there is a trade-off between benefiting from tax arbitrage and a penalty for transfer pricing as tax rates are different in different countries. Due to this fact the optimal transfer price is different from the arm's length price.

If the tax rate for the purchasing affiliate is higher than that for the supplying affiliate, then the optimal tax transfer price is higher than the arm's length price, implying that the optimal incentive transfer price is higher than the weighted average of the marginal cost of production and the arm's length price. In the special, but unlikely, case where the tax rates are the same and the arm's length price is equal to marginal cost, the optimal incentive transfer price is equal to marginal cost. (Choe and Hyde 2007, p.404)

It is possible to misuse transfer pricing for the multinational firm's own interests and to increase profit by income shifting and tax or tariff avoidance (Casson and Pearce 1988). The OECD Transfer Pricing Guidelines provide directions for valuation of trade between the affiliates. The main goal of these guidelines is to ensure that MNCs are not shifting tax income out of the country. While in developed countries regulatory framework tend to be

[2] http://www.oecd.org/ctp/transferpricing/transferpricingcountryprofiles.htm

well developed, in developing countries lacking a well-defined law system, trade mispricing can have negative effect on the overall economy. In such case transfer pricing may play a considerable role in the process of income shifting. Urquidi (2008) names larger profits and costs reduction as incentives to trade mispricing through transfer pricing. One of the main motives for transfer pricing is to minimize corporate tax and tariff payments. The empirical literature provides examples of how taxes and tariffs can influence transfer pricing (e.g. Lall (1973), Kopits (1976), Bernard and Weiner (1990), Eden (1998), Bartelsman and Beetsma (2003), Vincent (2004)).

Trade mispricing appears to be the least risky way of income shifting, as it is too complicated for the government to detect. Bartelsman and Beetsma (2003) provide some empirical evidence for this statement by analyzing income shifting in OECD countries through transfer pricing as an alternative for avoidance of the corporate tax. The authors investigate whether MNCs shift income to countries with low CIT, analyzing 15 different sectors. The empirical results of the research appear to be significant. However, the results are mostly based on the manufacturing sector, as the lion share of MNCs is concentrated there.

The existing literature on the transfer pricing focuses primarily on the close relationships between trade mispricing and taxes/tariffs. We will look further at this research, which also provides evidence for China**.** Azémar and Corcos (2009) analyze how the MNCs response with transfer price to tax changes and highlight the role of the firms' heterogeneity in their ability for trade mispricing in their model. The authors use data on Japanese multinationals and their affiliates in developing countries and come to the conclusion that the negative correlation between FDIs and host country's tax rate is highest in the R&D sector. This is interesting for China, as the manufacturing sector and low R&D are dominating here, which implies weaker correlation between the statutory tax and investments.

Sikka and Willmott (2010) state that the negative role of the transfer pricing is underestimated and emphasize the importance of studying this "dark" side of transfer pricing, especially how transfer pricing is used in order to avoid tax. The authors provide the evidence of transfer pricing in China. While FDIs in China were growing tremendously, the lion share of the MNCs reported negative taxable profits. As a result as much as 30 % of MNCs used transfer pricing in order to shift income by trade mispricing. The authorities started the investigation in 2005 and got back tax revenues of 970 million yuan (Sikka and Willmott

2010). The Chinese authorities state that more than 30 billion yuan are lost through MNCs transfer pricing according to China Daily (2004).

Though tax and tariff avoidance is often supported by empirical research, there exists some evidence to the contrary. Ho and Lau (2002) in their paper investigate international transfer pricing of MNCs in the developing and developed economies (in this case it is U.S. multinationals in People's Republic of China and UK) using surveys of U.S. multinationals. The results show that there is no clear evidence for trade mispricing in order to avoid tax and usually U.S. MNCs act in accordance with existing policies when performing intra-firm trade with their affiliates.

2.2.2 Exchange rate policy and exchange risk in case of China

Another motive for transfer pricing is the exchange rate, which is especially relevant for the PRC. In recent years, strongly controlled Chinese exchange rate policy attracted much attention, in context of the international trade as well. The PRC has been accused recently of undervaluing its currency for trade advantage. In this chapter we will look closer at the exchange rate policies in China and the relation between exchange risk and transfer pricing.

Exchange rates are not much discussed in case of transfer pricing. The role of the exchange rate on the activity of MNCs seems to be underestimated. Bernard et al. (2006) one of the first provides an evidence of the effect exchange rate has on the firm's pricing decision, especially on transfer pricing using data for U.S. trade data. The authors conclude that countries' real exchange rate makes multinationals adjust their prices. Analysis shows that 1% appreciation of the dollar reduces the price gap by 0.19%.

Also for China, Chan and Chow (1997) in their research study tax audits and conclude that tax avoidance is not the main reason for transfer pricing manipulation, as in case of China tax rate is even lower than in many other countries. The risk of devaluation of local currency and exchange rate control are important factors in transfer pricing decisions according to Chan and Chow (1997). The main explanations for this are the limitations of obtaining foreign exchange and the fact that the renminbi is not fully convertible. Xing (2004) in his paper argues that Chinese exchange rate policy had a dominating role in attracting FDI. The author analyzes Japanese FDI to Chinese manufacturing sectors in the period 1981-2002. The

empirical results show that the devaluation of yuan has a positive effect on the Japanese FDI. Eden (2012) provides two examples of transfer price manipulation due to exchange rate control:

• *If the host country's currency is not convertible so that the MNE cannot move its profits out, the MNE can, in effect, move its profits out despite the nonconvertible currency if it overinvoices inbound transfers and underinvoices outbound transfers.*

• *If there are foreign exchange restrictions on the amount of foreign currency that can be bought or sold in a particular time period, using overinvoicing of inbound transfers and underinvoicing of outbound transfers enables the MNE to move more funds out than would be permissible with currency controls.* (Eden 2012, p.214)

2.3 Trade intermediates and indirect trade

Previously data error was a standard explanation of the trade data discrepancies. However, there exist many different reasons for such types of errors. As it was already mentioned in the previous chapter, the indirect trade via third countries is one of the explanations for the trade data asymmetry. Globalization would be hardly imaginable without the intermediaries. In economics a standard assumption is often that goods are sold directly from the producers to the consumers. In reality the value chain may have several parts, and goods may be sold via intermediates. These intermediates may be allocated in the producing or consuming country or a third country, and they may be part of the multinational firm or not. For example, multinational clothing companies (e.g. H&M, ZARA, Mango etc.) have trading units that buy products from various producing countries and later distribute them to various final destinations.

It is well known that Hong Kong plays an important role as intermediate for China's trade, and there is a considerable research literature on this. China always had special trade relationships with Hong Kong after the country opened for trade with entire world in 1979. Hong Kong became the largest FDI supplier to China in the 1980s and was an important partner in processing trade (Jin 2005). Sung (2005) argues that role of Hong Kong is changing. Hong Kong had an intermediate role both in trade of goods and services after China opened its trade. In 1990s Chinese commodity trade via Hong Kong exceeded own direct trade. Though in academic literature exist evidences for decreasing role of Hong Kong as a middleman for Chinese trade (e.g. Ferrantino and Wang 2008)), Sung (2005) argues that

such prognosis is not significant and Hong Kong will continue to maintain its role for the Chinese international trade. The author points out two roles of Hong Kong: re-exports and middleman in offshore trade. The first case is more relevant for this research as in the second case goods do not go through Hong Kong customs, they are just purchased by Hong Kong's traders. Jin (2005) states that re-export of Chinese goods is the main reason for trade discrepancies in China's trade statistics. In addition as the role of Hong Kong for China's international trade is decreasing, it is still can be expected that discrepancies in trade statistics will remain.

Entrepôt trade[3] is further investigated by Feenstra and Hanson (2004). The authors look closer at the intermediaries by studying case of Chinese trade and Hong Kong's role as entrepôt. A significant share of Chinese goods are being re-exported and get price mark-up after they leave Hong Kong (53% of Chinese export passed through Hong Gong in the period 1988-1998 according to Feenstra and Hanson (2004)). The authors highlight several reasons for such a trend. Hong Kong traders have an informational advantage and play an introductory role for Chinese producers, as well as for interested buyers. Another reason is tax, tariff or quotas avoidance, as well as trade mispricing. Foreign-invested Enterprises (FIE) are also responsible for part of re-export, as many of them have headquarters in Hong Kong. Data analysis shows that re-export is usually typical for manufactured goods, machinery, transport equipment and manufactured materials. These industries are also dominated by FIEs. The authors make a conclusion that the industries producing differentiated products have the highest share of re-export. Econometric analysis shows that mark-ups are higher when the corporate tax is higher, which evidences for transfer pricing. Though, the role of Hong Kong as a hub for Chinese goods to reach their destination appears to be more important. Differentiated products get higher price mark-ups after re-export, likewise products sent to China for processing, products shipped to countries with less activity in Chinese market and products with higher variance in export prices (Feenstra and Hanson, 2004).

[3] Goods are imported to a country in order to be later re-exported and must go through the custom twice, first as import, then as export.

Figure 3. Source: Guo, 2009

	China	Hong Kong (SAR)	United States
	Exports US$5 million domestically-produced goods to Hong Kong (SAR)	Imports US$5 million domestically-produced goods from China (recorded as imports from China) Re-exports US$5 million to China (recorded as re-exports to the United States	Imports US$5 million goods from Hong Kong (SAR)
Situation	Exports record - China	Imports record – United States	Induced possible trade discrepancy between China and the United States
(1)	Exports to the United States	Imports from China	-
(2)	Exports to the United States	Imports from Hong Kong (SAR)	US$5 million
(3)	Exports to Hong Kong (SAR)	Imports from China	US$5 million
(4)	Exports to Hong Kong (SAR)	Imports from Hong Kong (SAR)	US$10 million

Guo et al. (2009) argues that re-exports are typical for countries with good geographical transportation position, for example, Singapore and Hong Kong in Asia, with Hong Kong being a major hub for Eastern Asia. The author states that such re-exports and re-imports can be the reason for trade discrepancies, however this depends on how transaction is recorded. Figure 3 presents an example of how this happens.

Analyzing bilateral trade data the "Rotterdam effect" term is sometimes being applied, which means that in some cases the exporter declares the country of last shipment instead of the country of final destination. While the country of final destination register those imports by country of origin (Nitsch 2012). Rojíček (2011) in his paper provide classification of some transactions in foreign trade. We will pay special attention to the definition "quasi-transit" trade, which the author uses in his paper.

Quasi-transit trade - concerns transactions in goods which are imported into the reporting country by a non- resident entity, and then re-exported to a third country within the same economic union (a variant being the case in which they are imported into the country and later sold to a resident there, sometimes at a much higher price, without significant change to the goods and without the involvement of any resident to whom the value added reflecting the increase in price might be attributed). (Rojíček 2011, p.5)

The author highlights that re-export is somewhat different from quasi-transit trade, as it is usually registered in national accounts. The Rotterdam effect according to the author is the case of quasi-transit trade typical for EU residents. We will further use quasi-transit trade definition describing trade relationships in China.

2.3.1 Role of the intermediates

Recently, a literature on the role of intermediates has evolved. Antràs and Costinot (2011) developed a model of intermediate trade. Traditionally, trade theory models assumed that producers sell directly to their international customers. Antràs and Costinot (2011) introduced intermediaries in the standard Ricardian model. Akerman (2012) further investigates the role of intermediates by extending the heterogeneous trade model of Melitz (2003). Exporters can export their goods directly to the customers who want to buy them or indirectly via intermediaries, which are companies who overtake the responsibility of finding foreign customers. Wholesalers and other intermediaries face higher fixed costs. However, wholesalers are able to spread that fixed cost over several goods. As a result most productive firms pay that fixed cost and export themselves, while the other less productive firms export through wholesalers paying the intermediary fixed cost, which is smaller than their own cost of direct export. Empirical analysis of Swedish firm level data shows that wholesalers export more variable products than manufacturers, though the amount of each product is smaller (14% of total export in 2005). Akerman (2012) concludes that wholesalers are more important for the countries with high fixed costs of entry.

.

When an intermediate is located in a third country, goods may be shipped to final destination indirectly, and an issue is whether such shipments are appropriately reported in statistics. Such errors in statistics may be one of the reasons for abnormal pricing. Bartelsman and Beetsma (2003) conclude that China sometimes reports erroneously imports failing to separate direct import from indirect. The authors use the intermediate goods concept in their model. The important issue here is that tax does not change if it is indirect trade, which implies that there is no advantage in using intermediate goods in order to avoid tax. Ahn et al. (2011) investigates the role of intermediates in Chinese trade using the same theoretical framework as Akerman (2012). However, in contrast to Akerman, authors find correlation between the share of intermediary export and market distance and size. Ahn et al. (2012)

argue that intermediaries are more important for markets which are difficult to enter. Intermediates accounted for 22% of total exports in China in 2005. Analyzing Chinese firm level export data, they find that intermediaries export more products than direct exporters and only the most productive firms choose to trade directly. The important finding is that small firms choose to export via intermediates and they can benefit from this even if they are not able to trade directly.

2.4 The data error issue

The discussion above provides different explanations for trade data asymmetry and trade mispricing. However, it is important to consider the data error problem as one of the reasons. It was already mentioned that trade mispricing is very complicated to measure and no perfect estimate has been developed. It appears that data is not always reported as accurately as it should be, which again leads to trade data discrepancies. Morgenstern (1950) in his classical paper discusses the problem of errors in statistical data.

There exist different reasons for trade data asymmetry. Hamanaka (2012) presents schematic overview of factors which may affect discrepancies in mirror data (Figure 4). Hamanaka (2012) uses the following classification for factors leading to discrepancies in data: *unavoidable factors* that are CIF-FOB difference, which means that by definition CIF is higher than FOB. This is an important factor, which affects the prices and is widely discussed in this chapter. Coverage between customs and exchange rates are classified to s*tructural differences*. Customs may for example set their own average exchange rate, which does not necessary match market value, which will usually result data discrepancies. The last factor is *human errors* and *deliberate misreporting*. Another factor named by Hamanaka (2012) is timing, because the good may achieve its destination only next year and this may cause some degree of discrepancies. We will pay special attention to different valuation for import (CIF) and export (FOB) in this paper.

Figure 4: Causes of discrepancies between mirror data.

Factors	Causes	Change in Price and/or Quantity
Unavoidable factors	FOB–CIF difference • freight cost • insurance costs	Price
Structural differences between two customs offices	Coverage • differences in rules of origin (especially in the cases of re-export) • processing zone • returned goods	Quantity
	Time lag	Quantity
	Exchange rate	Price
Deliberate misreporting by traders and errors committed by customs offices	False declaration of value by traders False declaration of origin by traders Commodity misclassification by customs Direction misclassification by customs	Quantity and Price Quantity Quantity Quantity

Source: Hamanaka (2012)

Differences in recording systems are still an issue nowadays, though UN has certain recommendations for that according to Guo et al. (2009). Usually countries register the country of origin as import partner and the destination country as their export partner. However, sometimes "a second rule of defining partner country" is used, when the partner country cannot be identified, the country of shipment may be registered for example (Guo et al. 2009). There exist two different trade systems: the General Trade System and the Special Trade System.

"The general trade system is in use when the statistical territory of a country coincides with its economic territory. Consequently, under the general trade system, imports include all goods entering the economic territory of a compiling country and exports include all goods leaving the economic territory of a compiling country.

The special trade system is in use when the statistical territory comprises only a particular part of the economic territory." (UN 1998, p. 23-24)

UN recommends the General Trade System, however, in the EU the Special Trade systems is used with some exceptions. (Guo et al. 2009)

2.5 CIF-FOB ratio as an indicator for trade mispricing

Trade mispricing, as described in the previous chapters, is considered to be an important phenomenon and one of the oldest methods of money laundering (FATF 2006). Since direct observations are difficult to obtain, there is a search for new data and methods that may shed light on such practices. One potential source is mirror data. Trade flows are reported to national statistic bureaus. Country's A export to country B is import for country B from country A. In this case values of country's B import to A are mirror data, which should be roughly the same.

The FOB (free on board) price measures the cost of an imported item at the point of shipment by the exporter, specifically as it is loaded on to a carrier for transport. The CIF (cost-insurance-freight) price measures the cost of the imported item at the point of entry into the importing country, inclusive of the costs of transport, including insurance, handling, and shipping costs, but not including customs charges. (Jansen, 2009, p.7)

Traditionally the CIF-FOB ratio was used as an estimator for transport costs and the rule of thumb of International Monetary Fund (IMF) to fill out missing data was a value 1.1 (IMF 2003), implying transport costs of 10%. The intuition is that export should be equal to import, if there were not transport costs. As it was already mentioned exports are reported according to free on board basis and imports according to cost, insurance and freight, the difference between CIF and FOB may be a result of higher import value. What is more, as the distance between trading parties increasing, the CIF-FOB difference is also increasing (Hamanaka 2012). Bilateral trade data received some attention in early researches and was used in the analysis of trade flows as an indicator for transport costs (e.g. Geraci and Prewo (1977), Limao and Venables (2001)). Limao and Venables (2001) find that infrastructure is an important factor for international trade and has positive affect on transport costs. Some recent researches have examined further whether CIF-FOB ratio accurately reflects transport costs. Hummels and Lugovsky (2006) find some drawbacks of this approach. The authors show that use of CIF-FOB as an indirect measure of transaction cost is not precise, as about half of all observations lay outside the acceptable range of variation and the others observation contains errors. By comparing CIF-FOB data and directly measured transport costs for US and New Zealand, the authors find that CIF-FOB deviates significantly from directly measured data. The authors employ simple regression analysis with CIF-FOB ratios on both sides to measure whether variation in national data affects variation in indirect measured data. Their results

show that there is correlation between national data and indirect measured data, though the regression fits poorly. The authors state that such matched partner data can be used as a control variable and is a valuable indicator for variation in shipping costs. It is important to mention that mirror data is a "second-best solution" used as an indicator for transaction costs, the best data would be direct information on transport costs, which is for some countries available from National Statistics reports (Guo, 2010).

In practice mirror data is much more volatile. It is assumed that matching mirror data is of good quality, while mismatches imply error in the data (Ferrantino et al. 2008). Recent research using mirror data started to pay attention towards additional information asymmetric data may contain (for example, Guo (2009), Melchior (2012), Hamanaka (2012)). Some studies have used mirror data as an indicator of trade mispricing and other illegal activities related to international trade. In order to evaluate the degree of trade discrepancy Ferrantino et al. (2008) uses three different indices and show how they work in case of China, Hong Kong and U.S.

1. $DIF_{it}^{sr} = 100\dfrac{M_{it}^{sr} - E_{it}^{sr}}{M_{it}^{sr}}$, where M is import, E is exports, s is reporting country, p is partner country, i is commodity and t is year. This index measures discrepancies at commodity level as a percent of import flow.

2. $ER_{it}^{sr} = 200\dfrac{M_{it}^{sr} - E_{it}^{sr}}{(M_{it}^{sr} + E_{it}^{sr})}$

The index uses the mean of trade flows as denominator. If we assume that E is Chinese exports, Hong Kong's export to partners and Hong Kong's re-exports for China, then M is the sum of imports from China to Hong Kong. If E is the sum of exports to China and Hong Kong, then M is the sum of Chinese and Hong Kong's imports minus Hong Kong's re-exports.

3. $AER_{it}^{sr} = \sum_i w_{it}^{sr} \left| ER_{it}^{sr} \right|$, where $w_{it}^{sr} = \dfrac{M_{it}^{sr} + E_{it}^{sr}}{\sum_i (M_{it}^{sr} + E_{it}^{sr})}$

The index measures absolute average aggregation index by partners or by commodities. The index varies from 0 to 200. The lower value of the index implies the smaller discrepancies.

Analyzing mirror data from China, Hong Kong on one side and U.S. trade data on another side, the author finds the evidence that most of the trade data discrepancies[4] appear not in indirect trade transactions, but in the direct trade. The conclusion is that trans-shipment and re-export are no longer responsible for trade asymmetry. The authors go further and investigate trade discrepancies for other major trade partners of China using data from UN COMTRADE database. By computing three indexes for other trade partners, they get the following result for eastbound trade: the aggregate discrepancy increases to a positive discrepancy, which is analogical to the China-U.S. case, where the aggregate discrepancy increased from 1% negative discrepancy in 1995 to around 18% positive discrepancy in 2004. In case of westbound trade the authors do not find any trend. CIF-FOB ratios data has large variance, so there exists always an issue how to handle this (e.g. Limao and Venables (2001) drop observations). Another approach is to use formal methods to sort out what is a "normal" or "abnormal" deviation.

Some authors have already used mirror data as direct evidence on illicit capital flows. Kar and Cartwright-Smith (2008) present different models used by economists since 1960s for estimating illicit capital flows[5] from developing countries. They conclude that World Bank Residual Model, which analyzes change of external debt, is the best measure for illicit trade flows. For best results World Bank Residual Model should be adjusted for trade mispricing in accordance with IMF Direction of Trade Statistics (Kar and Cartwright-Smith 2008). We will further discuss the model, which employs CIF and FOB. The DOTS-based trade mispricing model uses data from DOTS (Direction of Trade Statistics) and estimates illicit flows (K), which occurs due to trade mispricing.

$K = [X_i] - M_j\beta + [M_i / \beta] - X_j$, where E is import, M is import and β is factor adjusted for CIF.

This equation assumes that trade mispricing takes place through both exports and imports. The limitation of this model according to Kar and Cartwright-Smith (2008) is that trade mispricing is due to high tax, but illicit capital flows are not always involved in such cases.

[4] In this case U.S imports from China and Hong Kong exceeding reported exports of China and Hong Kong to the U.S.

[5] "*the term flight capital is most commonly applied in reference to money that shifts out of developing countries, usually into western countries.*" (Kar and Cartwright-Smith 2008, p. iii)

Another model presented in the paper is the IPPS-based Trade Mispricing Method, which evaluates the risk characteristics of prices related to international trade transactions with the help of four different filters: World 5th and 95th Percentile, Country 5th and 95th Percentile, World Mean (-) and (+) 2 Standard Deviations, Country Mean (-) and (+) 2 Standard Deviations. These statistical filters are calculated from United States Department of Commerce data on international trade transactions. Comparison of DOTS and IPPS-based models show that IPPS estimates for trade mispricing for Asia are lower than DOTS estimates and higher for European countries. The authors conclude that in the case when discrepancies are much lower in DOTS mode and some of DOTS data is missing, it is useful to employ IPPS-based estimates.

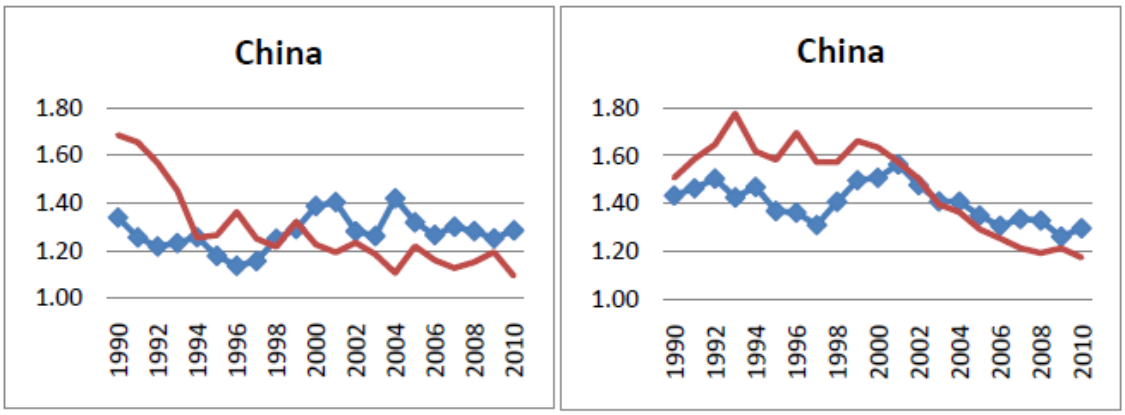
Although, Kar and Cartwright-Smith (2008) provide new interpretations of mirror data analysis, Nitsch (2012) states that such method is imprecise and problematic. One of the problems the author mentions is that Kar and Cartwright-Smith (2008) use aggregate level data, another problem is that transportation costs are difficult to include into their model. The author states that the main reason for trade data discrepancy is different valuation, what means that CIF must be converted into FOB values. As Kar and Cartwright-Smith uses 1.1 and do not take trade distance into account, it makes their conclusion about trade mispricing if CIF-FOB ratio is larger than 1 (after the value is corrected for 1.1) questionable. An example of transaction-level data analysis is the paper of de Boyre et al. (2005). The authors analyze trade flows between U.S. and Russia using micro-level trade data. Trade flows are narrowed to products code for each country and its partner. Nitsch (2012) criticizes this method as products may have different characteristics, which may lead to a wide price range.

More academic researches today find evidence of additional information in CIF-FOB ratio and employs it not only as an indicator for transport cost, but for other phenomena, such as trade mispricing, as well. For example, Guo (2010) analyses Chinese trade data with its top five trading partners in 1992-2008 in manufacturing sector. In order to explain asymmetries in Chinese trade the author uses the CIF-FOB ratio. The conclusion is that trade asymmetry varies a lot not only over time, but also among industries. The author highlights the importance of China's trading role, which is whether China is importer or exporter, when measuring geometric means of asymmetry.

Recent research has shown that the CIF-FOB ratio could carry additional information, which previously was considered as error (Hummels and Lugovsky (2006), Melchior (2012)). Melchior (2012) presents some evidence for additional information in CIF-FOB ratio by focusing on indirect trade. However, not only illegal activities affect this ratio and one should be careful when using mirror data, the example here is that trade through middlemen and additional costs may have legal reason. The author analyzes the role of intermediates and indirect trade using mirror data for 12 countries. The main reasons for high CIF-FOB ratios in the paper are intermediate trade, inaccurate trade reporting and "Rotterdam effect" (quasi-transit trade). In case of China CIF-FOB ratio changed a lot in a period 1990-2010. Figure 5 shows a trend of Chinese CIF-FOB ratio using median and average values for exports and imports in China. CIF-FOB ratio in China has changed dramatically during past 20 years. Melchior (2012) states that such a fall in values could be explained by decreased transaction costs.

Figure 5. Median and average CIF-FOB ratios for exports and imports 1990-2010

(a) Chinese export (b) Chinese import



Source: Melchior (2012)

3 Hypotheses, data and descriptive analysis

As we have previously seen, different lines of research have been followed to analyze trade mispricing and to find out what causes trade data asymmetry. It is not an easy task since many different reasons for trade mispricing and trade data errors exist. In this chapter we are going to describe the data and methodology used in our research. We have chosen econometric analysis of a panel data in order to investigate possible effects of MNCs' activity, tariffs and exchange rate may have on trade data asymmetry. In addition, multiple mirror technique, previously used by Hamanaka, is employed to analyze some specific cases. In both cases product-level data is used in addition to aggregate data. Using product-level data, we are able to transform aggregate-level CIF-FOB ratio, which was calculated from country-level data, and to compile two different CIF-FOB ratios, one for prices and one for quantity.

3.1 Hypotheses

In the theoretical part of the paper the main issues concerning trade data asymmetry were presented. The following areas were chosen as the background for further analysis: intermediate trade, trade mispricing in order to avoid tax/tariffs, transfer pricing and its motivations. From our review of the literature, we have seen that the CIF-FOB margin can be affected by a number of factors. In the empirical analysis, the task is to shed light on the role of these factors, with a particular emphasis on aspects related to FDI and aspects that have been shown to be of importance to China.

A general issue in the study is whether a hypothesis relates to all trade, or only the trade of related companies, affiliates in case of MNCs. For example, all firms would have an incentive to under-report prices in order to avoid tariffs, but only related firms would have an incentive to transfer funds across borders in order to avoid taxes or restrictions. In some cases, an incentive might apply to all firms, but MNCs may have better opportunities to exploit the possibilities. In this case, interaction terms may be used to capture the impact.

The following analysis relates to country's characteristics rather than product-level issues. For example, firms may have an incentive to reclassify goods into categories with lower tariffs. In order to analyze this, we would have to use product-level data and check mirror ratios for quantity and value units. Such analysis will not be undertaken here, where we use

aggregate indexes for China's trade with each trade partner. For each trade partner, we have decomposed the bilateral value CIF-FOB ratio into a CIF-FOB price index and a quantity ratio. Some research (e.g. Nitsch (2012)) has shown that aggregate level data is not appropriate to detect trade mispricing and other issues related to trade data errors. However, we know that price and quantity may reflect different issues related to trade data asymmetry, e.g. while price may show trade mispiricing, quantity will reflect data errors due to re-export. Such decomposition was not used previously and we hope this will be a step forward in research as we can use these decomposed CIF-FOB ratios in panel level regressions and check how such factors, as FDI, tariffs and exchange rate will affect them in case of China. In the following, we present hypotheses related to one or the other. In Table 1, we sum up whether each hypothesis applies to the value, quantity or price ratio. Some hypotheses will also be different for exports from China compared to imports into China. For example, if a trade partner has very high taxes creating a motive for transfer pricing, one would expect the effect to be opposite for exports and imports.

A first set of hypotheses relates to trade mispricing. Trade mispricing should generally be reflected in price and value ratios, but not in quantity ratios. The impact should generally be the opposite for exports and imports, as we expect exports to be underpriced and imports to be overpriced. Analyzing activity of the MNCs in China, it is necessary to mention, that one of the reasons why China continued experiencing economic growth was that a lot of government's efforts were directed towards attracting FDIs to China. The increasing FDI has a positive effect on an intra-firm trade according to the report of European Commission. Moreover, export-led FDI are more often used to shift income out of country. We have previously discussed different motives for transfer pricing. In Chinese international trade the exchange rate motive appears to have the biggest importance for MNCs according to previous researches and we will check the importance of it using the exchange rate variable in the regression.

Hypothesis 1: Increased activity of MNCs involves higher transfer pricing activity in order to shift income out of China.

Hypothesis 2: There is a motive for trade mispricing in order to avoid tariff in trade partner countries.

This should lead to overinvoicing of exports from China. Tariff data we have is for China's trade partners and therefore is applicable only for Chinese exports. MNCs may more easily exploit the opportunity, therefore the variables on tariff levels and MNCs presence could interact. Tax and tariff avoidance is not a common reason for trade mispricing in China generally (Chan and Chow 1996); however, in case of MNCs this motive is important, as they may manipulate the price under different conditions. We expect tariffs to have effect on prices for exporters only.

Another hypothesis is related to the presence of indirect trade. If goods are shipped indirectly, there is a greater possibility for quantity misreporting such as quasi-transit trade. Furthermore, indirect shipments are more frequent when intermediaries are involved, so that the price ratio increases due to added costs. Some of this may occur within multinationals, with own trade intermediaries. This is not so easy to analyze in regression analysis, and we start with a descriptive analysis. Consider that China ships goods to transit countries such as Hong Kong, Netherlands and others, and some of these goods are shipped on to other countries. In this case, Netherlands may report lower import quantity from China than the reported Chinese export quantity to the Netherlands. When goods are for example shipped on to Norway, the unit value may increase due to transport costs and intermediaries, so the CIF-FOB price ratio for China-Norway is high. The descriptive analysis traces this, but it is not straightforward to analyze in the regression due to the lack of appropriate country variables. Based on the chosen theoretical perspectives and empirical research, following hypothesis is derived concerning intermediate trade.

Hypothesis 3: Indirect trade and trade via intermediate trade is an important reason behind high bilateral CIF-FOB ratios observed for China's trade.

Data error due to intermediate trade via third countries is known to be a prevalent reason for asymmetry in trade data. The academic literature highlights the role of intermediaries in China's international trade. This fact may increase data errors due to misreporting, as wholesalers usually trade in more variable products (Akerman 2012). In addition, Hong Kong is an important operator for Chinese trade with other countries. However, there is evidence that such a trend is decreasing, but this may be compensated with the increasing number of MNCs trading between their affiliates directly. As it was mentioned, the number of multinationals is constantly growing in China, which might relate to the increase of the intermediate trade among the affiliates in addition to the trade between unrelated parts. A

quasi-transit trade is anticipated to affect CIF-FOB ratio through the volume. We expect opposite effect for exports and imports, which is positive for exporters and negative for importers.

3.2 Description of the Data

This study examines the relationship between the bilateral trade data and trade mispricing or errors in the data. The research is based on product-level and aggregate level export and import data to and from China, inward FDI to China, GDP, tariffs and exchange rate data for 147 countries (see Appendix B) from 1998 through to 2009. The dataset is composed from different sources of data. The final number of 147 countries was decided after the thorough analysis of all the data and excluding the countries with the missing observations.

The CIF-FOB ratios were calculated from the import/export and mirror data provided by WITS (World Integrated Trade Solutions). The trade database is provided by the World Bank and allows searching several international trade databases. The data was collected at the 6-digit level of the HS classification. The CIF-FOB ratio is used as the dependent variable.

Independent variables are FDI divided by GDP, tariffs and exchange rate. Inward FDI data in 10000 US$ is taken from National Bureau of Statistics of China (NBS) (see Table 2). Some of the countries were excluded from the analysis due to the missing data. FDI indicates the activity of the MNCs in this paper. FDI is divided by GDP, what helps to reduce a variation. GDP data is in current US$ and is taken from the World Bank database.

Most favored nation average tariff rates data is composed from The World Bank database and the World Development Indicators (WDI) database. Missing parts of the values were compiled by interpolating between 5 years intervals. The exchange rate data for yuan per 1$ is available from NBS (National Bureau of Statistics in China). We were unable to get data on multilateral exchange rate. As a result, we used the yuan-dollar exchange rate, which only expresses time trend, but does not measure cross-section variation.

3.2.1 Product-level data

In the beginning of this chapter three hypotheses were presented. Previous research has used aggregate level bilateral trade data in order to analyze trade data discrepancies. In our

research the new method is used. We use product-level data to differentiate between the price and quantity effects. According to Hamanaka (2012) it is problematic to differ between reasonable factors and human errors, such as misreporting. The way to do it is to compare the quantity, not the volumes. If the values are different, while the quantity is the same, then price is the issue. However, if the quantity is different, trans-shipment may be the issue. We will therefore decompose the bilateral CIF-FOB ratios into a quantity and a price component. For this purpose we calculate price indexes from more detailed product-level data. Consider the bilateral trade between two countries, where x_i is the observed quantity of some product, and v_i is the observed value. The observed unit value is then $p_i = \frac{v_i}{q_i}$. Now consider the mirror observations x_{im}, v_{im} and $p_{im} = \frac{v_{im}}{q_{im}}$. We will use the product level data to calculate an overall price index for bilateral trade. From trade values, the CIF-FOB ratio will be $R_v = \sum v_i / \sum v_{im}$. Having obtained the price index R_P, we can then obtain the bilateral quantity index R_q as R_v / R_p.

Calculating the overall price ratio is a classical price index problem, where we can use a Laspeyre, Paasche or Marshall-Edgeworth index for weighting different commodities. The Marshall-Edgeworth index was chosen for this purpose (see Appendix 1), as the index is an arithmetic average of Paasche and Laspeyeres indexes (Liu et al. (1992)).

For the calculation of price indexes, some technical problems have to be overcome. In particular, we have to be sure that q_i and q_{im} are comparable; e.g. that the same quantity units have been used in both countries. According to Hamanaka (2012) this is a difficult task, as different units are used for each commodity. In our research we try to overcome this problem. In order to find out the reason for the trade data mismatch the CIF-FOB ratio was decomposed according to price and quantity. Such decomposition can uncover whether CIF-FOB variation reflects a volume or prices mismatch. First of all, all the observations with different quantity units were dropped. Secondly, we calculate the CIF-FOB ratio for each product group. Then observations with values lower than 0.1 and higher than 10 are dropped, so we can get rid of extreme observations, which may affect the results of the regression. Afterwards we calculate the price of each product dividing each value by the quantity. The fourth step is to calculate the average quantity by summing up quantity and mirror quantity and dividing by two. The fifth step is to calculate price ratio using Marshall-Edgeworth index formula.

A second data problem is the presence of data errors: with 7000 different products at the 6-digit level of classification, there is inevitably data errors which show up in extreme observations; e.g. the ratio p_i/p_{im} can obtain extreme values. In order to avoid excessive influence from such observations, we filter data in STATA and exclude extreme values. As it was already mentioned, all the variables with the different quantity units (e.g. pieces vs. kgs) were excluded (Table 3); the variables with missing mirror data were also excluded. On average 37.54% of all the observations were left after the first filter was applied. This data still had many extreme values and it was difficult to interpret. In order to eliminate all the extreme observations, the CIF-FOB ratio was conducted for each product and all the ratios smaller than 0.1 or higher than 10 were excluded. The CIF-FOB ratio for prices was calculated from the rest dataset using the Marshall-Edgeworth index formula. The CIF-FOB ratio for quantity was calculated by dividing the CIF-FOB ratio from aggregate level data by the CIF-FOB ratio for prices.

3.3 Hamanaka method

A problem regarding the mirror data is a noise and it is challenging to distinguish between the true information and the noise analyzing such type of the data. Various methods have been suggested for this purpose (for example, IMF (2009)). An interesting recent contribution is Hamanaka (2012) who has recently analyzed mirror data in case study of Cambodia and concluded that some degree of discrepancies may be explained by trade mispricing. Hamanaka (2012) uses descriptive analysis in order to detect trade data discrepancies and the magnitude of the misclassification. In this paper the same method is partly used in order to analyze the bilateral Chinese trade data. General analysis of CIF-FOB ratios for Chinese trade may be a good introduction to further econometric analysis of the bilateral trade data.

Hamanaka (2012) uses "multiple mirror technique" to compare trade statistics, which focuses on two types of trade data discrepancies, specifically commodity misclassification and direction misreporting. The multiple mirror technique involves cross-checking various results of bilateral trade analyses and identifying misclassification (Hamanaka 2012). The author analyzes trade data on both aggregate and commodity level. Analyzing the magnitude of discrepancies, the author employs CIF-FOB ratio and describes two types of discrepancies: the "positive discrepancy", when the import value is larger than the export value more than 10% and "negative discrepancy", when the import value is smaller than the export value

more than 10% (the threshold author uses for analysis is a standard 1,1 CIF-FOB ratio). The multiple mirror technique allows examining direction of misclassification, which is committed by one of the customs.

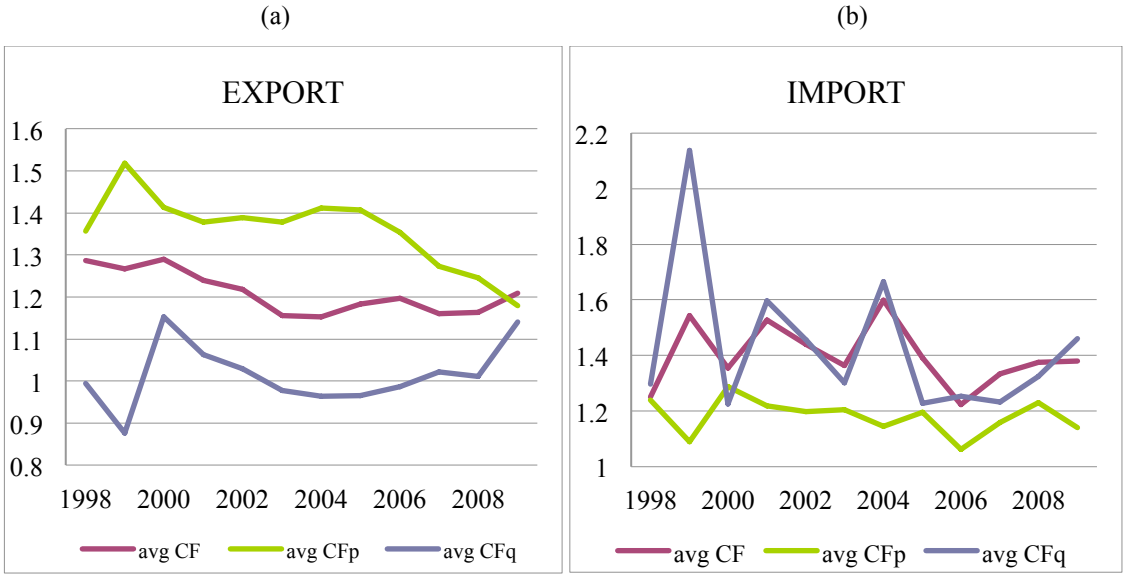
We will further compare Chinese bilateral trade data (Tables 4-9) for the period from 1998 to 2009 using Hamanaka's method. Data for major China's trade partners will be also investigated. In case of China, the main trade partners are France, Germany, Great Britain, Hong Kong, Japan, U.S., Netherlands, and Republic of Korea (calculated by the author from WITS database for China's export 2009). By applying the multiple mirror technique, the paper focuses on the inaccuracy in aggregate level data, which may be caused by price and quantity misreporting.

We will further employ a detailed analysis of different CIF-FOB ratios in order to investigate what is behind this deviation. Unlike Hamanaka (2012) we will not examine misclassified commodities. However, we are going to cross-check bilateral trade data and try to find the overall trend in different countries. We expect CIF-FOB ratios for price and quantity to provide relevant information to our hypotheses. Manova and Zhang (2009) emphasize in their paper the fact that Chinese exporters export to more countries, while importers to China import more products. We will take this into account in our further analysis.

3.3.1 China's exports

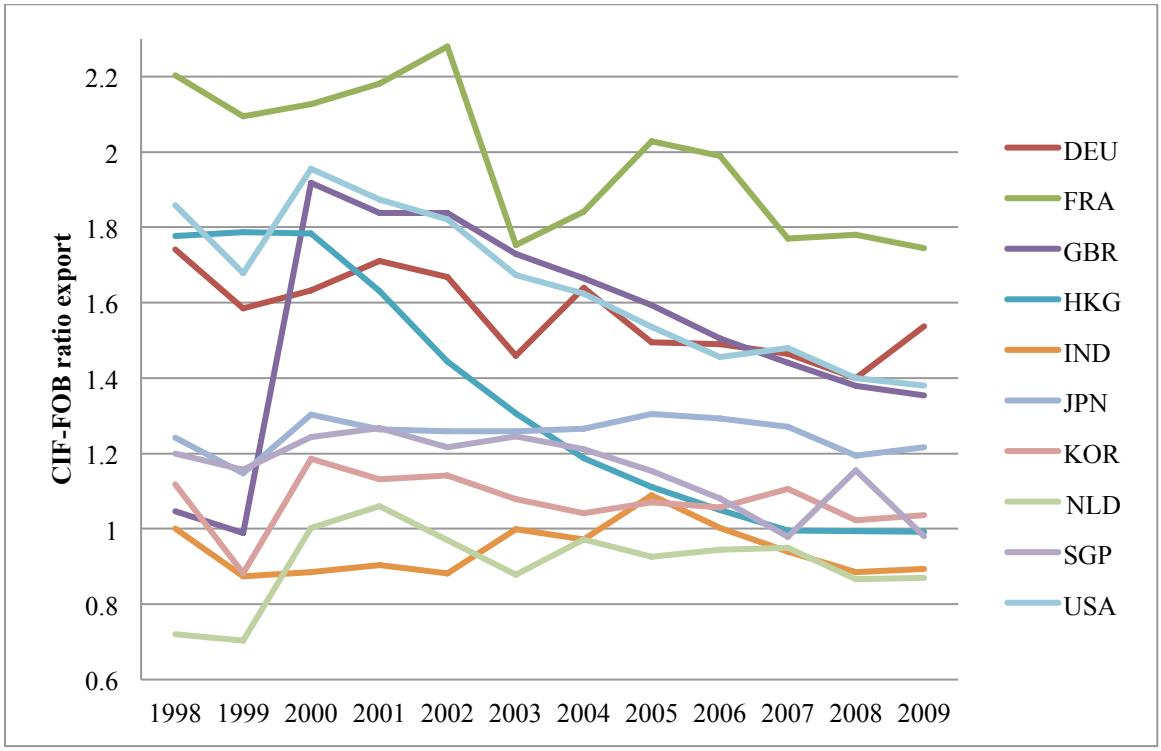
Being the largest exporter and the second largest importer in the world makes China an important player on the international trade arena. We will start in this chapter with the analysis of country-level data and then try to differentiate between price and quantity effect on CIF-FOB ratio. Figure 6 presents average CIF-FOB ratios for aggregate level trade data and transformed ratios for prices and quantities. We can see from this general figure that CFq is around 1 for export data in the period 1998-2008, what indicates that most of the high CIF-FOB ratio is due to the price and the gap has been shrinking over time.

Figure 6. Average CIF-FOB export and import



CIF-FOB ratio for China's ten main trade partners deviates significantly from 1.1 (Figure 7). Hong Kong is a specific case where CIF-FOB ratio value changes from the extremely positive discrepancy down to negative discrepancy in 2006-2009. In the Netherlands the CIF-FOB ratio shows a negative discrepancy for the whole period. Hamanaka (2012) points out that both countries have large transit ports. For the Netherlands such a low CIF-FOB ratio could imply trade asymmetry due to re-exporting and trans-shipment, however, the data shows that in case of China the Netherlands may not be such important transit port as Hong Kong. What is more, Hong Kong has another important role together with Singapore as financial centres. In the period 1998-2003, the CIF-FOB ratio for Hong Kong is much higher than 1.1. A high CIF-FOB ratio in the beginning of the period indicates that Hong Kong's import from China were much higher than Chinese exports. Possible reason for that are quantity misreporting, as well as mispricing, as CFp and CFq for Hong Kong's export both express positive discrepancies in the beginning of the period. There is evidence from previous researches that Chinese exports leave Hong Kong more expensive, in other words, they get a mark-up. The negative discrepancy at the end of the period may be explained by misreporting of partner countries' imports, which may erroneously register imports through Hong Kong as actual imports from Hong Kong and not China. The decreasing trend in Hong Kong's CIF-FOB ratio for exports may have some relation with the diminishing role of Hong Kong in Chinese trade and overall change in trading conditions.

Figure 7. CIF-FOB exports.



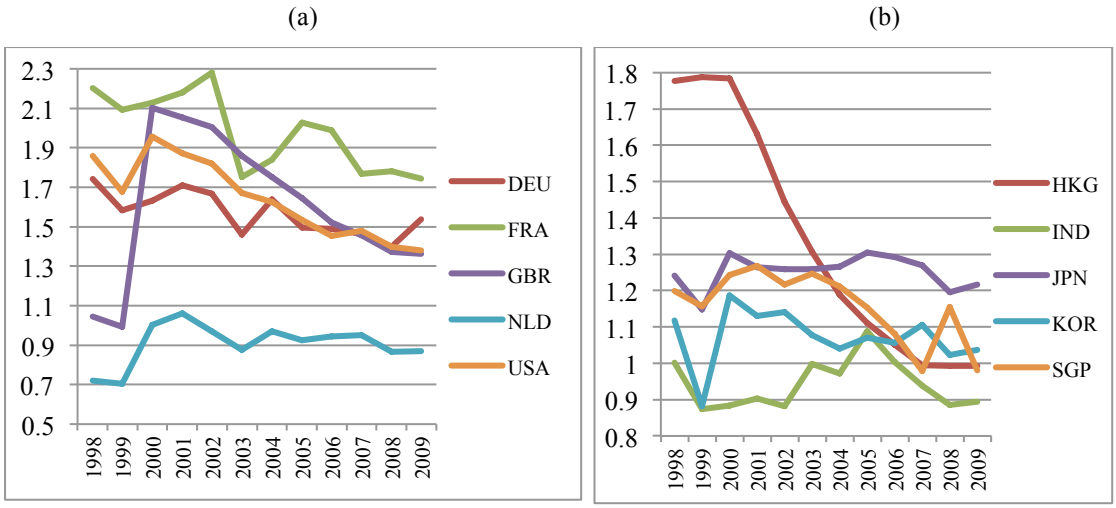
In the case of the Netherlands there is a possibility of trade mispricing, as exports are also much higher to the neighboring countries of the Netherlands (e.g. France, Germany, Great Britain) in case of China (as well as Cambodia in Hamanaka's research), which implies that some exports to these countries may be registered as exports to the Netherlands, which is actually just a transit port. CFq shows extreme negative discrepancy for the Netherlands, this supports the presence of a quasi-transit trade where the country of destination is misreported. Furthermore, as many different countries choose the Netherlands as the transit country for their goods, the possibility of different country reporting is much higher. The CIF-FOB ratio for exports to Great Britain, France and Germany has a positive discrepancy and a declining trend.

Hamanaka (2012) argues that Hong Kong is a transit port for such countries as China, U.S. and Japan and all these countries have CIF-FOB much higher than 1.1, as China's export in this case is smaller than partners' import from China. Japan's CIF-FOB ratio shows some degree of positive discrepancy, though it is relatively stabile. For Korea miserable discrepancy is detected. In Singapore there is light positive discrepancy. An interesting fact is that CFp and CFq for these countries express much higher discrepancy in opposite directions.

All three countries' prices suggest a positive discrepancy, while the quantity CIF-FOB ratio shows a high negative discrepancy. Concerning the prices, this may indicate classical trade mispricing, when exports are underpriced and imports are overpriced. Different registered quantities are a clear indicator for misreporting and a possible quasi-transit trade. If we assume Hong Kong is acting as a transit point for all three destinations, it can be expected that some of the Chinese trade to these countries was misclassified.

The U.S. as well as other European countries shows positive discrepancy with a declining trend. Again for prices and quantity we see opposite directions, positive discrepancy for price CIF-FOB ratio and negative discrepancy for quantity. What is more, numbers show that prices obviously have a much stronger effect on the aggregate CIF-FOB ratio. Such a trend indicates possible trade mispricing. Such results are consistent with finding of Ferrantino et al. (2008), who state that re-export and trans-shipment is decreasing in the case of the U.S., Hong Kong and China.

Figure 8. CIF-FOB export for (a) Germany, France, Great Britain, Netherlands and USA, (b) Hong Kong, India, Japan, Korea and Singapore



All in all, a declining trend for most of the countries since 1998 is a clear indicator that quality of the data is being improved, as well as international trade regulations. The main implication in this section is that CFp effect dominates for export data, which suggests that prices are responsible for the biggest part of discrepancies in mirror data for Chinese trade.

3.3.2 Filtered data for exports

Analysis of CFp for Chinese exports shows that an overall trend for OECD countries is declining with some exceptions and in almost all the cases positive discrepancy presents. Trade mispricing is an appropriate explanation for this, as exports from China are being underpriced and imports overpriced. CFq has negative discrepancy for many OECD countries, however, such countries as Austria, France, Spain, Belgium, Norway, Iceland (in some periods) show a positive discrepancy, which is very high for some countries (for example, Austria in 2009 CFq = 2,7). Such high CFq means that quantity registered as import from China is much higher than quantity registered as Chinese export. All this countries are strong economies. Possible scenario here is that commodities are being misclassified. If we assume that goods are shipped through some transit port, it may be that Chinese custom register export to the transit country.

If we cross check the so-called tax havens in Europe, such as Cyprus, Luxembourg and Switzerland, we detect a positive discrepancy in CFp as well, but it is not extreme and can have similar levels as for the other OECD countries. A positive discrepancy for CFp indicates a high value of import arriving from China and low value of Chinese export. Caribbean countries show some interesting cases with an extremely positive discrepancy in the CIF-FOB ratio for Bahamas, Belize, Dominica and Panama. CFp values reaches 3 in some cases, what is quite extreme, if we take into consideration a fact that the data is filtered and all extreme values are excluded. Such high values of CIF-FOB ratio may indicate illicit capital flows. Analysis of CFq for these countries shows another extreme case, as CIF-FOB ratio for quantities pulls in the opposite direction and expresses the extreme negative discrepancy. Opposite trends suggest that CIF-FOB ratio on the aggregate level may be close to normal; this gives weight to previous research that an aggregate data is not proper for tracing trade mispricing and quantity misreporting.

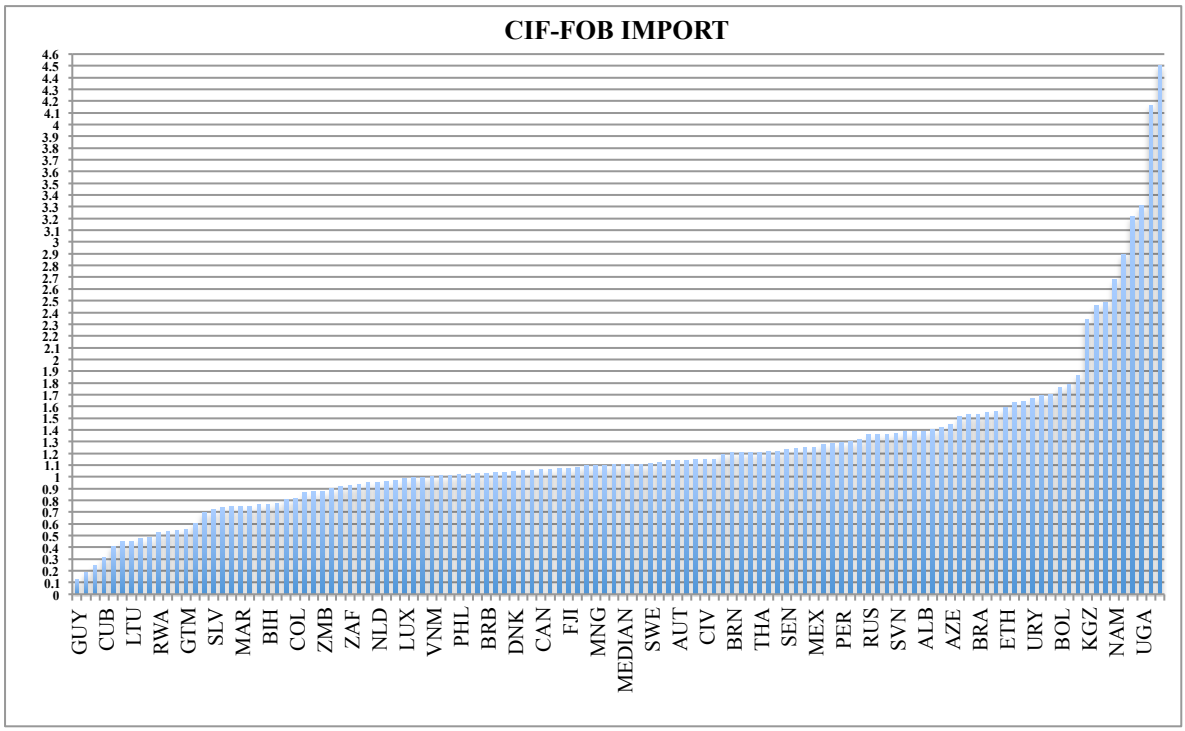
Neighboring countries and other Asian countries have positive discrepancies, which is quite extreme in case of Vietnam for example. Interesting case is Macao, which is special administrative region of China. CFp for Macao a very similar trend to Hong Kong, though Macao has even higher positive discrepancy in the beginning of the period. This suggests that the role of Macao is similar that of Hong Kong. Kar and Freitas (2012) argue that Hong Kong and Macao has important role in the illicit flows movement out of China.

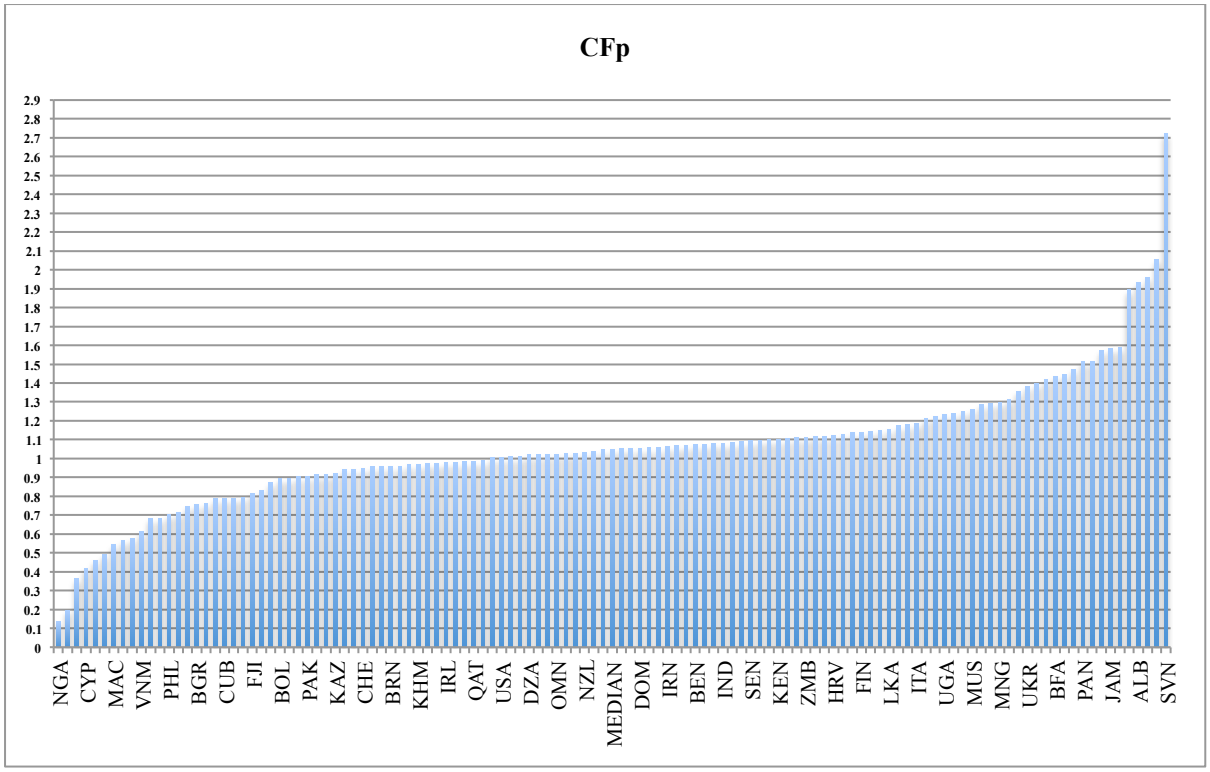
Over the period 2000 to 2011, cumulative illicit financial flows from China totalled a massive US$3.79 trillion, if one were to exclude the country's intra-regional trade with Hong Kong and Macao. We found that if adjustments for such trade were not made, the resulting outflows due to trade misinvoicing were significantly understated due to trade data distortions. (Kar and Freitas 2012)

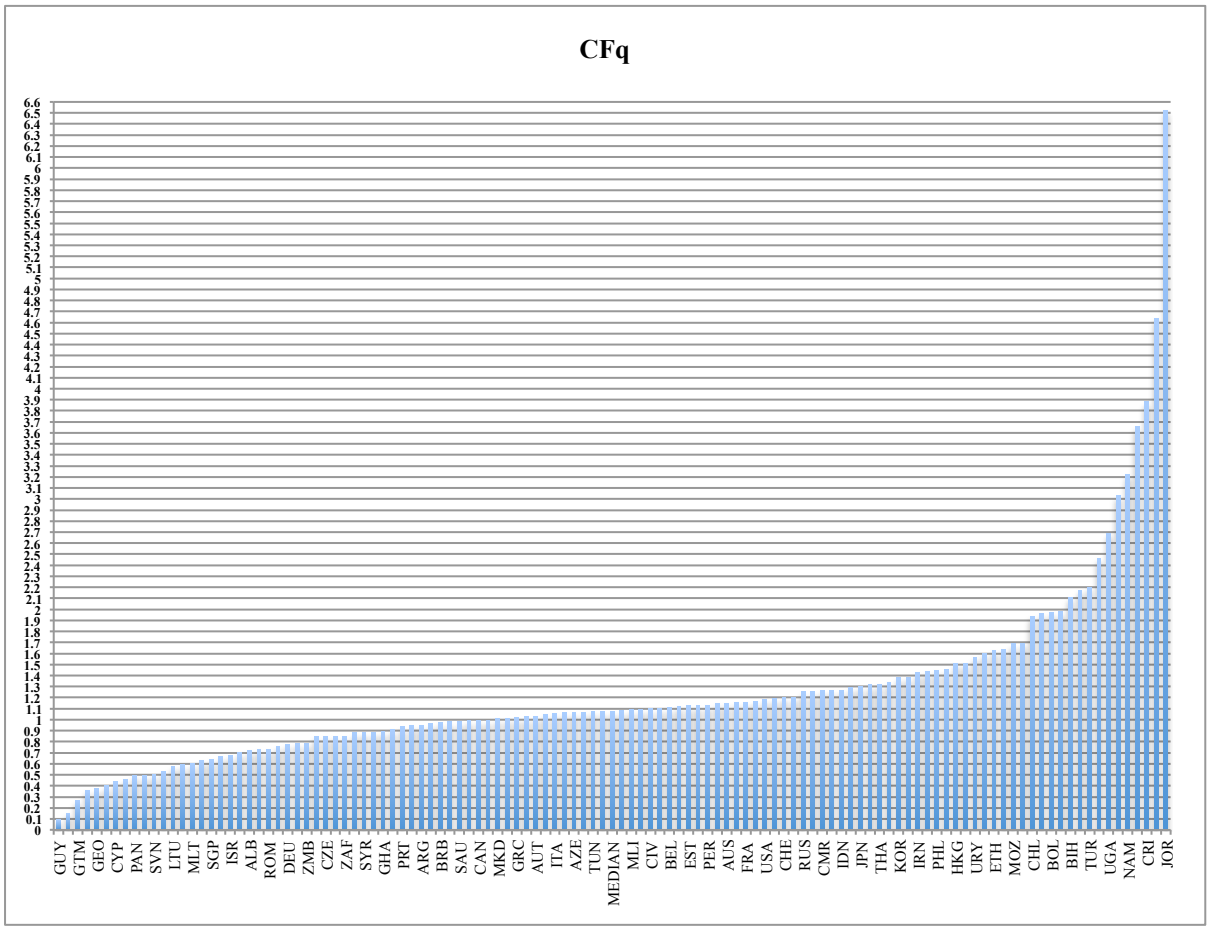
3.3.3 China's imports

CFq has a much stronger effect on the average CIF-FOB ratio for imports, and the CFp on exports (Figure 6). From this we can conclude that the overall trend for averages is mispricing for exports and erroneous report of quantities for imports. As it was previously mentioned, importers trade more commodities, what may indicate higher misreporting of the goods. Figure 9 presents cross-section imports spread with the medians. As the distribution of the spread is skewed, averages may not provide the objective picture, since few extreme values may have strong effect on the average value. In order to avoid this, the distribution for the year 2006 is presented. A large part of the spread is under or above 1.1, we can roughly estimate that 2/3 of the spread on the aggregate level reflects discrepancy. Both CFp and CFq express high variation, however, CFq shows more extreme spread than CFp. This result is consistent with the result we got for the average values, which showed that quantity explains the bigger part of the dispersion of the mirror data in case of imports.

Figure 9. CIF-FOB ratios for import 2006

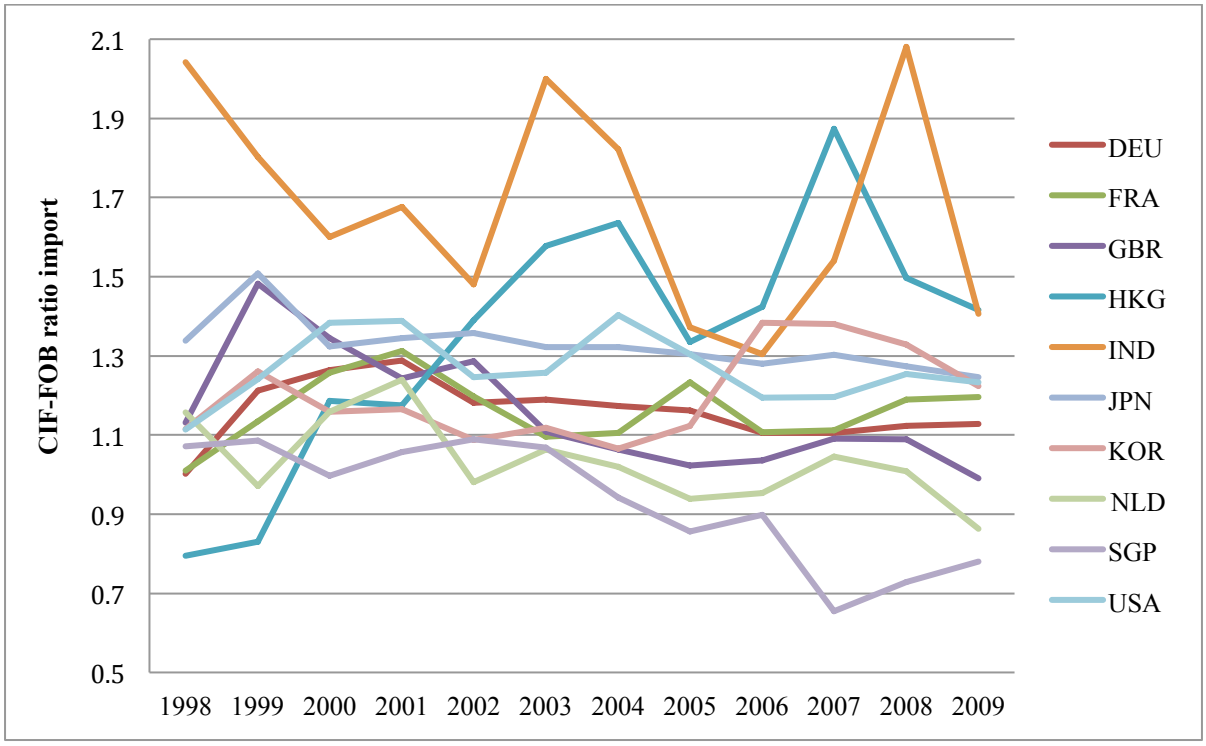



CFp
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
NGA CYP MAC VNM PHL BGR CUB FJI BOL PAK KAZ CHE BRN KHM IRL QAT USA DZA OMN NZL MEDIAN DOM IRN BEN IND SEN KEN ZMB HRV FIN LKA ITA UGA MUS MNG UKR BFA PAN JAM ALB SVN


CFq
6.6
6.5
6.4
6.3
6.2
6.1
6
5.9
5.8
5.7
5.6
5.5
5.4
5.3
5.2
5.1
5
4.9
4.8
4.7
4.6
4.5
4.4
4.3
4.2
4.1
4
3.9
3.8
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
GUY GTM GEO CYP PAN SVN LTU MLT SGP ISR ALB ROM DEU ZMB CZE ZAF SYR GHA PRT ARG BRB SAU CAN MKD GRC AUT ITA AZE TUN MEDIAN MLI CIV BEL EST PER AUS FRA USA CHE RUS CMR IDN JPN THA KOR IRN PHL HKG URY ETH MOZ CHL BOL BIH TUR UGA NAM CRI JOR

We continue with a more detailed description of CIF-FOB ratios for Chinese imports (Figure 10). Ratios for Netherlands' imports lie much lower than the ratios of the other countries, which again may indicate trade data error explained by quasi-transit trade. The CIF-FOB ratio for Hong Kong changes from negative discrepancy to extremely positive which is opposite to CIF-FOB ratio for Hong Kong's exports. If we look at the data for CFp and CFq, we find that CFp changes from negative discrepancy to positive and CFq has opposite directions. We can make a conclusion that price has a much stronger effect on the aggregate level CIF-FOB ratio for Hong Kong. Underpriced imports in the beginning of the period are an indicator of possible tariff avoidance. As regulations have increased and China joined the WTO in 2001, the CIF-FOB ratio for Hong Kong increased dramatically, which may indicate new issues such as transfer pricing.

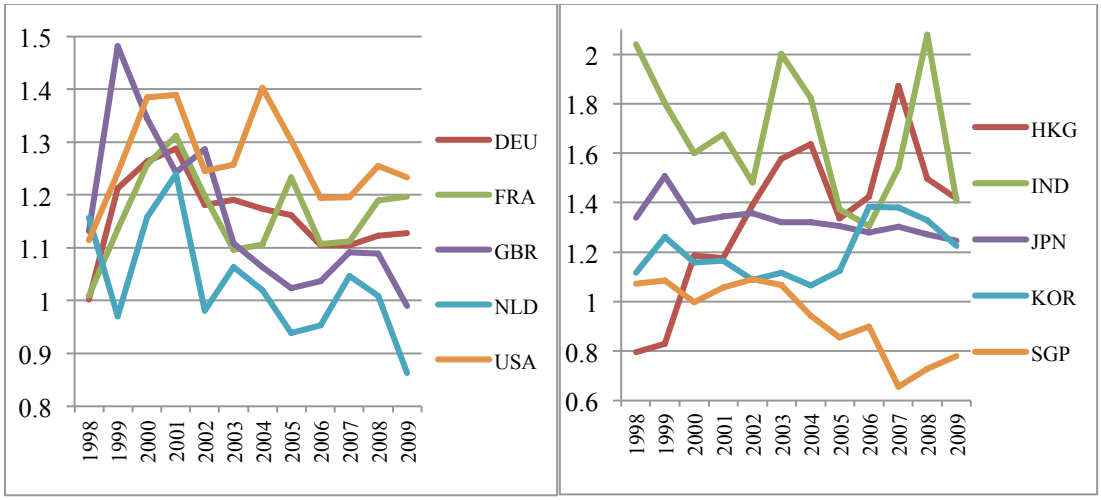
Figure 10. CIF-FOB import



A negative discrepancy in the case of Netherlands' imports means that Chinese imports from the Netherlands are much lower than exports to China registered in Netherlands. CFp and CFq are opposite with CFp showing almost no discrepancy and CFq negative discrepancy. As the CIF-FOB ratio on the aggregate level shows negative discrepancy, we conclude that the quantity effect is much higher. This is a clear indicator for the quasi-transit trade problem, in other words while China registers imports from the countries where goods have actually

originated from and are being only shipped through the transit port, the Netherlands register those goods as its imports exports to China. Germany, France and Great Britain all express exhibit positive discrepancy, which indicates that these countries erroneously register their exports to China as exports to transit countries.

Figure 11. CIF-FOB import for (a) Germany, France, Great Britain, Netherlands and USA, (b) Hong Kong, India, Japan, Korea and Singapore



3.3.4 Filtered data for imports

Import CIF-FOB exhibits quite a high volatility both in CFp and CFq. Asian countries, especially close neighbors such as Thailand, Vietnam and South Korea, show negative discrepancies for CFp, in the case of Macao this discrepancy is extreme. Such a trend means that Chinese import has a lower registered value and export to China is higher. In this case it can be explained by “missing imports” phenomenon described by Fisman and Wei (2001). CFq index for Thailand, Vietnam, India and South Korea reveals that volume of Chinese imports is much higher than the registered volume of the exports to China. In some cases positive discrepancy is extreme (for example, CFq for Macao ranges from 2.2 up to 11.4). In addition, on the aggregate level the trend for these countries is similar to CFp, in this case discrepancy means that trade mispricing may be the more common issue for some Asian countries importing to China than quantity misreporting.

For many West European countries CFp changes from negative discrepancy to positive. If commodities are coming to China through Hong-Kong or some other transit port, the country of origin may erroneously register that transit port as the final destination. Negative

discrepancy in this case means that volume of Chinese imports is lower than exports to China.

Transformation of the CIF-FOB ratio into price and quantity ratios allows having a better insight into the possible reasons of such discrepancies. An important implication of this analysis is that the quality of data for other countries seems improving, which may indicate that authorities are improving regulations. Extreme data discrepancies in case of tax havens, Hong Kong and Macao supports the facts presented by Kar and Freitas (2012) about the illicit capital flows to and from China. Another important finding is that quantity affects the variation of the larger part of bilateral data for imports, while price effect seems to be relevant for the export data.

4 Econometric analysis

Descriptive analysis together with the three hypotheses previously described some tentative evidence, however, multivariate analysis needed in order to get a broader picture and understanding of what stands behind trade data asymmetry. Therefore, regression analysis of the panel data over 11 years is employed.

The main objective of this paper is to investigate whether the decomposed CIF-FOB ratio will provide us better information on trade mispricing and data errors than the traditional CIF-FOB ratio based on aggregate level data. Attempts to evaluate and to describe the reasons for bilateral trade data discrepancies were different, however, no best solution was found. In this study estimate whether CIF-FOB ratio can be used for this purpose and to summarize the main reasons for Chinese trade data asymmetry. The random effects regression model is employed in most cases to investigate the impact of FDI, exchange rate and tariffs on the CIF-FOB ratio with the aim to detect if CIF-FOB contains any additional information and to test the three hypotheses. A Hausman test was performed with the purpose of comparing estimates from fixed effects with random effects estimation. The conclusion was that for all the estimations except the case of the CFq for imports, both the random effects model and the fixed effects modes are suitable estimation techniques.

4.1 Econometric model

The model is formulated on the background of the literature survey. According to this, there are several explanations of the strong variation in bilateral CIF-FOB ratios and we will try to capture this. Some of these apply to the price ratios only, others to the quantity ratios. Using the subscript *i* for China's trading partners and *t* for the time period (year). A general model for the econometric analysis will be:

$$lnCIF/FOB_{itzj} = \alpha + \beta_1 \cdot ln\frac{FDI_{it}}{GDP_{it}} + \beta_2 \cdot lntar_{it} + \beta_3 \cdot lne_t + \varepsilon_{it} ,$$

where $lnCIF/FOB$ is log of CIF-FOB ratio, α is a constant term, *lntar* is log of tariff, lne is log of exchange rate and ε is error term. *i* is country, t is year, z marks if it is aggregate level CIF-FOB ratio, CFq or CFp, j expresses exports or imports. This amounts to six different equations, three for exports and three for imports. Given that the value is affected by prices as well as quantities, the results may be correlated. The logarithmic transformation is used in order to estimate elasticities.

Building on the analysis in chapter 3, Table 11 shows the expected signs of variables involving the price and quantity indexes. Results using value CIF-FOB ratios may be affected by both and the outcome would depend on which one that dominates.

Increased activity of the MNCs may increase income shifting through transfer pricing as well as misreporting of goods. Higher investments in host country imply higher activity of MNCs and higher possibility for transfer pricing in both directions. In our regression this will be reflected in the β_1 coefficient, which is assumed to be positive for exports and for imports. Traders will tend to underprice Chinese exports in order to shift income out of country, while importers will tend to overprice their imports, the result is higher CIF-FOB ratio. Previous research has showed that MNCs may shift income by mispricing and misreporting goods, as a result both CFp and CFq are going to be affected. We expect the effect on CFp to be positive, however, in case of CFq the effect is ambiguous, as quasi-transit trade errors may appear both when goods are leaving the country and entering.

Tariffs are only relevant for export regressions since for imports, there are mostly the same tariffs for all. In case of tariffs, we can expect MNCs and other companies attempt to underprice imports in order to avoid tariffs. In our case this may indicate that imports from China to other countries will be underpriced which means that CIF-FOB ratio will be lower and β_2 is expected to be negative for Chinese exports. As well as in case with the increased MNCs activity, it is expected to have effect on both CFp and CFq, because income is shifted through the price channel.

If the exchange rate is important, the coefficient β_3 is expected to be positive for exports and imports, as devaluation will imply that traders will be motivated to shift their income out of China by underpricing export, which will lead to a high CIF-FOB ratio and overpricing import, which will have the same result. However, the yuan-dollar exchange rate used in our regression expresses only time trend, but does not measure cross-section variation, which means that we will not be able to conclude about the effect of exchange rate restrictions in China. Exchange rate is expected to have impact on CFp and aggregate level CIF-FOB ratio, as quantity misreporting is irrelevant in this case.

4.2 Results

We use random and fixed effects regressions for 6 different CIF-FOB ratios in order to test three hypotheses. The main emphasis is on the constructed CIF-FOB ratios, reflecting price and quantity. The research started with Hamanaka inspired analysis and continues to the empirical results from the regression.

Table 10 presents results from all six regressions, with standard errors reported in brackets. In all the regressions CIF-FOB ratios are regressed on the three different variables. FDIs are positively correlated with CFq for both exporters and importers. However, results for CFp imports and the aggregate level CIF-FOB ratios are not significant. FDIs have genuine effect on CFp exports according to the results of the regression. This fact confirms our hypotheses and indicates trade mispricing in case of exports. In addition we get positive correlation between FDIs and CFq, which we did not expect. It means that as the FDI to and out of China is increasing the CIF-FOB ratio for quantity in case of exports and imports is also increasing. The results of the regression suggests that quantity of export and import is misreported, export being lower than import, which indicates the problem of quasi-transit trade.

Tariff data we have is for China's trade partners and is applicable only for Chinese exports. We find further that tariffs of China's trade partners are positively correlated with the aggregate level CIF-FOB ratios and CFp for exports, what is opposite to our expectations. Positive relations may be explained with the fact that tariffs could have correlated with other variables (e.g. transaction costs, government revenues). Use of instrumental variables could have been a solution, however, this was not undertaken in our regression. Tariffs have positive effect on the aggregate level CIF-FOB ratio, what suggests that trade mispricing effect is much stronger in case of tariffs than erroneous declaration of the quantity.

Exchange rate shows the strongest correlation among all the variables and has positive effect on CFp for exports, which supports hypothesis about income shifting through trade mispricing due to devaluation. Opposite to our expectations, we get very strong negative effect of the exchange rate on the CFq for both exports and imports. As the exchange rate is related to trade mispricing, we did not expect it to have any effect on quantity misreporting. However, exchange rate data we use have some shortcomings. This correlation between exchange rate and CIF-FOB ratio does not actually say a lot about the effect of the exchange

rate on trade mispricing. However, we can conclude that trend over time is to a larger extent affected by the exchange rate. Probably dummy variable for exchange rate regimes in China could explain more of the exchange rate's effect on trade mispricing.

The results from the regressions confirm partly all of the three hypotheses. The main implication of the results is that the quantity effect has stronger effect on bilateral dispersion for import data. Though, in case of export there is stronger evidence for trade mispricing, as the price effect dominates.

5 Conclusions

In this paper, we take a new approach of decomposing the bilateral value of the CIF-FOB ratio into a CIF-FOB price index and a quantity ratio for each trade partner. We find that price effect, which is related to trade mispricing, is an important factor explaining mirror data variation in case of Chinese exports. While quantity effect, which is related to quasi-transit trade and misreporting of origin, explains the larger part of variation in mirror data for Chinese imports.

The main goal of the research was to investigate with the help of econometric analysis and theoretical framework if transformed CIF-FOB ratios contain more information than only transport costs and if it explains any trade mispricing or misreporting. From the crosscheck analysis of the mirror data we found that Chinese bilateral trade data is improving toward the end of the period. Another important finding is extreme data discrepancies in case of tax havens, Hong Kong and Macao, which supports previous discussions about illicit capital flows between these countries and China. Moreover, crosscheck analysis provides some evidence for the main conclusion of the paper, which is strong relationships between quantity effect and mirror data for imports, as well as the contribution of the price effect to the variation in export mirror data.

Our findings from the econometric analysis show that FDI contribute to explaining cross-sectional spread of CIF-FOB ratios through the quantity channel for both exports and imports and the price channel explains the spread only for exports. Tariff variable provide some evidence that price channel explains some variation in mirror data for exports, however, the results are not consistent with our expectations. We found that exchange rate has effect on the trend over time of the Chinese bilateral trade data. All considered, empirical results from the panel data regression are not very strong and we do not have enough evidence to form the conclusion about the role of the MNCs, tariffs and exchange rate in Chinese trade mispricing and misreporting.

Initially Corporate Income Tax (CIT) and Value Added Tax (VAT) variables were included in the fixed effects panel data regression. However, the data we found was constant over time and because of that not usable in this type of regressions. In our regression we used the yuan-dollar exchange rate, which only expresses time trend, but does not measure cross-section

variation. Exchange restrictions in case of China are an important factor, which may increase income shifting by trade mispricing. It is essential to consider further research of the impact the exchange rate has on income shifting in case of Chinese trade. Dummy variable for exchange rate regimes in China could be a possible solution.

Decomposition of the aggregate-level CIF-FOB ratio may be a useful tool analyzing product-level data and we believe that our approach can be applied to other countries. As analysis of the product-level mirror data is not undertaken in this paper, this could be an interesting and useful contribution to the research of capital flows in the future.

References

Ahn, J., A. K. Khandelwal, and S.J. Wei (2011): The role of intermediaries in facilitating trade, *Journal of International Economics* 84(1): 73–85.

Akerman, A. (2012): Wholesalers and Economies of Scope in International Trade, Department of Economics, Stockholm University, http://people.su.se/~ank/Wholesalers.pdf, accessed 4 September 2012.

Antràs, P. and A. Costinot (2011): Intermediate Trade, *The Quarterly Journal of Economics*, 126, 1319-1374.

Azémar, C. and G. Corcos (2009): Multinational Firm's Heterogeneity in Tax Responsiveness: The Role of Transfer Pricing, *The World Economy.*

Bartelsman, E.J. and R.M.W.J. Beetsma (2003): Why pay more? Corporate tax avoidance through transfer pricing in OECD countries, *Journal of Public Economics 87*, 2225-2252.

Bernard, A.B., J.B. Jensen and P.K. Schott (2006): Transfer Pricing by U.S.-Based Multinational Firms, *NBER Working Paper* No. 12493.

de Boyrie, M.E., S.J. Pak and J.S. Zdanowicz (2004): Estimating the magnitude of capital flight due to abnormal pricing in international trade: the Russia–USA case. *Accounting Forum*, 29, 249–270.

Car, D. and D. Cartwright-Smith (2008): Illicit Financial Flows from Developing Countries: 2002-2006, *Global Financial Integrity*, http://works.bepress.com/dev_kar/2, accessed 6 September 2012.

Chan, K.H. and L. Chow (1997): An empirical study of tax audits in China on international transfer pricing*, Journal of Accounting and Economics* 23, 83-112.

China Daily (2004): Evasion a taxing problem, *China Daily*, 25 November, http://www.chinadaily.com.cn/english/doc/2004-11/25/content_394744.htm, accessed 27 August 2012.

Choe, Ch. and Ch.E. Hyde (2007): Multinational Transfer Pricing, tax Arbitrage and the Arm's Length Principle, *The Economic Record*, Vol. 83, NO. 263, 398-404.
Clausing, K.A. (2000): The Impact of Transfer Pricing on Intrafirm Trade, *National Bureau of Economic Research.*

Eden, L. (2012): Transfer Price Manipulation, In *Draining Development?: Controlling Flows of Illicit Funds from Developing Countries,* ed. P. Reuter, 205-234, World Bank.
Eden, L. (1998): Taxing multinational: Transfer pricing and corporate income taxation in North America, University of Toronto Press Incorporated.

FATF (Financial Action Task Force) (2006): Trade Based Money Laundering, http://www.fincen.gov/news_room/rp/files/fatf_typologies.pdf, accessed 11 July 2012.
Feenstra, R.C. and G.H.Hanson (2004): Intermediaries in Entrepot Trade: Hon Kong Re-Exports of Chinese Goods, *Journal of Economics &Management Strategy*, Volume 13, Number 1, 3-35.

Ferrantino, M.J. and Z. Wang (2008): Accounting for discrepancies in bilateral trade: The case of China, Hong Kong and the United States, *China Economic Review 3*: 34-47.

Ferrantino, M., X. Liu and Z. Wang (2009): Avoidance Behaviors of Exporters and Importers: Evidence from the U.S.-China Trade Data Discrepancy, *U.S. International Trade Commission Economics Working Paper* No. 2008-09-B.

Fukusaku, R. and F. Kimuru (2001): Globalization and Intra-firm Trade: Further Evidence, http://www2.e.u-tokyo.ac.jp/~seido/output/Ishikawa/003.pdf, accessed 27 August 2012.

Guo, D. (2010): Mirror Statistics of International Trade in Manufacturing Goods: The Case of China, Research and Statistics Branch, United Nations Industrial Development Organization.

Guo, D., C. Webb and B. Yamano (2009): Towards Harmonized Bilateral Trade Data for Inter-Country Input-Output Analyses: Statistical Issues, OECD Science*, Technology and Industry Working Papers*, OECD Publishing.

Helleiner, G.K (1978): Freedom and management in primary commodity markets: US imports from developing countries, *World Development*, Volume 6, Issue 1, 23-30.

Hamanaka, S. (2012): Whose trade statistics are correct? Multiple mirror comparison techniques: a test case of Cambodia, *Journal of Economic Policy Reform*, Vol. 15, No. 1. 33-56.

Ho, D.H.K. and P.T.Y. Lau (2002): A Comparative Empirical Study of International Transfer Pricing Practices of US Multinationals with their Affiliates in the PRC an the UK, School of Business, Business Research Centre, http://net2.hkbu.edu.hk/~brc/WP200213.PDF, accessed 28 August 2012.

Hummels, D. and V. Lugovsky (2006): Are Matched Partner Trade Statistics a Usable Measure of Transportation Costs?, *Review of International Economics*, 14(1), 69–86.
IMF (2009): Export and Import Price Index Manual: Theory and Practice, Washington DC, The World Bank, http://www.imf.org/external/np/sta/xipim/pdf/xipim.pdf, accessed 16 November.

International Monetary Fund (IMF) (2003): Data quality assessment framework, Statistics Department, http://unstats.un.org/unsd/dnss/docs-nqaf/IMFdqrs_factsheet.pdf, accessed 5 September 2012.

Jansen, M. (2009*):* Income Volatility in Small and Developing Economies: Export Concentration Matters, World Trade Organization (WTO).

Jin, H. (2005): Reasons for the discrepancies in China's Trade Statistics with major partners: The particular role of the processing trade, OECD, Statistics Directorate, http://www.oecd.org/trade/internationaltradeandbalanceofpaymentsstatistics/35308958.pdf, accessed 29 August 2012.

Kar, D. and D.Cartwright-Smith (2008): Illicit financial flows from developing countries, Global Financial Integrity, Washington DC, http://works.bepress.com/dev_kar/2, accessed 6 September 2012.

Kar, D. and S. Freitas (2012): Illicit Financial Flows from China and the Role of Trade Misinvoicing, Global Financial Integrity, http://www.gfintegrity.org/storage/gfip/documents/reports/ChinaOct2012/gfi-china-oct2012-report-web.pdf, accessed 7 January 2013.

Konrad, K.A. and K.E. Lommerud (2001): Foreign direct investment, intra-firm trade and ownership structure, *European Economic Review* 45, 475-494.

Lanz, R. and S. Miroudot (2011): Intra-Firm Trade: Patterns, Determinants and Policy Implications, *OECD Trade Policy Working Papers*, No.114, OECD Publishing.

Limão, N. and A.J. Venables (2001): Infrastructure, Geographical Disadvantage, Transport Costs, and Trade, *World Bank Economic Review* 15(3), 451-479.

Liu, X. Q., B. W. Ang and H. L. Ong (1992): The Application of the Divisia Index to the Decomposition of Changes in Industrial Energy Consumption, *The Energy Journal*, Vol. 13, No. 4, 161-177.

Manova, K. and Zh. Zhang (2009): China's Exporters and Importers Firms, Products and Trade Partners, *NBER WORKING PAPER SERIES*, National Bureau of Economic Research.

Melchior, A. (2012): International Trade, Trade Costs and Middlemen: A New Look at Mirror Data, *Norwegian Institute of International Affairs*, Oslo.

Morgenstern, O. (1950): The Accuracy of Economic Observations, http://dido.econ.yale.edu/P/cm/m13/m13-16.pdf, accessed 16 November 2012.

Nitsch, V. (2012): Trade Mispricing and Illicit Flows, In *Draining Development?: Controlling Flows of Illicit Funds from Developing Countries,* ed. P. Reuter, 309-334, World Bank.

Rojíček, M. (2011): Globalisation Effects on the Trade Flows: Czech Experience, *Centre for Economic Studies*, *University of Economics and Management*, Prague Czech Statistical Office, Prague.

Sikka, P. and H. Willmott (2010): The dark side of transfer pricing: its role in tax avoidance and wealth retentiveness*, Critical Perspectives on Accounting* 21, 342-356
Sun, H. (2007): Impact of FDI on the Foreign Trade of China, *Journal of the Asia Pacific Economy*, 4:2, 317-339.

Sung, Y. (2005): The China-Hong Kong Connection: The Key to China's Open Door Policy, Department of Economics, *Chinese University of Hong Kong*, http://www.apeaweb.org/confer/hito05/papers/sung_y.pdf, accessed 28 August 2012.

UNCTAD (2011): World Investment Report 2011: Non-equity modes of International Production and Development, http://www.unctad-docs.org/files/UNCTAD-WIR2011-Full-en.pdf, accessed 20 August 2012.

Urquidi, A.J. (2008): An Introduction to Transfer Pricing, *New School Economic Review,* Volume 3(1), 27-45.

Xing, Y. (2006): Why is China so attractive for FDI? The role of exchange rates, *China Economic Review*, Volume 17, Issue 2, 198-209.

Table 1. Hypotheses

	Hypothesis 1	Hypothesis 2	Hypothesis 3
CF export	×	×	×
CFp export	×	×	
CFq export	×		×
CF import	×		×
CFp import	×		
CFq import	×		×

Table 2. Variable Descriptions and Sources of Data

Variable	Description	Source
CIF-FOB	CIF-FOB ratio for exports and for imports	UN's COMTRADE database
$\frac{FDI}{GDP}$	Inward FDI in current 1000 US$ over GDP in current 1000 US$	National Bureau of Statistics of China (NBS) and The World Bank
tar	Most favored nation average tariff rates	The World Bank and World Development Indicators (WDI)
e	Excahange rate	National Bureau of Statistics of China (NBS)

Table 3. Dropped observations

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
miror value dropped	115261	130222	115838	113462	113960	113669	117768	116134	119262	120002	127786	134537
%	40,20 %	43,16 %	30,85 %	28,08 %	26,34 %	24,36 %	23,37 %	21,43 %	20,64 %	20,40 %	21,40 %	22,42 %
different quantity units dropped	103993	104219	118699	135358	143881	155931	163053	166856	178689	195987	196017	191593
%	36,27 %	34,54 %	31,62 %	33,49 %	33,25 %	33,42 %	32,36 %	30,80 %	30,93 %	33,32 %	32,83 %	31,93 %
total dropped	286750	301711	375428	404120	432716	466633	503908	541818	577761	588274	597013	599995
% dropped	77,47 %	78,70 %	64,45 %	63,79 %	61,87 %	60,15 %	58,74 %	55,60 %	55,17 %	57,45 %	57,97 %	58,19 %
variables left	64602	64262	133480	146319	164985	185933	207893	240571	259004	250318	250915	250871
%	22,53 %	21,30 %	35,55 %	36,21 %	38,13 %	39,85 %	41,26 %	44,40 %	44,83 %	42,55 %	42,03 %	41,81 %

Table 4. CIF-FOB Chinese exports

CIF/FOB (value)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	1,74	1,58	1,63	1,71	1,67	1,46	1,64	1,49	1,49	1,46	1,40	1,54
FRA	2,20	2,09	2,13	2,18	2,28	1,75	1,84	2,03	1,99	1,77	1,78	1,74
GBR	1,05	0,99	1,92	1,84	1,84	1,73	1,67	1,59	1,50	1,44	1,38	1,35
HKG	1,78	1,79	1,78	1,63	1,44	1,31	1,19	1,11	1,05	1,00	0,99	0,99
IND	1,00	0,87	0,88	0,90	0,88	1,00	0,97	1,09	1,00	0,94	0,89	0,89
JPN	1,24	1,15	1,30	1,26	1,26	1,26	1,27	1,30	1,29	1,27	1,19	1,22
KOR	1,12	0,88	1,19	1,13	1,14	1,08	1,04	1,07	1,06	1,11	1,02	1,04
NLD	0,72	0,70	1,00	1,06	0,97	0,88	0,97	0,93	0,94	0,95	0,87	0,87
SGP	1,20	1,16	1,24	1,27	1,22	1,25	1,21	1,15	1,08	0,98	1,16	0,98
USA	1,86	1,68	1,96	1,87	1,82	1,67	1,62	1,53	1,46	1,48	1,40	1,38

Table 5. CIF-FOB Chinese imports

CIF/FOB (value)	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	1,00	1,21	1,26	1,29	1,18	1,19	1,17	1,16	1,10	1,10	1,12	1,13
FRA	1,01	1,14	1,26	1,31	1,20	1,10	1,11	1,23	1,11	1,11	1,19	1,20
GBR	1,13	1,48	1,35	1,24	1,29	1,11	1,06	1,02	1,04	1,09	1,09	0,99
HKG	0,79	0,83	1,19	1,18	1,39	1,58	1,64	1,34	1,42	1,87	1,50	1,42
IND	2,04	1,80	1,60	1,68	1,48	2,00	1,82	1,37	1,30	1,54	2,08	1,41
JPN	1,34	1,51	1,32	1,34	1,36	1,32	1,32	1,30	1,28	1,30	1,27	1,25
KOR	1,12	1,26	1,16	1,17	1,09	1,12	1,07	1,12	1,38	1,38	1,33	1,22
NLD	1,16	0,97	1,16	1,24	0,98	1,06	1,02	0,94	0,95	1,05	1,01	0,86
SGP	1,07	1,09	1,00	1,06	1,09	1,07	0,94	0,86	0,90	0,65	0,73	0,78
USA	1,11	1,24	1,38	1,39	1,25	1,26	1,40	1,30	1,19	1,20	1,25	1,23

Table 6. CIF-FOB price (Chinese exports)

CFp	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	1,66	1,76	2,01	1,96	2,08	1,86	1,82	1,73	1,69	1,37	1,46	1,33
FRA	1,79	1,87	1,52	1,45	1,40	1,31	1,32	1,22	1,31	1,25	1,54	1,13
GBR	1,58	1,76	1,69	1,38	1,36	1,31	1,37	1,30	1,19	1,15	1,09	1,02
HKG	1,39	1,54	1,56	1,59	1,14	1,10	1,07	1,00	0,96	0,90	0,92	0,92
IND	1,16	1,37	1,36	1,08	0,94	1,32	1,41	1,47	1,50	1,30	1,26	1,14
JPN	1,36	1,41	1,46	1,15	1,11	1,14	1,11	1,44	1,35	1,31	1,31	1,07
KOR	1,20	1,40	1,24	1,40	1,44	1,51	1,52	1,39	1,34	1,16	1,18	1,18
NLD	1,73	2,07	1,43	1,33	1,30	1,39	1,44	1,33	1,32	1,20	1,20	2,30
SGP	1,36	1,53	1,36	1,34	1,10	1,18	0,93	1,14	1,17	1,17	1,27	1,20
USA	1,72	1,79	2,03	1,94	1,86	1,68	1,70	1,45	1,50	1,34	1,51	1,18

Table 7. CIF-FOB price (Chinese imports)

CFq	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	1,05	0,90	0,81	0,87	0,80	0,78	0,90	0,86	0,88	1,07	0,96	1,16
FRA	1,23	1,12	1,40	1,51	1,63	1,34	1,39	1,66	1,51	1,41	1,16	1,54
GBR	0,66	0,56	1,13	1,33	1,35	1,32	1,21	1,23	1,27	1,25	1,26	1,33
HKG	1,28	1,16	1,14	1,03	1,26	1,19	1,11	1,11	1,09	1,10	1,08	1,08
IND	0,86	0,64	0,65	0,83	0,94	0,76	0,69	0,74	0,67	0,72	0,70	0,78
JPN	0,91	0,82	0,89	1,10	1,14	1,10	1,14	0,91	0,96	0,97	0,91	1,13
KOR	0,93	0,63	0,95	0,81	0,79	0,71	0,68	0,77	0,79	0,95	0,86	0,88
NLD	0,42	0,34	0,70	0,80	0,74	0,63	0,68	0,70	0,72	0,79	0,72	0,38
SGP	0,88	0,76	0,91	0,95	1,10	1,06	1,31	1,01	0,92	0,83	0,91	0,82
USA	1,08	0,94	0,96	0,96	0,98	0,99	0,95	1,06	0,97	1,11	0,93	1,17

Table 8. CIF-FOB quantity (Chinese exports)

CFp	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	0,74	0,77	1,13	1,05	1,27	1,29	1,40	1,39	1,42	1,27	1,30	1,30
FRA	1,02	1,00	0,96	1,02	1,07	1,02	1,01	1,05	0,96	0,90	0,95	0,97
GBR	0,82	0,92	1,14	1,01	1,03	1,00	1,07	1,21	1,01	0,96	1,11	1,23
HKG	0,56	0,56	0,63	0,61	0,88	0,87	0,93	0,99	0,94	1,15	1,31	1,38
IND	1,19	1,01	0,84	1,04	0,89	0,96	1,18	1,21	1,08	1,17	1,33	1,17
JPN	0,69	0,77	0,72	0,86	0,92	0,77	0,90	1,13	0,98	0,97	1,02	1,02
KOR	0,96	0,97	0,88	0,98	1,00	1,04	1,01	0,98	1,00	1,14	1,05	1,05
NLD	0,98	0,93	1,05	1,16	1,04	1,08	1,06	1,04	0,97	0,92	1,02	1,11
SGP	0,96	0,90	0,81	0,85	0,91	0,99	1,12	1,53	1,40	1,49	1,27	0,94
USA	0,98	0,87	0,98	1,14	1,16	1,10	1,15	1,21	1,01	1,01	1,37	1,12

Table 9. CIF-FOB quantity (Chinese imports)

CFq	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
DEU	1,34	1,57	1,11	1,22	0,93	0,92	0,84	0,84	0,78	0,87	0,86	0,87
FRA	0,99	1,13	1,32	1,29	1,12	1,07	1,09	1,17	1,16	1,23	1,26	1,23
GBR	1,38	1,61	1,18	1,24	1,25	1,11	1,00	0,84	1,03	1,13	0,98	0,80
HKG	1,41	1,48	1,88	1,92	1,57	1,82	1,76	1,35	1,51	1,62	1,15	1,03
IND	1,72	1,78	1,91	1,61	1,67	2,08	1,54	1,14	1,21	1,31	1,57	1,20
JPN	1,95	1,96	1,85	1,56	1,47	1,71	1,47	1,15	1,30	1,35	1,25	1,22
KOR	1,16	1,31	1,31	1,19	1,09	1,08	1,06	1,15	1,38	1,21	1,26	1,16
NLD	1,17	1,04	1,10	1,07	0,94	0,99	0,96	0,90	0,98	1,14	0,99	0,78
SGP	1,12	1,21	1,22	1,25	1,20	1,08	0,84	0,56	0,64	0,44	0,57	0,83
USA	1,13	1,43	1,42	1,21	1,07	1,14	1,22	1,08	1,19	1,18	0,92	1,10

Table 10. Regression filtered data

	CF export	CF import	CFp export	CFp import	CFq export	CFq import
	RE(log)	RE(log)	RE(log)	RE(log)	RE(log)	FE(log)
constant	6,168404	5,985119	5,627207	6,147015	5,80121	5,341146
	(0,1202333)	(0,1553002)	(0,1384802)	(0,15738)	(0,315558)	(0,3245031)
FDI	-0,0100713	0,0297351	0,0236946*	-0,019382	0,0691722***	0,00615452**
	(0,0097255)	(0,014913)	(0,0123588)	(0,0149718)	(0,0265062)	(0,0309464)
Tariff	0,0324876**	0,0029379	0,063091***	0,0213157	-0,014709	0,0080853
	(0,0142856)	(0,0213748)	(0,0182167)	(0,0211979)	(0,0403945)	(0,0467822)
Exchange rate	-0,0393663	0,001602	0,1273887***	-0,0324974	-0,6008339***	-0,9182924***
	(0,0250145)	(0,0391269)	(0,0329368)	(0,0377158)	(0,0716308)	(0,0794818)
R^2	0,0089	0,0023	0,0227	0,0026	0,0479	0,0863

Notes: N = 147 countries. Robust standard errors in parentheses. *** denotes significance at 1%, ** denotes significance at 5%, * denotes significance at 10%.

Table 11. Expected signs of the variables

	FDI	*lntar*	*lne*
CF export	+/-	-	+
CFp export	+	-	+
CFq export	+/-		
CF import	+/-		+
CFp import	+		+
CFq import	+/-		

Appendix A

Marshall–Edgeworth index

$$P_{ME} = \frac{\sum\left[p_{c,t_n} \cdot \frac{1}{2} \cdot \left(q_{c,t_0} + q_{c,t_n}\right)\right]}{\sum\left[p_{c,t_0} \cdot \frac{1}{2} \cdot \left(q_{c,t_0} + q_{c,t_n}\right)\right]} = \frac{\sum\left[p_{c,t_n} \cdot \left(q_{c,t_0} + q_{c,t_n}\right)\right]}{\sum\left[p_{c,t_0} \cdot \left(q_{c,t_0} + q_{c,t_n}\right)\right]}$$

Appendix B

ALB (Albania)
ARE (United Arab Emirates)
ARG (Argentina)
ARM (Armenia)
AUS (Australia)
AUT (Austria)
AZE (Azerbaijan)
BEL (Belgium)
BEN (Benin)
BFA (Burkina Faso)
BGD (Bangladesh)
BGR (Bulgaria)
BHR (Bahrain)
BHS (Bahamas)
BIH (Bosnia and Herzegovina)
BLR (Belarussia)
BLZ (Belize)
BMU (Bermuda)
BOL (Bolivia)
BRA (Brazil)
BRB (Barbados)
BRN (Brunei)
BWA (Botswana)
CAF (Central African Republic)
CAN (Canada)
CHE (Switzerland)
CHL (Chile)
CIV (Cote d'Ivoire)
CMR (Cameroon)
COG (Congo, Rep.)
COL (Colombia)
CPV (Cape Verde)
CRI (Costa Rica)
CUB (Cuba)
CYP (Cyprus)
CZE (Czech Republic)
DEU (Germany)
DJI (Djibouti)
DMA (Dominica)
DNK (Denmark)
DOM (Dominican Republic)
DZA (Algeria)
ECU (Ecuador)
EGY (Egypt)
ERI (Eritrea)
ESP (Spain)
EST (Estonia)
ETH (Ethiopia(excludes Eritrea))
FIN (Finland)
FJI (Fiji)
FRA (France)
GAB (Gabon)
GBR (United Kingdom)
GEO (Georgia)
GHA (Ghana)
GIN (Guinea)
GMB (Gambia, The)
GRC (Greece)
GRD (Grenada)
GTM (Guatemala)
GUY (Guyana)
HKG (Hong Kong, China)
HND (Honduras)
HRV (Croatia)
HUN (Hungary)
IDN (Indonesia)
IND (India)
IRL (Ireland)
IRN (Iran, Islamic Rep.)
ISL (Iceland)
ISR (Israel)
ITA (Italy)
JAM (Jamaica)
JOR (Jordan)
JPN (Japan)
KAZ (Kazakhstan)
KEN (Kenya)
KGZ (Kyrgyz Republic)
KHM (Combodia)
KOR (Korea, Rep.)
KWT (Kuwait)
LBN (Lebanon)
LKA (Sri Lanka)
LSO (Lesotho)
LTU (Lithuania)
LUX (Luxembourg)
LVA (Latvia)
MAC (Macao)
MAR (Marocco)
MDG (Madagascar)
MEX (Mexico)
MKD (Macedonia, FYR)
MLI (Mali)
MLT (Malta)
MNG (Mongolia)
MOZ (Mozambique)
MRT (Mauritania)
MUS (Mauritius)
MYS (Malaysia)
NAM (Namibia)
NER (Niger)
NGA (Nigeria)
NLD (Netherlands)
NOR (Norway)
NPL (Nepal)
NZL (New Zealand)
OMN (Oman)
PAK (Pakistan)
PAN (Panama)
PER (Peru)
PHL (Philippines)
PNG (Papua New Guinea)
POL (Poland)
PRT (Portugal)
PRY (Paraguay)
QAT (Qatar)
ROM (Romania)
RUS (Russian Federation)
RWA (Rwanda)
SAU (Saudi Arabia)
SDN (Sudan)
SEN (Senegal)
SGP (Singapore)
SLB (Solomon Islands)
SLE (Sierra Leone)
SLV (El Salvador)
SUR (Suriname)
SVN (Slovenia)
SWE (Sweden)
SYC (Seychelles)
SYR (Syrian Arab Republic)
TGO (Togo)
THA (Thailand)
TUN (Tunisia)
TUR (Turkey)
TZA (Tanzania)
UGA (Uganda)
UKR (Ukraine)
URY (Uruguay)
USA (United States)
VCT (St. Vincent and the Grenadines)
VEN (Venezuela)
VNM (Vietnam)
VUT (Vanuatu)
ZAF (South Africa)
ZMB (Zambia)