

Measurement of Illicit Trade: The Case of Pakistan



By:

Um-e-Salma

12/M.Phil-ECO/PIDE/2012

Supervisor:

Prof. Dr. Eatzaz Ahmad,

Director, School of Economics

Quaid-e-Azam University, Islamabad.

A thesis submitted to the Department of Economics, Pakistan Institute of Development Economics in partial fulfillment for the degree of Master of Philosophy in Economics

Department of Economics

Pakistan Institute of Development Economics, Islamabad

January, 2015

**DEDICATED TO MY AFFECTIONATE
PARENTS**

ACKNOWLEDGEMENT

In the name of Allah (S.W.T), the Most Gracious and the Most Merciful, all praises to Allah (S.W.T) who bestowed me with the determination, potential and capability to complete this dissertation.

I would like to express my most sincere gratitude to my supervisor Dr. Eatzaz Ahmed for his support, encouragement, and guidance through every step of this research. Working with him has been a true privilege and a great experience for me. His kind efforts contributed greatly to my knowledge, understanding and eagerness for this research. Without his guidance and support this thesis would never have been accomplished. It has been a real honor for me to work under his supervision.

I am also deeply thankful to all the teachers of Pakistan Institute of Development Economics (PIDE), especially Dr. Ahsan-ul-Haq Satti who helped me a lot in the estimations of thesis. Likewise Dr. Hafsa Hina, Dr. Sajid Amin Javid, and Ms. Rafat Mahmood also contributed in this dissertation with their immense knowledge and remarkable support.

I, hereby, acknowledge sincerest efforts of Dr. Zafar Mahmood (HEC Foreign Professor of Economics) who always updated me with his innovative ideas, concept and broad vision. I'm grateful to Dr. M. Aman Ullah (Assistant Chief at Planning Commission) for his hasty and impartial assistance in data assemblage.

In the completion of my thesis, my friends act like a motivational force for me. Their consistent support gave me confidence in climbing the steps of ladder easily. I would like to thank my all friends and class mates for their encouragement and motivation.

Last but not the least, my deepest gratitude goes to my loving parents for their guidance, love, and moral support in every walk of my life. Furthermore, I would never forget to mention the love and care of my brothers who played a pivotal role in achieving this Hallmark.

May the Allah Almighty richly bless all of you!

Um-e-Salma, January 2015

ABSTRACT

Illicit trade is a sever affliction, usually faced by less developed countries. It not only mis-invoices the trade statistics but also hurts the society morally. Moreover, researchers may avoid the topic, owing to its sensitive and explosive nature. The present study provides the quantitative estimates of import smuggling as well as export smuggling for Pakistan by using a specific form of structural equation model i.e. Multiple Indicators Multiple Causes (MIMIC). Using annual data for the fiscal years 1972-73 to 2010-11, the results show an increasing trend in import smuggling as a percentage of imports in the early period of analysis but it declines afterwards. However, a rising trend has been observed for export smuggling as a percentage of exports throughout the considered period. It is found that in the case of Pakistan imports are under-invoiced and exports are over-invoiced.

CHAPTER 1

INTRODUCTION

International trade has flourished over the years because of several benefits it has offered to various countries all over the globe. Literary meaning of trade is the phenomenon of exchange of goods and services at the national or international level for other goods and services or for money. International trade encompasses both export and import where exports represent the “commercial sale of goods, services and financial assets in the international market” while imports are the purchase of them from international market. Trade boosts the economy by generating growth and reducing poverty through increased investment, more employment opportunities and higher public-private sector contribution (especially in case of mixed economies). Furthermore, international trade strengthens the bilateral and multi-lateral relations of a country with the rest of the world economies along with satisfying the domestic demand or supply conditions. In addition to that, trade is a potential source of government revenues. Owing to its importance at numerous fronts, international trade is thus one of the vital policy concerns. Less developed countries usually follow tight trade policies to protect their domestic industries such as import restrictions, export subsidies and inflexible exchange rate.

International trade statistics would be in a perfect manner if the value of reported exports in the same country is equal to the value of reported imports reported in the destination countries. However, several causes make discrepancy in this statistics. According to Berger and Nitsch (2008), conceptual difference in valuation, incorrect identification of source or destination country, time lags, differences in exchange rates,

misclassification of commodities may lead to trade discrepancy. Another worth focusing reason for the trade discrepancy is the illegal behavior among traders. High level of corruption, ignorance of law and order, and political instability helps the traders to show the criminal behavior. Traders have strong incentive to smuggle goods when export restrictions in source country are severe and there are no barriers to import them in the destination country. Thus smuggling is one of the causes of the discrepancy in international trade.

Smuggling is a technical word which means "clandestine movement of goods (import and export) without payment of legal duty or in violation of law." It is an ancient phenomenon having two types that are "technical smuggling" and "pure smuggling". Technical smuggling is the process of evasion of duties on the smuggled goods by fake manipulation of the technical process like undervaluing of shipment and misclassification of imported goods. However, pure smuggling refers to the stealthily land of a highly dutiable cargo, beyond the reach of customs authorities [See Alano, (1984)]. The unsatisfactory conditions of supply and demand originate smuggling. Whenever state interference drives a wedge between international and domestic prices through excise duties, custom duties and trade restrictions, underground activities are resulted at the end [See Farzanegan, (2008)]. The motivational potency behind this illicit activity is based on factors including foreign trade restrictions, exchange controls, state trading monopolies, and capital transfer restrictions that can create incentives for smuggling in foreign sector policies. Moreover, Indirect taxes and indirect subsidies to consumers can also create incentives for smuggling in domestic sector policies. Countries like Indonesia,

Afghanistan, India, Pakistan, Bangladesh, Turkey, Philippines, Ghana, and many other developing countries have large flows of illegal goods [See Sheikh, (1974)].

Smuggling, whether it is of imports or of exports, has become an interesting issue for economists. It affects all the categories of traded goods like agriculture products, drugs, manufactured items and many more. Smuggling as a curse of economy has an important corner in the policy discussion. Illegal trade not only mis-invoices the trade statistics but also reduces the government's revenue by evading the payment of duties and taxes and makes the trade policies ineffective. As it is not easy to measure these illicit activities accurately, hence policy makers are not in a position to make a fruitful policy for the economy. Despite its importance, it is very hard to cover this area of research. Due to the sensitive and explosive nature of the issue, researchers may avoid the topic. In addition, dubious nature of trade statistics is also a great hurdle to estimate the illicit transaction. Collectively, all the above mention problems make the subject more problematic and more hazardous [See Alano, (1984)].

In spite of all difficulties in the 18th century, for the first time an Italian economist Cesare Beccaria (1764-65) analytically studied the phenomenon of smuggling from the economic point of view. Although, enough theoretical evidence is present to analyze the welfare implication of smuggling yet empirical evidence is required to gauge its extent to the economy. It is very challenging to estimate smuggling because it is illicit and hidden. A few methods that are available to estimate smuggling along with limitations, can be categorized as direct and indirect approaches. According to Farzanegan (2008), direct methods are micro-economic approaches and are based on well-designed surveys to collect direct information from persons and firms about smuggled merchandises.

The indirect methods can be classified as follows.

- Compare the sale of products under consideration to its estimated consumption by using household surveys.
- Compare the sale of products under consideration to its estimated consumption by using econometric estimation.
- Compare the trade statistics of source country with the trade statistics of her destination partners in order to find out “mis-invoicing”.
- Apply the model approach or MIMIC (Multiple Indicators and Multiple Causes) method.

To protect the domestic industries and to generate the government revenue, imposition of trade barriers like high tariffs and quantitative restrictions are the common phenomenon adopted by developing countries. But these restrictions give incentive to traders for illegal transition of goods.

Only scant literature is available on smuggling, in case of Pakistan. Mahmood and Mahmood (1993) analyzes under-invoicing of imports for Pakistan by using trade discrepancy approach with 6 major partner countries namely France, Germany, Italy, U.K., Japan, Netherlands, covering the period of 1981-1988. Furthermore Mahmood and Azhar (2001) make an effort to analyze the presence of export over-invoicing in Pakistan, where results justify the presence of export over-invoicing. At aggregate level, U.S. \$ 24 million over-invoicing was found whereas product-wise analysis for ten major export goods finds the over-invoicing of around U.S. \$ 54.82 million, U.S. \$ 413.67 million, and U.S. \$ 455.78 million for the years 1984, 1992, and 1994 respectively. The sector-specific study between India and Pakistan has been conducted by Khan *et al.* (2005),

where he finds informal exports to India at \$ 10.4 million and informal imports at \$534.5 million. The study also finds that informal exports from Pakistan mainly consist of textile products and dry fruits while informal imports from India comprise of a variety of products. In addition to that, Ahmed *et al.* (2013) captures the informal trade flowing from India to Pakistan through Dubai, Kabul, Kandahar, Chaman and Bander Abbas and finds the informal flow of value USD 1.79 billion occurs annually from India to Pakistan. This is, however, only a regional analysis while smuggling needs to be estimated at aggregate level with improved methodology.

The trade data discrepancy approach is mostly employed to estimate the size of illegal trade which is purely a statistical phenomenon. But this approach does not work out when illegal activities occur at both ends. In this scenario, structural equation approach is no doubt an improvement over trade data discrepancy technique. This approach not only includes causes and indicators of smuggling but also widens the scope of analysis. Mahmood (2011) uses structural equation approach to capture import smuggling in Pakistan for the time period of 1973 to 2010. The results show a rising trend in import smuggling in the early period of analysis but it declines afterwards.

Smuggling is theoretically seen as an exploitation of a profit opportunity. Thus, in order to understand the gravity of the problem of illegal trade in Pakistan, to see how much does it contribute to the substantial size of underground economy and to bridge the gap in the official trade statistics, the issue of smuggling needs to be study in detail.

The objective of the present study is to provide quantitative estimates of import smuggling as well as of export smuggling for Pakistan for the fiscal years 1972-73 to

2010-11. Moreover, the study is also intended at determining the significant causes and consequences of smuggling in the economy.

In order to achieve these objectives, a specific form of structural equations model i.e. Multiple Indicators Multiple Causes (MIMIC) is used by constructing two separate models for import smuggling and export smuggling. The study uses annual data for the fiscal years 1972-73 to 2010-11 published officially by the Government of Pakistan except for a few variables. As the methodology employed gives ordinal index of smuggling, certain benchmark is used to convert it into cardinal index. For import smuggling, this bench mark has been obtained by calculating discrepancies between exports to Pakistan as reported by her trading partners and imports from partners as reported by Pakistan while for export smuggling discrepancies between exports to trading partners as reported by Pakistan and imports from Pakistan as reported by trading partners are calculated. Thus, quantitative estimates for smuggling are obtained.

The rest of the study is organized as follows. Chapter 2 presents the review on the theoretical and empirical literature available on smuggling. Methodology employed in the study is discussed in Chapter 3 along with the theoretical justification of the variables used. Moreover, the description of data and variables construction is explained in Chapter 4 while results are presented and discussed in chapter 5. Finally, Chapter 6 concludes the study.

CHAPTER 2

REVIEW OF LITERATURE

2.1 INTRODUCTION

Smuggling has been classified as an illegal directly unproductive profit-seeking (DUP) activity of category I in Bhagwati (1982) i.e. an activity that arises in initially distorted situation and leaves the final situation distorted too. The topic of illegal trade could not even occupy a corner place in the economics literature until lately. Only recently the matter has attracted a considerable attention in the literature. Mostly the literature on smuggling is based on its welfare analysis as well as on determining the causes of trade mis-invoicing and also on measuring its extent. In the present chapter, an effort is to cover the available literature on smuggling. Section 2.2 covers the theoretical literature while section 2.3 analyzes the empirical literature with sub-sections focusing on other countries and also on Pakistan. Section 2.4 concludes the chapter.

2.2 THEORETICAL LITERATURE

For the first time in the 18th century an Italian economist Cesare Beccaria (1764-65) analytically studies the phenomenon of smuggling from the economics point of view. He estimates a condition in which trader is indifferent in avoiding the duty and smuggle the goods or legally importing them by paying the duty. This analysis though is not so productive yet it contributes to literature in recognizing the importance of smuggling at that point in time.¹

¹ See Bhagwati and Hansen (1973)

In underdeveloped countries, smuggling is not only the moral or legal issue but also an economic problem, thus a skeptical eye should be kept on this economic phenomenon. Bhagwati and Hansen (1973) demonstrate the welfare analysis of smuggling with reference to different market structures and cost conditions along with phenomenon of faked invoices. Generally, it is considered that smuggling is a welfare improving phenomenon by evading trade restrictions but the study explores that within the Hicks-Samuelson theoretic framework for two good trade model, welfare effect of smuggling is ambiguous or adverse. As the two goods considered are exportable and importable commodities with a given production possibility frontier, smuggling in response to tariff imposition is considered as a transformation of exportable into importable. The study explores the welfare effect of smuggling in cases of non-prohibitive tariffs and prohibitive tariffs by assuming smugglers as foreign residents, having constant rates of transformation. Whether there is perfect competition or monopoly, welfare effect is ambiguous for non-prohibitive tariffs if cost structure causes smuggling to eliminate legal trade and it is overall adverse if both legal and illegal trade co-exists. However, in case of prohibitive tariffs, welfare is positively related with smuggling. These results have also been reinforced later by mathematical proofs (Bhagwati and Srinivasan, 1974).

Contrary to Bhagwati and Hansen (1973) two-good trade model of smuggling, Shiekh (1974) introduces a third non-traded good (transportation cost) and allows price disparity to exist in the situation where only legal trade occurs and also in the situation where smuggling exists along with legal trade. The study also assures the co-existence of legal trade and smuggling where illegal trade is considered as a welfare improving

phenomenon. By using the “partial equilibrium model” Shiekh (1977) recognizes the price differential between home and foreign markets, other than those attributed to transportation costs, to be the incentive for smuggling. In addition to that, foreign trade restrictions, exchange control, state trading monopolies, and capital transfer restrictions can also create incentives for smuggling in foreign markets whereas indirect taxes and subsidies to consumer may also create incentive for smuggling in domestic market. Demand for a smuggled good is a function of price differential between the legally traded good and the smuggled good; the greater the risk aversion of a consumer, the greater will be the price differential required to incentivize the consumer to indulge in the illegal market. Formally, the demand curve is derived under the assumption that overall expenditures of the consumers remain unchanged while switching from legal to illegal market. For a given price of the smuggled good, higher price in legal market due to high tariff rate as compare to illegal market induces consumers to purchase the smuggled good. On the other hand, supply of the smuggled good is the summation of all the marginal cost curves of different suppliers at various prices where marginal costs are assumed to be increasing due to rising marginal real resource costs and the risk costs. Demand and supply intersect to determine equilibrium in the market where it is shown that smuggling increases total imports and has ambiguous effects on welfare. Moreover, smuggling lowers the price at which tariff becomes redundant generates two prices in the domestic markets but doesn’t provide protection to the domestic industries as long as legal imports exist.

Extending the framework of Bhagwati and Hansen (1973) model, Falvey (1978) finds that unlike the import tariff, under quantitative restriction smuggling leads to an

unambiguous welfare gain. Pitt (1981) recommends another model of smuggling which explores the coexistence of smuggling, legal trade and price disparity. According to this framework, legal trade is used to wrap the illegal trade, and thus reduces the cost of smuggling. Contrary to Bhagwati and Hansen (1973), the study finds that smuggling can increase welfare both in case of tariffs and quantitative restrictions by expansion of consumption possibility frontier. Moreover, it is suggested that allowing smuggling rather than prohibiting it is a better strategy for welfare-increasing at a given tariff rate because the level of legal trade increases if some illegal trade is allowed with it. The model is empirically tested and validated for Indonesian exports of coffee and rubber for the period 1949-72.

Moreover, Martin and Panagariya (1984) find out ambiguous welfare effects of smuggling by taking into consideration the risk and uncertainty associated with smuggling. In addition to the analysis of enforcement of laws against smuggling, the effects of changes in tariff rates and world terms of trade are also analyzed in the study. The model predicts that with the increase in tariff rates, the overall imports decrease even though the share of smuggling increases; hence tariff increases result in welfare loss.

Another issue is the smuggling of agriculture goods, which is an increasing cost industry because of increasing transport cost. The earlier models of smuggling are silent to incorporate the transport cost. Norton (1988) constructed a model for intra-EEC (European Economic Community) trade to deal with such type of costs. Increasing costs are associated with smuggling; greater the distance from frontier, the greater the per unit cost of smuggling. Smuggling would be preferable for the firms located within a certain range closer to the frontier as compared to those beyond that range. The model suggests

that if the price differentials between the two countries increase then the distance margin for profitable smuggling and thus its volume increases. The model is empirically supported by the study of agriculture trade between Republic of Ireland and Northern Ireland for the period Oct 1974 to Dec 1982.

Smuggling among African countries takes place not only to evade taxes but also to improve survival prospects. A region specific approach to smuggling is given by Dredoff and Stolper (1990) who inquire the pushing force behind smuggling and also determine its welfare effects on African trade. Contrary to the well-known theoretical result of Bhagwati and Hansen (1973), the study reveals that smuggling is so beneficial and well-organized in African economy that it doesn't involve much real cost, whereas complicated institutional framework generates real cost in legal trade. Hence smuggling in African circumstances is no doubt a blessing and a healthy reaction to the distortionary policies of government and is thus welfare improving.

Lovely and Nelson (1995) analyze the welfare implication of smuggling by using Ricardo-Viner framework. They find that smuggling is welfare improving only if it smooths the domestic price along with covering the loss caused by smuggling activity. On the other hand, increase in tariff may improve welfare in a small country, if it reduces the devotion of the country's resources to smuggling. As smuggling is just a profit seeking activity, it cannot enter into the utility function directly. Thus strengthened enforcement may also be a welfare improving phenomenon. Briefly, smuggling is a welfare improving phenomenon only if the gains from relaxing the domestic tariff distortion outweigh the resource cost of smuggling.

The trade policy questions relating to smuggling revolve around the maximal revenue tariff and optimal tariff levels. Both in the presence of smuggling and in its absence, Bhagwati and Srinivasan (1974) show that the maximal revenue tariff rate is greater than the optimal tariff rate within the trade theoretic framework. In addition, the values of the maximal revenue tariff rates cannot be compared across with and without smuggling scenarios; same being true for optimal tariff rate. On the other hand, Johnson (1974) shows that in the presence of smuggling, revenue maximizing tariff rate is lower as compared to its absence due to increase in import elasticity of demand which decreases the quantity of imports on which tariff is imposed. Moreover, revenue of government is found to be less in the presence of smuggling than in its absence. Taking into consideration that a single revenue level can be achieved by two tariff rates, a higher one and a lower one owing to the Laffer curve phenomenon, Bhagwati and Srinivasan (1974) show that the lower and higher tariffs required to achieve the same target level of revenue in presence of smuggling lie within the range of those in the absence of smuggling.²

As trade taxes are the major revenue raising device in the third world. Fausti (1997) shows the effects of smuggling on the tax rate and tax revenue are dependent upon the relationship between legal and illegal trade. If legal trade is positively (negatively) related to the illegal trade then tariff revenue and revenue maximizing tax rates will be higher (lower) in the presence of smuggling than in its absence.

To capture the effects of different trade policies on black market premium and illegal capital outflow, Biswas and Marjit (2007) develop a three-country preferential and non- preferential trade model where a developing country has preferential trade (low or

² Laffer curve is the theoretical relationship between rate of taxation and the government revenue raised through it, which is so postulated to bend backward after a certain tax rate.

zero tariff) with one developed country and non-preferential trade (comparatively higher tariff rates) with the other developed country. The study finds that in the partial equilibrium framework where black market premium is exogenous and the gain from tariff evasion outweighs the black market premium loss, imports are under-invoiced given the risk of detection is covered. On the other hand, export subsidy in terms of local currency to be less than the black market premium is required for export under-invoicing. Furthermore, reduction in black market premium leads to illegal capital outflows in search of attractive profit opportunities in foreign countries. Tight trade policies and foreign exchange regime are the incentive creator phenomena for misreporting the trade values. On the other hand, preferential trade lowers tariff duties, which sweep off the incentives for trade mis-invoicing. In this way, demand for illegal foreign exchange decreases, hence black market premium falls. At the same time, decrease in black market premium decreases the incidence of export under-invoicing and, hence, the supply of illegal foreign exchange. Thus, the introduction of preferential trade regime to the economy reaps triple benefits of decrease in illegal trade, black market premium and illegal capital outflows.

By using Cournot model, Biswas and Sangupta (2011) examine the effects of tariffs and government monitoring of smuggling activities on domestic production, volume of imports, and the degree of under-invoicing by importers. The model shows the increase in tariff rates stimulates domestic producers to increase production, discourages importers from imports but results in increase in the degree of under-invoicing of imports. Furthermore, increase in monitoring of under-invoicing by the government is ineffective for the domestic production and imports but decrease under-invoicing. The

study also conducts welfare analysis, which incorporates consumer surplus, profits of domestic producers, government revenues from tariffs, earring from penalties on under-invoicing and cost of monitoring faced by the government. It is explored that up to an optimal level of government expenditures on monitoring, welfare increases with the severity of penalty but falls afterwards. This is because the probability of detection of under-invoicing is concave in monitoring expenditures; beyond a certain level of monitoring expenditures, the expenses government has to incur to curb under-invoicing rise higher than the effectiveness of monitoring in decreasing under-invoicing. However, welfare function does not include profits of importers, which in case importers are also nationals of the country under consideration, is not truly representative. Biswas (2011) theoretically discovers the possibility of smuggling even in the absence of black market premium. Possibility is there to make a cartel by the illegal traders in both the partner countries where the benefit of tax evasion by importers can also be enjoyed by the exporter of partner country if exporter incentivize importer by exports under-invoicing. In this case, government is unable to detect smuggling by matching the partner country trade statistics.

2.3 EMPIRICAL LITERATURE

2.3.1 Empirical Literature on Other Countries

In the construction of appropriate trade policy, authentic trade statistics provide a sound base to get the reliable trade statistics. When exporters urge to gain export subsidies and importers try to attain extra foreign exchange, trade data discrepancy may emerge. On the other hand, import taxes and import tariff induce the phenomenon of underreporting. Since it is very difficult to detect illegal transaction of goods across borders, the

phenomenon of gauging the extent and volume of illegal activity is complex. There are numerous studies, containing analysis of illicit trade but are restricted for detection of illegal trade only, thus to measure the extent and to determine the motivational force behind these activities is required. Various approaches have been employed to full fit the purposes.

Most of the empirical studies use the famous statistical technique of “trade discrepancy approach” in which the reported exports of a source country are compared with reported imports of the destination country, where difference in trade statistics is accounted for smuggling after covering the transportation charges, etc. This approach has been used in a number of studies but Morgenstern (1963) was the pioneer, Naya and Morgan (1969) follow the same technique for Asian countries while Yeats (1990) conducts the analysis for Sub-Saharan countries.

Following the approach of trade discrepancy, Bhagwati (1964) attempts to capture the extent of illegal imports in Turkey along with its possible causes and consequences. Whenever the imported commodity contains a higher tariff duty or it is banned strictly, under-invoicing of imports occurs, where a risk factor is attached with it. The study argues that if the tariff rate on the imported commodity is higher than the premium on foreign exchange to be obtained from the black market, the importer has incentive to under-invoice the commodity instead of legally importing it. In case of Turkey for 1960-61, the f.o.b. (free on board) values of exports reported by the trading partners of Turkey are compared to the c.i.f. (cost of insurance and freight) values of imports recorded by turkey. The case where c.i.f. value is found to be less than the f.o.b. value, the situation is attributed to under invoicing otherwise over invoicing. The outcome of comparison

results in a strong evidence of import under-invoicing for manufactured goods in Turkey in 1960-61. The study further observes that the category of imports having higher rate of tariff ends up with the greater under-invoicing which is obvious for transport equipment and machinery in the case under consideration. However, as the goods could be legally exempted from the tariffs under certain circumstances, the result could be relied upon only with reservations.

Seldom attempts are made to analyze and forecast the unrecorded trade of Indonesia, as being politically sensitive problem is the obvious reason for negligence and statistically obscure may be the other, however a few analyses, of course, have been made to highlight the importance of the issue. Following trade discrepancy approach, Simkin (1974) uses partner countries' trade statistics to estimate unrecorded trade in Indonesia for the period of 1958 to 1967. The statistics are adjusted for freight, insurance and transport costs at 10 percent of value of total trade. Using the data from Direction of Trade (DOT) Statistics of International Monetary Fund (IMF), the estimated unrecorded exports are found to be \$144 million a year and unrecorded imports to be \$166 million a year on average between 1958 to 1962. Illegal trade is found to decline considerably after 1962 but the study attributes this decline to the lack of DOT statistics data on Indonesia's trade with Malaysia and Singapore during the period of decline, but as illegal trade carries out illegally in both the countries, the estimates of illegal trade might be lower.

By extending the analysis, Simkin (1974) breaks ups the illegal trade into smuggling and under-invoicing specific to exports of major commodities. Difference between the 'normal' level of exports (defined as the difference between production and domestic consumption of a representative year) and the recorded exports of particular

commodities, gives the volume of smuggling whereas under-invoicing is found by finding the difference between the world price of a commodity and its recorded unit values applied to the recorded export quantity. The study considers six major export commodities i.e. rubber, copra, coffee, tobacco, tea, and pepper where rubber is the highest unrecorded export commodity at an average annual value of U.S. \$ 80 million for the period 1958 to 1962 and U.S. \$ 117 million for the period 1963 to 1966. The analysis, however, is quite doubtful as it is subjective in determining the normal price as well as quantity of exports. As Indonesian economy is unstable, so considering a single normal price for a set of years is not a realistic assumption. Moreover changes in transportation costs and qualities of product also contribute in making these estimates less reliable. Richter (1974) points out that the methods used by Simkin (1974) to capture the unrecorded trade of Indonesia may overestimate the volume and value because of the difference in classification system of Indonesia and its trading partners.

Cooper (1974) also analyzes smuggling in case of Indonesia. The study shows that extra-ordinarily high tariffs imposed on many imports along with corruptible enforcement made smuggling more attractive in Indonesia as compared to other developing countries. Smuggling has a strong influence on market prices, which also increase with increase in duty but less than proportionately. In order to measure the effect of smuggling on the market prices, Cooper (1974) compares the local wholesale prices with c.i.f. prices inclusive of tariff and other taxes on imported goods for about 70 commodities. The result shows that the increase in market prices is greater at lower tariff plus tax rates but smaller on higher rates. In particular, in response to increase in tariff plus tax rate from zero to 100 percent, the market price increases by 82 percent whereas

when tariff plus tax rate rises further from 100 to 200 percent, the market price rises just by 39 percent. The market price can even fall with tariff rates greater than 258 percent. Cooper (1974) explains this less than proportionate rise in prices in response to smuggling by proposing that there exists a threshold level of tariff, varying from country to country, below or around which importers stick to legal trade channels but as tariff crosses the thresholds, they start resorting to illegal means along with legal trade to stay competitive in business. Thus higher tariff rate raises the illegal component which further decreases the rate of increase in market prices. The conclusion is that lower effective rate of protection and lower government revenues with higher tariffs just induce smuggling.

To gauge the level of illegal trade Aleno (1984) develops a microeconomic model for the Philippines import trade and tries to seek out the factors that can matter in the decision of traders to make choices between smuggling and legal trade. Empirical estimations of this theoretical model is made possible by observing discrepancies in partner country data. Time series data of partner-country discrepancy, from 1965 to 1978, is generated by comparing partner country export values, getting from GATT secretariat in Geneva, with import values of Philippines provided by national census and statistics office. Then the discrepancy statistics are regressed on the level of income, probability of being caught, black market premium, and dummies for containerization and military regime. Regression results show that smuggling is positively related with the level of income and black market premium and negatively related with the probability of getting caught whereas dummies are found insignificant in affecting smuggling. Moreover, the estimated level of smuggling ranged from 28.95% to 53.81% of reported exports to Philippines from partner countries.

Considering smuggling to be a widespread and relatively open activity in Sub-Saharan African countries, May (1985) proposes a model to estimate the underground economy in Ghana for the period 1976 to 1982 via estimation of smuggling of cocoa, the major export product of Ghanaian economy. Instead of trade discrepancy approach, smuggling of cocoa is gauged by summing up its production, imports and depletion in stocks and subtracting consumption and legal exports from the sum, to obtain the volume of smuggled goods. In order to find out the quantity money used in smuggling, volume of the smuggled goods is converted into value by employing black market exchange rate which is then subtracted from $M1^3$ to get legal money. Dividing legal money by GDP then gives velocity of circulation of legal money. On the assumption that velocity of money is the same for legal and illegal money, the underground economy is estimated. The study concludes that by 1982, the underground economy climbed to a 32.4 percent of the official GDP in 1982.

Macdonald (1985) analyzes the relationship of trade data discrepancy with incentives to smuggle by considering the exports of ten developing countries for the period of 1962-1979. Here the data discrepancies are specifically in the relation of export taxation and the exchange rate premium on the black market; higher the premium or export tax, higher the incentive to under-invoice exports. Calibrations show a weak relationship between trade data discrepancies and incentives to smuggle, which suggests that a great caution should be practiced while inferring the scale of smuggling by using trade data discrepancy approach.

³ A measure of the money supply that includes all physical money, such as coins and currency, as well as demand deposits, checking accounts and Negotiable Order of Withdrawal (NOW) accounts.

Country having oil as a resource is to be considered as a prosper country but the possibility is there to face the illegal transaction of it as well. Jian-ye Wang (1994) explain the phenomenon of illegal trade of oil by using a simple model. In his paper, he focuses on the linkages between the level of smuggling and government policies like monetary, fiscal and domestic pricing policies. To build a relationship between macroeconomic policies and smuggling, the study analyzes the illegal oil trade between Nigeria and its neighboring countries in West Africa and finds its peak during the period of 1986-93. The study further finds smuggling not only disturbs price and output structures but also has its effects on exchange rate and public finances. Inappropriate domestic oil pricing is the main cause of this illegal transaction, where government tries to fix the price of petroleum product which creates implicit oil subsidy. Moreover, smuggling weaken the government's financial position, eventually creates fiscal deficit, which leads the domestic economy to the condition of inflation and currency depreciation.

Cortes *et al.* (1995) empirically estimate the aggregate welfare effects of smuggling for Paraguay- a Latin American economy, by conducting the analysis for the single year i.e. 1990. International trade of Paraguay consists of both legal and illegal trade for almost all the goods. It is estimated that 58 percent of exports and 31 percent of imports are unrecorded for Paraguay while welfare increased by 2.1 percent of GDP in 1990. However the study incorporates the highly restrictive assumptions, hence the estimates of welfare analysis are not reliable.

Despite trade liberalization, smuggling occurs between India and Bangladesh on a large scale where informal trade includes illegal and extra-legal economic activities and

those unregulated by government to beat tariff and non-tariff barriers. One of the root causes of this informal trade is the traditional, historical, and ethnic link between India and Bangladesh and the other one is traders with lower education who prefer to indulge themselves into informal channel of trade as compared to the formal one. Pohit and Taneja (2003) conduct an extensive survey in both the countries, India and Bangladesh, to gather and examine the cross-border trade statistics, and to give a solution for better policy making. The study finds that the lower transaction cost in smuggling and the procedural delays in formal trade incentivize traders to trade goods through improper channels as compare to proper one. Moreover, if free trade exists in the SAARC region, even then illegal trade coexists with legal trade except when formal transaction may improves.

Less developed countries usually apply tight trade policies such as high tariff rate and exchange control to manage the balance of payments which induces illegal transactions. High tariff gives incentive to the traders to mis-invoice the trade which will tend to raise black market premium. An increase in the premium will not only take away the significant foreign resources from legal to illegal channel but also affect the domestic foreign exchange reserves. With the help of three country preferential plus non-preferential trade model, Biswas and Marjit (2005) examine the effect of different trade policies on smuggling, foreign exchange market and the extent of illegal capital outflow. The study finds that at the beginning illegal capital outflow is encouraged by preferential trade whereas non-preferential trade supported foreign exchange market, but at the end preferential trade channel deal with both illegal capital outflow and illicit transaction in foreign exchange market.

Tax evasion is the root cause of illicit trade which is very difficult to observe. Fisman and Wie (2004) have given a detail analysis to analyze the relationship between tax rates and tax evasion in China where tax rate is the summation of tariff and value added tax rates, UN-COMTRADE database are used to compare the statistics of China's imports from Hong Kong at product level mainly for the year 1998. According to the study, tax evasion is increased by 3% for 1% increase in tax rate. Whilst for closely related products, tax evasion is negatively correlated to tax rates where underreporting and misclassification of imports is very common.

Antiques and cultural goods are considered as assets of a country, so restrictions are imposed on the export of goods having artistic value like coins, artistry items, statues, and all other archeological objects. This prohibition gives incentive to transit these ancient items illegally. Although the export of the cultural objects is restricted in the source country yet it is not considered as smuggling in the destination country, specifically in the United States. Tariff free attitude of U.S. encourages to declare the true value of imports of antiques and cultural objects (U.S. Department of Homeland security, 2006). Comparison of the reported imports in the USA with reported exports of source country gives a precise figure of this illicit trade which is encouraged by corrupt bureaucracies. Fisman and Wei (2007) use UN-COMTRADE database for the period 1996 to 2005 to compare the partner country trade statistics for the United States, Canada, Germany, the Great Britain and Switzerland. So the trade gap is found to be positively correlated with corruption in the source country and the relationship is stronger for the source country rich in cultural objects.

High level of corruption, ignorance of law and order and political instability help traders to show criminal behavior. Berger and Nitsch (2008) analyze trade gap for five largest importing countries i.e. the USA, Germany, China, the UK, and Japan for the period of 2002-2006. Trade gaps are regressed on certain export specific, import specific and product specific variables. The study finds a firm association of trade gap with the level of corruption, specifically in the source country. Hence, the study reinforced the results in Fisman and Wie (2007) but for a wider range of products.

By using trade discrepancy approach Beja (2008) focuses on trade mis-invoicing between China and its trading partners through bilateral trade mis-invoicing between China and Hong Kong and between Hong Kong and identified trade partners (Japan and USA) for 2000-2005. Analysis determines the net trade mis-invoicing of U.S. \$ 287.6 billion in China whereas total volume of unrecorded trade account for U.S. \$1.4 trillion. Thus, the study concludes that a close coordination and collaboration between trading partners is required.

The study of Farzanegan (2008) investigates the main causes and consequences of smuggling for the Iranian economy by using structural equation approach. For the period of 1970-2002, ordinal estimates of smuggling are obtained by using MIMIC model. The ordinal estimates are then converted into cardinal ones by using trade discrepancy data for one year and then calibrating the structural equations by using the already obtained estimates of the coefficients. The results show that on average, the relative size of smuggling of total trade is about 13 percent whereas absolute amount of smuggling per year is about \$ 3 billion over the period 1998-2002. Of the various causes of smuggling, the rate of fine and general level of education reduce smuggling whereas tariff burden

gives incentives for it. Moreover, trade openness also positively correlated with illegal trade.

Buehn and Eichler (2011) evaluate the determinants of trade mis-invoicing across the US-Mexico border. They used microeconomic framework to relate micro economic incentives with trade mis-invoicing. For the time span of 1980-2005, the study finds that black market premium and evasion of taxes influence the level of smuggling. Moreover, tariff and trade mis-invoicing are positively related with smuggling while evading income tax plays only a minor role for mis-invoicing. GDP per capita plays no significant role, real depreciation of domestic currency affects the import under-invoicing only and the risk of detection is mostly found insignificant.

Following Farzanegan (2008), Buehn and Farzanegan (2012) apply MIMIC approach to 54 countries around the world to capture the unobservable volume of smuggling and rank the countries according to the extent of mis-invoicing. The estimated smuggling index shows that smuggling is common in Latin America, Asia and Africa whereas rare in western European countries.

2.3.2 Empirical Literature on Pakistan

Only limited literature is available on the subject of smuggling in case of Pakistan. Shiekh (1974) not only sets up the base for this scant literature but also confirms the existence of under-invoicing of specific imports in response to restrictive import policies in Pakistan during the period of 1965-68. As under-invoicing of imports is one of the types of import smuggling in Pakistan, so it is captured by trade discrepancy approach by considering 36 commodities, the study mainly focus on the trade partners of Pakistan that

have relatively free trade i.e. the USA, Canada, western European countries, Japan, Australia and New Zealand. The results generally demonstrate that under-invoicing exists for goods that face some sort of import restrictions. Regressing under-invoicing on tariff rates and categorical variable representing imports either as liberal or restricted, analysis shows the the category of imports significantly affects under-invoicing especially in case of restricted goods, though tariff rate is found to be insignificant. Moreover the study also conducts another regression analysis involving a dummy variable to categorize goods in higher and lower tariff rate groups where goods with higher tariff rate are found to be more under-invoiced.

Mahmood and Mahmood (1993) analyze under-invoicing of imports for Pakistan by using trade discrepancy data with 6 major partner countries namely France, Germany, Italy, the UK, Japan, Netherlands, covering the period of 1981-1988. They investigate various categories of goods at both the one digit and the three digit levels of Standard International Trade Classification (SITC), and find a 30% of export value as the extent of under-invoicing of imports. Significant difference between import duties and black market premium supports import under-invoicing.

Mahmood (1997) proceeds further by incorporating the factors determining under-invoicing. By considering major importing countries that are France, Germany, Italy, the UK, Japan, and Netherlands, pool data for 96 commodities is used for the years 1981 and 1988, where import under-invoicing is regressed on import taxes and non-tariff restrictions. The results show that import taxes are significant factor while non-tariff restriction is insignificant determinant of under-invoicing.

Whenever subsidy is offered to exporters to promote exports of the country, instead of that it leads towards illicit activity of over-invoicing due to weak law and order situation. Due to this factor loss of government revenue and ineffectiveness of trade policy occur to face. Mahmood and Azhar (2001) make an effort to analyze the presence of export over-invoicing in Pakistan. Geographic and product wise patterns in export over-invoicing are also included in this analysis. Trade data discrepancy technique is used for the period 1984-1994. The results indicate the presence of export over-invoicing. At aggregate level, U.S. \$ 24 million over-invoicing is found whereas product-wise analysis for ten major export goods show over-invoicing of around U.S. \$ 54.82 million, U.S. \$ 413.67 million, and U.S. \$ 455.78 million for the years 1984, 1992, and 1994 respectively. Moreover, significant difference between duty drawback rate and the premium on foreign exchange in the kerb market further confirm the presence of over-invoicing.⁴

Khan *et al.* (2005) conduct a sector-specific study between India and Pakistan, where they try to capture the impact of partial and complete trade liberalization on switching to formal trade from informal trade as well as on the government revenue and domestic industry protection. The study contains survey based data from January through May 2005 from all the provinces of Pakistan. Informal exports to India are estimated to be \$ 10.4 million whereas informal imports are \$534.5 million. Informal exports from Pakistan mainly consist of textile products and dry fruits while informal imports from India comprise of a variety of products.⁵ The study argues that since the volume of

⁴ Duty drawback refers to the facility where government remits part or whole of the taxes (central excise, customs duty on inputs to production, etc.) levied on goods in the event of their export.

⁵ Informal imports from India include: cloths, machinery, tires, cosmetics and jewelry, livestock, herbs and spices, and medicines.

informal trade of Pakistan with India has already declined over the years due to Chinese products in the market, thus granting of MFN (most favored nation) status to India i.e. partial trade liberalization will not result in any significant increase in conversion of trade from informal to formal channels. However, complete trade liberalization e.g. SAFTA (South Asian free trade agreement) will encourage the traders to switch from informal to formal trade, but it may be hazardous for the local industry protection.

Another survey-based effort is made by Ahmed *et al.* (2013) to capture the informal trade flowing from India to Pakistan through various routes including Dubai, Kabul, Kandahar, Chaman and Bander Abbas. The survey is conducted in January 2013 for the specific sectors in which informal flow of value USD 1.79 billion occurs annually from India to Pakistan.⁶ On one hand, this illegal transaction has welfare improving impact on poor regions by narrowing down the demand-supply gap; on the other, it hurts the manufacturing community and also gives revenue loss to the government.

In Pakistan only trade discrepancy approach is used to capture the traces of smuggling or a survey based studies have been done up till now, that are not only the statistical phenomenon but also contracts the scope of study. In order to widen the prospect of analysis, structural equation approach is a good alternative over trade discrepancy technique. Mahmood (2011), in her MPhil thesis, captures import smuggling of Pakistan by using the specific form of structural equation approach i.e. MIMIC covering the fiscal years 1973 to 2011. The analysis has been done through controlling few of casual variables of import smuggling including trade restrictions, remittances,

⁶ Specific sectors in which informal trade occurs from India to Pakistan include: fruits and vegetables, textile, automobile parts, jewelry, cosmetics, medicine, tobacco, herbal products, spices and herbs, paper products and crockery.

employment rate and the event of Afghan war. The study reveals an increasing trend in import smuggling in early period but it declines afterwards.

2.4 CONCLUSION

The literature on smuggling reveals that now it is the emerging interest of researchers not because of its welfare implication on the economy but also because its accurate estimation is required for policy making. As the motivational force behind this illegal phenomenon is varying for various countries, so country specific analysis is required for better policy formulation. It has, however, been somewhat ignored as an area of research in case of Pakistan and needs to be addressed afresh. The present study hence adds to the literature in that using the specific form of structural equation approach i.e. multiple indicators multiple causes (MIMIC), it provides estimates of the overall import smuggling and export smuggling separately along with determining its various causes and consequences.

CHAPTER 3

METHODOLOGY AND THEORETICAL FRAMEWORK

3.1 INTRODUCTION

Smuggling is an illicit activity which is not recorded officially. However, certain techniques are available for the measurement of smuggling through which observable variables in the economy are used to estimate the unobservable phenomenon of smuggling. This chapter provides details of the method employed in the present study along with the theoretical justifications for the variables used. In the present study, two separate models are constructed for the measurement of illegal imports and illegal exports in the economy respectively. Section 3.2 generally describes the Multiple Indicators Multiple Causes (MIMIC) model. Section 3.3 gives the justifications for the variables used in the measurement of import smuggling and Section 3.4 provides the specific model for import smuggling. Likewise Section 3.5 refers to the justifications for the variables used in the measurement of export smuggling and Section 3.6 specifies the model for export smuggling. The MIMIC model provides qualitative index of smuggling so the procedure for conversion to quantitative index is explained in Section 3.7. Finally Section 3.8 concludes the chapter.

3.2 THE STRUCTURAL MODEL APPROACH (THE MIMIC MODEL)

Structural Equation Model (SEM) examines the relationships among one or more latent variables which represent themselves through different observable variables. In this study, a specific form of SEM (i.e. Multiple Indicators Multiple Causes) with only one latent variable η is used. Multiple Indicators Multiple Causes (MIMIC) is used to examine

the relationship between manifest variables and latent variable by minimizing the distance between the sample covariance matrix, denoted by \mathbf{S} , and the covariance matrix $\Sigma(\boldsymbol{\theta})$ predicted by the model. The observable variables consist of causes of the latent variable under consideration and its indicators, so MIMIC captures multiple indicators of smuggling in an economy by considering multiple causes.

Formally the MIMIC model consists of two parts, one is the structural equation model and the other one is measurement model. The structural equation model specifies the relation between the latent variable (η) and its causes, given as:

$$\eta = \gamma' \mathbf{x} + \zeta \quad (1)$$

where

$\mathbf{x}' = (x_1, x_2, \dots, x_q)$ is a $(1 \times q)$ vector of casual variables x_i , $i = 1, \dots, q$. It is assumed that all the variables are measured in terms of deviation from their mean, therefore the conditions $\mathbf{E}(\mathbf{x}) = \mathbf{E}(\eta) = 0$ hold. In the structural equation model, $\gamma' = (\gamma_1, \gamma_2, \dots, \gamma_q)$ is a $(1 \times q)$ vector of coefficients where each γ_i describes the relationship between the latent variable η and its particular cause. Since the latent variable cannot be fully explained by its causes, so the unexplained portion is captured through error terms ζ where $\mathbf{E}(\zeta) = 0$. It is assumed that error terms do not correlate to the causes i.e. $\mathbf{E}(\mathbf{x}\zeta) = 0$. Moreover the variance of the ζ is depicted by ψ whereas the $(q \times q)$ covariance matrix of causal variables is abbreviated by Φ .

The measurement model presents the relationship of latent variable (η) to its various indicators. Generally it is specified as follows.

$$\mathbf{y} = \lambda\eta + \varepsilon \quad (2)$$

where

$\mathbf{y}' = (y_1, y_2, \dots, y_p)$ is a $(1 \times p)$ vector and each y_j , $j = 1, \dots, p$ is the indicator of the latent variable (η), λ is $(p \times 1)$ vector of coefficients with each λ_j measuring the effect of change in the latent variable on its particular indicator and $\boldsymbol{\varepsilon}' = (\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p)$ is $(1 \times p)$ vector of random error terms with $(p \times p)$ covariance matrix Θ_{ε} , holding the condition of $\mathbf{E}(\boldsymbol{\varepsilon}) = 0$. Furthermore, the indicator variables of the latent variable are also measured as deviation from their mean, hence $\mathbf{E}(\mathbf{y}) = 0$. Additionally, it is assumed that the error terms ($\boldsymbol{\varepsilon}$) in the measurement model do not correlate either to the causal variables \mathbf{x} or to the latent variable η , specifically $\mathbf{E}(\mathbf{x}\boldsymbol{\varepsilon}) = 0$, $\mathbf{E}(\eta \boldsymbol{\varepsilon}) = 0$. Moreover error terms of causal variables ($\boldsymbol{\zeta}$) and indicator variables ($\boldsymbol{\varepsilon}$) do not correlate with each other i.e. $\mathbf{E}(\boldsymbol{\varepsilon}\boldsymbol{\zeta}) = 0$.

MIMIC models are often easily conceptualized and communicated in graphical forms. In these graphical forms, a directional arrow (\rightarrow) is universally used to indicate a hypothesized casual direction. The variables to which arrows are pointing are commonly termed endogenous variables and the variables having no arrows pointing to them are called exogenous variables. Unexplained covariances among variables are indicated by bidirectional arrows (\leftrightarrow). Following figure shows the general structure of the MIMIC model.

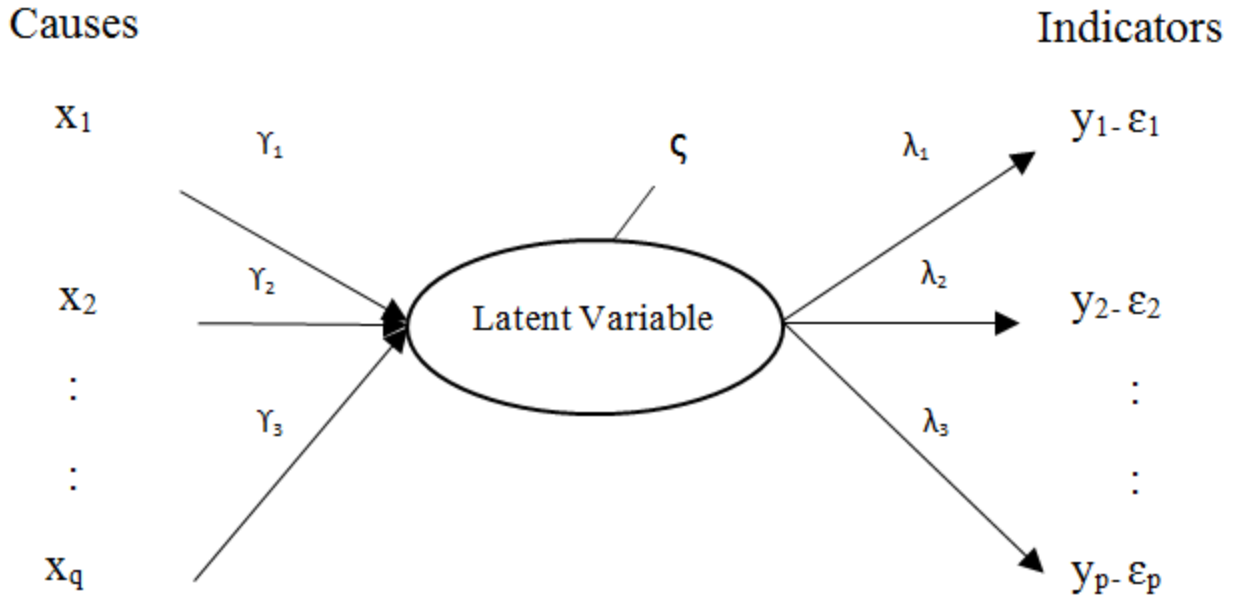


Figure 3.1: Structure of a MIMIC Model

The model can be transformed as a function of the observed variables where exogenous variables y_j are the indicators of the latent variable η whereas endogenous variables x_i are its causes. By putting equation (1) into (2), the resolved model is

$$\mathbf{y} = \lambda(\gamma'\mathbf{x} + \zeta) + \varepsilon \quad (3)$$

The covariance matrix of the model in equation (3), denoted as $\Sigma(\theta)$, is given by

$$\Sigma(\theta) = \begin{bmatrix} V(y) & Cov(y, x) \\ Cov(x, y) & V(x) \end{bmatrix} \quad (4)$$

Where $V(y)$ and $V(x)$ depict the variance-covariance matrices of y and x respectively while $Cov(x, y)$ and $Cov(y, x)$ denotes the matrix of covariance across the sets of variables in x and y . Putting in the expressions for variance and covariance into equation (4) gives:

$$\Sigma(\theta) = \begin{bmatrix} \lambda(\gamma' \Phi \gamma + \psi)\lambda' + \Theta_\varepsilon & \lambda\gamma' \Phi \\ \Phi \gamma \lambda' & \Phi \end{bmatrix} \quad (5)$$

Hence $\Sigma(\theta)$ is a function of the parameters of the model as well as variances and covariance of causal variables and error terms (see Appendix A). This matrix describes the relationship between the observed variables in terms of their covariances. Since the latent variable is not observable, its size is unknown, and the parameter of the model must be estimated using the links between the observed variables' variances and covariances. Thus the parameters are estimated such that the model's covariance matrix $\Sigma(\theta)$ becomes as close as possible to the covariance matrix \mathbf{S} of the observable causes and indicators.

Thus the estimation procedure deriving the parameters of the model involves minimization of the following function.

$$F = \ln |\Sigma(\theta)| + \text{tr}[\mathbf{S}\Sigma^{-1}(\theta)] - \ln \mathbf{S} - (p + q) \quad (6)$$

Once the parameters of the model are estimated, the index of the latent variable can be computed through the following equation.

$$\hat{\eta} = \sum_{j=1}^q \hat{\gamma}_j x_j \quad (7)$$

Ordinal index of the latent variable is obtained by the above mentioned equation, which is then converted into cardinal index by the procedure explained in Section 3.7.

Smuggling is also an unobserved phenomenon so MIMIC model is employed for the measurement of the size of this activity.⁷ In the present study, smuggling has been

⁷ The discussion on MIMIC models has been extracted from Farzanegan (2008) and Buehn and Farzanegan (2010).

categorized as import smuggling and export smuggling. The details are given into the Sections 3.4 and 3.6 respectively.

3.3 Justification for the Potential Causes and Indicators of Import Smuggling

This section gives details of the variables employed as the causes and indicators of import smuggling along with the theoretical justification of their use.

(i) Workers Remittances

Remittances, the portion of overseas workers' livelihood sent back from the country of employment to the country of origin, play a major role in promoting the economy of a country. Thus Pakistan is one of the ten leading countries receiving high inflows of remittances through formal (banking system) as well as informal channels (like self-carry, hand carry by friends or family members or through 'hundi' in Pakistan). The unrecorded remittances can be used as a source of financing the legal as well as illegal transactions and thus can contribute to a rise in smuggling. Thus the direction of the relationship between working remittances and import smuggling is expected to be positive but the strength of this relationship cannot be postulated on theoretical grounds and is, therefore, left as an empirical question.

(ii) Import Tax Rate

Import taxes i.e. tariffs and sales tax on imports being one of the major trade policy instruments are a crucial factor to motivate traders to engage in smuggling activity because the trade taxes can be avoided both through under-invoicing of imports as well as their non-reporting. Theoretical literature gives the evidence of increase in smuggling whenever government introduces or increases the magnitude of distortions in terms of

tariffs and other trade restrictions (Bhagwati and Hansen, 1973; Shiekh, 1974; Falvey, 1978; etc.). Furthermore, trade restriction introduce price disparity up to some extent between domestic and world markets, they motivate agents to exploit the profit opportunity arising due to this disparity through buying from the world cheap market to sell in the domestic expensive market at lower rates by means of import smuggling (Shiekh, 1974). Thus, the assumed positive relationship between import tax rate and import smuggling is theoretically justifiable.

(iii) Black Market Premium

Generally illegal activities are financed through illegal means. Likewise, parallel or black markets are funds generating sources for illegal transactions. In order to pay for illegal imports, foreign currency is obtained from these informal markets for foreign exchange (called Kerb markets in Pakistan) where exchange rate is determined on the basis of demand and supply forces. The black market premium is defined as the difference between the official exchange rate and the parallel market exchange rate. Higher the parallel market rate relative to the official rate, the lower will be the incentive to engage in import smuggling [Bhagwati, (1964)] owing to increase in the cost of operation. Consequently, a negative relationship is assumed between the two variables. However, in the situation of organized smuggling, where illegal trades are transacted under the cover of legal trades, high premium in black market encourages traders to use formal banking system to over-invoice their imports. Thus a positive impact of black market premium may also be expected on import smuggling [Pitt, (1981)].

(iv) Corruption

Corruption provides a base to flourish smuggling and makes it easier for the traders to bribe the relevant officials to secure them from any kind of penalty in case of detection of mis-invoicing of trade as well as seizure of stealthy transaction of goods into the country. Thus, the risk involved in engaging smuggling is cured by corruption, thereby increasing the incidence of smuggling (Shiekh, 1977). Fisman and Wei (2007) also give empirical evidence for the positive relationship between corruption and illicit transaction which is also true in case of Pakistan.

(v) Unemployment Rate

There is a noticeable relationship between unemployment and illegal activities; increase in unemployment in the formal economy makes more workers available in informal economy, one fraction of which is smuggling. Likelihood the workers employed in such illicit activities may enter as a part of unemployed labor force or may not be reported as a part of labor force at all, e.g., retired people, illegal immigrants, etc. Some people may also keep formal and informal job simultaneously like part time workers (Dell'Anno and Schneider, 2003). Thus the relationship between unemployment and smuggling is ambiguous (Tanzi, 1999). Similarly, in case of Pakistan, a weak relationship is expected between the two variables.

(vi) Real Exchange Rate

Real exchange rate is demonstrated as purchasing power of the currency of one country in terms of the currency of another country adjusted for the difference in price levels prevailing in the two countries. Normally a rise in real exchange rate refers to real

depreciation of a currency and vice versa where the rise can be attributed to the rise in nominal exchange rate or foreign prices or to a fall in domestic prices. Whatever be the reason, real depreciation makes foreign goods more expensive for local buyers, thereby decreasing the level of imports; both legal and illegal. Hence, a negative relationship between real exchange rate and import smuggling is expected to be obtained.

(vii) Trade Openness

Smuggling has significant influence on trade openness. A country which has more illicit transactions, may be perceived to have less trade liberalization. Therefore, it indicates the government to show flexibility in trade policies to integrate a country into global markets. Consequently, a negative relationship is expected between import smuggling and trade openness. Hence, smuggling forces country to liberalize which in turn minimizes smuggling to adequate extent. As an illustration, it is just acting like cause and effect relationship that if one is affected, there are more chances that the other one will be affected too. Pitt (1981) revealed another aspect of higher index of smuggling; the easier it is to hide illegal trade under the cover of legal trade, the more a country gets liberalization. So a positive relationship may exist between import smuggling and trade openness.

(viii) Currency in circulation to M2 ratio

Currency is the exclusive medium of exchange in an unreported transaction which boosts up the demand for the generally acceptable currency; usually it is the US dollar. In legal transactions, a letter of credit is used to sell and purchase the goods across the border.

Letter of credit is a document to assure the seller that he will receive the full payment as certain delivery conditions are met. The following figure explains the whole channel.

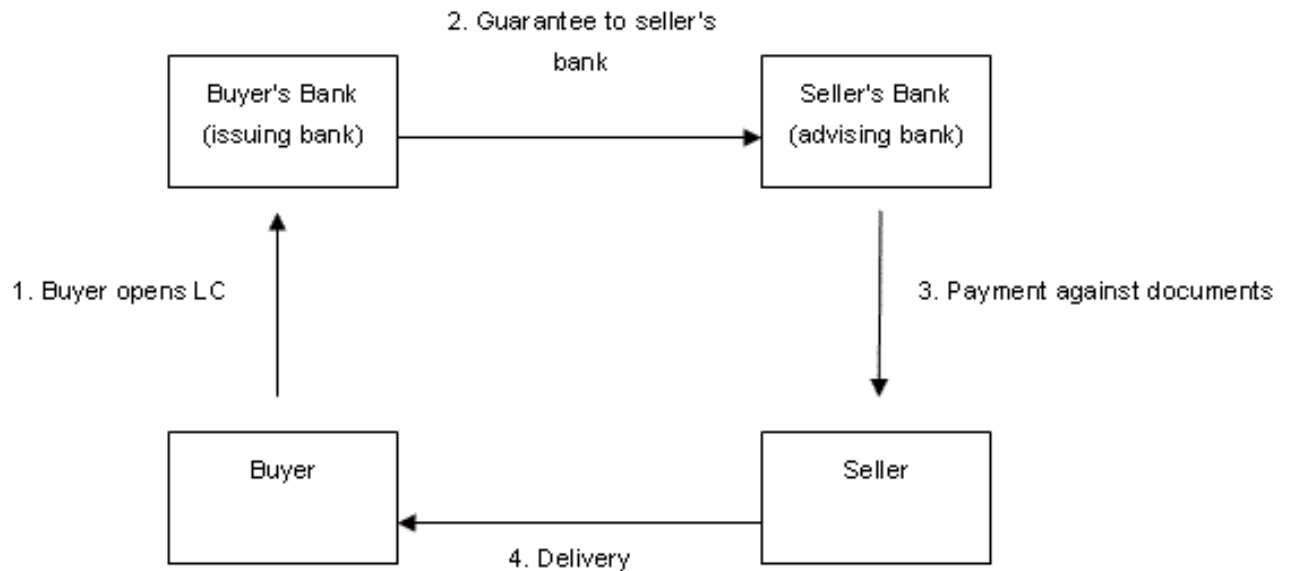


Figure 3.2: The Letter of Credit Cycle

However in case of smuggling, neither legal nor formal institute is used as an intermediary. Therefore importer, himself is in need of foreign currency, so the demand of foreign currency increases as compared to domestic currency. Thus, the currency in circulation as a ratio of total monetary assets can be seen as an indicator of import smuggling where a negative relation can be hypothesized between the two variables.

(ix) Unit Value Index of Imports

Import price index measures changes in the prices of the officially recorded goods and services provided by the rest of world and used by residents of the importing country. Trade restriction introduces price disparity between domestic and world markets which in turn creates incentives for import smuggling. Hence, the fraction of legal imports

decreases and the fraction of illegal imports increases. Theoretical evidence, given by Thursby *et al.* (1991), indicates that if the price effect of smuggling is greater than its cost, then it is possible that smuggling improves the welfare (Farzanegan, 2008). Through the evasion of legal duties and tariff, smugglers have a cost advantage compared to legal importers in the domestic market. Therefore, they are able to earn their expected profit margin with lower prices than the market equilibrium price. Depending on the share of the smuggled product in the domestic market, the market equilibrium price of that product will decline. Thereby the impact of import smuggling on unit value index of imports is expected to be negative.

(x) Consumption Per Capita

As trade restriction introduce price disparity up to some extent between domestic and world markets which motivate traders to buy the goods from world cheap market and sell them in the domestic expensive market at lower rates by means of import smuggling (Shiekh, 1974). In this way, smuggling brings down the market equilibrium prices and thus increases the consumption per capita. A positive relation can be assumed between import smuggling and consumption per capita.

(xi) Government Revenue to GDP

Legal imports are one of the leading sources of governmental revenues, which is unfortunately reduces through illegal imports specifically because of tariff evasion of smugglers. Thus, the impact of illicit trade on government revenues is noteworthy and a negative relationship is to be assumed between import smuggling and government revenue to GDP.

(xii) Current Account Deficit

Current account deficit is the measurement of country's trade balance. As illegal channel is used for the illegal transaction of imports, the officially recorded current account deficit is expected to fall with a rise in the volume of informal imports. Hence, current account deficit can be considered as an indicator of import smuggling and a negative relation is expected between the two variables.

3.4 The MIMIC Model for Import Smuggling

By considering the theoretical justification in section 3.3, in the MIMIC approach to import smuggling, the causes of smuggling considered are workers remittances, import tax rate, black market premium, corruption, unemployment rate and real exchange rate. Hence, the specific form of the structural equation (1) in the model is:

$$[Import\ Smuggling] = [\gamma^1, \gamma^2, \gamma^3, \gamma^4, \gamma^5, \gamma^6] \times \begin{bmatrix} workers\ remittances \\ import\ tax\ rate \\ black\ market\ premium \\ corruption \\ unemployment\ rate \\ real\ exchange\ rate \end{bmatrix} + [\zeta] \quad (8)$$

For the measurement model, the indicators of import smuggling include trade openness, currency in circulation to M2 ratio, unit value index of imports, consumption per capita, government revenue to GDP and current account deficit. Thus, equation (2) of the measurement model is specified as:

$$\begin{bmatrix} trade\ openness \\ currency\ in\ circulation\ to\ M2\ ratio \\ unit\ value\ index\ of\ imports \\ consumption\ per\ capita \\ government\ revenue\ to\ GDP \\ current\ account\ deficit \end{bmatrix} = \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \\ \lambda_4 \\ \lambda_5 \\ \lambda_6 \end{bmatrix} \times [Import\ Smuggling] + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix} \quad (9)$$

The following hypothesized path diagram specifies the MIMIC model in its causes and indicators.

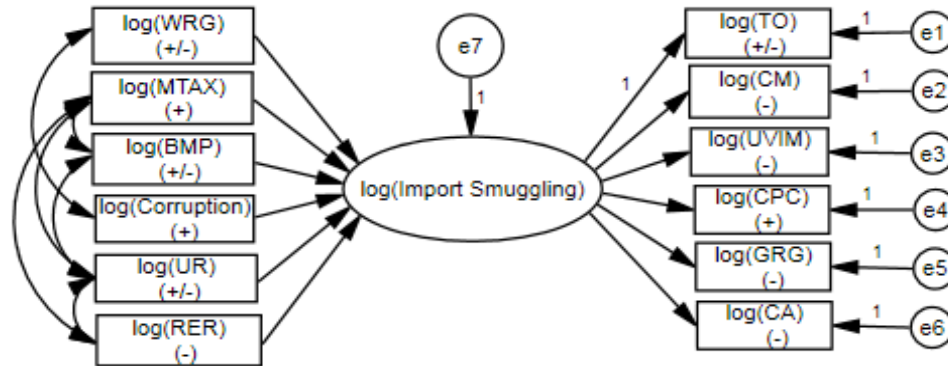


Figure 3.3: Path diagram of import smuggling MIMIC Model

3.5 Justification for the Potential Causes and Indicators of Export Smuggling

(i) Rate of Duty Drawback

Duty drawback or the rebate scheme is a refundable scheme under which custom duties, excise duty, and sales tax, etc. paid on raw materials are refundable if the goods made of these raw materials are exported afterwards. The purpose of this duty drawback is to support exports and make them more valuable in the world markets through providing raw materials and intermediate goods at zero duty [Haque and Kemal, (2007)]. Thus a negative relationship can be considered between rate of duty drawback and export smuggling.

(ii) Export Financing to Exports

Export financing scheme was introduced in 1973 to widen the fraction of exports by encouraging the tax payers or exporters. The objective of this scheme is to facilitate the

exporters through short term financing sourced by banks to export all kinds of manufacturing goods. The export financing motivates traders to use legal ways for export transactions, hence reduce illegal transactions. Consequently, a negative relationship is assumed between export financing and export smuggling. However, it is difficult to monitor export promoting schemes, in particular to trace whether funds granted through these policies are being used for the purpose intended. Thus export financing scheme is subjected to the possibility of rent-seeking where traders have incentives to over-invoice their exports [Haque and Kemal, (2007)]. Thus a positive impact of export financing may also be expected on export smuggling.

(iii) Black Market Premium

Import smugglers are the main demanders of foreign exchange in the black market which is supplied by the export smugglers through under-invoicing of their exports. Hence export smuggling increases with the increase in black market premium. Consequently a positive impact of BMP is expected on export smuggling. Moreover studies also suggest that export supplying domestic companies tend to reduce exports with the rise in black market premium and resort to mis-invoicing or export smuggling [Farzanegan, (2008)].

(iv) Corruption

The influence of corruption on illicit transactions has already been explained in section 3.3. As in case of import smuggling, a positive relationship of corruption with export smuggling is also expected.

(v) Real Exchange Rate

Real depreciation, that is an increase in real exchange rate, makes domestic goods cheaper for international buyers, thereby increasing the level of exports; both legal and illegal. Hence, a positive relationship between real exchange rate and export smuggling is expected to be obtained.

(vi) Unemployment Rate

The possible relationship of unemployment with smuggling has already been explained in detail in section 3.3. Accordingly the direction of relationship between unemployment rate and export smuggling is ambiguous and expected to be weak.

(vii) Trade Openness

The details of possible impact of smuggling on trade openness have been given in section 3.3. Like import smuggling, export smuggling also has positive as well as negative influence on trade openness.

(viii) Unit Value Index of Exports

Export price index measures the changes in the prices of the officially recorded goods and services provided by the residents of the specific country and used by the rest of world. If total exports of a country remain the same despite the switching of legal exports into illegal exports then there is no impact of export smuggling on unit value index of exports. Nevertheless, if with export smuggling total exports increases then there is a possibility of a fall in the unit value index of exports. Thus, unit value index of exports

can be considered as an indicator of export smuggling where the influence of latter on the former is expected to be negative.

(ix) Current Account Deficit

The officially recorded current account deficit is expected to rise with a growing volume of informal exports relative to the formal exports for the economy. Hence, a positive relationship is expected between export smuggling and current account deficit.

(x) GDP Per Capita

Smugglers evade legal taxes and social contributions along with the wastage of resources in unproductive activities like corruption, money laundering. Collectively, all those activities adversely affect the government’s ability to provide public goods and services in the official economy to increase productivity. Thus, illegal transaction also has negative impact on GDP. Accordingly, a negative relationship is expected between export smuggling and GDP per capita.

3.6 The MIMIC Model for Export Smuggling

Again with the help of theoretical justification in section 3.3, a MIMIC model for the export smuggling is specified. By considering rate of duty drawback, export financing to exports, black market premium, corruption, real exchange rate and unemployment rate as the causes of export smuggling, the specified structural equation in the model is given by.

$$[Export\ Smuggling] = [\gamma^1, \gamma^2, \gamma^3, \gamma^4, \gamma^5, \gamma^6] \times \begin{bmatrix} \textit{rate of duty drawback} \\ \textit{export financing to exports} \\ \textit{black market premium} \\ \textit{corruption} \\ \textit{real exchange rate} \\ \textit{unemployment rate} \end{bmatrix} + [\zeta] \quad (10)$$

For the measurement equation model, the indicators of export smuggling are trade openness, unit value index of exports, current account deficit and GDP per capita. Thus, the precise specification of the measurement model is:

$$\begin{bmatrix} \text{trade openness} \\ \text{unit value index of exports} \\ \text{current account deficit} \\ \text{GDP per capita} \end{bmatrix} = \begin{bmatrix} \lambda^1 \\ \lambda^2 \\ \lambda^3 \\ \lambda^4 \end{bmatrix} \times [\text{Export Smuggling}] + \begin{bmatrix} \varepsilon^1 \\ \varepsilon^2 \\ \varepsilon^3 \\ \varepsilon^4 \end{bmatrix} \quad (11)$$

Figure 3.4 illustrates the path diagram of export smuggling.

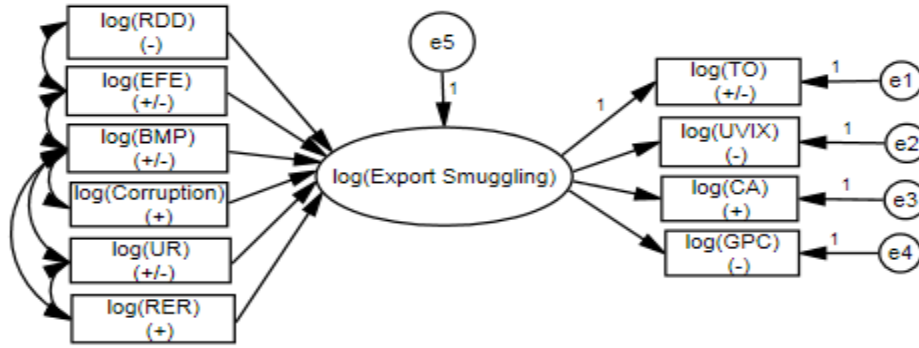


Figure 3.4: Path diagram of export smuggling MIMIC Model

3.7 CONVERSION TO QUANTITATIVE INDEX

The ordinal indices show the trends in import smuggling as the fraction of imports and export smuggling as the fraction of exports over time respectively. In order to obtain a cardinal series from the ordinal indices, a meaningful benchmark period is requisite. The trade discrepancy approach is used to arrive at a benchmark period which employs the differences in reported import and export figures of partner countries to compute the

trade mis-invoicing.⁸ The data of exports and imports reported in UNCOMTRADE database are usually used where the data of exports are reported on FOB (free on board) basis, while data of imports are reported in CIF (cost, insurance and freight costs) basis. In order to make a standardized comparison of imports and exports, 10% of export value (suggested by IMF (1993)) is added in the export figures to capture the transportation and other costs involved. The export mis-invoicing and import mis-invoicing is therefore calculated through the following equations.

$$Import\ Misinvoicing_t = \sum_{i=1}^n [\{M_t^i + (0.1 * M_t^i)\} - M_t^i] \quad (12)$$

$$Export\ Misinvoicing_t = \sum_{i=1}^n [\{X_t^i + (0.1 * X_t^i)\} - X_t^i] \quad (13)$$

where

M_t^i is exports to Pakistan in period t as recorded by her ith trading partner.

M_t^i is imports as recorded by Pakistan in period t with her ith trading partner.

X_t^i is exports as reported by Pakistan in period t to her ith trading partner

X_t^i is imports from Pakistan in period t as reported by her ith trading partner.

The positive value of the formula in equation (12) shows the under-invoicing of imports by Pakistan whereas the negative result refers to the over-invoicing of imports in any period t . Similarly, the positive value of the formula in equation (13) means the exports over-invoicing by Pakistan while the negative value refers to the under-invoicing of exports in any period t . The obtained mis-invoicing is then divided by total imports

⁸ In the present study, USA, U.K., Canada, France, Netherlands, Italy, Japan, Malaysia, Singapore, Indonesia, Philippines, Australia, New Zealand, and Mexico are considered as the major trading partners of Pakistan.

and total exports of Pakistan with the same set of trading partners in the respective period to obtain a series for import mis-invoicing as a ratio of imports as well as export mis-invoicing as a ratio of exports. Bench mark period is then selected looking at the trends in the series. In the present study, a common reference period i.e. 1989-90 is considered the bench mark period for both the models where import smuggling is found to be 18.29% and export smuggling is 4.71%.

The next step is to use the obtained figures for the bench mark period to convert the qualitative indices of smuggling into quantitative indices. The series are generated using the following formula:

$$(C/T)_t = \frac{(C/T)_o}{(O/T)_o} (O/T)_t$$

This shows the percentage variation in smuggling ratio where (O/T) represents the qualitative index while (C/T) denotes the quantitative index and subscript o indicates the bench mark period. The values used for the bench mark period are obtained through proper method and are less arbitrary; avoid the main criticisms raised on both the trade discrepancy approach and MIMIC approach.

3.8 CONCLUSION

A number of methods can be used to measure the extent of illicit activities. MIMIC modeling has also been extensively used for estimating the underground economy, owing to its flexibility and less restrictive assumptions. Although none of the approaches can be claimed to be free of limitations, however the MIMIC approach can be regarded as the

best available technique amongst the approaches developed to capture the unobservable segment of the economy.

CHAPTER 4

DATA AND VARIABLES

4.1 INTRODUCTION

Various data sets, for the fiscal year (FY hereafter) 73 to FY 11, have been used in this study to estimate the Latent variables that are import smuggling and export smuggling, based on the MIMIC methodology. This chapter is arranged to explain the issues regarding data and construction of variables. Since both the prospects of smuggling employed certain common and certain uncommon causes and indicators, the data will be described collectively under the single heading in Section 4.2 where the sub-section 4.2.1 describes data for the causal variables of the analysis while sub-section 4.2.2 gives information for variables used as indicators. Section 4.3 gives key descriptive statistics, while Section 4.4 discusses about the trade data.

4.2 DESCRIPTION OF DATA

4.2.1 Causes

(i) Workers Remittances

The data on workers remittances, denoted as WR, are obtained from *Hand Book of Statistics on Pakistan Economy* published by State Bank of Pakistan, for FY 73 to FY 11. The data are available in units of million US dollars which are, converted into million rupees by using the exchange rate for the relevant years. These data are then divided by nominal GDP to get workers' remittances as a fraction of GDP, that is

$$WR = \frac{\text{Worker Remittances}}{\text{Nominal GDP}}$$

Remittances have shown a generally rising trend in Pakistan. As a percentage of GDP, however, they have shown fluctuations, gained peak value of 8.7% in the early 1980s and then dipped down to 1.4% in the end of 1990s and rising again to 5.4% in the 2000s.

(ii) Import Tax Rate

Import tax is obtained by the summation of tariffs and sales tax on imports where gross import duty is considered as an indicator of tariffs. The data on gross import duty as well as sales tax on imports in unit of rupees are collected from *Central Board of Revenue (CBR) Year book* for FY 73 to FY 11, Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan is the source of data for nominal imports for the respective years. The sum of the two taxes is then divided by nominal imports in rupees to get import tax rate, symbolized by MTAX as given below.

$$MTAX = \frac{\text{Gross import duty} + \text{Sales tax on imports}}{\text{Nominal imports}}$$

Initially a rising trend has been shown by the import taxes in the decade of 1970s till mid-1980s, reaching their peak value of 45% of imports in FY 87. However, a sharp decline has been noted in import tax rates in the span of 1990s which continued to decrease in 2000s, reaching a minimum of 1.1% in FY 2011.

(iii) Black Market Premium

The difference between the official exchange rate and the parallel market exchange rate is defined as black market premium, denoted by BMP, formulated as:

$$BMP = \frac{\textit{Parallel Exchange Rate} - \textit{Official Exchange Rate}}{\textit{Official Exchange Rate}}$$

The data on BMP for the FY 73 to FY 93 are obtained from Dorash and Salam (2007) while the data for the FY 94 to FY 11 are collected from the *Annual Reports*, State Bank of Pakistan.

The BMP shows a declining trend over the years. The main reason behind this decline is the intervention of State Bank in official market in the determination of exchange rate. The difference between the two exchange rates is obvious till the mid of 1980s and is negligible afterwards.

(iv) Corruption

The data on corruption index has been taken from *International Country Risk Guide (ICRG)*, published by the political risk services. The available data covering the period of FY 84 to FY 11 with the range of 0 to 6, where the higher value of index shows a lower level of corruption. The corruption index stays around the average at 2 points; being lower in earlier years and higher in later ones. It reached at the maximum value of 3 in FY 98 showing the least level of corruption but then has dropped again to the average of 2 for the last period.

(v) Unemployment Rate

The unemployment rate is obtained by dividing the number of unemployed persons by the number of persons in labor force. It is denoted as UR in the present study and is given as follows.

$$UR = \frac{\text{Number of unemployed persons}}{\text{Number of persons in labor force}}$$

The data on unemployment and labor force are taken from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan for the considered time span.

Generally an increasing trend has been tracked in unemployment rate over the decades. Starting from 1.9% the FY 73, it reached at the point of 3.9% in the FY 83 followed by a decline to 3% in the FY 87. Afterwards, the rate rose to 6 % in the 1990s chased by the peak of 9.8% for the 2000s.

(vi) Real Exchange Rate

Real exchange rate is constructed by multiplying nominal exchange rate with the ratio price of indices of the United States and Pakistan respectively. Real exchange rate is depicted by RER here and is given by the following formula:

$$RER = \text{Nominal Exchange Rate} * \left[\frac{CPI(U.S.)}{CPI(Pak)} \right]$$

where direct definition of exchange rate is used, that is, in terms of rupees per U.S. dollars.

The data on nominal exchange rate, consumer price index of Pakistan, and consumer price index of the United States have been taken from *International Financial Statistics (IFS)* of International Monetary Fund for the respective years. The real exchange rate shows an increasing trend through the 1980s and the 1990s reaching its highest value of 70 in FY 01 and declining in trend afterwards to 50.2 in FY 11.

(vii) Rate of Duty Drawback

Rate of duty drawback is attained through dividing duty drawback by nominal exports where the data on duty drawback and nominal exports in unit of rupees in million are collected from *Central Board of Revenue (CBR) Year book* for FY 73 to FY 11. Rate of duty drawback is depicted by RDD here and is calculated as:

$$RDD = \frac{\text{Duty Drawback}}{\text{Nominal Exports}}$$

Initially an increasing trend has been followed by the rate of duty drawback which attained its highest value of 6.3% of exports in FY 83. Then a gradual decrease has been observed that ends at 3.2% in FY 95 and afterwards a rise to 4.7% have been noted in FY 02. Later on a declining trend has been adopted by rate of duty drawback with minimum value of 0.35% in FY 11.

(viii) Export Financing to Exports Ratio

Export financing to exports ratio is the ratio of export finance to nominal exports, denoted by EFE in the present study as shown below.

$$EFE = \frac{\text{Export Finance}}{\text{Nominal Exports}}$$

The available data in unit of rupees in million on export finance and nominal exports are sourced from State Bank of Pakistan for the FY 78 to FY 11. Starting from FY 78, a rising trend has been observed till 1980s which then dipped down in the middle of 1990. After that a rise has been noted in FY 99 followed by a decline afterwards.

4.2.2 Indicators

(i) Trade Openness

Trade openness is calculated as the ratio of the country's trade i.e. sum of imports and exports to the gross domestic product (GDP), denoted as TO here, and is given as:

$$TO = \frac{\text{Nominal Imports} + \text{Nominal Exports}}{GDP}$$

The data on nominal imports, nominal exports, and GDP in unit of million rupees are collected from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan for the considered time span. The overall trend of trade openness is rising with little bit fluctuations in case of Pakistan. Starting with 20.9% in 1970s, it ends at 31.3% in 2000s.

(ii) Currency in Circulation to M2 Ratio

In this ratio M2 (total monetary assets) includes M1 (narrow money) and schedule bank time deposits with the exclusion of RFCD (resident foreign currency deposits). The data on currency in circulation and M2 are obtained from *Handbook of Statistics on Pakistan Economy* issued by State Bank of Pakistan for the FY 73 to FY 11.

In case of Pakistan the ratio does not show an obvious drift; it shows fluctuation with an average value of 0.28, hitting the maximum in FY 91 (i.e. 0.35) and minimum in FY 07 (i.e. 0.20).

(iii) Unit Value Index of Imports

The data on unit value index of imports are taken from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan for the considered time period. The data are available with different bases which are, however, converted into the same base year 1975-76. These data are then divided by WPI to get unit value index of imports as a fraction of WPI.

Initially an increasing trend has been observed for unit value index of imports that reaches to its maximum value of 1.34 in FY 91 then dips down to 0.49 in FY 98 and shows an increasing trend afterwards.

(iv) Consumption per capita

In order to construct the variable consumption per capita, the data on consumption (at constant LCU), in million rupees have been taken from *World Development Indicators (WDI)*, which are then divided by population of county in millions for the time period of FY 73 to FY 11. The data on population are taken from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan. The overall increasing trend has been noted for consumption per capita.

(v) Government Revenue to GDP ratio

The data on government revenue, in million rupees, have been collected from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan, which are then divided by nominal GDP, in million rupees, for the time span of FY 73 to FY 11. The ratio does not show an obvious drift.

(vi) Current Account Deficit

The current account deficit, denoted as CA, is defined as the ratio of credit entries to debit entries in goods, services and income portion of the current account; ratio less than 1 being indicative of current account deficit and vice versa. The data are obtained from Balance of Payments chapter of *Pakistan Statistical Yearbook*, Federal Bureau of Statistics. The data are in million rupees for the FY 73 to FY 89 while for FY 90 to FY 11, the data are available in million US dollar which are, however, converted into the same unit of million rupees by using exchange rate for the respective years.

The CA ratio is found to be less than 1 throughout the period of analysis. However, the current account balance has shown a slight improvement over decades, starting with the value of 0.76 the ratio reaches at 0.91 over the considered span.

(vii) Unit Value Index of Exports

The data on unit value index of exports are sourced from *Statistical bulletin of Economic Survey*, Ministry of Finance, Government of Pakistan, for the considered time period. The data are available in different bases which are, however, converted into same base year 1975-76. These data are then divided by WPI to get unit value index of exports as a fraction of WPI.

The overall a decreasing trend has been observed for unit value index of exports; starting from 1.18 in FY 73 it hits the least value of 0.46 in FY 11.

(viii) GDP per capita

In order to construct the variable GDP per capita, the data on GDP (at constant price) in million rupees, have been taken from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan, which are then divided by population of county in millions for the time period of FY 73 to FY 11. The data on population are also obtained from Statistical bulletin of Economic Survey, Ministry of Finance, Government of Pakistan. The overall increasing trend has been noted for GDP per capita for the time span considered in the analysis.

4.3 DESCRIPTIVE STATISTICS

This section contains descriptive statistics for all the variables used in the present study under two headings that are for causes and indicators of the latent variables.

Causes

Table 4.1 gives the descriptive statistics of causal variables used in the present study. Mean and median are used as the measures of central tendency of the variables which are almost same for all the variables except black market premium (BMP), real exchange rate (RER), corruption and export financing to exports (EFE). It implies that WR, MTAX, UR, RDD have symmetrical distribution. The mean of the BMP is greater than the median; it implies that BMP is positive skewed, same is the case with RER and EFE. However, the corruption index is negatively skewed as its mean is less than its median.

Table 4.1: Descriptive Statistics of Causal Variables

	Mean	Median	Maximum	Minimum
WR	0.04	0.04	0.08	0.01
MTAX	0.28	0.28	0.45	0.11
BMP	0.06	0.04	0.20	-0.003
UR	0.06	0.06	0.10	0.03
RER	51.82	51.24	69.34	35.51
Corruption	1.96	2.00	3.00	1.00
RDD	0.04	0.04	0.06	0.003
EFE	0.13	0.12	0.21	0.08

Indicators

Table 4.2 explains the descriptive statistics of indicator variables used in the analysis. Central tendency is same just for two variables; current account deficit (CA) and government revenue to GDP ratio (GRG) while other variables; TO, CM, CPC, UVIM, UVIX, and GPC have asymmetrical distribution. Moreover, TO, CPC, UVIM, UVIX are positively skewed variables while CM and GPC are negatively skewed.

Table 4.2: Descriptive Statistics of Indicator Variables

	Mean	Median	Maximum	Minimum
TO	0.26	0.25	0.37	0.19
CM	0.29	0.30	0.35	0.20
CA	0.64	0.64	1.01	0.45
GRG	0.14	0.14	0.16	0.09
CPC	33969.99	33174.13	45733.89	22419.69
UVIM	0.87	0.86	1.34	0.50
UVIX	0.81	0.62	1.44	0.45
GPC	24030.49	25009.9	34703.08	14846.52

4.4 TRADE DATA

Figure 4.1 shows the international trade of Pakistan as a percentage of GDP for the considered time period of 1972-73 to 2010-11. Exports, imports and the favorable or unfavorable balance between both are the economical determinants of a country's success. The overall growth rate of exports is not much satisfactory; however in the 1970s a considerable improvement was observed in Pakistan's exports. According to the economic survey, in 1976-77, the total exports were 6.28% of GDP that continued to increase in the 1980s and reached at 9.70% of GDP in 1988-89. In 1995-96, exports jumped to 11.43% of GDP which remained stagnant in the period of 1994-95 to 1999-00. However, higher level of exports had been observed in 2004-05 at 13.35% of GDP. Afterwards, the growth rate of exports slows down and marks the exports 11.74% of GDP in 2010-11. In Pakistan, the requirement of imports always raised higher than the level of exports. Consequently imports are higher than exports for the considered period. Overall, an increasing but fluctuated trend has been observed for imports. Starting with the imports of 10.36% of GDP in 1972-73, it marks the value of 15.79% of GDP in 1984-85. Afterwards, a persistent growth rate has been observed in imports' trend in 1990s that ends up with a significant jump to 19.11% of GDP in 2004-05. At the end, in 2010-11, the increasing pattern of Pakistan's imports attains the level of 19.13% of GDP.

Unfortunately, Pakistan always suffered a negative trade balance owing to its reliance on imports, which consist of essential raw materials and equipment. Starting with the surplus of 0.19% of GDP in 1972-73, trade balance faced deficit throughout the time span with fluctuations. In 1976-77, Pakistan faced deficit of 6.51% of GDP which further increases to the level of 9.11% of GDP in 1984-85. Continue with fluctuated drift, trade balance

marks the deficit of 4.72% of GDP in 1996-97. Afterwards ups and downs have been observed in trend that attains the noteworthy deficit of 7.39% of GDP in 2010-11 [See Pakistan economic survey (2004-2005 and 2011-2012)].

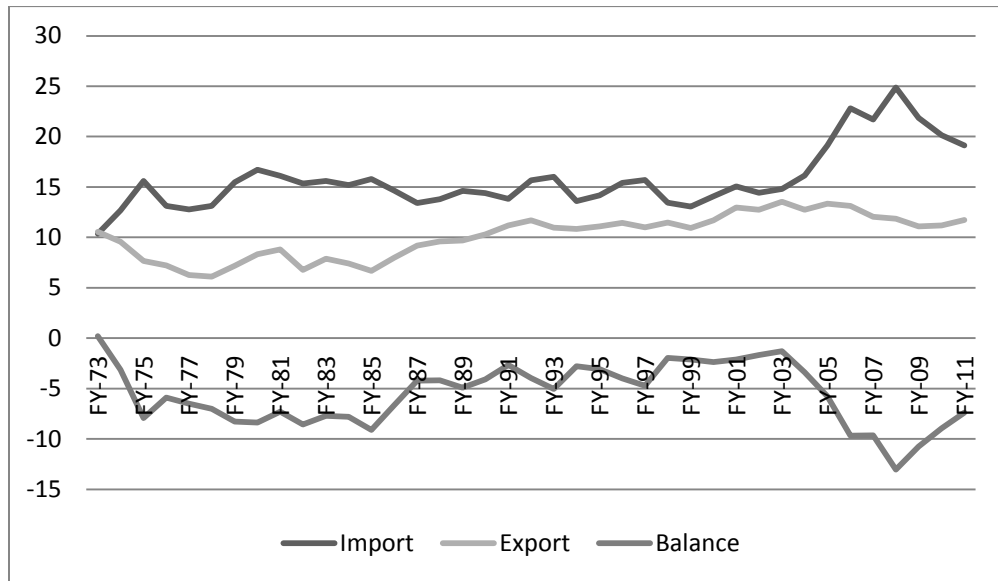


Figure 4.1: Trade pattern as a percentage of GDP

CHAPTER 5

RESULTS AND DISCUSSION

5.1 INTRODUCTION

This chapter comprises of the results and discussion regarding the estimation of models designed to measure import smuggling as well as export smuggling. In section 5.2, issues regarding the estimation and the results obtained are discussed separately, for import smuggling and export smuggling in sub-sections 5.2.1 and 5.2.2 respectively. Then the discussion on results follows in section 5.3 while section 5.4 concludes the chapter.

5.2 THE RESULTS FROM MIMIC APPROACH

In the present analysis estimations of the models have been done in AMOS using Maximum Likelihood method. All causes and indicators of the study are in logarithmic form. Ordinal estimations of import smuggling and export smuggling have been obtained from the structural part of the models, which are then converted into cardinal indices with the help of exogenous information provided by trade discrepancy approach.

5.2.1 Import Smuggling

Estimations of import smuggling for four specifications are given in Table 5.1. The impact of working remittances on import smuggling is found to be positive for all specifications that ratify the use of unrecorded remittances in illegal transactions. Moreover the hypothesized relationship of tariff burden with import smuggling is also confirmed entirely. In specifications 1 and 2, unemployment rate has been controlled; a positive impact has been found that justifies the contribution of unemployed persons in

informal economy. Likewise corruption has positive effect on smuggling in specifications 1 and 3. The black market premium has different impact on import smuggling in different specifications. In specifications 1 and 2 black market premium has negative influence on import smuggling. This means that by increasing premium, the phenomenon of under invoicing becomes costly and smugglers have to pay more to under invoice their imports. On the other hand, in specifications 3 and 4 it has positive effect and encourages smuggling. Furthermore, a negative relation of real exchange rate with import smuggling has been confirmed for all the specifications considered.

In the measurement part of the model, scaling the latent variable to one of the indicators with correct sign is essential for the identification of a model [See Farzanegan, (2008)]. The coefficient of trade openness in all specifications, except specification 4, is selected as a scale variable and fixed to 1. In order to explore the robustness of estimations, in specification 4, the consumption per capita is opted for the scale variable and fixed to 1. The results are found to be robust. In addition, the effect of smuggling on trade openness and consumption per capita is positive and significant for all the specifications.

The effect of smuggling on unit value index of imports is negative entirely. For specifications 1 and 2, smuggling has negative influence on governmental revenue and justifies the hypothesized relationships, while it is positive for the specifications 3 and 4. For all specifications, negative and significant relationship of import smuggling has been confirmed with currency in circulations (CM). Similarly a negative influence of import smuggling has been obtained on the current account deficit (CA), which also confirms the theorized relationship.

After analyzing different specifications on the bases of their significance and goodness of fit indices, the index of import smuggling is estimated through specification 1 as follows.

$$\log(\mathit{Imp Smug}) = 0.04 \log(\mathit{WR}) + 0.11 \log(\mathit{MTAX}) - 0.04 \log(\mathit{BMP}) + \\ 0.05 \log(\mathit{Corruption}) + 0.09 \log(\mathit{UR}) - 0.24 \log(\mathit{RER}) \quad (5.1)$$

The calibration of equation (5.1) gives the ordinal index of import smuggling as a fraction of imports in logarithmic form. Taking anti-log and converting into cardinal index with the reference year, i.e. FY 89-90 provides a quantitative index of import smuggling. The results are mentioned in Table 5.2.

The trend shown by import smuggling in Table 5.2 is more or less same with the average annual import smuggling i.e. 18% of imports in the period of analysis which is approximately 1982 million dollars. Moreover it indicates under-invoicing of imports where traders try to avoid the duties and taxes.

Table 5.1: Estimation for Import Smuggling

Specification	1	2	3	4
Causes				
Log(WR)	0.039 (0.002)	0.025 (0.015)	0.059 (0.019)	0.065 (0.020)
Log(MTAX)	0.111 (0.011)	0.118 (0.015)	0.163 (0.002)	0.245 (0.031)
Log(BMP)	-0.035 (0.001)	-0.069 (0.06)	0.075 (0.02)	0.071 (0.42)
Log(Corruption)	0.053 (0.049)		0.058 (0.10)	
Log(UR)	0.087 (0.010)	0.09 (0.011)		
Log(RER)	-0.244 (0.001)	-0.226 (0.025)	-0.371 (0.030)	-0.507 (0.041)
Indicators				
Log(TO)	1	1	1	0.709 (0.001)
Log(CM)	-0.682 (0.00)	-0.699 (0.00)	-0.68 (0.00)	-0.49 (0.00)
Log(UVIM)	-1.132 (0.00)	-1.128 (0.00)	-1.087 (0.00)	-0.762 (0.00)
Log(CA)	-1.231 (0.00)	-1.249 (0.00)	-1.234 (0.00)	-0.885 (0.00)
Log(CPC)	1.439 (0.00)	1.427 (0.00)	1.43 (0.00)	1
Log(GRG)	-0.522 (0.00)	-0.513 (0.00)	0.525 (0.00)	0.362 (0.00)
Goodness of Fit				
Indices				
NFI ^a	0.622	0.634	0.620	0.636
CFI ^b	0.661	0.643	0.663	0.682
NCP ^c	161.642	155.049	125.342	117.232
F0 ^d	4.254	4.080	3.298	3.085
FMIN ^e	5.517	5.107	4.377	3.953
AIC ^f	293.642	270.049	238.342	214.232
ECVI ^g	7.727	7.107	6.272	5.638

Note: P-values in parenthesis.

Range of Goodness of Fit Indices is given in Appendix B.

Table 5.2: Import smuggling as a percentage of Imports

Years	Import Smuggling
1972-73	17.86
1973-74	16.93
1974-75	17.37
1975-76	18.45
1976-77	19.49
1977-78	20.32
1978-79	20.42
1979-80	20.3
1980-81	20.31
1981-82	19.45
1982-83	19.63
1983-84	19.27
1984-85	19.41
1985-86	19.57
1986-87	19.28
1987-88	18.9
1988-89	18.28
1989-90	18.3
1990-91	18.55
1991-92	18.56
1992-93	18.01
1993-94	18.11
1994-95	18.4
1995-96	17.83
1996-97	17.93
1997-98	17.84
1998-99	16.97
1999-00	16.73
2000-01	16.53
2001-02	16.99
2002-03	17.52
2003-04	17.34
2004-05	17.16
2005-06	16.79
2006-07	17.27
2007-08	17.1
2008-09	17.09
2009-10	17.61
2010-11	17.36

5.2.2 Export Smuggling

Table 5.3 presents estimations of export smuggling for four specifications. For all specifications, the effect of the rate of duty drawback on export smuggling is negative that confirms the hypothesized relationships. The impact of export financing scheme on export smuggling is positive for specifications 1, 2, and 4, which shows that export financing policy is used for over-invoicing of exports, however it is negative for specification 3 and supports the argument that export financing scheme promotes formal exportation. In specifications 1 and 3 black market premium discourages export smuggling while in specifications 2 and 4 it encourages. The influence of corruption on export smuggling is positive in specification 1 and justifies the hypothesized relationship but negative in specification 2. Moreover, unemployment rate encourages smuggling in specifications 1 and 3 by significant magnitudes. The real exchange rate is positively related to export smuggling in all specifications where results are significant.

Likewise sub-section 5.2.1, trade openness in all the specifications, except specification 4, is selected as a scale variable and its coefficient is fixed to 1. In order to verify the robustness of estimations, in specification 4, the GDP per capita is opted for the scale variable and fixed to -1. The results are found to be robust. Moreover the effect of smuggling on trade openness is positive while its effect on GDP per capita is negative in all the cases.

The effect of export smuggling on unit value index of exports is found to be negative and significant for all the specifications, which indicates increase in total exports due to export smuggling. Moreover, the hypothesized relationship of export smuggling

and current account deficit has been confirmed except in specification 3; however the results are significant in all specifications.

After evaluating all the specifications, the ordinal index of export smuggling is estimated on the bases of specification 1 as follows.

$$\log(\text{Exp Smug}) = -0.03 \log(RDD) + 0.02 \log(EFE) - 0.07 \log(BMP) + \\ 0.02 \log(Corruption) + 0.14 \log(UR) + 0.21 \log(RER) \quad (5.2)$$

Also the calibration of equation (5.2) gives the index of export smuggling as a fraction of exports in logarithmic form. Afterwards anti-log has been taken and converted ordinal index into cardinal index with the same reference year, i.e. FY 89-90. The results of quantitative index of export smuggling are given in Table 5.4.

Likewise in Table 5.4, export smuggling also drifts around the average annual export smuggling of 5% of exports over the period of analysis that is approximately 402 million dollars and directs towards over-invoicing of exports that supports the argument that traders get benefit from export subsidies by over-invoicing their exports.

Table 5.3: Estimation for Export Smuggling

Specification	1	2	3	4
Causes				
Log(RDD)	-0.03 (0.00)	-0.062 (0.002)	-0.03 (0.013)	-0.11 (0.025)
Log(EFE)	0.018 (0.048)	0.019 (0.058)	-0.018 (0.047)	0.033 (0.060)
Log(BMP)	-0.065 (0.047)	0.196 (0.011)	-0.06 (0.051)	0.344 (0.011)
Log(Corruption)	0.013 (0.065)	-0.014 (0.073)		
Log(UR)	0.138 (0.010)		0.371 (0.025)	
Log(RER)	0.203 (0.002)	0.448 (0.011)	0.206 (0.030)	0.794 (0.015)
Indicators				
Log(TO)	1	1	1	0.564 (0.00)
Log(UVIX)	-2.457 (0.00)	-2.4 (0.00)	-1.33 (0.00)	-1.355 (0.00)
Log(CA)	1.329 (0.00)	1.381 (0.00)	-2.452 (0.00)	0.777 (0.00)
Log(GPC)	-1.802 (0.00)	-1.771 (0.00)	-1.798 (0.00)	-1
Goodness of Fit				
Indices				
NFI ^a	0.775	0.787	0.821	0.847
CFI ^b	0.815	0.828	0.856	0.884
NCP ^c	76.678	56.152	57.438	35.864
F0 ^d	2.018	1.478	1.512	0.944
FMIN ^e	2.781	2.083	2.09	1.391
AIC ^f	177.678	141.152	143.438	106.864
ECVI ^g	4.676	3.715	3.775	2.812

Note: P-values in parenthesis.

Range of Goodness of Fit Indices is given in Appendix B.

Table 5.4: Export smuggling as a percentage of Exports

Years	Export Smuggling
1972-73	4.43
1973-74	4.26
1974-75	4.12
1975-76	4.24
1976-77	4.26
1977-78	4.13
1978-79	4.28
1979-80	4.34
1980-81	4.28
1981-82	4.44
1982-83	4.48
1983-84	4.58
1984-85	4.7
1985-86	4.71
1986-87	4.55
1987-88	4.58
1988-89	4.73
1989-90	4.72
1990-91	5
1991-92	5.2
1992-93	5.13
1993-94	5.07
1994-95	5.17
1995-96	5.27
1996-97	5.36
1997-98	5.46
1998-99	5.49
1999-00	5.71
2000-01	5.95
2001-02	5.8
2002-03	5.88
2003-04	5.9
2004-05	5.84
2005-06	5.7
2006-07	5.9
2007-08	6.11
2008-09	6.23
2009-10	6.2
2010-11	6.15

5.3 DISCUSSION

The structural equations approach takes into account different causes and consequences of the latent variable to measure the illicit phenomenon of smuggling. In case of import smuggling, an increasing trend has been found initially where remittances, import tax rate, corruption, and unemployment rate also have rising trend and have encouraged illegal transactions. Moreover, black market premium and real exchange rate significantly contributed in import smuggling as well that it reached at its maximum level in early 1980s. Subsequently, a reverse trend has been observed for the considered causes of import smuggling which resulted in downward trend afterwards. Figure 5.1 graphically represents import smuggling as a percentage of imports.

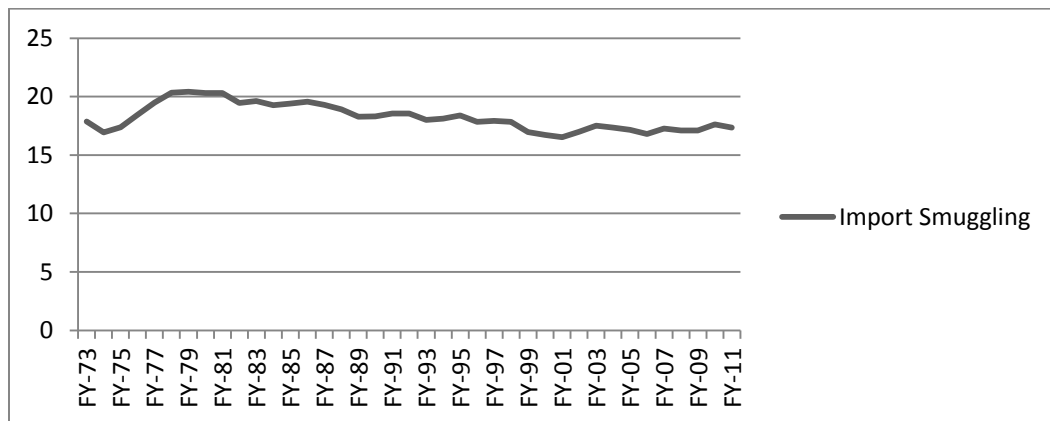


Figure 5.1: Import smuggling as a percentage of Imports (1973-2011)

Figure 5.2 represents the trend of import smuggling in absolute terms. Though Pakistan was facing massive trade restrictions in the early period of 1980s yet government introduced trade reforms in the late 1980s. Initially an increasing trend is observed for imports as well as import smuggling, afterwards level of imports continued to increase but for import smuggling it declined. In 1985, import smuggling had the value of 1092 million dollars as compared to legal imports of 5627 million dollars. Pakistan

became a member of World Trade Organization in 1995 that called for further reforms and trade liberalization and Pakistan has persuaded a relatively open and transparent trade policy ever since. In 1997 illegal imports were valued at 1958 million dollars where legal imports were of value 10921. Afterwards import smuggling showed decline, in 2005 informal imports were of value of 3517 million dollars while formal imports were of value of 20497 million dollars.

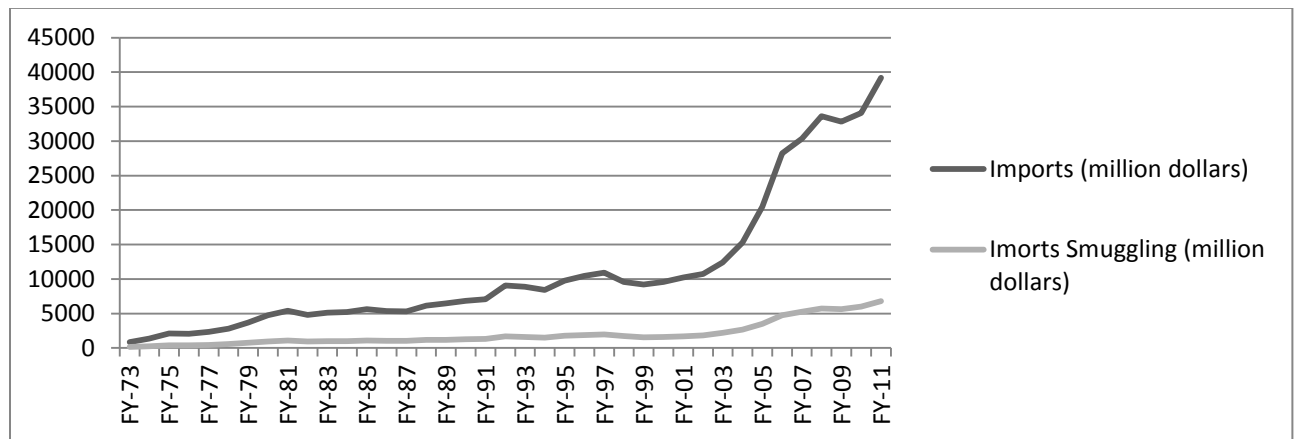


Figure 5.2: Import Smuggling in Absolute Terms (1973-2011)

On the other hand, export smuggling follows an increasing trend throughout the considered period. The rate of duty drawback and black market premium discourage export smuggling whereas unemployment rate, corruption, export financing scheme and depreciation of real exchange rate encourage this illicit phenomenon. So, by considering the impact of all these variables on export smuggling, an increasing trend has been observed. Graphic representation of export smuggling as a percentage of exports is given in figure 5.3.

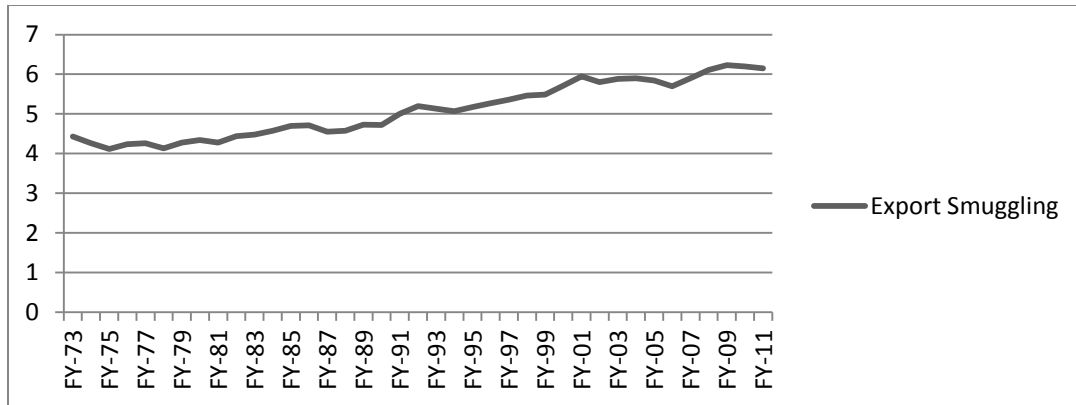


Figure 5.3: Export smuggling as a percentage of Exports (1973-2011)

Furthermore figure 5.4 gives the tendency of export smuggling in absolute terms along with the trend of legal exports. The figure shows that in the beginning illegal exports were negligible; in 1990 the value of export smuggling was 231 million dollars as compared to legal exports which were 4883 million dollars. Subsequently over-invoicing of exports was observed and traders misused the export financing schemes. In 2005, export over-invoicing of 836 million dollars was observed where legal exports were of value of 14314 million dollars.

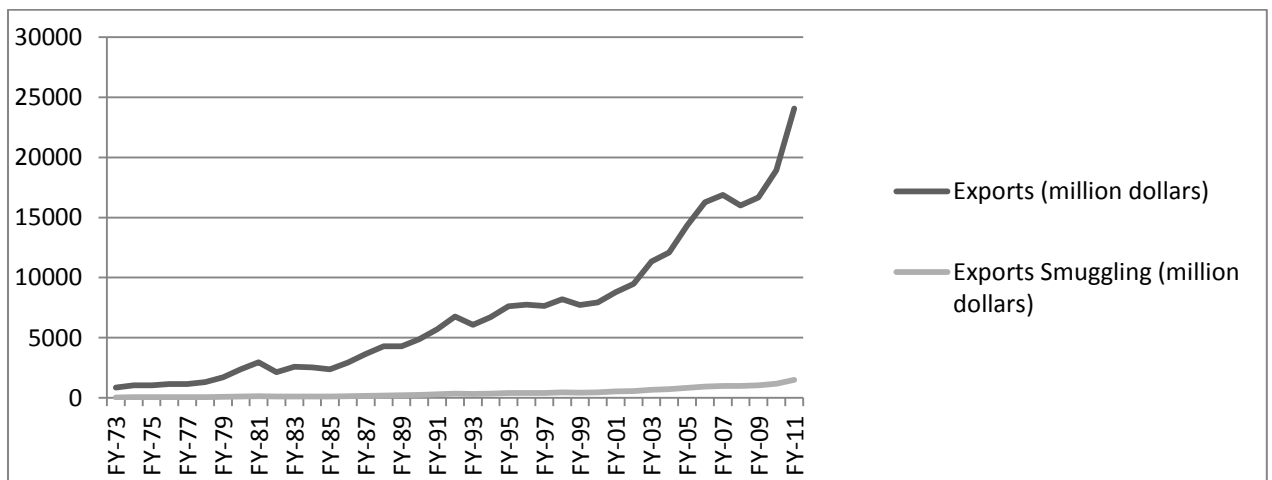


Figure 5.4: Export Smuggling in Absolute Terms (1973-2011)

5.4 CONCLUSION

For Pakistan, the quantitative indices of import smuggling as a fraction of imports as well as of export smuggling as a fraction of exports have been obtained through structural equation approach. The approach may not be perfect in itself, gives an estimate of 1982 million dollars of imports and 402 million dollars of exports on average that are being smuggled annually. The compound annual growth rate for import smuggling is 18.73% however it is 2.22% for export smuggling, for the entire period. But the trend for import smuggling is now decreasing due to liberal and flexible policies pursued by the government. However, export suppliers have tendency to mis-invoice their exports to get benefit from export subsidies.

CHAPTER 6

SUMMARY AND CONCLUSIONS

Smuggling whether it is of imports or of exports has become an interesting issue for the policy makers, not only because of its welfare implication for the economy but also because its accurate estimation is required for policy making. Thus, information about the level of smuggling is important when designing trade policies as use of certain policy tool can cause promotion of this activity. It has, however, been ignored as an area of research in case of Pakistan and needs to be addressed formally. The present study attempts to cover this information gap by measuring the extent of illicit trade in case of Pakistan.

As trade data discrepancy approach is mostly employed to estimate the size of illegal trade which is purely a statistical phenomenon. But this approach does not work out when illegal activities occur at both ends. In this scenario, structural equation approach seems to be a reasonably good alternative over trade data discrepancy technique. The present study hence employed the specific form of structural equation approach i.e. multiple indicators multiple causes (MIMIC), it provides estimates of the overall import smuggling and export smuggling separately by using various observable causes and indicators.

To capture the trend of import smuggling various causes, that are remittances, import tax rate, black market premium, corruption, unemployment rate, and real exchange rate, are used where remittances, import tax rate, corruption, and unemployment rate encourages import smuggling while depreciation of real exchange rate and increase in premiums discourages this phenomenon. The indicators of import

smuggling include trade openness, currency to money ratio in the economy, unit value index of imports, current account deficit, consumption per capita and government revenue. The index of import smuggling shows a fluctuating trend; slowly rising in the beginning, attaining its maximum in the early 1980s and falling afterwards.

Likewise, the causes of export smuggling in the present study include the rate of duty drawback, export financing scheme, black market premium, unemployment rate, corruption, and real exchange rate. Export smuggling is found to be significantly discouraged by increase in premiums and rate of duty drawback; however it is encouraged by export financing scheme, unemployment rate, corruption and real exchange rate. The indicators of export smuggling consist of trade openness, unit value index of exports, current account deficit, and GDP per capita. Contrary to import smuggling, an increasing trend has been found in case of export smuggling with minute fluctuations.

Policy Recommendations

- Import restriction including tariffs and all other taxes, is a crucial factor to motivate traders to engage in smuggling activity. Thereby flexible and liberal trade policies are supposed to decrease the cost associated with formal transactions and make them more preferable. However, as the results are indicative of an already declining trend in import smuggling, government may give more weight to the revenue impact of further liberalization of trade policy which is crucial for the problem of budget deficit in the economy.
- The government needs to formulate an appropriate system to encourage the overseas Pakistanis to remit income back to their homeland through formal

channels with reduced procedural delays. It will not only discourage informal channels of remittances, i.e., hundi system but also improve the balance of payments' condition.

- Export promoting schemes, were introduced to make the country's exports more competitive over the globe, and have been falsely used by traders to induce illegal transactions of exports. An efficient system should be introduced to curb the possibility of rent-seeking by exploring whether these policies are being used for the purpose intended.
- Government needs to formulate policies for the creation of more employment opportunities in the long run. However, in the short run it is not possible to generate enough jobs to absorb all the labor force but government can facilitate people by introducing various entrepreneurship schemes with less procedural delays and easy legal requirements. This will not only prosper the country but also reduce the incidence of smuggling.

REFERENCES

- Ahmed, V., Suleri, A. Q., Wahab, M.A., Javed, A. (2013), “Informal Flow of Merchandise from India: The Case of Pakistan”, *Sustainable Development Policy Institute*, Working Paper No. 141.
- Aleno, B. (1984), “Import Smuggling in the Philippines: An Economic Analysis”, *Journal of Philippines Development*, Vol. XI, No. 2, pp. 157-189.
- Alano, B. (1984). Import smuggling in the Philippines: An economic analysis. *Journal of Philippine Development*, 11(2), 157-189.
- Beccaria, C. (1764-1765), “Tentativo Analitico Sui Contrabbandi” *Estratto dal foglio periodic intitolato: il Caffè*, Vol. 1 (Brescia), reprinted in: Scrittori Classici Italiani di Economia Politica, 1804, parte moderna, tomo XII (Milano), pp.235-241.
- Berger, H. and Nitsch, V. (2008), “Gotcha! A Profile of Smuggling in International Trade”, *CESifo Working Paper No. 2457*, Venice Summer Institute.
- Beja, E. I. (2008), “Estimating trade mis-invoicing from China: 2000-2005”, *China and World Economy*, 16: 82-92.
- Bhagwati, J. (1964), “On the under invoicing of imports” , *Bulletin of the Oxford University Institute of Economics and Statistics*. 26 (August): 389-397.
- Bhagwati, J. and Hasen, B. (1973), “A theoretical Analysis of Smuggling”, *Quarterly Journal of Economics*, Vol. 81 No. 1, pp.172-87.
- Bhagwati, J. and Srinivasan, T.N. (1974), “Smuggling and Trade Policy”, in Bhagwati, J. (Ed.), *Illegal Transactions in International Trade*, North-Holland, Amsterdam.

- Biswas, A. K. (2011), "Import Tariff Led Export Under-invoicing: a Paradox", *The Journal of International Trade & Economics Development*, pp. 1-14.
- Biswas, A. K. and Marjit, S. (2005), "Mis-invoicing and Trade Policy", *The Journal of Policy Reform*, Vol. 8, No.3, pp. 189-205.
- Biswas, A. K. and Marjit, S. (2007), "Preferential Trade and Mis-invoicing: Some Analytical Implications", *International Review of Economics and Finance*, No. 16, pp. 130-138.
- Biswas, A. K. and Sengupta, S. (2011), "Tariffs and Imports Mis-invoicing Under Oligopoly", *Economics & Politics*, Vol. 23, Issue, pp. 254-270.
- Buehn, A. and Eichler S. (2011), "Trade Mis-invoicing: The Dark Side of World Trade", *The World Economy*, Volume 34, Issue 8, pp. 1263-1287.
- Buehn, A. and Farzanegan, M.R. (2012), "Smuggling Around the World: Evidence from a Structural Equation Model", *Applied Economics*, Vol. 44, pp. 3047-3064.
- Cooper, R. (1974), "Tariffs and Smuggling in Indonesia", In J. Bhagwati (ed.), *Illegal Transactions in International Trade*, North-Holland, Amsterdam.
- Cortes, M., Devereux, J. and Connolly, M. (1995), "The Transshipment Problems: Smuggling and Welfare in Paraguay", *World Development*, Vol. 23, No.6, pp. 975-985.
- Deardorff, A. and Stolper, W. (1990), "Effects of Smuggling under African Conditions: A Factual, Institutional and Analytic Discussion", *Weltwirtschaftliches Archiv*, Vol. 126 No. 1, pp. 116-41.

Dell' Anno, R. and Schneider, F. (2003) "The Shadow Economy of Italy and other OECD Countries; What do we know?", *Journal of public Finance and Public Choice*, XXI (2,3), 97-120.

Dorosh, P.A. and Abdul. S (2007), "Distortions to Agricultural Incentives in Pakistan", *Agricultural Distortions Working Paper*, Vol. 2, No. 33.

Farzanegan, M. R. (2008), "Illicit Trade and Globalization", *CESifo Venice Summer Institute*.

Falvey, Rodney E. (1978), "A note on preferential and illegal trade under quantitative restrictions", *Quarterly Journal of Economics*, XCII, pp. 175-78. Fisman, R. and Wei, S. (2004), "Tax Rates and Tax Evasion: Evidence from "Missing imports in China", *Journal of Political Economy*, 2004, Vol. 112, No.2.

Fisman, R. and Wei, S. (2004), "Tax Rates and Tax Evasion: Evidence from "Missing imports in China", *Journal of Political Economy*, 2004, Vol. 112, No.2.

Fisman, R. and Wei, S. (2007), "The smuggling of Art, and the Art of smuggling Uncovering the Illicit Trade in Cultural Property and Antiques," *NBER working paper*, No.13, 446.

Fusti, Scott, W. (1997), "Joint-Product Export Smuggling and Export Tax Policy", *Open Economics Review*, No.8, pp 61-70.

Government of Pakistan (various years), *CBR/FBR Yearbook* , Directorate of Research and Statistics, Federal Board of Revenue, Islamabad, Pakistan.

Government of Pakistan (various years), *Pakistan Economic Survey*, Finance Division, Economic Advisor's Wing, Islamabad.

Government of Pakistan (various years), *Pakistan Statistical Yearbook*, Federal Bureau of Statistics, Islamabad, Pakistan.

IMF (2012), *International Financial Statistics*, CD-ROM. Washington D.C.: The World Bank.

Johnson, H. G. (1974), "The Economic Theory of Smuggling", in Bhagwati, J. (Ed.), *Illegal Transactions in International Trade*, North-Holland, Amsterdam.

Khan, R.S., Yusuf, M., Bokhari, S. and Aziz, S. (2005), "Quantifying Informal Trade between Pakistan and India", *Sustainable Development Policy Institute*, available at: <http://sdpi.org/sdpi>.

Old//help/research_and_news_bulletin/may_june_05/can_illegal_trade.htm.

Lovely, Mary E. and Nelson, D. (1995), "Smuggling and welfare in a Ricardo-Viner model", *Journal of Economics Studies*, Vol. 22 No. 6, pp. 26-45.

Mahmood, Z. and Mahmood, R. (1993), "Over-invoicing of Exports in Pakistan", *The Pakistan Development Review*, Vol. 32, No. 4, pp. 1141-1155.

Mahmood, Z. (1997), "Research Note: determinants of Under-invoicing of imports in Pakistan", *Journal of International Development*, Vol. 9, No.1, pp. 85-96.

Mahmood, Z. and Azhar, M. (2001), "On Over-invoicing of Exports in Pakistan", *The Pakistan Development Review*, Vol. 40, No.3, pp. 173-185.

- Mahmood, R. (2011), *Measurement of Import smuggling in Pakistan*, unpublished MPhil dissertation, School of Economics Quaid-e-Azam University, Islamabad, Pakistan.
- Martin, L. and Panagariya, A. (1984), "Smuggling, Trade and Price Disparity: A Crime-Theoretic Approach", *Journal of International Economics*, Vol. 23, pp. 377-381.
- May, E. (1985), "Exchange Controls and Parallel Market Economies in Sub-Saharan Africa-Focus on Ghana", *World Bank Staff Working Papers*, 711, Washington.
- McDonald, D.C. (1985), "Trade Data Discrepancies and the Incentive to Smuggle", *IMF Staff Paper*, 4: 668-692.
- Morgenstern, O. (1963), "On the accuracy of economic observations" in Bhagwati, J. (Ed.), *Illegal Transaction In International Trade*, North-Holland, Amsterdam.
- Naya, S. and Morgan, T. (1969), "the accuracy of international trade data: the case of South East Asian countries", *Journal of American Statistical Association*, June, reprinted in Bhagwati (1974), 123-137.
- Norton, D.A.G. (1988), "On the Economic Theory of Smuggling", *Economica*, Vol. 55, No. 217, pp. 107-118.
- Sheikh, M.A. (1974), "Smuggling, Production and Welfare", *Journal of International Economics*, No. IV, pp 355-64.
- Pitt, M. (1981), "Smuggling and price disparity", *Journal of International Economics*, Vol. 11, No. 4, pp. 447-58.
- Pohit, S. and Nisha, T. (2003), "Indian's Informal Trade with Bangladesh: A Qualitative Assessment", *The world Economy*, 26: 1187-1214.

Richter, Hg. V. (1974), "Problems of Assessing Unrecorded Trade", in Bhagwati, J. (Ed.), *Illegal Transactions in International Trade*, North-Holland, Amsterdam.

Shiekh, M. A. (1974), "Under-invoicing of Imports in Pakistan" *Oxford Bulletin of Economics and Statistics*, Vol. 36, Issue 4, pp 287-296.

Sheikh, M.A. (1977), "A Partial Equilibrium Model of Smuggling", *Review of World Economics*, Vol. 113, No. 2, pp. 268-283.

Simkin, C. G. F. (1974), "Indonesia's Unrecorded Trade" in Bhagwati, J. (Ed.), *Illegal Transactions in International Trade*, North-Holland, Amsterdam.

State Bank of Pakistan (various years), *Hand Book of Statistics on Pakistan Economy*, Statistics & DWH Department, Karachi.

Tanzi, V. (1983), "The Underground Economy in the United States: Annual Estimates, 1930-80" , *Staff papers-International Monetary Fund*, Vol. 30, No.2, pp. 283-305.

Thursby, M. Jensen, R. and Thursby, J. (1991), "Smuggling, Comouflaging and Market Structure", *The Quarterly Journal of Economics*, Vol. 106, No. 3, pp. 789-814.

The PRS Group (various issues), *International Country Risk Guide*,

<http://www.prsgroup.com/ICRG.aspx>.

United Nations, Commodity Trade Statistics Database, Statistics Division available at <http://comtrade.un.org>

Wang, Jian-Ye (1994), "Macroeconomic Policies and Smuggling: An Analysis of Illegal Trade in Nigeria", *IMF Working Papers*, No. 115, Policy Development and Review Department.

World Development Indicators (2013), available at <http://data.worldbank.org/data-catalog/world-development-indicators>

Yeats, A. (1990), "On the Accuracy of Economics Observations: Do Sub-Saharan Trade Statistics Mean Anything?", *The World Bank Economic Review*, Vol. 4, No.2, pp. 135-146.

Appendix A: Derivation of Covariance Matrix in MIMIC Approach

Multiple Indicators Multiple Causes (MIMIC) models are a class of Structural Equation Model. It consists of two equation models; one is structural equation model and the other one is measurement equation model that are

$$\eta = \gamma'x + \zeta \qquad \mathbf{y} = \lambda\eta + \varepsilon$$

By substituting structural equation into measurement equation;

$$\mathbf{y} = \lambda(\gamma'x + \zeta) + \varepsilon$$

Covariance Matrix of the above model is

$$\Sigma(\theta) = \begin{bmatrix} V(\mathbf{y}) & Cov(\mathbf{y}, \mathbf{x}) \\ Cov(\mathbf{x}, \mathbf{y}) & V(\mathbf{x}) \end{bmatrix}$$

As

$$V(\mathbf{y}) = Cov(\mathbf{y}, \mathbf{y}) = E(\mathbf{y}\mathbf{y}')$$

$$V(\mathbf{x}) = Cov(\mathbf{x}, \mathbf{x}) = E(\mathbf{x}\mathbf{x}')$$

$$Cov(\mathbf{y}, \mathbf{x}) = E(\mathbf{y}\mathbf{x}')$$

$$Cov(\mathbf{x}, \mathbf{y}) = E(\mathbf{x}\mathbf{y}')$$

By taking transpose, multiplications, and taking few assumptions into the consideration that are

- The variables are taken as deviation from mean, that is

$$E(\eta) = E(\mathbf{x}) = E(\zeta) = E(\mathbf{y}) = E(\varepsilon) = 0 \quad ;$$

- There is no correlation between error terms and causes of the model, that is

$$E(\mathbf{x}\zeta') = E(\zeta\mathbf{x}') = 0 \quad \text{and} \quad E(\mathbf{x}\varepsilon') = E(\varepsilon\mathbf{x}') = 0 \quad ;$$

- The error terms of structural equation and measurement equation do not correlate, that is $E(\varepsilon\varepsilon') = E(\zeta\varepsilon') = 0$;
- Latent variable does not correlate to the errors term of the measurement model, that is $E(\eta\varepsilon') = E(\varepsilon\eta') = 0$

Moreover,

Θ_ε is the covariance matrix of the error terms in the measurement model i.e.

$$E(\varepsilon\varepsilon') = \Theta_\varepsilon$$

Φ is the covariance matrix of the causes i.e. $E(\mathbf{xx}') = \Phi$

ψ is the variance of the error term in structural equation i.e. $E(\zeta\zeta') = \psi$

For deriving both variance and covariance between the observable variables, expectation operator has been distributed which is following as:

$$\begin{aligned}
E(\mathbf{yy}') &= E[(\lambda\eta + \varepsilon)(\lambda\eta + \varepsilon)'] \\
&= E[\lambda\eta\eta'\lambda + \lambda\eta\varepsilon' + \varepsilon\eta'\lambda' + \varepsilon\varepsilon'] \\
&= \lambda E(\eta\eta')\lambda' + \lambda E(\eta\varepsilon') + E(\varepsilon\eta')\lambda' + E(\varepsilon\varepsilon') \\
&= \lambda E(\eta\eta')\lambda' + 0 + 0 + \Theta_\varepsilon \\
&= \lambda E[(\gamma'x + \zeta)(\gamma'x + \zeta)']\lambda' + \Theta_\varepsilon \\
&= \lambda E[\gamma'xx'\gamma + \gamma'x\zeta' + \zeta x'\gamma + \zeta\zeta']\lambda' + \Theta_\varepsilon \\
&= \lambda[\gamma'E(\mathbf{xx}')\gamma + \gamma'E(\mathbf{x}\zeta') + E(\zeta\mathbf{x}')\gamma + E(\zeta\zeta')]\lambda' + \Theta_\varepsilon \\
&= \lambda(\gamma'\Phi\gamma + 0 + 0 + \psi)\lambda' + \Theta_\varepsilon \\
&= \lambda(\gamma'\Phi\gamma + \psi)\lambda' + \Theta_\varepsilon
\end{aligned}$$

$$E(\mathbf{xx}') = \Phi$$

$$E(\mathbf{xy}') = E[\mathbf{x}(\lambda\eta + \varepsilon)']$$

$$\begin{aligned}
&= E[x\eta'\lambda' + x\varepsilon'] \\
&= E(x\eta')\lambda' + E(x\varepsilon') \\
&= E(x\eta')\lambda' \\
&= E[x(\gamma'x + \varsigma)'\lambda'] \\
&= E[xx'\gamma + x\varsigma']\lambda' \\
&= [E(xx')\gamma + E(x\varsigma')]\lambda' \\
&= [\Phi\gamma + 0]\lambda' \\
&= \Phi\gamma\lambda'
\end{aligned}$$

$$\begin{aligned}
E(yx') &= [E(xy')]' \\
&= (\Phi\gamma\lambda')' \\
&= \lambda\gamma'\Phi
\end{aligned}$$

So

$$\Sigma(\theta) = \begin{bmatrix} \lambda(\gamma'\Phi\gamma + \psi)\lambda' + \Theta\varepsilon & \lambda\gamma'\Phi \\ \Phi\gamma\lambda' & \Phi \end{bmatrix}$$

Appendix B: Goodness of Fit Indices

B.1: Range for Import Smuggling

Saturated Model < Default Model < Independence Model

(a): $0 < \text{NFI} < 1$.

(b): $0 < \text{CFI} < 1$.

(c): NCP

(1): $0 < \text{NCP} < 476.461$.

(2): $0 < \text{NCP} < 474.729$.

(3): $0 < \text{NCP} < 371.767$.

(4): $0 < \text{NCP} < 368.122$.

(d): F0

(1): $0 < \text{F0} < 12.538$.

(2): $0 < \text{F0} < 12.493$.

(3): $0 < \text{F0} < 9.783$.

(4): $0 < \text{F0} < 9.687$.

(e): FMIN

(1): $0 < \text{FMIN} < 14.591$.

(2): $0 < \text{FMIN} < 13.940$.

(3): $0 < \text{FMIN} < 11.520$.

(4): $0 < \text{FMIN} < 10.872$.

(f): AIC

(1): $180 < \text{AIC} < 578.461$.

(2): $154 < \text{AIC} < 573.729$.

(3): $154 < \text{AIC} < 459.767$.

(4): $130 < \text{AIC} < 453.122$.

(g): ECVI

(1): $4.737 < \text{ECVI} < 15.223$.

(2): $4.053 < \text{ECVI} < 15.098$.

(3): $4.053 < \text{ECVI} < 12.099$.

(4): $3.421 < \text{ECVI} < 11.924$.

B.2: Range for Export Smuggling

Saturated Model < Default Model < Independence Model

(a): $0 < \text{NFI} < 1$.

(b): $0 < \text{CFI} < 1$.

(c): NCP

(1): $0 < \text{NCP} < 414.295$.

(2): $0 < \text{NCP} < 327.053$.

(3): $0 < \text{NCP} < 397.763$.

(4): $0 < \text{NCP} < 309.649$.

(d): F0

(1): $0 < \text{F0} < 10.903$.

(2): $0 < \text{F0} < 8.607$.

(3): $0 < \text{F0} < 10.467$.

(4): $0 < \text{F0} < 8.149$.

(e): FMIN

(1): $0 < \text{FMIN} < 12.350$.

(2): $0 < \text{FMIN} < 9.791$.

(3): $0 < \text{FMIN} < 11652$.

(4): $0 < \text{FMIN} < 9.096$.

(f): AIC

(1): $130 < \text{AIC} < 489.295$.

(2): $141.152 < \text{AIC} < 390.053$.

(3): $108 < \text{AIC} < 460.763$.

(4): $88 < \text{AIC} < 361.649$.

(g): ECVI

(1): $3.421 < \text{ECVI} < 12.876$.

(2): $2.842 < ECVI < 10.265$.

(3): $2.842 < ECVI < 12.125$.

(4): $2.316 < ECVI < 9.517$.

B.3: Goodness of Fit Indices

(a) NFI

The normed fit index (NFI) is given by

$$NFI = \Delta_1 = 1 - \frac{\hat{C}}{\hat{C}_b} = 1 - \frac{\hat{F}}{\hat{F}_b}$$

where $\hat{C} = n\hat{F}$ is the minimum discrepancy of the model being evaluated and $\hat{C}_b = n\hat{F}_b$ is the minimum discrepancy of the baseline model.

(b) CFI

The comparative fit index (CFI) is given by

$$CFI = 1 - \frac{\max(\hat{C} - d, 0)}{\max(\hat{C}_b - d_b, 0)} = 1 - \frac{NCP}{NCP_b}$$

where \hat{C} , d and NCP are the discrepancy, the degree of freedom and the noncentrality parameters estimate for the model being evaluated, and \hat{C}_b , d_b and NCP_b are the discrepancy, the degree of freedom and the noncentrality parameter estimate for the baseline model. CFI falls in the range from 0 (saturated model) to 1 (independence model). Whenever default model has value close to 1 indicates a very good model.

(c) NCP

$NCP = \max(\hat{C} - d, 0)$ is an estimate of the noncentrality parameter, $\delta = C_0 = nF_0$. The columns labeled LO 90 and HI 90 contains the lower limit (δ_L) and upper limit (δ_U) of a 90% confidence interval for δ , where $\Phi = (x | \delta, d)$ is the distribution function of the noncentral chi-squared distribution with noncentrality parameter δ and d degree of freedom.

(d) F0

$F0 = \hat{F}_0 = \max\left(\frac{\hat{C}-d}{n}, 0\right) = \frac{NCP}{n}$ is an estimate of $\frac{\delta}{n} = F_0$ with lower limit and upper limit of 90% confidence interval.

(e) FMIN

FMIN is the minimum value, \hat{F} , of the discrepancy where the default model can vary between 0 (saturated model) and 14.591 (independence model).

(f) AIC

The Akaike information criterion is given by

$$AIC = \hat{C} + 2q$$

(g) ECVI

ECVI is given by

$$ECVI = \frac{1}{n} (AIC) = \hat{F} \frac{2q}{n}$$

with the lower limit and upper limit of a 90% confidence interval.

Appendix C: Correlations

Table C-1: Correlations Import Smuggling

Variables	Estimates
Log(UR) <--> Log(RER)	0.860
Log(MTAX) <--> Log(RER)	-0.015
Log(BMP) <--> Log(UR)	0.147
Log(MTAX) <--> Log(UR)	-0.238
Log(WRG) <--> Log(Corruption)	-0.508
Log(MTAX) <--> Log(BMP)	0.421

Table C-2: Correlations Export Smuggling

Variables	Estimates
Log(BMP) <--> Log(RER)	-0.799
Log(RDD) <--> Log(EFE)	0.244
Log(EFE) <--> Log(BMP)	0.226
Log(BMP) <--> Log(UR)	-0.611
Log(RER) <--> Log(UR)	0.831
Log(BMP) <--> Log(Corruption)	0.033