



UNIVERSITI PUTRA MALAYSIA

***ROLE OF TRADE DATA DISCREPANCY IN THE EXCHANGE RATE-
TRADE
DILEMMA***

KARAM SHAAR

FEP 2014 27



**ROLE OF TRADE DATA DISCREPANCY IN THE EXCHANGE RATE-TRADE
DILEMMA**

By

KARAM SHAAR

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
fulfilment of the requirements for the degree of
Master of Science.

November 2014

COPYRIGHT

All material contained within the thesis, including without limitation text, logos, icons, photographs and all other artwork, is copyright material of Universiti Putra Malaysia unless otherwise Stated. Use may be made of any material contained within the thesis for non-commercial purposes from the copyright holder. Commercial use of material may only be made with the express, prior, written permission of Universiti Putra Malaysia.

Copyright © Universiti Putra Malaysia



This study is dedicated to my father, Ahmad Adib Shaar.



© COPYRIGHT UPM

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

ROLE OF TRADE DATA DISCREPANCY IN THE EXCHANGE RATE-TRADE DILEMMA

By

KARAM SHAAR

November 2014

Chairman: Professor Ahmad Zubaidi Baharumshah, PhD

Faculty: Economics and Management

Previous empirical studies investigating the effects of real exchange rate depreciation on sectoral trade balance have widely ignored the fact that trade data can be substantially inaccurate. By comparing what each side of a bilateral trade claims to have actually traded with the other, the problem of sectoral trade data discrepancy can be assessed. For the very crucial case of the US-China bilateral trade, this research compiles all available sectoral trade data as reported by both countries over 26 years and 1366 sectors of trade. This study first assesses the discrepancy in trade data using the tools of Reports Ratio and Pearson's Product-Moment Correlation Function. Subsequently, trade balance as reported by both China and the US independently is established for 55 sectors of average discrepancy. After it, the only dynamic theory in concept on this issue, the J-Curve Theory, is tested for the 55 sectors using the Autoregressive Distributed Lag technique of cointegration and Error Correction Mechanism to capture the short and long-run effects. The J-Curve is tested twice for each sector, each time using the data reported by one partner only, *ceteris paribus*. The results of this research confirm the existence of the research problem and draw many conclusions on the issue. First, there is a profound trade data discrepancy between the US and China, although the data is still heading towards reconciliation over time. Second, the strength of discrepancy depends on many factors, i.e. the direction of trade flow, the level of disaggregation of trade data, and time. Third, the use of different trade data resources for assessing the J-Curve yields relatively different coefficient estimates for real exchange rate, in some cases, the coefficient estimates are contradictory even. Fourth, the effects of Yuan depreciation on the US bilateral trade deficit with China are still apparent and affluent using either data resource, while coefficient estimates claiming the opposite are highly mixed and inconsistent. This study proposes Mutual Confirmation as a technique for improving the reliability of the J-Curve empirical results. That is, an estimation of the effect of real exchange rate depreciation on trade balance should be supported using the data reported by both trade partners separately.

Abstrak tesis yang dikemukakan senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sians

**PERANAN PERCANGGAHAN DATA PERDAGANGAN DALAM KADAR
PERTUKARAN-PERDAGANGAN DILEMA**

Oleh

KARAM SHAAR

November 2014

Pengerusi: Profesor Ahmad Zubaidi Baharumshah, PhD

Fakulti: Ekonomi dan Pengurusan

Kajian empirikal terdahulu menyiasat kesan susut nilai kadar pertukaran sebenar terhadap imbalan perdagangan sektor telah mengabaikan hakikat bahawa data perdagangan boleh sebahagian besarnya tidak tepat. Dengan membandingkan apa yang setiap pihak dalam sebuah perdagangan dua hala mendakwa apa yang telah diniagakan, masalah percanggahan data perdagangan sektor boleh dinilai. Bagi kes perdagangan dua hala AS-China, kajian ini menyusun semua data perdagangan sektor didapati yang telah dilaporkan oleh kedua-dua negara untuk lebih 26 tahun dan 1366 sektor perdagangan. Kajian ini bermula dengan menilai percanggahan dalam data perdagangan menggunakan Nisbah Laporan dan Fungsi Korelasi Produk-Moment Pearson. Selepas itu, imbalan perdagangan seperti yang telah dilaporkan oleh kedua-dua China dan Amerika Syarikat secara berasingan akan ditubuhkan bagi 55 sektor percanggahan secara purata. Selepas itu, satu-satunya teori dinamik di isu ini, teori J-Curve, akan diuji bagi sektor 55 menggunakan teknik Kointegrasi Lag Pengedaran Autoregresi dan Pembetulan Ralat Mekanisme untuk menangkap kesan jangka pendek dan jangka panjang. J-Curve akan diuji sebanyak dua kali bagi setiap sektor, setiap kali menggunakan data yang dilaporkan oleh satu pasangan sahaja, ceteris paribus. Hasil kajian ini mengesahkan kewujudan masalah kajian dan menarik ramai kesimpulan mengenai isu itu. Pertama, terdapat percanggahan mendalam data perdagangan antara Amerika Syarikat dan China, walaupun data yang masih menuju ke arah perdamaian dari masa ke masa. Kedua, kekuatan percanggahan bergantung kepada banyak faktor, iaitu arah aliran perdagangan, tahap pengasingan data perdagangan, dan masa. Ketiga, penggunaan sumber-sumber data perdagangan yang berbeza untuk menilai hasil J-Curve anggaran pekali yang agak berbeza untuk kadar pertukaran sebenar, dalam beberapa kes, anggaran pekali bercanggah. Kajian ini mencadangkan Pengesahan Mutlak sebagai teknik untuk meningkatkan kebolehpercayaan keputusan empirikal J-Curve. Iaitu, anggaran kesan susut nilai kadar pertukaran sebenar terhadap imbalan perdagangan perlu disokong dengan menggunakan data yang dilaporkan oleh kedua-dua rakan kongsi perdagangan secara berasingan.

ACKNOWLEDGEMENTS

Foremost, I would like to thank my family for their unconditional trust and love. I would also like to express my sincere gratitude to my supervisor, Prof. Ahmad Zubaidi Baharumshah, for the freedom he allowed me during the two years of working under his supervision, for his conciseness, clarity, and immense knowledge. I am truly thankful for all the knowledge I gained from him.





This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the supervisory committee were as follows:

Ahmad Zubaidi Baharumshah, PhD

Professor
Faculty of Economics and Management
Universiti Putra Malaysia
(Chairman)

Zulkornain Yusop, PhD

Professor
Faculty of Economics and Management
Universiti Putra Malaysia
(Member)

BUJANG BIN KIM HUAT, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

Declaration by graduate student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations, and citations have been duly referenced;
- this thesis has been not been submitted previously or concurrently for any other degree at any other institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed, or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules, or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: _____ Date: 2 March 2015

Name and Metric No: Karam Shaar (GS34056)

Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____

Name of
Chairman of
Supervisory
Committee

Signature: _____

Name of
Member of
Supervisory
Committee

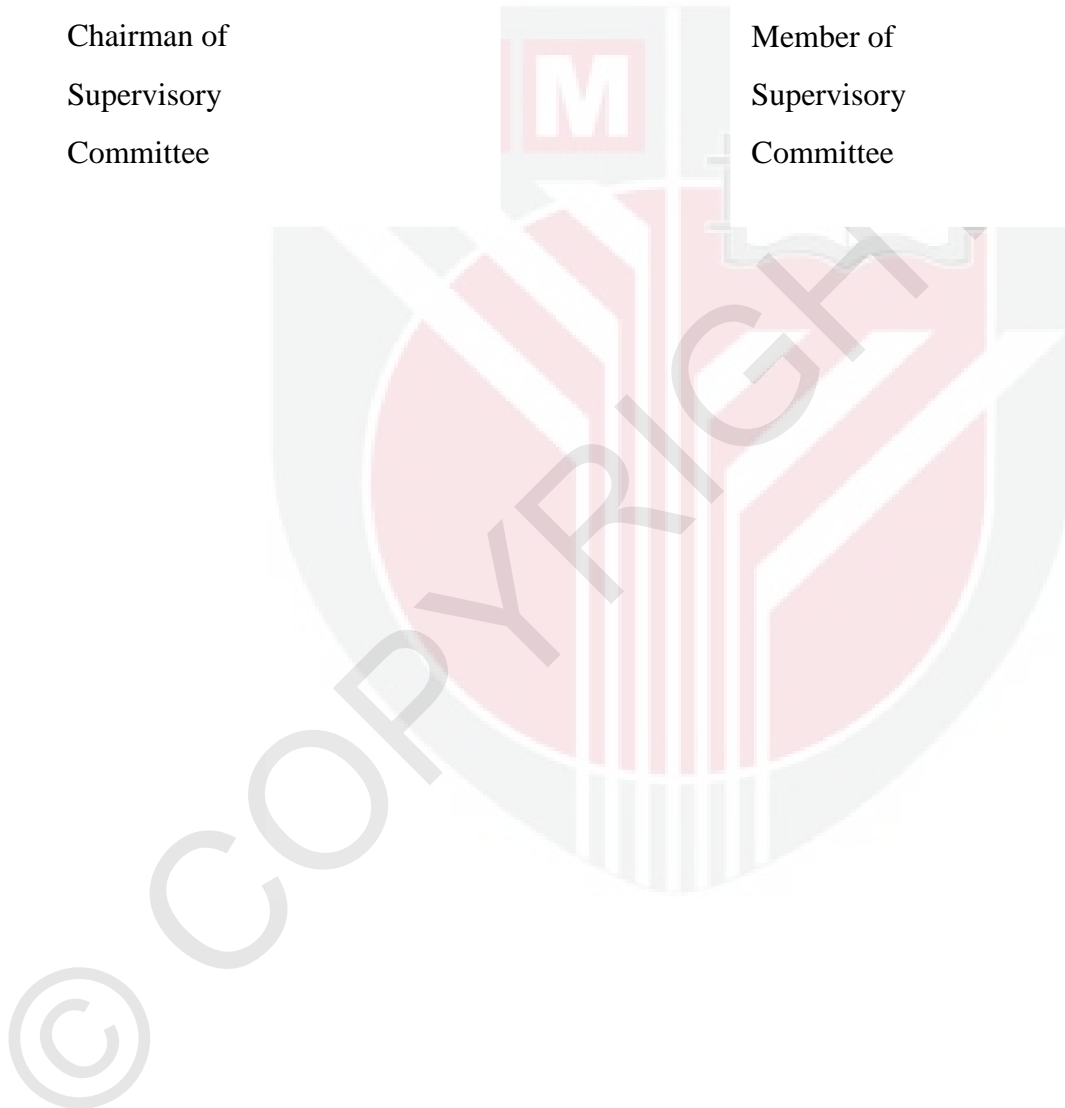


TABLE OF CONTENTS

	Page
ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENTS	iv
APPROVAL	v
DECLARATION	vii
LIST OF TABLES	xi
LIST OF FIGURES	xii
CHAPTER	
1 Introduction	
1.1 Background of the Study	1
1.1.1 Trade data discrepancy	2
1.1.2 The J-Curve Phenomenon on sectoral level	4
1.1.3 The US-China bilateral trade as a case study	7
1.2 Problem statement	10
1.3 Research objectives	11
1.4 Significance of the study	11
1.5 Organization of the study	12
CHAPTER	
2 LITERATURE REVIEW	13
2.1 The problem of trade data discrepancy	13
2.1.1 Timing	14
2.1.2 The differing definitions of exports and imports	15
2.1.3 General vs. special trade, and goods in transit	15
2.1.4 Middleman effect	16
2.1.5 Misclassification of goods	18
2.1.6 Deliberate mis-invoicing, and misattribution	18
2.1.7 Smuggling	19
2.1.8 Geographical definition of partner countries	20
2.1.9 Changes in exchange rate	20
2.2 J-Curve Theory	21
2.2.1 J-Curve in a theoretical context	21
2.2.2 Empirical literature on the J-Curve	25
2.3 Remarks on the literature	33

CHAPTER		
3	RESEARCH METHODOLOGY	35
	3.1 Research Approach	35
	3.2 Data definitions and resources	36
	3.3 Research Methods	37
	3.3.1 Empirical assessment for data discrepancy	37
	3.3.2 Estimating the J-Curve	38
CHAPTER		
4	EMPIRICAL RESULTS	43
	4.1 Empirical results of reports' discrepancy	43
	4.1.1 Overall assessment of sectoral trade data discrepancy	43
	1.1.1 Dynamic assessment of sectoral trade data discrepancy	47
	4.1.3 Results summary for data discrepancy	52
	4.2 Empirical results of the J-Curve	53
	4.2.2 Short-run coefficient estimates of REX	58
	4.2.3 long-run coefficient estimates	65
	4.2.4 Results Summary of the J-Curve	72
CHAPTER		
5	CONCLUSION	73
	5.1 Summary of the study and major findings	73
	5.2 Research Implications	74
	5.3 Recommendations for further research	75
REFERENCES		76
APPENDICES		
	APPENDIX A: SECTORS ANALYZED FOR THE J-CURVE	84
	APPENDIX B: VARIABLE DEFINITIONS AND RESOURCES	86
BIODATA OF STUDENT		87
LIST OF PUBLICATIONS		88

LIST OF TABLES

Table		Page
3.1	Summary of trade data	36
4.1	Summary of trade data discrepancy	44
4.2	Dynamic analysis of discrepancy in SITC for US imports	48
4.3	Dynamic analysis of discrepancy in SITC for US exports	49
4.4	Results summary for data discrepancy	52
4.5	Cointegration results using US report	53
4.6	Cointegration results using China's report	55
4.7	Short-run effects of REX on trade balance (US reports)	58
4.8	Short-run effects of REX on trade balance (China's reports)	61
4.9	Long-run coefficient estimates using US reports	65
4.10	Long-run coefficient estimates for China data	68
4.11	J-Curve analysis results summary	72

LIST OF FIGURES

Figure		Page
1.1	US total imports data discrepancy	3
1.2	The J-Curve Phenomenon	6
2.1	Elasticities Approach	22
2.2	Marshall-Lerner Condition	23
4.1	Average correlation for each level of disaggregation	45
4.2	Average reports' ratio for each level of disaggregation	45
4.3	Annual size ratio among reports [SITC 5 digits]	50
4.4	Annual correlation among reports [SITC 5 digits]	51

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

It is still remembered that nearly six decades ago, in 1949, the post-Keynesian high-profile economist Joan Robinson turned down an offer for the position of Vice-president of the Econometric Society, which sponsors today's top-notch academic journal *Econometrica*. By that time, she justified her decision on the grounds that she would not accept a position in an editorial committee of a journal she "could not read" (Saith 2008). It is reasonable to wonder whether she would make the same decision if she were offered the same position today.

Like all sciences, Econometrics has never been criticism-free. This complex combination of economic theory, mathematics, and statistics has historically been the subject of denigration from mainly two perspectives. First, the group of economists who opposed the "econometric formalism" of the economic phenomena. They denied the econometric techniques themselves. The main objection could be summarized by the claim that Econometrics oversimplifies the macroeconomic behavior (Lucas Jr 1976). Assuming wrong models, modifying data, and applying inaccurate estimation techniques that do not account for changes in the patterns of economic behavior can result in spurious conclusions, as its claimed that Ronald Coase have said "if you torture the data long enough, it will confess" (Tulloch 2001). As Lucas Jr (1976) believed, the sciences of Economics and Econometrics should be recognized as two distinct disciplines, he further predicted that reconciliation along these two lines will fail in the future. Furthermore, he alleged that one of these two traditions is "fundamentally in error". The supporters of this notion seem to be mainly post-Keynesians, as John Maynard Keynes himself opposed "arid mathematical formalism" of economics (Dow and Hillard 2002). Nevertheless, the tendency towards denying the key role of econometrics as a tool for economic analysis has gradually lost momentum by the recent novel advancements in econometric methods. Currently, developments in econometrics and computerization have helped making econometrics the dominant research methodology in economics (Johnson, Perry and Petkus 2012).

On the other hand, the second reason for criticism stems from another commonsense discrete issue, that is, the accuracy of the data employed in econometric analysis, regardless the validity of the models and/or methods themselves. This point of view which goes one step prior to raising the question of estimation techniques and model specification poses some tough questions in today's econometric analysis. Since the inputs

of the models, the data, is occasionally in substantial error as various sources suggest, the expediency of econometrics becomes questionable (Bagus 2011).

The lack of accuracy in economic data can affect all scholarly studies in economics, although to different extents. For an economic historian, the quality of data is important, since incorrect data can lead to incorrect interpretations for the past. More importantly, for a policymaker, the accuracy of data is crucial, as policymakers might make their decisions based on the results of econometric tests, which used inaccurate data. Such incident might be catastrophic with extensive consequences on the whole economy (Bagus 2011; Morgenstern 1950).

Following the guidelines of applied statistics for certain econometric analysis where the independent variable might have a weak effect or no effect at all on the dependent variable, data accuracy plays a more crucial role in determining the true relation i.e. the effect of exchange rate depreciation on sectoral trade. Attaining meaningful results for studying the effect of exchange rate depreciation on sectoral trade does not only require applying rightful econometric methods, but requires in the first place employing accurate data, the fact that has been broadly neglected.

The purpose of this study is to investigate the role of sectoral trade data inaccuracy on estimating the effect of exchange rate depreciation on trade. Although the researcher spends a considerable proportion of this study searching and assessing the right theory to investigate regarding the exchange rate-trade dilemma, the J-Curve Theory, the focus of this thesis is to test the effects of trade data inaccuracy on that dilemma rather than the Theory itself.

The subsequent three points explain the ideas the topic of this thesis revolves around. First, 1.1.1 briefly explains the issue of trade data inaccuracy. The following point 1.1.2, elucidates the theory this thesis is to investigate, the J-Curve. Finally, 1.1.3 justifies the choice of the US-China bilateral trade as a case study. A summary of these three points will function as the problem statement of this study, as shown in section 1.2.

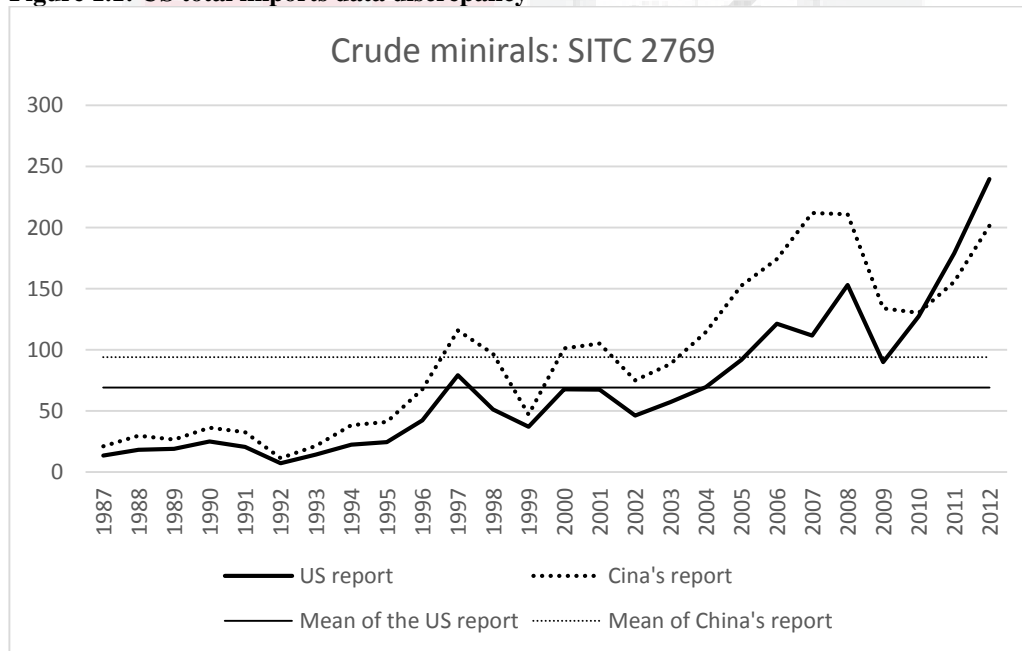
1.1.1 Trade data discrepancy

Despite the recent vast developments in international trade, especially in manufactured goods, such development does not seem to be reflected on the quality of trade data. Discrepancy in international trade data is becoming more and more obvious, thus, pausing major concerns among econometricians, policymakers, economists and statisticians (Ferrantino and Wang 2008). Assuming commodity x is traded between countries (a) and (b), the problem of trade data discrepancy can be summarized as follows: Exports value of country (a) to country (b) as reported by country (a) does not equal the imports value

of country (b) from country (a) as reported by country (b). Discrepancy in trade data, which was first observed and analyzed in the early twentieth century, has become since then a major field of research, with outcomes affecting both policymakers and academia (Tsigas, Hertel and Binkley 1992).

Figure 1.1 depicts a real example of trade data discrepancy from the data used in this study. It plots the data of the US imports of crude minerals from China as reported by the US compared with the mirrored trade flow reported by China. It covers the period 1987-2012 as retrieved from the World Integrated Trade Solution, the World Bank, SITC revision 1, digit 4. (refer to the research methodology chapter for the data resource). The values are converted to millions of dollars for the ease of charting.

Figure 1.1: US total imports data discrepancy



Source: World Integrated Trade Solution, the World Bank

As Figure 1.1 shows, there is an apparent difference between what the US claims to have imported from China and China claims to have exported to the US of the same sector over the same period. Furthermore, the mean of the time series of the US report stands at 69.14, while for China's report it is 93.96, that is 24.8 million dollars difference. Thus, China's report is almost 36% higher than the US report. However, by descending to lower levels of aggregation, i.e. five digits, the problem can be more and more apparent as chapter 4 shows in detail.

1.1.2 The J-Curve Phenomenon on sectoral level

Although stimulating trade flows is not the chief goal of monetary policy, or at least not one of the announced major roles of a modern central bank, trade has been empirically proven to be affected by many of the activities taken by the central bank, either directly or indirectly. Thus, the effect of exchange rate on trade flows has been a major question that many studies tried to address. This thesis is concerned about one factor of monetary policy in relation with trade, the real exchange rate.

Many theories were put forward to explain the relation between real exchange rate and trade flows. As widely accepted by the traditional school of trade, currency depreciation can be a basic policy to improve trade balance since a real currency depreciation makes exported domestic products more competitive in international markets, because they become relatively cheaper for the foreign importers. On the other hand, currency depreciation for a country makes it harder for the domestic market to import foreign commodities because they become relatively more expensive (Zhang 2008). However, empirical results fail to provide a unanimous support for this view, the results are highly mixed, and even contradictory.

By the gradual improvement in economic thought, other theories started to emerge as alternatives for the rudimentary classical trade theory. Other theories integrated the elasticities of demand for exports and imports in the analysis, arguing that the relation can be better grasped if we are able of recognizing the difference between markets that are sensitive to changes in price and others which are not (Lerner 1944). Another theory put by Meade (1951), Alexander (1952) and others, called the Absorption Approach, combined the Elasticities Approach with the Keynesian macroeconomics. This approach claims, if the value of domestic expenditure is higher than the value of domestic output (income), trade balance deteriorates.

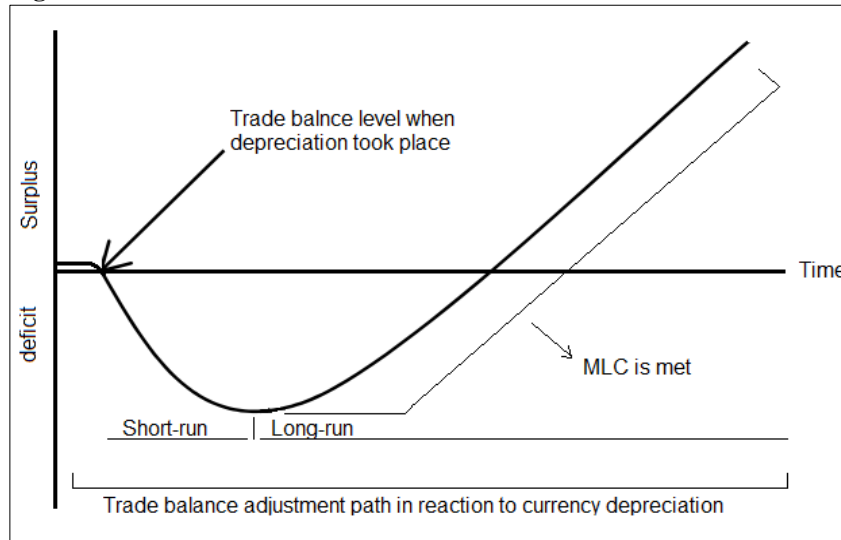
However, among the most prominent approaches in explaining the relationship between trade flows and currency depreciation in international trade is an observed Phenomenon, known as the J-Curve. As first observed by Magee (1973), according to the J-Curve, the trade balance firstly deteriorates by currency depreciation, where the value of imports increase relative to exports. Gradually, trade balance starts improving above its initial level before currency devaluation took place. The J-Curve Theory is one of the best theories, which looks at the issue dynamically. It distinguishes the worsening short-run effect of real exchange rate depreciation on trade balance from the improvement in the long-run. This change in the direction of the relationship takes place mainly due to the sluggish nature of trade volume in response to price changes (low elasticity).

The rationale behind the J-Curve Theory is that; although the nominal exchange rate is changed instantly, it still takes time for the trade volumes to adjust to changes in relative prices in foreign and domestic markets. A devaluation of the real exchange rate affects trade flows/trade balance through two effects, the volume and price effects. The price effect initiated by the depreciation of the domestic currency (an increase in the nominal exchange rate expressed as the number of units of the domestic currency for one unit of the foreign currency) causes exports to become relatively cheaper expressed in foreign currency units. On the other hand, imports become relatively more expensive expressed in domestic currency. The two reasons work in the same direction causing a trade balance to deteriorate.

The short-run price effect discussed above takes place quickly after the exchange rate changes. However, it also paves the way for the second phase of the J-Curve by leading to changes in export and import volumes. The long-run gradual decrease in the volume of imports and the increase in the volume of export, known as the volume effect, reflect the slow adjustments to changes in relative prices and commonly causes the trade balance to improve to a higher level compared to the initial level before the depreciation occurred.

Actually, if the pattern of short-run deterioration and long-run improvement of the trade balance as a result of currency depreciation occurs, that is the J-Curve Phenomenon exists, it can be indicative that the Marshall-Lerner Condition (MLC) is met, too (Clarke and Kulkarni 2010). In simplified terms, the condition claims that if the central bank depreciates currency aiming to improve trade balance, the demand for the nation's exports and imports should be elastic enough to cause a favorable volume effect. The condition under the simplest circumstances states that the sum of the absolute value of the two demand elasticities for exports and imports must exceed unity (Brown and Hogendorn 2000). Figure 1.2, depicts the J-Curve and its relation with MLC:

Figure 1.2: The J-Curve Phenomenon



Source: Author's depiction

Assuming there is a currency appreciation in the domestic country, instead of a depreciation, there could be an inverted J-Curve, or the J-Curve might appear in the partner country instead of the appreciating country. Although the J-Curve seems to be a plausible theory to test, the results of empirical studies are highly mixed. This empirical ambiguity does not seem surprising since trade balance may have different patterns of reaction to currency depreciation depending on the traded commodity, the partner, the structure of the economy, the level of development, and the strength of the devaluation. To solve some of the causes of heterogeneity, empirical studies have accounted for them on two overlapping stages.

After earlier studies on the J-Curve employed aggregate trade data, which means investigating the J-Curve in a country and all of its trade partners in one regression (Himarios 1985; Magee 1973), the first stage of improvement came in the shape of separating the countries into bilateral relations to reduce heterogeneity, thus, these studies investigated the J-Curve in one country with one partner at a time (Rose and Yellen 1989), (Marwah and Klein 1996), and (Bahmani-Oskooee and Brooks 1999).

The second stage of analysis improvement is the latest group of empirical studies which utilized further disaggregated trade data. This group of studies worked on bilateral trade for a set of trade sectors or commodities instead of using the overall bilateral trade. As pointed out by Bahmani-Oskooee and Hegerty (2010) “aggregate or bilateral studies often arrive at ambiguous or conflicting results, or sometimes even no results at all”. Consequently, some studies have disapproved the use of aggregated and bilateral trade data because they might obscure significant results. In other words, when using aggregate trade data, some commodities or sectors might show a positive response to exchange rate

depreciation, while others might show a negative reaction. When the two effects are combined, as done using aggregate and bilaterally aggregate data, these contradictory significant responses might cancel out one another, leading to a false conclusion of one insignificant effect.

There is an enormous body of literature on the J-Curve Theory on sector level. The list includes Baek (2007), Ardalani and Bahmani-Oskooee (2007), Wang (2005), Bahmani-Oskooee and Kovryalova (2008), Bahmani-Oskooee and Mitra (2009), Bahmani-Oskooee and Harvey (2010), and Jamilov (2013). Although these studies are reviewed later in chapter 3, it should be noted that all of them found partial support for the J-Curve in some sectors, all used Autoregressive Distributed Lag approach to cointegration (ARDL), and Error Correction Mechanism (ECM) to capture the short and long-run effects of real exchange rate movements on sectoral trade balance.

1.1.3 The US-China bilateral trade as a case study

US-China trade has developed substantially since the two nations reestablished diplomatic relations in 1979. The total US-China trade has dramatically increased from \$1 billion in 1978, when China was still the 32nd largest nation in the US export market and its 57th largest imports source, to \$536 billion in 2012, where China became America's third largest export market and its greatest source of imports. In terms of total trade, China is the second largest US trade partner preceded only by Canada (Morrison 2013). Given the growth of China's economy, China's market is forecast to grow more significant for the US exports (Morrison 2013). Despite the global financial crisis, half of the US states showed growth in exports to China in 2009 versus 2008. In 2010, twenty four American states exported more than \$1 billion dollars to China, which is three folds higher than the number of states which exported at that level just five years earlier (Full 2000-2010 State Report 2011).

Most importantly for this study, the US-China bilateral trade deficit has surged over the past two decades, skyrocketing from \$10 billion in 1990 to \$315 billion in 2013 (Flannery 2013). China was the second largest source of US trade deficit, preceded by Japan only in 1991, but it became the largest since 2000 onwards. Some US politicians and economists have criticized the high level of trade deficit with China, claiming that it has stolen US jobs and threatened the US economy. The US claim that this deficit is mainly due to China's unfair economic policies against the US (Li 2008). In 2010 alone, the US filed three disputes against China to the World Trade Organization (WTO). The first was regarding China's subsidies to promote its wind power industries, the second about its use of trade "remedy laws" to protect domestic industries, and finally, against China's restrictions on electronic payment services (Morrison 2011). By reviewing the literature, US deficit with China could be attributed to three factors.

First, China's role in the intra-Asia trade framework. Some researchers believe that the US-China trade deficit is chiefly because of China's role in the intra-Asia trade framework (Bottelier 2008). Instead of exporting to the US market directly, several companies from Japan, Taiwan, South Korea, Hong Kong, Singapore, and even American companies investing in China, indirectly export to the US market, after assembling products in China. For example, Eastman Kodak Company which works in digital imaging photography shifted production of its digital cameras in 2004 from Japan to China, and now exports from China to the world including its homeland. As stated by China's Ministry of Commerce, the share of exports from China to the US from foreign-invested companies, including many US-owned companies located in China, mounted 65.8 percent in 2004 of its total exports to the US (Bottelier 2008).

Second, China's inadequate protection of the US intellectual property rights (IPR). On 2007, the Office of the United States Trade Representative filed two IPR cases against China in the WTO involving a number of complaints. The complaints include the claim that China's government only pursue IPR infringement cases it considers to be excessively large, creating a safe harbor for smaller producers or violators. Additionally, the cases claimed that China often allows seized imported pirated goods to reenter the market rather than disposing of them (Morrison 2011). Kabirou and Gao (2014) estimated that China's IPR infringements cost the US \$48 billion in 2008 only.

Third, China's resistance to adopting a market-based currency, which remains as the most important unsolved dispute between the two giant economies. The row over China's undervalued Yuan against the USD dates back to 1994 when China pegged the Yuan to the USD at the rate of 8.7 Y/\$ (Devadoss, Hilland, Mittelhammer and Foltz 2014). From the following year until 2005, China appreciated the Yuan and pegged it at 8.28 Y/\$, which the US claimed to be still highly undervalued (Poleg 2005). After continuous pressure from the US, China adopted a new exchange rate regime in 2005 and moved away from the rigid fixed regime to the USD. Instead, China pegged the Yuan to a basket of currencies including the euro, Japanese yen, US Dollar, South Korean won, the British pound, Thai baht, and the Russian ruble (Devadoss, Hilland, Mittelhammer and Foltz 2014).

The Yuan again appreciated against the USD, falling from nearly 8.10 Y/\$ in 2005 to 6.83 Y/\$ in 2008, which continued at the same rate throughout the global financial crisis (Morrison 2011). In 2010, the Yuan continued to appreciate and reached 6.21 Y/\$ in 2012 (Devadoss, Hilland, Mittelhammer and Foltz 2014), as of August 2014, the Y/\$ remained around the same value at 6.18. However, even with this trend of Yuan appreciation relative to USD, many studies believe the Yuan is still undervalued and far from its actual value if determined by the laws of free market under the free floating exchange rate regime. Subramanian (2010) estimated the Yuan to be undervalued by almost 30% as of April 2010, while Ferguson and Schularick (2011) estimated the undervaluation to be between 30% and 40% for the period of 1980-2008. In summary, estimates of undervaluation in

empirical studies range from 15% to 50% depending on the period and the estimation technique (Morrison 2011).

Many US officials and researchers argue that the undervalued Yuan has given China an immoral trade advantage over the US. They claim that this policy constitutes a de facto subsidy for China's exports to the US, and acts as a de facto tariff barrier on China's imports from the US (Morrison 2011). In line with the existence of substantial US trade data discrepancy, this study believes that the US conclusions on the effects of currency exchange rate movements on its trade balance are questionable. This is because the employed data in empirical analysis is all reported by the US only, rather than any of its partners. Himarios (1985), Rose and Yellen (1989), and Bahmani-Oskooee and Hajilee (2009) are all examples of studies which investigated the effects of exchange rate movements on trade between the US and one or more of its partners using the US trade data only. These studies and others are reviewed in chapter 2.

The dispute over the Yuan value triggered a long political and economic debate between the US and China, and within the US itself on how to tackle with it. A number of bills were proposed (yet, never passed) by the US Congress to counter the effects of Yuan undervaluation on US trade. Many of these bills called for taking corrective measures, such as tariffs, to offset the damage caused by China. For instance, a Senate bill in the US congress in 2003 recommended imposing a 27.5% tariff on Chinese imports, which equaled the level of Yuan undervaluation in that year according to some estimates.

On the other hand, Chinese officials insist that the current managed-float exchange rate regime is not meant to favor exports over imports, but to foster domestic economic stability (Archie 2011). However, in 2010, China's central bank, the People's Bank of China (PBOC) promised that, given the current economic conditions, it had decided to "proceed further with reform of the Yuan exchange rate regime and to enhance the Yuan exchange rate flexibility." The PBOC ruled out any large one-time evaluations, stating that it is important to avoid any sudden substantial shocks of the Y/\$ exchange rate to avoid market disruptions (Wray and Liu 2014).

For the sake of capturing the role of trade data discrepancy in investigating the J-Curve, the US-China bilateral trade could be the best choice given the long experience of these two partners in highly volatile real exchange rate environment and the formidable size of their bilateral trade. Most importantly, regarding the question of the US trade balance deficit with China due to the undervaluation of the Yuan, this study provides better answers through employing the trade data provided by both the US and China independently in the econometric analysis of the J-Curve. Thus, looking at both sides of the coin.

1.2 Problem statement

Previous studies assessing the effects of real exchange rate movements on trade balance broadly neglected the role of trade data inaccuracy, which is the discrepancy between what each side of a bilateral trade claims to have actually traded with the other. Conversely, the literature has mainly focused on the methodological issues of econometric assessment.

When estimating the effect of exchange rate movement on trade balance, say by investigating the J-Curve Theory, if we simply employ the data reported by only one side of a bilateral trade relation, the resulting estimated coefficients might be partial. That is, the regression results retrieved from applying the data of one partner only will be able to reflect merely half of the picture. Therefore, the true effect cannot be accurately captured and it is somewhere between the two regression results as obtained from employing the data reported by each side, once at a time.

Empirical assessment for the effect of real exchange rate on sectoral trade by using the trade data reported by one side only seems unjustifiable. For the case of US-China bilateral trade, the data employed in the literature for econometric analysis has been reported by the US. For instance, Wang (2005) investigated the J-Curve between the US and China on sector level for 88 trade flows over the period 1978-2002 as reported by the US only.

For the same bilateral relation, covered here as a case-study, the average correlation coefficient between the two reports of sectoral trade balances, for all 189 trade sectors of three and four SITC digits, is merely 57%, for the period 1987-2012. However, by comparing the relative size of trade balance as US report/China report, the figure averages 1.34 for the same 189 sectors. Thus, given the considerable difference between what the US claims to have traded with China and what China claims to have traded with the US, what logic can justify the use of the data reported by one side only to assess the effect of bilateral exchange rate movements on bilateral trade balance?

1.3 Research objectives

This study aims to present evidence that previous studies on the effects of Yuan/USD exchange rate movements on the US-China bilateral trade balance are questionable. This is because there is substantial trade data discrepancy between the US and China, while the employed trade data in econometric analysis is reported by the US only. In summary, this thesis has two core objectives:

- i. To assess sectoral trade data discrepancy between the US and China for the whole bulk of available sectoral trade data reported by both partners from 1987 to 2012.
- ii. To investigate the dynamic effects of real exchange rate depreciation on sectoral trade balance in the short and long-run between the US and China using the data provided by each partner independently for 55 rightfully selected representative sectors from 1987 to 2012.

1.4 Significance of the study

For a monetary policymaker, perceiving in advance how would the sectoral trade balance react to a change in the consumer price index or nominal exchange rate (components of real exchange rate) allows taking more rational decisions by assessing the advantages and disadvantages on each sector of trade separately. Additionally, in the context of improving trade balance (increasing the surplus or reducing the deficit), this study improves the comprehension of the J-curve Phenomenon by determining how accurate are the studies which included trade data from one side of a bilateral trade relation rather than both, or a certain combination of both. Building on the findings of this study, researchers might even conclude that with the current state of data inaccuracy, no precise sectoral trade-real exchange rate analysis could be meaningful at all. Furthermore, the detailed investigation for the sectoral trade data discrepancy could find a contribution in any study interested in using sectoral bilateral trade data, not necessarily for the J-Curve analysis.

1.5 Organization of the study

After this preliminary chapter, chapter 2 halves into two sections, where section 2.1 discusses the causes of trade data discrepancy with special attention to the case of the US-China bilateral trade. Section 2.2 first summarizes the theories tried to explain the effect of exchange rate movements on trade balance, and then, explores the empirical literature related to the J-Curve Phenomenon in specific.

Chapters 3 and 4 are for research methodology and test results, respectively. The study is concluded by chapter 5, which summarizes the major findings, the implications of the study, and some recommendations and hints for further research in this field.

REFERENCES

- Alexander, S. S., (1952) Effects of a Devaluation on a Trade Balance, *Staff Papers-International Monetary Fund*, 2, 263-278.
- Archie, C. V., (2011) China cannot have its cake and eat it too: coercing the PRC to reform its currency exchange policy to conform to its WTO obligations, *NCJ Int'l L. & Com. Reg.*, 37, 247.
- Ardalani, Z., and Bahmani-Oskooee, M., (2007) Is there a J-curve at the industry level, *Economics Bulletin*, 6, 1-12.
- Backus, D., and Kehoe, P., (1994) F. Kydland (1994). Dynamics of the Trade Balance and the Terms of Trade: The J-Curve, *The American Economic Review*, 84.
- Bagus, P., (2011) Morgenstern's Forgotten Contribution: A Stab to the Heart of Modern Economics, *American Journal of Economics and Sociology*, 70, 540-562.
- Bahmani-Oskooee, M., (1986) Determinants of international trade flows: the case of developing countries, *Journal of Development Economics*, 20, 107-123.
- Bahmani-Oskooee, M., and Alse, J., (1994) Short-run versus long-run effects of devaluation: error-correction modeling and cointegration, *Eastern Economic Journal*, 20, 453-464.
- Bahmani-Oskooee, M., and Bolhasani, M., (2008) The J-Curve: Evidence from commodity trade between Canada and the US, *Journal of Economics and Finance*, 32, 207-225.
- Bahmani-Oskooee, M., and Brooks, T. J., (1999) Bilateral J-curve between US and her trading partners, *Review of World Economics*, 135, 156-165.
- Bahmani-Oskooee, M., and Hajilee, M., (2009) The J-Curve at industry level: Evidence from Sweden–US trade, *Economic Systems*, 33, 83-92.
- Bahmani-Oskooee, M., and Harvey, H., (2010) The J-curve: Malaysia versus her major trading partners, *Applied Economics*, 42, 1067-1076.
- Bahmani-Oskooee, M., and Hegerty, S. W., (2009) The Japanese–US trade balance and the yen: Evidence from industry data, *Japan and the World Economy*, 21, 161-171.
- Bahmani-Oskooee, M., and Hegerty, S. W., (2010) The J-and S-curves: a survey of the recent literature, *Journal of Economic Studies*, 37, 580-596.

- Bahmani-Oskooee, M., and Kovryalova, M., (2008) Industry Trade Data between US and UK, *Economic Issues*, 13.
- Bahmani-Oskooee, M., and Mitra, R., (2009) The J-curve at the industry level: evidence from US-India trade, *Economics Bulletin*, 29, 1520-1529.
- Bahmani-Oskooee, M., and Ratha, A., (2004) The J-curve dynamics of US bilateral trade, *Journal of Economics and Finance*, 28, 32-38.
- Bahmani-Oskooee, M., and Zhang, R., (2013) The J-curve: evidence from commodity trade between UK and China, *Applied Economics*, 45, 4333-4342.
- Bahmani-Oskooee*, M., and Ratha, A., (2004) The J-curve: a literature review, *Applied Economics*, 36, 1377-1398.
- Bahmani-Oskooee, M., and Wang, Y., (2007) The J-Curve At The Industry Level: Evidence From Trade Between The Us And Australia, *Australian Economic Papers*, 46, 315-328.
- Bickerdike, C. F., (1920) The instability of foreign exchange, *The Economic Journal*, 118-122.
- Brada, J. C., Kutan, A. M., and Zhou, S., (1997) The exchange rate and the balance of trade: the Turkish experience, *The Journal of Development Studies*, 33, 675-692.
- Bronfenbrenner, K., Burke, J., Luce, S., Hickey, R., Juravich, T., Braunstein, E., and Epstein, J., (2001) Impact of US-China trade relations on workers, wages, and employment: Pilot study report.
- Brown, W. B., and Hogendorn, J. S., (2000) *International Economics: In the Age of Globalization*, University of Toronto Press.
- Bruton, A., Conway, J. H., and Holgate, S. T., (2000) Reliability: what is it, and how is it measured?, *Physiotherapy*, 86, 94-99.
- Chao, L., (1994) Customs Crackdown Gets \$270M in Goods, *China Daily Newspaper*, p3, Feb 1.
- Chin, J., (2010) MRCB, Pos in focus after PM unveils new economic model, *The Edge Malaysia news*, 31 March 2010.
- Clarke, A., and Kulkarni, K. G., (2010) Testing the Application of Heckscher-Ohlin Theorem to Contemporary Trade Between Malaysia and Singapore, *Journal of Emerging Knowledge on Emerging Markets*, 1, 10.
- Daniels, J., and VanHoose, D. D., (2005) International monetary and financial economics.

- Demeterfi, K., Derman, E., Kamal, M., and Zou, J., (1999) A guide to volatility and variance swaps, *The Journal of Derivatives*, 6, 9-32.
- Demirden, T., and Pastine, I., (1995) Flexible exchange rates and the J-curve: an alternative approach, *Economics Letters*, 48, 373-377.
- Derrick, T. R., Bates, B. T., and Dufek, J. S., (1994) Evaluation of time-series data sets using the Pearson product-moment correlation coefficient, *Medicine and science in sports and exercise*, 26, 919-928.
- Devadoss, S., Hilland, A., Mittelhammer, R., and Foltz, J., (2014) The effects of the Yuan-dollar exchange rate on agricultural commodity trade between the United States, China, and their competitors, *Agricultural Economics*.
- Dhasmana, A., (2012) India's Real Exchange Rate and Trade Balance: Fresh Empirical Evidence, Working Paper in Economics no. 373, IIM Bangalore Research Papers, Bangalore.
- Dow, S., and Hillard, J., (2002) *Post Keynesian econometrics, microeconomics and the theory of the firm*, Post Keynesian Economics Study Group (PKSG), Downing College, Cambridge, UK.
- Meade, E. E., (1988) Exchange rates, adjustment, and the J-Curve, *Federal Reserve Bulletin*, 74, 633.
- Engle, R. F., and Granger, C. W., (1987) Co-integration and error correction: representation, estimation, and testing, *Econometrica: journal of the Econometric Society*, 251-276.
- Feenstra, R. C., Hai, W., Woo, W. T., and Yao, S., (1998) The US-China bilateral trade balance: Its size and determinants, Paper presented at the UNDP-HIID Conference on China's Integration into the Global Economy, January 17, 1998
- Feenstra, R. C., Lipsey, R. E., Branstetter, L. G., Foley, C. F., Harrigan, J., Jensen, J. B., Kletzer, L., Mann, C., Schott, P. K., and Wright, G. C., (2010) Report on the State of Available Data for the Study of International Trade and Foreign Direct Investment, *National Bureau of Economic Research*, No. w16254.
- Fei, W., (1993) New Trends of the Mainland's Anti smuggling Actions, *Wen Wei PQ*, September 23, 1993, p.5 in FBIS-CHI-93-194 October 8, 1993, pp. 10-1 1.
- Ferguson, N., and Schularick, M., (2011) The end of Chimerica, *International Finance*, 14, 1-26.

- Ferrantino, M. J., Liu, X., and Wang, Z., (2012) Evasion behaviors of exporters and importers: Evidence from the US–China trade data discrepancy, *Journal of International Economics*, 86, 141-157.
- Ferrantino, M. J., and Wang, Z., (2008) Accounting for discrepancies in bilateral trade: The case of China, Hong Kong, and the United States, *China Economic Review*, 19, 502-520.
- Flannery, R., (2013) What Can Be Done About The Big U.S. Trade Deficit With China?, *Forbes*, <http://www.forbes.com/sites/russellflannery/2013/08/03/what-can-be-done-about-the-big-u-s-trade-deficit-with-china/>.
- Full 2000-2010 State Report, (2011), *U.S.-China Business Council*, uschina.org, Web.
- Fung, K.-C., and Lau, L. J., (2001) New Estimates of the United States–China Bilateral Trade Balances, *Journal of the Japanese and International Economies*, 15, 102-130.
- Fung, K.-C., and Lau, L. J., (2003) Adjusted estimates of United States–China bilateral trade balances: 1995–2002, *Journal of Asian Economics*, 14, 489-496.
- Gärtner, M., (1993) *Macroeconomics under flexible exchange rates*, Harvester Wheatsheaf.
- Guo, D., (2010) Mirror Statistics of International Trade in Manufacturing Goods: The Case of China, Working Paper 19/2009, United Nations Industrial Development Organization, Research And Statistics Branch, Vienna, Austria..
- Hacker, R. S., and Abudlnasser, H.-J., (2002) The Effect of Real Exchange Rate Changes on Trade Balances in the Short and Long Run: Evidence from German Trade With Transitional European Economies, *access to web www. ihh. hj. se/ersasise2002/papers/Hacker_and% 20Hatermi_J_Emerging_Markets. pdf*.
- Hacker, R. S., and Hatemi-J, A., (2004) The effect of exchange rate changes on trade balances in the short and long run, *Economics of Transition*, 12, 777-799.
- Hakkio, C. S., and Rush, M., (1991) Cointegration: how short is the long run?, *Journal of International Money and Finance*, 10, 571-581.
- Hamanaka, S., (2012) Whose trade statistics are correct? Multiple mirror comparison techniques: a test case of Cambodia, *Journal of Economic Policy Reform*, 15, 33-56.
- Hendry, D. F., and Mizon, G. E., 1990. *Evaluating dynamic econometric models by encompassing the VAR*.

- Himarios, D., (1985) The effects of devaluation on the trade balance: A critical view and re-examination of Mile's 'new results', *Journal of International Money and Finance*, 4, 553-563.
- Hooy, C.-W., and Chan, T.-H., (2008) Examining Exchange Rates Exposure, J-Curve and the Marshall-Lerner Condition for High Frequency Trade Series between China and Malaysia.
- HS, (2014) The Harmonized Commodity Description and Coding System, The International Convention on the Harmonized Commodity Description and Coding System, World Customs Organization, Brussels, Belgium, May- 2014, available at <http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>.
- Hummels, D., and Schaur, G., (2012) Time as a trade barrier, working paper No. 17758, National Bureau of Economic Research.
- Inman, D. L., (1952) Measures for describing the size distribution of sediments, *Journal of Sedimentary Research*, 22.
- Jamilov, R., (2013) J-Curve Dynamics and the Marshall–Lerner Condition: Evidence from Azerbaijan, *Transition Studies Review*, 19, 313-323.
- Javorcik, B. S., and Narciso, G., (2008) Differentiated products and evasion of import tariffs, *Journal of International Economics*, 76, 208-222.
- Jingjing, J., (2004) Wal-Mart's China's Inventory to hit US \$18 by this year, *China Business Weekly*, November 29, 2004.
- Johnson, B. K., Perry, J. J., and Petkus, M., (2012) The status of econometrics in the economics major: A survey, *The Journal of Economic Education*, 43, 315-324.
- J JCCT Joint Report, (2012) *The Statistical Discrepancy of Merchandise Trade Between The United States and China*, This project is a cooperation between The Office of Trade Representative in the Department of Commerce of the United States of America and People's republic of China Ministry of commerce, Available at: http://www.esa.doc.gov/sites/default/files/reports/documents/2ndphaserepor_tjccsigned1.pdf.
- Kabirou, A., and Gao, Y., (2014) Relationship between RMB to US Dollar Exchange Rate and Prices of US Textile Exports from China, *International Journal of Business and Management*, 9, p179.
- Kremers, J. J., Ericsson, N. R., and Dolado, J. J., (1992) The power of cointegration tests, *Oxford bulletin of economics and statistics*, 54, 325-348.

- Lee Rodgers, J., and Nicewander, W. A., (1988) Thirteen ways to look at the correlation coefficient, *The American Statistician*, 42, 59-66.
- Lerner, A., (1944) *Economics of Control: Principle of Welfare Economics*, New York.
- Li, W., (2008) *China-U.S. Relations Transformed: Perspectives and Strategic Interactions, China-U.S. Economic Relations and the Trade Imbalance Issue*, Suisheng Zhao. New York: Routledge, 2008. 103-115. Print. *Routledge Contemporary China Ser.*
- L Liu, Y., Kemper, M. M., Magrath, P., and Giesze, C. R., (2008) *China's Global Trade Balance Discrepancy: Hong Kong Entrepôt Effects and Roundtripping Chinese Capital*, USC US-China Institute, University of Southern California, available at <http://china.usc.edu/App/Images/round-tripping-capital.pdf>.
- Loraine, W., (1995) *Reconciling China's trade statistics*, Staff Paper NO. 76, International Programs Center (IPC), US Bureau of the Census Population Division.
- Lucas Jr, R. E., (1976) *Econometric policy evaluation: A critique*, *Carnegie-Rochester conference series on public policy*, 1, 19-46, ISSN 0167-2231.
- Mackintosh, M., Brown, V., and Costello, N., (1996) *Economics and changing economies*, Open University Press.
- Magee, S. P., (1973) *Currency contracts, pass-through, and devaluation*, *Brookings Papers on Economic Activity*, 1973, 303-325.
- Mahmood, Z., and Azhar, M., (2001) *On overinvoicing of exports in Pakistan*, *The Pakistan Development Review*, 3, 173-185.
- Marshall, A., and Groenewegen, P. D., (1923) *Money, credit & commerce*.
- Martin, M. F., (2013) *What's the Difference?-Comparing US and Chinese Trade Data*, *Congressional Research Service*, 7-5700, RS22640, available at: <http://fpc.state.gov/documents/organization/206142.pdf>.
- Marwah, K., and Klein, L. R., (1996) *Estimation of J-Curves: United States and Canada*, *Canadian Journal of Economics*, 29, 523-539.
- Meade, J., (1951) *The Removal of Trade Barriers: The Regional versus the Universal Approach*, *Economica*, 18, 184-198.
- Menon, J., (1995) *Exchange rate pass-through*, *Journal of Economic Surveys*, 9, 197-231.
- Miles, D., and Scott, A., (2005) *Macroeconomics: understanding the wealth of nations*, Wiley. com.

Morgenstern, O., (1950) On the Accuracy of Economic Observations, Princeton, NJ: Princeton University Press.

Morrison, W. M., (2011) China-US trade issues, Congressional Research Service [electronic version], Washington DC, available at: http://digitalcommons.ilr.cornell.edu/cqi/viewcontent.cqi?article=1867&context=key_workplace&sei-redirect=1&referer=http%3A%2F%2Fscholar.google.com.my%2Fscholar%3Fq%3DC hina-US%2Btrade%2Bissues%26btnG%3D%26hl%3Den%26as_sdt%3D0%252C5#search=%22China-US%20trade%20issues%22.

Morrison, W. M., (2013) *China-US trade issues*, Bibliogov, Columbus, United States.

Narayan, P. K., (2005) The saving and investment nexus for China: evidence from cointegration tests, *Applied Economics*, 37, 1979-1990.

Pesaran, M. H., Shin, Y., and Smith, R. J., (2001) Bounds testing approaches to the analysis of level relationships, *Journal of applied econometrics*, 16, 289-326.

Poleg, D., (2005) China currency: trade, revaluation, exchange rate, *Danwei news website*, published on 9/April/2005, Available at: http://www.danwei.org/china_information/china_currency_trade_revaluati.php.

Rose, A. K., and Yellen, J. L., (1989) Is there a J-Curve?, *Journal of Monetary Economics*, 24, 53-68.

Saith, A., (2008) Joan Robinson and Indian Planning: An Awkward Relationship, *Development and Change*, 39, 1115-1134.

Södersten, B., & Reed, G., (1994) *International economics* (3^{ed} ed), MacMillian, London.

, A., (2010) New PPP-based estimates of renminbi undervaluation and policy implications, *Peterson Institute for International Economics*, Policy Briefs, PB10-8.

Tsigas, M. E., Hertel, T. W., and Binkley, J. K., (1992) Estimates of systematic reporting biases in trade statistics, *Economic Systems Research*, 4, 297-310.

Tullock, G., (2001) A Comment on Daniel Klein's "A Plea to Economists Who Favor Liberty", *Eastern Economic Journal*, 27, 203-207.

UN, (2011) *International Merchandise Trade Statistics: Concepts and Definitions 2010*, United Nations Publication, Sales No. E.10.XVII.13, Rev. 3.

Wang, Y., 2005. *U.S.-China Commodity Trade and the Yuan/Dollar Real Exchange Rate*(The University of Wisconsin-Milwaukee, ProQuest Dissertations and Theses).

West, A., (2010) Sources for International Trade, Prices, Production, and Consumption, *IASSIST*, Quarterly Winter/Spring 2010.

Wray, L. R., and Liu, X., 2014. *Options for China in a Dollar Standard World: A Sovereign Currency Approach*.

Zhang, W.-B., (2008) *International trade theory [electronic resource]: capital, knowledge, economic structure, money, and prices over time*, Springer.

Zhou, S., (2001) The power of cointegration tests versus data frequency and time spans, *Southern Economic Journal*, 906-921.