Chapter III
METHODOLOGICAL FRAMEWORK

The previous chapters on introduction and review of literature make a strong case for commencing the study. This chapter is devoted to a presentation of the methodology, which includes the choice of the study areas, database and methodological framework used in the present study. The intention is to find the extent of IIT by discussing the different methods of measurement, sources of the data, years of the study and variables used in the study.

The chapter is divided into two sections. In Section I sources of secondary data and the methodology adopted to analyze this data are presented. The sampling technique and the collection of primary data and methods and tools of analysis used are discussed in Section II.

SECTION- I

Secondary Data Methodology

Data are collected from the Monthly statistics of foreign trade of India, volume I and II published by Directorate General of Commercial Intelligence and Statistics (DGCI & S) for exports and imports containing commodity by country details. The data for the commodities in this publication is given maximum up to eight digit level codes of the India Trade Classification (ITC). The DGCI&S adopted a new commodity classification system, known as the Harmonized system from April 1987. From 1994-95, the DGCI & S data are available in computer data-base (called, 'India
Trades') supplied by Centre for Monitoring India economy (CMIE). The analysis of present study pertains to commodities under sections that include two-digit level of Indian trade classification (ITC) for broad categories of commodities in general and four-digit level and six-digit of ITC for Transport equipment in particular.

India is chosen for the study as Indian economy has witnessed various reforms in 1990 and has moved from closed economy with licenses and quotas to a free and globalized economy. Thus it becomes important to analyze the effects of these reforms on the Indian economy so far as intra-industry trade is concerned. In India, the potential for trade was limited during import substitution policy regime. However, this scenario underwent significant changes during 1990s, with the opening up of the economy for competition. One of the outcomes of liberalization in India is an intra-firm resource shift from inefficient to efficient activities. A manifestation of this process is the growth of intra-industry trade. Thus in the event of liberalization and later on globalization of Indian economy it becomes important to analyze the significant growth of intra-industry trade in large number of industries during the post-liberalized period.

The years selected for the study are: 1989-90 - the year before liberalization; 1994-95- the year after liberalization and formative years of WTO to study growth and extent of intra-industry trade in pre-liberalized and post-liberalized era; 1999-2000, 2002-03 and 2004-05; and 2006-07 the latest year for which data was available at the time of conducting the study.
The sections given under Indian Trade Classification (ITC) in general and 4 digits and 6 digits of ITC in Transport Equipment in particular are as follows:

**Commodity Sections**

I Live Animals; Animal Products

01 Live Animals
02 Meat and Edible Meat Oil
03 Fish and Crustaceans, Molluscs and other Aquatic Invertebrates
04 Dairy Produce; Birds, Eggs; Natural Honey; Edible Products of Animal Origin N.E.S.
05 Products of Animal Origin, N.E.S. of Included.

II Vegetable Products

06 Live Trees & other Plants; Bulbs; Roots & the Like; Cut Flowers & Ornamental Foliage
07 Edible Vegetables and Certain Roots and Tubers
08 Edible Fruit & Nuts; Peel of Citrus Fruit or Melons
09 Coffee, Tea, Mate & Spices
10 Cereals
11 Products of the Milling Industry; Malt; Starches; Insulin; Wheat Gluten
12 Oil Seeds Oleaginous Fruits; Misc. Grains, Seeds & Fruits; Industrial or Medicinal Plants; Straw & Fodder
13 Lac; Gums, Resins & other Vegetables Saps & Extracts
14 Vegetable Plaiting Materials; Vegetable Products not Elsewhere Specified or Included

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III Animal or Vegetable Fats & Oils and their Cleavage Products: Animal or Vegetable Waxes

15 Animal or Vegetable Fats & Oils & their Cleavage Products; Animal Vegetable Waxes

IV Prepared Food Stuffs Beverages & Tobacco

16 Preparations of Meat of Fish or of Crustaceans, Molluses of other Aquatic Invertebrates
17 Sugars and Sugar Confections
18 Cocoa and Cocoa Preparations
19 Preparations of Cereals, Flour, Starch or Milk; Pastry Cook Products
20 Preparations of Vegetables, Fruits, Nuts or other Parts of Plants
21 Miscellaneous Edible Preparations
22 Beverages, Spirits and Vinegar
23 Residues and Waste from the Food Industries; Prepared Animal Fodder
24 Tobacco and Manufactured Tobacco Substitutes

V Mineral Products

25 Salt: Sulphur; Earths and Stone; Plastering Materials, Lime and Cement.
26 Ores, Slag and Ash
27 Mineral Fuels, Mineral Oil & Products; Bituminous Substances; Mineral Waxes

VI Products of Chemical or Allied Industries

28 Inorganic Chemicals; Compounds of Precious Metals, or Rare-Earth Metals, of Radio-Active Elements or of Isotopes.
29 Organic Chemicals
30 Pharmaceuticals Products
31 Fertilizers
32 Dyeing, Tanning Colouring Matter
33 Essential Oil Resinous; Cosmetic and other Similar Preparations
34 Soap & Other Similar Preparations; Polishes & Creams; Candles and the Like, Dental Waxes & Preparations
35 Albuminoidal Substances, Modified Starches, Glues, Enzymes
36 Explosives; Matches, Certain Combustibles Preparations
37 Photographic or Cinematographic Goods
38 Miscellaneous Chemical Products

VII Plastics & Rubber
39 Plastics and Articles Thereof
40 Rubber and Articles Thereof

VIII Hides & Skins; Leather Products; FurSkins and Articles Thereof
41 Raw Hides and Skins (Other Then Furskins) and Leather
42 Articles of Leather, Saddlery Harness and Animals Guts
43 Furskins and Artificial Fur, Manufactures Thereof

IX Wood, Cork and Articles Thereof Manufacture of Plaiting Materials; BasketWare and Wickerwork
44 Wood & Articles of Woods; Wood Charcoal
45 Cork & Articles of Core
46 Manufactures of Plaiting Materials; Basket Ware & Wickerwork
X Paper and Paper-Board and Articles Thereof

47 Pulp of Wood or of other Materials; Waste and Scrap of Paper or Paperboard

48 Paper and Paperboard; Articles of Paper Pulp, of Paper and Paperboard

49 Printed Books & other Products of Printing Industry

XI Textile and Textile Articles

50 Silk

51 Wool, Fine or Coarse Animal Hair

53 Cotton

54 Other Vegetable Textile Fibres, Paper Yarn and Fabrics

55 Man-Made Staple Fibres

56 Wadding, Felt and Nonwovens; Special Yarns; Twine, Cordage, Ropes and Cables and Articles Thereof

57 Carpets and other Textile Floor Coverings

58 Special Woven Fabrics; Tufted Textile Fabrics; Lace; Tapestries; Embroidery

59 Impregnated, Coated & Laminated Textile Fabrics; Textile Articles For Industrial Use

60 Knitted or Crocheted Fabrics

61 Articles of Apparel and Clothing Accessories, Knitted or Crocheted

62 Articles of Apparel and Clothing Accessories, Not Knitted or Crocheted

63 Other Made Up Textile Articles; Sets; Worn Textile Articles; Rags
XII Footware, Headgear, Umbrellas; Prepared Feathers & Articles Thereof
64 Footwear, Gaiters and the Like; Parts of Such Articles
65 Headgear and Parts Thereof
66 Umbrellas, Walking & Seat Sticks; Whips, Riding Crops and Parts Thereof
67 Prepared Feathers & Down With Articles, Artificial Flowers; Articles of Human Hair

XIII Stone, Cement and Similar Materials; Ceramic Products; Glass and Glassware
68 Articles of Stone, Plaster, Cement, Asbestos, Mica or Similar Materials
69 Ceramic Products
70 Glass & Glassware

XIV Pearls, Precious or Semi-Precious Stones/Metals and Articles Thereof; Imitation Jewellery and Coin
71 Pearls, Precious or Semi-Precious Stones/Metals And Articles Thereof; Imitation Jewellery and Coin

XV Base Metals & Articles of Base Metals
72 Iron & Steel
73 Articles of Iron & Steel
74 Copper & Articles Thereof
75 Nickel & Articles Thereof
76 Aluminum & Articles Thereof
78 Lead & Articles Thereof
79 Zinc & Articles Thereof
80 Tin & Articles Thereof
81 Other Base Metals; Cements; Articles Thereof
82 Tools and Their Parts of Base Metal
83 Miscellaneous Articles of Base Metal

XVI Machinery & Their Parts, Electrical & Electronic Equipment, Parts Thereof
84 Nuclear Reactors, Boilers, Machinery and Mechanical Appliances; Parts there
85 Electrical Machinery & Equipment & Parts Thereof, Sound & TV

XVII Transport Equipment
86 Railway/Tramway Locomotives, Trucks Etc., Equipment and Parts Thereof
87 Road Vehicles and Parts
88 Aircraft, Spacecraft and Parts Thereof
89 Ship, Boat & Floating Structure

XVIII Instruments & Apparatus; Clocks & Watches; Parts and Accessories Thereof
90 Optical, Measuring, Medical & Similar Instrument & Parts Thereof
91 Clocks and Watches and Their Parts
92 Musical Instrument; Parts and Accessories

XIX Arms & Ammunition; Parts & Articles Thereof
93 Arms and Ammunition; Part and Accessories Thereof

XX Miscellaneous Manufactured Articles
94 Furniture, Bedding and Allied Articles; Lighting, Fittings, Illuminated Articles; Prefabricated Building
95  Toys, Games & Sports Requisites; Parts and Accessories Thereof.
96  Miscellaneous Manufactured Articles

**XXI Works of Art, Collectors’ Pieces and Antiques**
97  Works of Art, Collectors, Pieces and Antiques.

**Transport Equipment**

<table>
<thead>
<tr>
<th>Code</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>8702</td>
<td>Public Transport Type Passenger Motor Vehicles.</td>
</tr>
<tr>
<td>8703</td>
<td>Motor Cars and Other Motor Vehicles for transport of Persons (Exclusive of 8702)</td>
</tr>
<tr>
<td>870321</td>
<td>Vehicles with spark-ignition internal combustion reciprocating piston engine of cylinder capacity ≤ 1000 CC</td>
</tr>
<tr>
<td>870322</td>
<td>Vehicles with spark-ignition internal combustion reciprocating piston engine of cylinder capacity &gt; 1000 CC but not &gt; 1500 CC</td>
</tr>
<tr>
<td>870323</td>
<td>Vehicles with spark-ignition internal combustion reciprocating piston engine of cylinder capacity &gt; 1500 CC</td>
</tr>
<tr>
<td>870324</td>
<td>Vehicles with spark-ignition internal combustion reciprocating piston engine of cylinder capacity &gt; 3000 CC</td>
</tr>
<tr>
<td>870331</td>
<td>Vehicles with Compression ignition internal combustion piston engine (diesel/semi-diesel) of a cylinder capacity ≤ 1500 CC</td>
</tr>
<tr>
<td>870332</td>
<td>Vehicles with compression ignition internal combustion piston engine (diesel/semi-diesel) of a cylinder capacity &gt; 1500 CC but ≤ 2500 CC</td>
</tr>
<tr>
<td>870333</td>
<td>Vehicles with compression ignition internal combustion piston engine (diesel/semi-diesel) of a cylinder capacity &gt; 2500 CC</td>
</tr>
</tbody>
</table>

*Source: Monthly Statistics of Foreign Trade of India*
Using data from the above sources, the present study aims to provide estimates of intra-industry trade for different sections, which include two digit level industry groups. In all there are 21 (twenty one) sections for which intra-industry trade estimates are to be calculated. The sections with different headings contain chapters with two digit level classification related to section headings. There are total 99 two digit industry level groups as given in India's Foreign Trade by chapters and sections in MSFTI.

As defined earlier intra-industry trade is defined as the simultaneous export and import of goods in the same industry. But we first have to decide what we want to measure. The history of intra-industry trade has been mired by allegations of being a 'statistical phenomenon' (Lipsey, 1976). For example at the 3 digit SITC level of aggregation, canoes and 200,000 tonne tankers are in the same "ships and boats" industry, at the same level of aggregation, table model radios and airport flight control equipment are in the "Tele communication apparatus" industry (Lipsey, 1976). Also, Finger (1975) notes that trade overlap are not inconsistent with classical trade theory if empirical product groups do not correspond with the appropriate factor proportion groupings.

In HTS (Harmonized Tariff schedule) 10 digit classification systems with over 20,000 entries separates canoes from 200,000 tonne tankers, but also from any other boat designed to use with motors or sails. In the light of these we discuss various measures of intra-industry trade including static, quasi-static and dynamic measures. The properties as well as short-comings of measures are also discussed in detail.
The choice of intra-industry trade measure is more influenced by the significance of the theory of international trade. Since trade theory mostly deals with static models, Grubel-Lloyd method has been the most widely used measure. But as discussed by Hamilton and Kniest (1991) dynamic measures of intra-industry trade may be more informative. They proposed an index of “marginal intra-industry trade” (MIIT).

**Static Measures**

Balassa (1966) was the first person that proposed intra-industry trade index that measured the degree of trade overlap in the form of simultaneous import and export of goods within an industry.

\[ B_j = \frac{|X_i - M_i|}{(X_i + M_i)} \]

Where \( i = \) commodity within industry \( j \). Bj index is a ratio of net trade to gross trade and ranges from 0 to 1, where ‘0’ represents ‘perfect’ trade overlap and thus pure intra-industry trade, and ‘1’ represents pure inter-industry trade.

Balassa also took an unweighted average for each index to calculate intra-industry trade for all industries.

\[ B = \frac{1}{n} \sum B_j \]

Where \( n = \) number of industries. It can be generalized to weighted index.

\[ B = \sum_{j=1}^{n} W_j B_j \]
Where \( W_j \) = industry j’s share of total trade.

But this index gives pure intra-industry trade a value of zero has not been appreciated by most of the economists.

Grubel and Lloyd (1975) measured intra-industry trade as the percentage of country’s total trade (exports plus imports) in the products of given industry which was matched or balanced, that is exports equal imports.

\[
B_i = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)}
\]

\[
B_i = 1 - \frac{|X_i - M_i|}{(X_i + M_i)} = 1 - B_j
\]

where \( i \) = commodity within an industry \( j \). if all trade was balanced, \( B_i \) would be equal to 1 and if all trade was one way, \( B_i \) would be zero.

Thus closer the \( B_i \) is to 1, greater is the importance of intra-industry trade and closer is \( B_i \) to zero (0) larger is the level of inter industry trade.

Grubel and Lloyd also calculated a weighted mean for average level of intra-industry trade for a country.

\[
B_j = \frac{\sum_{i=1}^{n} B_i(X_i + M_i)}{\sum_{i=1}^{n} (X_i + M_i)}
\]

\( j \) represents the \( j^{th} \) country and \( i \) represents the industry.
The GL index can be calculated for a country’s world-wide trade or for a subset of trade partners, as well as for total merchandise trade or for a subset of industries. The statistical properties and limitations of the GL index have been carefully scrutinized in the literature. An authoritative survey can be found in Greenaway and Milner (1986). A brief summary of the four main measurement issues therefore is presented.

1. **Categorical aggregation:** As seen above, the definition of an “industry” central to the SAH and probably the most contentious issue in applied IIT research. Grubel and Lloyd (1975, p. 86), have defined IIT as “trade in differentiated products which are close substitutes”. Over time, it has become generally accepted that the relevant criterion is substitutability in production (rather than in consumption), since this is the aspect of industries that: (a) distinguishes IIT from comparative-advantage based trade; and (b) lies at the heart of the link between IIT and factor-market adjustment. While statistical product classifications are inevitably imperfect in this respect, they are nevertheless largely guided by the correct criterion, that is, an effort to group together goods with similar input requirements. This still leaves open the question about the most appropriate level of statistical aggregation for the calculation of IIT indices. Whilst the majority of empirical studies use data at the 3-digit level, this choice is mostly motivated by expediency rather than any *a priori* reason for favouring that level of aggregation.

2. **Adjustment for overall trade imbalance:** The upper bound of a country’s mean GL index is negatively related to the share of the overall trade surplus or deficit in total trade. Hence, imbalance in the trade account will tend to bias the GL index
downwards. Adjustment methods have therefore been suggested, with the one brought forward by Aquino (1978) having been most widely used. The Aquino index is defined as follows

\[ GL_i^A = 1 - \frac{X_i^p - M_i^p}{X_i^p + M_i^p} \]

where

\[ M_i = M_i^p \left( \frac{\sum X_i + M_i}{2 \sum M_i} \right) = \text{expected imports} \]
\[ X_i^p = X_i^p \left( \frac{\sum X_i + M_i}{2 \sum X_i} \right) = \text{expected exports} \]

The rationale for such adjustment measures has been questioned on the grounds that visible trade imbalances, both bilateral and multilateral, may well be compatible with balance of payments equilibrium (Greenaway and Milner, 1986; Kol and Mennes, 1989; Vona, 1991). Given the difficulty in estimating equilibrium trade imbalances, the professional consensus has been to work with unadjusted GL indices.

3. **Scale invariance:** The GL index for an individual industry is not related to the absolute size of imports and exports in that sector, or indeed to the size of the industry in terms of domestic production or consumption. What matters for studies of trade-induced adjustment is not only the structure of trade flows, which is captured by the GL index, but also the degree of openness of individual sectors. In regression analysis it is therefore advisable to relate the GL index with a measure of sectoral trade openness or simple trade volumes.
4. **Static nature:** The GL index refers to the pattern of trade in one year. In the context of structural adjustment, however, it is the structure of changes in trade patterns, which is important. This insight, attributable to Hamilton and Kniest (1991), has motivated the development of measures of marginal IIT (MIIT) and thus provides the key issue for this survey.

An aggregation problem is discussed in detail:

**Aggregation problem:**

The grouping of two, or more, categories together that should not be in same industry is explained with the table given below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Xi</th>
<th>Mi</th>
<th></th>
<th>Xi-Mi</th>
<th></th>
<th>(Xi+Mi)</th>
<th>GL index</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 digit</td>
<td>150</td>
<td>160</td>
<td>10</td>
<td>310</td>
<td>0.968</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subgroup 5 digit</td>
<td>0</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subgroup 5 digit</td>
<td>150</td>
<td>0</td>
<td>150</td>
<td>150</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As we see, in 3-digit industry that contains 2 subgroups and each subgroup is engaged in pure inter-industry trade. GL index is zero for each of sub groups. If export and import values are summed to form 3 digit categories, we get almost pure intra-industry trade with GL index of 0.968. It is clear from the above that aggregating across improper categories can lead to a misrepresentation of the degree of intra-industry trade.

The example given above is a particular case of trade imbalance bias. Trade imbalance, occurs when subgroups are appropriately aggregated. The problem arises when the net trade-gross trade ratio is characterized by opposite trade
imbalances for the subgroups (Greenaway and Milner, 1983).

Suppose there are two commodities within an industry.

\[
\frac{|X_i - M_i|}{(X_i + M_i)} = \frac{(X_{i1} - M_{i1}) + (X_{i2} - M_{i2})}{(X_{i1} + X_{i2} + M_{i1} + M_{i2})}
\]

If the country in question is net exporter (importer) in both subgroups, the weighting effect of the ratio is maintained, but if the country is net exporter of one good and net importer of the other good, the weighting effect is lost and Grubel-Lloyd index will take on different value (Greenaway and milner, 1983). It can be seen in the following table.

| Category       | Xi   | Mi   | |Xi-Mi|   | (Xi+Mi) | GL Index |
|----------------|------|------|----------------|----------------|--------|
| 3 digit        | 180  | 310  | 130             | 490             | .735   |
| Subgroup 5 digit | 80   | 160  | 80              | 240             | .667   |
| Subgroup 5 digit | 100  | 150  | 50              | 250             | .800   |
| 3 digit        | 230  | 260  | 30              | 490             | .939   |
| Subgroup 5 digit | 80   | 160  | 80              | 240             | .667   |
| Subgroup 5 digit | 150  | 100  | 50              | 250             | .800   |

In the fist category the country is a net importer in both subgroups, but in the second category the country is a net importer in one good and net exporter in the other. Since GL index does not recognize the direction of trade, the sub group GL indices are same in both cases, but when the sub groups are aggregated the GL index for the second category is biased upward.
This index can be corrected by replacing the original net trade gross trade ratio with following net trade-gross trade ratio:

\[
\sum_{i} \frac{|X_{i} - M_{i}|}{(X_{i} + M_{i})}
\]

where \( i \) represent subgroup within industry. This adjustment removes the trade imbalance bias that results from countries being a net exporter in one subgroup of an industry and net importer in another subgroup as well as the simple aggregation bias.

GL index has also been criticized for not possessing dynamic properties. Increase or decrease in the GL index is not necessarily associated with corresponding increases or decreases in intra-industry trade. Caves (1981) and Hamilton and Kniest (1991) have noted that an equal/proportional increase in the exports and imports, within an industry from trade liberalization would raise the quantity of intra-industry trade, but its proportion measured by the GL index would remain the same. Suppose trade liberalization doubles both imports and exports within a particular industry.

| Category             | \( X_{i} \) | \( M_{i} \) | \(|X_{i} - M_{i}|\) | \((X_{i} + M_{i})\) | GL index |
|----------------------|-------------|-------------|---------------------|-------------------|-----------|
| Pre liberalization   | 200         | 100         | 100                 | 300               | .667      |
| Pre trade barrier    | 200         | 100         | 100                 | 300               | .667      |
| Post liberalization  | 400         | 200         | 200                 | 600               | .667      |
| Post trade barrier   | 100         | 100         | 0                   | 200               | 1.00      |

It follows from the above table that net trade-gross trade ratio is multiplied directly by the same scalar, that is, two in the
above case. The value of net trade-gross trade ratio, and hence GL, remains the same.

\[
\frac{2X_i - 2M_i}{2X_i + 2M_i} = \frac{2|X_i - M_i|}{2(X_i + M_i)} = \frac{|X_i - M_i|}{(X_i + M_i)}
\]

Also, we can infer from the table the effect of imposing trade barriers. The exports of one country are decreased, thereby leading to fall in the level of intra-industry trade. Yet this decrease in exports has put the two countries in perfect trade balance in this industry. The GL index has increased from .667 to 1.00 even through intra-industry trade has decreased. This implies that we must be careful when interpreting change in the index.

**Trade imbalance bias:** GL index makes no allowance for any imbalance in a country’s total trade, where a country has large trade imbalance (surplus or deficit), Bj will be biased downwards, and, the true extent of intra-industry trade will be under estimated.

GL thus came up with the modified formula

\[
GL_{kAdjusted} = \frac{\sum j|X_{jk} + M_{jk}| - \sum X_{jk} - M_{jk}|}{\sum (X_{jk} + M_{jk}) - \sum (X_{jk} - M_{jk})}
\]

Comparing with the earlier formulas this method entails subtracting country k’s global trade imbalance from total trade making intra-industry trade represent the total balanced trade instead of the share of overlap trade in total trade.

**Aquino (1978)** criticized GL correlation and came up with the following measure.
The above measures are so much observed with trade imbalance that they lose sight of the need to deal with the pattern of trade. That is why people still prefer the unadjusted trade measures.

The above discussion proves that intra-industry trade is not merely statistical phenomenon. High levels of intra-industry trade exist even when the data is disaggregated and level of intra-industry trade appears to be continuously increasing over time.

**Quasi-Dynamic Measures: Changes in Intra-Industry Trade**

Some measures have been developed that are neither static nor measures of intra-industry trade in the strict sense. These quasi-dynamic measures take account of trade flows in two different years.

**First-Differenced GL Indices**

Prior to the introduction of the Marginal Intra-Industry Trade concept, the valuation of intra-industry trade changes over time was confined to the comparison of GL Indices for different time periods, where

\[
\Delta GL = GL_t - GL_{t-n} = 1 - \left(1 - \frac{|M - X|}{(M + X)} \right)_t - \left(1 - \frac{|M - X|}{(M + X)} \right)_{t-n}
\]

\(\Delta\) is the first-difference operation, \(t\) is the end year and \(n\) is the number of years separating the base end years.
The Greenaway-Hine-Milner-Elliott Measure

Greenaway et al. (1994) have suggested the following measure:

\[
GHME = \left[ (X + M) - |X - M| \right] - \left[ (X + M) - |X - M| \right]_t
\]

\[
GHME = \Delta \left[ (X + M) - |X - M| \right]
\]

The GHME measure fundamentally differs from the GL index in that it reports intra-industry trade as an absolute value rather than as a ratio. This feature can be desirable because it facilitates the scaling of intra-industry trade relative to gross trade levels, production or sales in a particular industry: which, in turn, is useful for the econometric analysis of the forces that determine structural adjustment. The drawback in this is that the unscaled GHME measure says nothing about the proportion of (marginal) intra-relative to inter-industry trade and it lacks the presentational appeal of a simple bounded index. Hence, its raison d'etre rests upon the fact that "it can be related to corresponding levels of gross trade or real output" (Greenaway et al., 1994, p.424).

The GHME measure belongs to the "quasi-dynamic" class, since it corresponds to the difference in the amounts of intra-industry trade between two periods, and it, therefore, shares limitations of the GL index for the assessment of the structure of change in trading patterns. Hamilton and Kniest's (1991) insight on the GL index thus also applies to the GHME measure. Assume, for instance, that over the period of investigation a particular section experiences a shift from a trade deficit to balanced trade while exports remain unchanged. The GHME measure will show a positive value of twice the increase in exports, even though this is an obvious case of inter-industry
adjustment, because the increase in exports is not matched by any corresponding increase in imports.

Dixon and Menon (1997) have developed two alternative "quasi-dynamic" measures. The first measure captures base-year weighted percentage growth of intra-industry trade and the second measure captures the base-year weighted percentage growth of net trade.

\[
DM^\text{ii} = GL_{t-n} \frac{\Delta (X+M) - \Delta \vert X-M \vert}{\Delta (X+M) - \Delta \vert X-M \vert} \times 100
\]

These measures can take values from 100 to infinity. An appealing feature is that these two measures add up to the percentage growth in total trade of the relevant industry. However, the Dixon-Menon measures belong to the "quasi-dynamic" class, because they cannot consistently separate intra-industry trade from marginal inter-industry trade. For illustration, suppose again that over the period of investigation a particular sector experiences a shift from a trade deficit to balanced trade while exports remain unchanged. \(K^\text{ii}(DM^\text{NT})\) will yield a positive (negative) value, even though this is an obvious case of inter-industry adjustment. To summarize, the "quasi-dynamic" measures are representations of the change in the share or the amount of matched trade between two years, using different scaling yardsticks. However, measures do not consistently relate to the degree of "matchedness" in trade changes, that is, they do not capture intra-industry trade in strict sense.
Marginal Intra-Industry Trade: Matched Trade Changes

Measures of intra-industry trade quantify the degree of intra-sectoral symmetry of trade changes. Hence, they are computed from first difference in exports and imports $\Delta X$ and $\Delta M$, that is they can be unrelated to the level of trade or intra-industry trade either the base or end period. In a nutshell, marginal intra-industry trade is about the importance of intra-industry trade in trade changes, and not about the change in intra-industry trade.

The Hamilton-Kniest Index

The first measure of marginal intra-industry trade was proposed by Hamilton and Kniest (1991).

\[
H_k = \frac{\Delta M}{\Delta X} \text{ for } \Delta X > 0, \Delta M > 0
\]

This measure is related strictly to the structure of the change in trading patterns and information on levels of exports or imports is not required.

This index, however, has some important limitations. Greenway et al. (1994) have highlighted that the fact of the HK index being undefined when either X or M has decreased can lead to a non-random omission of a significant number of statistical observations and therefore to potentially misleading results. Furthermore, Hamilton and Kniest (1991) have
interpreted any situation where their index is undefined as representing "an increase in exports and a decrease in imports (or vice versa), which indicates inter-industry trade".

A Grubel-Lloyd Style Measure of Intra-Industry Trade

The following index is derived in Brulhart (1994):

\[ B^\lambda = 1 - \frac{|\Delta X - \Delta M|}{|\Delta X| + |\Delta M|} \]

This index, like the GL coefficient, varies between 0 and 1, where 0 indicates marginal trade in the particular industry to be completely of the inter-industry type, and 1 represents marginal trade to be entirely of the intra-industry type. The main appeal of the B^\lambda index lies in the fact that it reveals the structure of the change in import and export flows, similar to the HK index. Yet, unlike the latter measure, the B^\lambda coefficient is defined in all cases and shares many familiar statistical properties of the GL index.

Brulhart (1994) has also introduced an index to capture industry performance. This will allow for an investigation into the distribution of trade induced gains (losses) between countries. It is also known as “B” index.

\[ \text{B index} = \frac{\Delta X - \Delta M}{|\Delta X| + |\Delta M|} \]

Or \[ |B| = 1 - A \]

This index ranges between -1 and 1. It is two dimensional, containing information about both the proportion of MIIT and
country specific sectoral performance. The closer $B$ is to zero, the higher is marginal intra-industry trade and closer the value is to -1 and 1, and higher be marginal inter-industry trade.

Sectoral performance is a change in exports and imports in relation to each other, with exports representing good domestic performance and imports reflecting weak domestic performance in particular sector.

Thus if $\Delta X > \Delta M$, $B > 0$

It is implied that exports are expanding at the expense of import and $\Delta M > \Delta X$, $B < 0$ implies weak domestic industry performance.

**Oliveras and Terra (1977)** have shown that the statistical properties of the $B^A$ index differ from those of the GL index in two particular respects. First, this index is not subject to a rising downward bias as the level of statistical disaggregation is increased. Second, there is no functional relationship between the $B^A$ index for a certain period and the $B^A$ indices of constituent sub-periods.

Note that $B^A$ can be summed, like the GL index, across industries of the same level of statistical disaggregation by applying the following formula for a weighted average:

$$B^A_{tot} = \sum W_i B^A_i,$$

where

$$W_i = \frac{\left| \Delta X_i + \Delta M_i \right|}{\sum \left( \left| \Delta X_i + \Delta M_i \right| \right)}$$
and where $B_{\text{tot}}$ is the weighted average of marginal intra-industry trade over all industries of the economy or over all sub-industries of an industry, denoted by $i,...,k$.

**Extensions to the Marginal Intra-Industry Trade Index**

Several authors have put forwards amended versions of the $B^A$ index, which are tailored to particular underlying assumptions on the nature of the adjustment problem. Lloyd (1998) has argued that it may be useful in certain contexts to incorporate local sales of foreign affiliates ("international production") in an analysis of trade flows. He suggested that the $B^A$ index could be computed for $X_i = \sum X_i$ and $M_i = \sum M_i$, where $i$ again denotes the industry, and $j$ stands for the "mode of supply". If a particular flow is a cross-border import or export in the traditional sense then $j=1$; and when we look at local sales of foreign affiliates then $j=2$. This index could be useful for a study of the adjustment implications of globalization in a broader sense, since it can be decomposed into the separate contributions to intra-industry trade of changes in international goods trade and of changes in the pattern of international production.

Another variant of the intra-industry trade index, which takes into account of the increasing fragmentation of international production, is developed by Thom and McDowell (1999).

$$TM_i = 1 - \frac{|\Delta X_i - \Delta M_i|}{\sum_{i=1}^{i}|\Delta X_i| + \sum_{i=1}^{i}|\Delta M_i|}$$
Where I denotes sub industries of i. The index is bounded between zero and one, but it differs from $B^A_{\text{tot}}$ aggregated over-industries j of i.

The rationale underlying the TM index is that offsetting net trade changes across sub sectors should be counted as intra-industry trade if those sub sectors are vertically linked. This is best illustrated with a simple example. Assume that country A increases its exports and reduces its imports of finished watches vis-à-vis country B, and that A simultaneously reduces its exports and increases its imports of watch components. Furthermore, suppose that the two trade changes are of equal size. If we apply the $B^A$ index to the industries "finished watches" and "components" separately, we diagnose zero intra-industry trade. On the other hand, if we define finished watches plus components as an industry, then the $B^A$ index is undefined, since we observe zero aggregate trade change. The TM index, however, will return a value of 1, i.e. perfect intra-industry trade, since the two net changes at sub-industry level offset each other perfectly. In an application to data on trade between the EU and some Eastern European countries, Thom and McDowell (1999) have found their index to return significantly higher values on average than $B^A$. The validity of the TA index hinges on the appropriate definition of industries and sub-industries. If one had a classification with sub-industries defined according to the stages of production of the industry’s final product, then the TA index provides an elegant measure of the international fragmentation process of production. In the face of the untidy existing statistical classification schemes, however, it is difficult to state a priori which might be the appropriate level of aggregation, and whether one should prefer the TM or $B^A$ indices.
Annicchiarico and Quintieri (2000) have suggested a third extension of the marginal intra-industry trade index. They propose that the index should take a negative sign when the matched trade change is negative so that the index would range from -1 to 1:

$$AQ = \begin{cases} -B^A & \text{if } \Delta M < 0 \text{ and } \Delta X < 0 \\ B^A & \text{otherwise} \end{cases}$$

This touches on an important point. Underlying the $B^A$ index is the implicit assumption that the quantity of production factors displaced by a one unit increase in imports (decrease in imports) is identical to the quantity of production factors required for a one unit increase in exports (decrease in imports). One corollary is that a matched increase in imports and exports has a zero net effect on factor demand at the industry level, and likewise for a matched decreased in imports and exports. Unless we are in the context of multiple regressions, where one can control for trade-independent changes in sectoral demand and productivity, we may plausibly assume that matched expansion of trade will be associated with growing sectors, whilst matched contraction of trade would be indicative of sectors that are in general decline. Hence, unless we can control for non-trade determinants of structural change, it appears plausible that the adjustment implications of matched trade expansion differ from those entailed by matched trade contraction, and the transformed index suggested by Annicchiarico and Quintieri (2000) may well be informative in descriptive studies.

**Unscaled Intra-Industry Trade Measures**
There are undeniable advantages in a simple bounded index for presentation and interpretation. Yet, as pointed out by Greenaway et al. (1994), it can be useful in certain applications to have gross measures of intra-industry trade, or to scale intra-industry trade to production variables. For that reason the following measure has been suggested by Brulhart (1994):

\[ B_c = (|\Delta X| + |\Delta M|) - |\Delta X - \Delta M|, \]

this is strictly non-negative and can be scaled even at the disaggregated industry level like the GHME measure:

\[ B_{cv} = \frac{B_c}{V} \]

where \( V \) is any relevant scaling variable.

**Menon and Dixon (1997)** have proposed a similar measure. Instead of capturing absolute values of sectorally matched trade change like \( B_c \), theirs is a "measure of unmatched change in trade".

\[ \text{MD}^{\text{UMCIT}} = |\Delta X - \Delta M|. \]

\( \text{MD}^{\text{UMCIT}} \) and \( B_c \) are closely related, as \( B_c \) shows the absolute magnitude of intra-industry trade and \( \text{MD}^{\text{UMCIT}} \) shows the absolute magnitude of marginal inter-industry trade. Absolute values of intra-industry trade, such as \( B_c \) and \( \text{MD}^{\text{UMCIT}} \), are difficult to interpret in isolation, since they give no indication of the proportion between intra- and inter-industry trade, which, after all, is central to the definition of the very concept of intra-industry trade and inter-industry trade. Therefore, it might be appropriate for studies investigating intra-industry trade and
adjustment to use a two-stage approach, where intra-industry trade is expressed both in relation to marginal \textit{inter}-industry trade and in relation to other scaling variables.

As far as the question out of all measures which measure is best, from the above discussion it can be inferred that marginal intra-industry trade is the one that shows the degree of intra-sectoral (a)symmetry in trade changes and thus should be preferred over static and quasi-dynamic measures.

\textbf{SECTION II}

\textbf{Primary data methodology}

The aim of the primary data collection has been to ascertain the impact of the decision to buy a new car or replacing an old car or buying additional cars can have on the level of satisfaction or welfare of the individuals.

Keeping in view the above objective of the present study, survey method has been considered to be the most appropriate. Survey studies are conducted to collect data of existing phenomenon with a view to investigate current conditions and practices. It deals not only with the collection of the data, their analysis, interpretation and report on the status of existing institutions and groups or areas in order to guide for future, but it also determines the adequacy of status by comparing them with established standards or norms for understanding and finding solutions to the problems.

In any survey of research, covering the entire population is practically an impossible task. What is frequently and generally practiced is to study a sample representative of the population.
The aim of the sampling is to choose a subset in a way that it should be adequate in size and representative of population as a whole.

For the primary data, a questionnaire has been framed and target is to have a sample of more than 300. The researcher visited all the respondents for the collection of data. The researcher first discussed in detail about the need, importance and significance of the present study and then gathered required information from them. For the primary data analysis, several techniques such as tables, graphs, regression and ordered probit model have been used. A precise review of these statistical techniques is attempted below for facilitating convenience in the comprehension of the results emanating from the present study.

To study the welfare part of intra-industry trade in passenger cars industry that is whether increased intra-industry trade leads to increase in welfare and satisfaction, it was thought more appropriate to collect primary data with the help of a questionnaire. The different issues related to data collection, development of questionnaire and the methodology to be adopted for analyzing are discussed below.

For choice of area for survey, the data were collected through primary survey with the help of questionnaire, which was designed so as to ascertain the maximum possible information relevant for the study. The study was limited to tricity that is Chandigarh, Panchkula, and Mohali. Special care has been taken in choosing the respondents from different professions like Businessman, Government employees, private executives and self employed people with different income levels.
A care has also been taken to ensure that all age categories are included and both sexes male and female are considered. A stratified random sampling has been chosen for the study.

In structuring the questionnaire, the care has been taken to ensure that questionnaire contained questions on various satisfaction characteristics of respondents and questions on satisfaction. The questions selected for the study have been kept simple and easy to understand. Instead of judgmental questions, an ordinal scale of 0-9 or -5 to +5 has been chosen so that respondents are able to answer them easily. The analysis based on such a questionnaire is based on the assumption that individuals are able to understand and answer the questions correctly.

The questionnaire (given in Appendix of this chapter) has been designed to capture information on the various reasons for buying the car. The different reasons have been designed in the form of questions like comfort and convenience, fuel efficiency, bigger family, easy loan availability, status symbol etc. and respondents have been asked to rank them in order of their preference. The mode of buying the car has also been considered and what implications it has so far as financial burden is concerned and what impact increase in parking, maintenance cost can have on the satisfaction level of the consumer has also been considered. An attempt has also been made to judge the level of happiness of the respondents. Various conceptual and definitional issues relevant for the questionnaire have been discussed below.
Before trying to ascertain the level of satisfaction, it is imperative to understand the meaning of the concept. Several definitions have been put forward by number of academicians. Although the various efforts (Allen et al, 19880; Bowen, 2001) to analyze the concept of satisfaction have been discussed, this concept is still undefined.

According to the normative standard definition (Cadotte et al; 1982), satisfaction refers to the comparison of expectation with experiences in terms of performance. Hughes( 1991) and Olander (1997) reported the relativity of the satisfaction concept. They distinguished three levels of satisfaction; Very satisfied, quite satisfied and satisfied. (Oliver, 1989) describes satisfaction as the process of comparison between what one expects and what one receives. In general terms satisfaction implies the fulfillment or gratification of a desire, need. It is also a source of pleasure or contentment derived from such gratification. Westbrook (1987) defines satisfaction a ‘global evaluative judgment about product usage or consumption’.

The measurement of satisfaction requires a judgment, which could be made by the individual for himself. For this a direct method that is asking a respondent to indicate about his judgment choice has been chosen. The significance of this type of scale was recognized by Diener (1983) while discussing various scales. This method also helps in reducing the influence of current mood on the response of individuals.

As mentioned earlier above a direct method of measuring satisfaction is the scale used to measure the responses of the individuals on different questions. The present study used a
scale of 0-9 for a large part of the questionnaire and respondents were asked to give their preferences on this scale. In some of the questions a scale of -5 to +5 is also selected for the study. An ordinal scale helps to broaden the scope of statistical operations.

As far as relationship between satisfaction and various factors, the dependent variable in the study has been selected to be satisfaction level and various reasons for selecting a car chosen from list of family, personal or economic factors has been selected as explanatory variables. Some analysts have examined the causality between the different variables and satisfaction.

There are two approaches for measuring satisfaction: (a) measurement of overall satisfaction; and (b) measurement of satisfaction with various elements contributing to overall satisfaction. Indirect rather than direct techniques have been found to be more useful.

An attempt has been made to analyse the effect on the level of welfare on satisfaction of the respondents. The main explanatory variables of the study are comfort and convenience, fuel efficiency, bigger family, status etc. Even though there has been no single definition of welfare, the concept of wellbeing has been the basis of most of the economic analysis. As stated by Slesnick (1998), lack of relationship between theoretical developments and empirical measurement has been the major problem in the analysis of welfare. In the earlier times, income at individual level and GDP and GNP at country level have been indicators of welfare levels of an economy. Since the criticism by Hicks (1940), various economists defined welfare in different sense. The inclusion of leisure (Nordhaus and Tobin, 1972),
Physical Quality of Life Index (Morris, 1979), Human Development Index (UNDP 1990), Human needs (Naveen 1994) all give a more meaningful measure of welfare. Thus as far as one is getting satisfaction from the product, welfare is seen on the positive side. In other words, so long as product or services are having need satisfying capacity, welfare seems to increase. Thus the examination of satisfaction or welfare as a result of purchase of car is very important. Taking into account of these considerations, a question has also been included in the questionnaire to ascertain the level of welfare an individual gets after car purchase.

**Mode of Buying:** It is another important variable in the process of purchasing car and has a considerable influence on the level of satisfaction. Level of satisfaction is greatly influenced by financial burden a product has. Lesser the financial burden more will be satisfaction and vice a versa. Thus a question was included to ascertain the mode of purchasing the car.

**Level of Happiness:** Happiness is a particular emotion. It is an overall evaluation made by the individual in accounting all his pleasant and unpleasant experiences in the recent past (Fordyce, 1972). Several definitions of happiness given in context of experience over a longer period, satisfaction and achievement of goals. A financial burden one experiences after the purchase and satisfaction achieved after the purchase have been utilized to measure level of happiness on a numerical scale of 0-9. Consequently a question has been included in the questionnaire on the level of happiness an individual experiences after the purchase of a car.
**Level of Dissatisfaction, Degree of dissatisfaction:** It is a feeling of being displeased or annoyed or dissatisfied with someone or something. Thus if a product is not up to the expectations of the customer, a sense of dissatisfaction develops. A question has been included in the questionnaire to find dissatisfaction, if any, after the purchase of cars due to problems like increase in expenditure, security problems etc. Similarly, larger variety of cars in the market also leads to dissatisfaction of not being able to purchase the desired one because of financial constraints etc. Thus a respondent can respond on a scale -5 to +5 and 0-9, which will specify his level and degree of dissatisfaction. A negative scale has been chosen on the grounds that dissatisfaction can also be result of the decision to buy a car.

**Data collection**

The detail description about the nature of information required for the present study has been discussed above under different aspects. Each aspect like satisfaction, reason for the choice of car, cost incurred and mode of buying the car etc. requires information pertaining to various domains of life. More than 50 variables have been incorporated in the questionnaire. The numbers of variables have, however been, reduced after doing adequate sorting and aggregation. An attempt has been made to collect information on more than 300 individuals in all. The respondents have been personally interacted while filling the questionnaire, wherever it was possible. Out of 300 questionnaires which were distributed, around 289 were received back and correct and acceptable number of
questionnaires was restricted to 251, on the basis of which the empirical investigation have been carried out.

The questionnaire has been divided into two sets; Set I and Set II. Set I deals with owners who have purchased car for the first time. The reasons for buying the car and their effects on satisfaction, happiness, overall welfare etc has been included in Set I.

Similarly set II deals with owners who have purchased car for the 2nd, 3rd or 4th time. The reasons for addition or replacement of a car and their effects on the level of satisfaction, happiness, overall welfare etc. have also been incorporated in this set.

**Statistical and Econometric Applications**

The descriptive statistics as well as econometric techniques have been used for analyzing the data and deriving results there from. Among the descriptive statistics, the graphical presentation, mean, deviation from the mean, test for difference of means etc. have been used. The graphical presentation is based on bar, line and scatter diagrams. For empirical examination of various structural relationships, econometric analysis has been carried out with the help of single equation regression. Most of the variables have been defined as to vary between 0 and 10.

Recent years have witnessed a tremendous growth in the use of regression techniques as a tool of analysis pertaining to social sciences in general and economic analysis in particular. To put the record straight, this technique has come to be viewed as a very powerful tool in the kit-bag of an empirical economist.
The regression technique, it needs to be noted in particular, is generally used for lending precision to the analysis primarily because it helps in determining the exact degree of relationship between the dependent and the independent variable(s). Given the value of explanatory (independent) variable(s), it enables us to estimate the value of the explained (dependent) variable.

Estimation of Satisfaction: Although OLS which is based on the assumption of linearity, does not fit logically with the type of data we intend to analyze, some studies have, however, used the OLS to treat data on happiness have found that the signs of estimated coefficients are same in both the models. Consequently, to just get an idea about the relationship between level of satisfaction and other variables OLS has been applied which is as follows:

\[ Y_i = b_0 + b_1 X_{i1} + b_2 X_{i2} + \ldots + b_n X_{in} + u_i \]

Where \( Y_i \) = dependent variable satisfaction

\( X_{i1} \) = Fuel Efficiency

\( X_{i2} \) = Comfort and Convenience

\( X_{i3} \) = Bigger Family

It is on the basis of these independent variables that accountability of satisfaction has been done.

In practice, the qualitative dependent variables are treated with logit and probit models. These two models are extensively used where dependent variable is of binary type or dichotomous. Since most of the variables in the present study have been
defined to take multinomial value, like other studies on happiness, the Probit or Logit models have not been considered appropriate. A variation of these models called ‘Ordered Probit Models’ is used instead. The use of these models is quite common in the studies on subjective well-being (Frey and Stutzer 2002).

Before discussing the Ordered Probit model, it will be useful to discuss in brief the Logit and Probit models. To start with, one may consider a simple model

$$Y_i = b_0 + b_1X_i + u_i$$

Where $Y$ can take only two values say 0 and 1. This model looks like a typical regression model but because dependent variable is binary, it is called linear probability model (LPM). This is because the conditional expectation of $Y_i$ can be interpreted as the conditional probability of the event to take place (that is $Y$ will assume value 1) for a given value of $X_i$. It seems from the above specification that Ordinary Least Squares can be applied to the models involving binary dependent variables. Such a treatment will, however, be characterized by the problems like non-normality of random term $u_i$, heteroscedasticity and inconsistency in estimated values of dependent variable (Gorirox 2000). These problems can be resolved to some extent by applying the restricted least squares and by increasing the sample size. The basic problem of the model is, however, its logical inconsistency as it assumes that probability $P_i$ increases linearly with $X_i$. This is inconsistent with the concept of probability, which cannot exceed 1 and cannot be negative. There could be various types of cumulative frequency
distributions but the frequently used ones are ‘normal’ and ‘logistic’ distributions generating ‘Probit” and “Logit” models, respectively. Probit model is briefly discussed below. The probit analysis is based on transformation of a dichotomous dependent variable into a continuous non-observable variable. This variable is called latent variable, which depends on factors determining the binary dependent variable say x.

\[ \text{I}_i \text{ (latent variable)} = b_0 + b_1 x_i \]

This latent variable is related with \( y_i \) through a threshold limit \( I^* \) such that \( y_i = 1 \) if \( I_i > I^* \) and equal to 0 otherwise. Assuming the normality feature, the probability that \( I_i \) is less than or equal to \( I^* \) can be estimated or calculated from the standardized normal cumulative distribution function in the following manner:

\[ P_i = P(y=1/x) = P(I_i \leq I^*) = P(Z_i \leq b_0 + b_1 x_i) = F(b_0 + b_1 x_i) \]

The information on \( I_i \) could be ascertained from the inverse of above function.

\[ I_i = F^{-1} (P_i) = F^{-1} (P_i) = b_0 + b_1 x_i \]

The grouped data may be treated with Least Squares method, whereas for estimation from individual data the Maximum Likelihood method is applied. The dependent variable, however, cannot be restricted to two values. It can take more than two values and in that case it is called multinomial choice variable. The variable in such cases take values like 0, 1, 2, 3 etc. These values are normally responses given on a ranking. For treating the data like this, Ordered Probit and Ordered Logit models are frequently used. The model is built around a latent regression like binomial Probit model. To begin with
\[
Y^* = B'X + e \text{ (where } Y, B, X \text{ are vectors containing variables and parameters)}
\]

\[Y^* \text{ is unobserved variable similar to that in Probit model. What is observed is}
\]

\[Y = 0 \text{ if } Y^* \leq 0
\]
\[= 1 \text{ if } 0 < Y^* \leq u_1
\]
\[= 2 \text{ if } u_1 < Y^* \leq u_2
\]
\[= 3 \text{ if } u_2 < Y^* \leq u_3
\]
\[\vdots
\]
\[= j \text{ if } u_{j-1} < Y^*
\]

which is a form of censoring. The \(u_s\) are unknown parameters to be estimated along with \(B\). The random term \(e\) is assumed to be normally distributed across observations. With the normal distribution, we have the following probabilities:

\[\text{Prob (} y=0 \text{)} = f(-B'X)
\]
\[\text{Prob (} y=1 \text{)} = f(u_1 - B'X) - f(-B'X)
\]
\[\vdots
\]
\[\text{Prob (} y=j \text{)} = 1 - f(u_{j-1} - B'X)
\]
The log likelihood function and its derivative can be obtained readily, and optimization can be done in a usual manner. An attempt has also been made to make a comparison of the coefficients estimated from OLS and Ordered Probit models.

LIMITATIONS OF THE STUDY

From the above study it should not be interpreted that the present study is free from all sorts of limitations whatsoever. Rather every research study, however, carefully planned is likely to have some limitations which remain unknown to the researcher or come to their knowledge much later in the study. Thus some of the limitations noticed during the study are as discussed below:

Firstly, our study is based on the secondary data and limitations of using secondary data cannot be ruled out.

Secondly due to time constraint and keeping the main objective of the present study in mind the estimation of intra-industry trade for 6 digit and 8 digit classification have not be computed. These evaluations may have analyzed the extent of intra-industry trade in detail for each category and sub-category
APPENDIX
QUESTIONNAIRE ON AUTOMOBILE USE

Dear sir/madam,

I request you to kindly spend a few minutes of your valuable time in filling up this questionnaire.

Thank you.

1) NAME : ________________________________________________

2) PROFESSION: __________________________________________

3) AGE : _________________________________________________

4) Do you own a car? YES/NO

If YES answer the following questions.

5) Please rank each of the reasons to indicate your preference for the car (1 for most preferred, 8 for least preferred).

   a) comfort and convenience ( )

   b) fuel efficiency ( )

   c) bigger family ( )

   d) security and protection ( )

   e) easy availability of loan ( )

   f) family pressures ( )

   g) demonstration effect ( )

   h) effective advertising ( )

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6) For which purpose you use the car?
   a) Business     b) Personal     c) Both

7) On an average, How many kms you drive the car in a month? ---- (kms)

8) Is it your first car? YES/NO

   If YES answer the SET1
   If NO answer the SET1AND SET2.

**SET 1**

1) Which brand of car you had or still having? ________________

2) Please rate the relative importance of the factors you considered in selecting a car on 0 to 9 scale (0 means 'not important' 9 means 'very important').
   a) Increase in income       0 1 2 3 4 5 6 7 8 9
   b) Fuel efficiency          0 1 2 3 4 5 6 7 8 9
   c) Security and protection  0 1 2 3 4 5 6 7 8 9
   d) Easy loan availability   0 1 2 3 4 5 6 7 8 9
   e) Family pressures         0 1 2 3 4 5 6 7 8 9
   f) Bigger family            0 1 2 3 4 5 6 7 8 9
   g) Status conscious         0 1 2 3 4 5 6 7 8 9
   h) Comfort and convenience  0 1 2 3 4 5 6 7 8 9
   i) Attractive look          0 1 2 3 4 5 6 7 8 9

3) Considering all the above factors, specify the overall level of satisfaction you achieved on a scale 0 to 9 (0 means completely dissatisfied, 9 means completely satisfied).

   0  1  2  3  4  5  6  7  8  9
4) Do you think your welfare increased after the purchase. Rate on a scale 0 to 9 (0 means remained unchanged, 9 means fully increased).

0 1 2 3 4 5 6 7 8 9

5) How did you buy that car?

a) On installment basis  b) borrowed from friend  c) both ‘a’ and ‘b’
   d) from own sources.

6) Rate the level of financial burden after the purchase on a scale -5 to +5 (-5 means extreme liability, +5 means extreme asset).

-5 -4 -3 -2 -1 0 1 2 3 4 5

7) Specify the degree of dissatisfaction arose out of problems (security problems, parking and congestion, maintenance, increase in expenditure in terms of insurance, theft alarm etc.) on a scale -5 to +5 (-5 means extreme dissatisfaction, 5 means extreme satisfaction).

-5 -4 -3 -2 -1 0 1 2 3 4 5

8) Given the larger choice of cars, rate the level of dissatisfaction that arose from not able to purchase the desired one on a scale 0 to 10 (0 means completely dissatisfied, 9 means completely satisfied).

0 1 2 3 4 5 6 7 8 9

9) Comparing the financial burden and satisfaction received specify level of happiness on a scale 0 to 9 (0 means completely unhappy, 9 means completely happy).

0 1 2 3 4 5 6 7 8 9
10) Please rate on a scale -5 to +5, with the arrival of new models, the resale value of car is decreasing substantially (-5 means value decreased substantially, +5 means value increased substantially).

-5 -4 -3 -2 -1 0 1 2 3 4 5

**SET 2**

1) Which car did you buy?

2) Give the reasons for replacement/addition of your car on a scale 0 to 9 (0 means least important, 9 means most important).
   a) Increase in income level
   b) Noise / Maintenance
   c) Fuel efficiency / Better mileage
   d) Increase in family size
   e) Luxurious exteriors and interiors
   f) Part of changing trends

3) Compared to first purchase, specify level of satisfaction you received after purchase on a scale 0 to 9 (0 completely dissatisfied, 9 completely satisfied)

0 1 2 3 4 5 6 7 8 9

4) How did you buy this car?
   a) On installment basis   b) borrowed from friend   c) both ‘a’ and ‘b’   d) from own sources

5) Compared to first purchase, rate the level of financial burden after the purchase on a scale -5 to +5 (-5 means extreme liability, +5 means extreme asset).

-5 -4 -3 -2 -1 0 1 2 3 4 5
6) Compared to first purchase, specify the degree of dissatisfaction arisen out of problems (security problems, parking and congestion, maintenance, increase in expenditure in terms of insurance, theft alarm etc.) on a scale -5 to +5 (-5 means extreme dissatisfaction ,+5 means extreme satisfaction).

-5  -4  -3  -2  -1  0  1  2  3  4  5

7) Considering the maximum thrill you had with the first car, Where do you place yourself on a scale 0 to 9 after 2nd and 3rd purchase(0 means thrill remained same,9 means thrill increased)

0  1  2  3  4  5  6  7  8  9

8) After how much period you started getting dissatisfied with your car? ______ years.

9) Comparing the financial burden and satisfaction received, specify level of happiness on a scale 0 to 9(0 means completely unhappy,9 means completely happy)

0  1  2  3  4  5  6  7  8  9

10) Please rate on a scale -5 to +5, with the arrival of new models, the resale value of car is decreasing substantially (-5 means value decreased substantially,+5 means value increased substantially).

-5  -4  -3  -2  -1  0  1  2  3  4  5

11) Do you intend to buy a new car? YES/NO

If yes, then after how much period? ------------------------ (years).