Chapter 6

Model Specification and Research Methodology

This chapter builds on the theoretical framework discussed in the earlier chapter. The empirical model along with the estimation of the linear regression equation to be tested is specified in section I. Section II covers the variable description. The data sources from which data has been gathered is elaborated in section III. The chapter concludes with the framing of the hypothesis.

6.1 Model Specification

Based on the theoretical literature and earlier empirical studies on locational choice of emerging multinationals (Buckley et al., 2007; Pradhan, 2009, 2011; De Beule, 2010; De Beule and Duanmu, 2012), the present study has specified the cross country distribution of foreign acquisitions by Indian Pharmaceutical firms as a function of a set of host country-specific locational factors.

There exist a large number of variables that constitute location advantages. As it is not possible to take all variables into consideration, the current study includes some of the major location factors subject to the availability of data, literature review undertaken and their relevance to the industry under study and the Indian context. The dependent variables, i.e., the number of foreign acquisitions abroad by Indian pharmaceutical firms have been collected for the period 2000-2012 to test various hypotheses. The dependent variable (acquisitions in numbers) has been matched by year by host countries and various independent variables (such as host-country's GDP, political risk, patents applications and so on) have been collected by year for each host country to create a panel data set. The dependent variable along with the set of independent variables is presented in figure 6.1.
Figure 6.1: Host Country Determinants of Indian Pharmaceutical Acquisitions

- Market Size
  [GDP]

- Strategic Assets
  [Patents, Trademarks, Secondary School Enrolment, R&D]

- Economic Environment
  [Total tax rate, GDP Deflator]

- Cultural Environment
  [Geographical distance, Language]

- Institutional Environment
  [Political Stability, Rule of Law, Corruption]

- Openness
  [Trade as a % of GDP]
Therefore, the estimated empirical model in this study specified as follows:

$$ACQ_{it} = \alpha + \beta_1 GDP_{it} + \beta_2 PAT_{it} + \beta_3 TRD_{it} + \beta_4 RDE_{it} + \beta_5 ENROL_{it} + \beta_6 CT_{it} + \beta_7 INF_{it} + \beta_8 COR_{it} + \beta_9 POLST_{it} + \beta_10 DIS_{it} + \beta_11 TGD_{it} + \beta_{13} LAN_i + \mu_t i = 1 \text{ to } 33; t = 1 \text{ to } 12$$

Where

$ACQ_{it} =$ Number of acquisitions done by Indian firms in $i$th host country in year $t$

$GDP_{it} =$ GDP (constant 2000 USD) of $i$th host country

$PAT_{it} =$ Natural log of resident patent applications per $\$ billions of current GDP of $i$th host country

$TRD_{it} =$ Natural log of resident trade mark applications per $\$ billions of current GDP of $i$th host country

$RDE_{it} =$ Research and development expenditure of the $i$th host country in the year $t$

$ENROL_{it} =$ Natural log of gross secondary school enrolment (per cent) of $i$th host country

$CT_{it} =$ Natural log of the total tax rate of $i$th host country in year $t$

$INF_{it} =$ Annual percentage change in GDP deflator of $i$th host country in year $t$

$COR_{it} =$ Control of corruption of the $i$th host country in year $t$

$POLST_{it} =$ Political stability of the $i$th host country in year $t$

$DIS_i =$ Natural log of distance in kilometres between India and $i$th host country

$TGD_{it} =$ Trade as a percentage of GDP of $i$th host country

$LAN_i =$ Language Dummy*

*(Takes value of one if a common language is spoken by at least 9% of the population of both $i$th host country and India, zero otherwise)

$\mu_t =$ Random errors.
6.2 Variable Description

This section covers the definitions, and theoretical foundations governing each of the dependent and independent variables along with their data sources (Table 6.2).

**Dependent variable**

The dependent variable is the number of acquisitions done by Indian pharmaceutical firms over the period 2000-2012 and is a count variable. The data has been sourced from Grant Thornton India and ISI Emerging Markets. The data on acquisitions has also been verified independently through company annual reports and the print media. The deal value of these acquisitions has not been considered as a dependent variable in the empirical model as the value for a large proportion of Indian acquisition deals are not disclosed by Indian companies. The data set reveals that during the last twelve years, 67 Indian Firms have undertaken 191 acquisitions valued at US $ 6 billion approximately (Table 4.1). The concentration of the acquisitions has been across 33 countries which include 21 developed countries, 11 developing countries and 1 transition economy.

**Independent variables:** This section mentions the independent variables and their proxies.

1. **Market size:** The importance of market size as a locational determinant and its positive influence in attracting FDI has been confirmed by numerous studies (Kravis and Lipsey, 1982; Chakrabarti, 2001; Buckley *et al.*, 2007; UNCTAD, 2006). A large market size not only facilitates economies of scale for the firms but also result in the optimal utilisation of resources bringing about specialization of factors of production, leading to minimisation of costs and better market opportunities Moosa (2001). India and china are attractive investment destinations for many countries on account of its vast markets.
Table 6.2 : Variable Description and Data Sources

<table>
<thead>
<tr>
<th>Variable name</th>
<th>Expected Sign</th>
<th>Source</th>
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<tbody>
<tr>
<td>M&amp;A Deals</td>
<td>ACQ (Dependent Variable)</td>
<td>Grand Thorton and ISI Emerging Market Database</td>
</tr>
<tr>
<td>Market Size</td>
<td>GDP</td>
<td>+</td>
</tr>
<tr>
<td>Strategic Assets</td>
<td>PAT (Patents Filings)</td>
<td>+ World Intellectual Property Office</td>
</tr>
<tr>
<td></td>
<td>TRD (Trademark Filings)</td>
<td>+ World Intellectual Property Office</td>
</tr>
<tr>
<td></td>
<td>RDE (R&amp;D expenditure)</td>
<td>+ World Development Indicators</td>
</tr>
<tr>
<td></td>
<td>ENROL (Secondary school enrolment)</td>
<td>+ World Development Indicators</td>
</tr>
<tr>
<td>Economic environment</td>
<td>TT (Total tax rate)</td>
<td>- World Development Indicators</td>
</tr>
<tr>
<td></td>
<td>INF (Inflation)</td>
<td>- World Development Indicators</td>
</tr>
<tr>
<td>Institutional Environment</td>
<td>POLST (Political stability)</td>
<td>+ World Governance Indicators</td>
</tr>
<tr>
<td></td>
<td>COR (Control of Corruption)</td>
<td>+ World Governance Indicators</td>
</tr>
<tr>
<td>Cultural environment</td>
<td>DIS (Geographic distance)</td>
<td>– CEPII Database</td>
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<td></td>
<td>LAN (Language)</td>
<td>+ CEPII Database</td>
</tr>
<tr>
<td>Openness</td>
<td>TGDP</td>
<td>+ World Development Indicators (2012)</td>
</tr>
</tbody>
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Regional economic integration further enhances the market size of countries. Regional integration agreements like European Union (EU) and North American Free Trade Agreement (NAFTA), have led to the formation of agglomeration economies (UNCTAD, 2006; Geppert et al., 2008) which...
given their large size, and high per capita income have generated positive externalities attracting significant FDI flows.

Several empirical studies (Schneider & Frey (1985); Cheng & Kwan (2000); Pradhan and Singh (2010), Pradhan (2010), De Beule, F. (2010) Buckley et al., (2007); Buckley et al., (2009), Anwar et al., (2008) have customarily identified GDP, GDP growth, and GDP Per capita as proxies for market size which have emerged statistically significant in these studies. Consistent with a majority of empirical studies, the current study also measures market size using GDP as an indicator. The current study expects this variable to play a positive role in the spatial distribution of pharmaceutical acquisitions.

**a) GDP:** GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2000 official exchange rates.

**2. Strategic Assets of the host country**

Athreye and Kapur (2009) identify Strategic Assets to be the third most important motivation besides markets and natural resources especially for Chinese and Indian investors. According to UNCTAD (2006), most emerging market multinationals from predominantly knowledge or innovation-based such as software, business process outsourcing and the pharmaceuticals sectors from countries such as India and China have mostly sought to acquire strategic assets such as access to new technologies, patents and trademarks besides managerial skills and competencies in their quest to globalise and urgently upgrade their knowledge base and technology through foreign acquisitions to complement their firm specific advantages (Kaartemo, 2007; Pradhan, 2008a; Balasubramanyam and Forsans, 2010; Pradhan(2010).
In this study the strategic asset base of host countries is proxied by the size of patent filings by residents, trademarks (proxy for technological resources), research and development expenditure (proxy for innovative output) along with gross secondary school enrolment ratio (proxy for educational skills). These measures are postulated to attract greater Indian acquisitions.

The variable definitions are listed below.

a) **Secondary School enrolment ratio gross (%):** refers to the total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age. Gross Enrollment Ratio (GER) can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.

b) **Trademark filings:** refer to the trademark applications per $billions of the current GDP of the host country.

c) **Patents:** refer to the resident patent applications per $ billions of current GDP of the host country.

d) **Research and Development expenditure (% of GDP):** Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.

3. **The economic environment**

The economic environment of the host country plays a key role in attracting FDI flows. The current study uses important proxies such as GDP deflator that measures inflation, along with total taxes to represent the economic environment of the host country.

a) **Inflation:** Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of
acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Rising inflation makes future market planning and assessment of profit unpredictable thereby impacting the investment decisions of MNCs leading to overall uncertainty (Buckley et al., 2007). Extant literature highlights the negative relationship between inflation and FDI inflows. Constantly rising inflation in the host country lowers the real earnings of the acquiring firms making them vulnerable targets. Asiedu (2006) in his study of 22 sub Saharan African countries confirms that low inflation attracts inflows into that region Schneider and Frey (1985). Contradictory to these results, Buckley et al., (2007), in their study of Chinese OFDI have empirically found a positive and significant relationship between inflation and Chinese OFDI. The authors have rationalised their finding with the reason that this could be because most of the Chinese projects are in developing countries where the inflation levels are often high and volatile. In the current study, it is expected that there prevails negative relationship between inflation and OFDI.

b) **Total tax rate:** Total tax rate or corporate tax measures the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions as a share of commercial profits. Taxes withheld (such as personal income tax) or collected and remitted to tax authorities (such as value added taxes, sales taxes or goods and service taxes) are excluded. MNEs are attracted to those locations where the statutory tax rates are reasonably low (Grubert and Slemrod, 1998). The governments of both developing as well as developed countries often provide investment incentives in the form of tax incentives such as tax rates, tax depreciation, tax credits, tax holidays along with non-tax government incentives such as government grants in order to attract foreign investment. (Kumar, 2001) found investment incentives to be positively related with FDI inflows while, tax rates were found to be negatively and linearly correlated with FDI. (Gastanaga et al., 1998; Cassou, 1997) found tax rates to be negatively and linearly correlated with FDI. India’s growing investments into tax
heavens like Bermuda, British Virgin Islands and Mauritius for round tripping investment and tax concealment explains this trend.

4. Institutional Environment

The institutional differences of host countries have a bearing on their relative attractiveness to foreign investors (Dunning, 2009). Various empirical works highlight the importance of institutional environment on FDI. Baniak et al. (2003) opines that a weak institutional environment of the host country has a negative effect on FDI. The current study has used political stability, rule of law, and control of corruption as proxies to capture the perception of the institutional quality.

a) **Political Stability**: This variable combines several indicators which measure perceptions of the likelihood that the government in power will be destabilised or overthrown by possibly unconstitutional and/or violent means, including domestic violence and terrorism. Political instability in the form of policy uncertainty can prove to be detrimental to any business thereby aggravating the risks associated with operating in an unfamiliar environment. In several studies [Root & Ahmed (1979), Schneider and Frey (1985), Dunning (1993), and Chakrabarti (2001)] political stability has emerged as a statistically significant predictor of FDI. (Buckley and Casson, 1981, 1999) have observed that countries with high political risks are generally served by arm length-servicing modes, e.g., exporting, licensing, and outsourcing in the place of FDI. However recent research on emerging markets reveals that high political risk in the host country may not be a deterrent if the firms themselves are from weak institutional backgrounds Pradhan (2010).

b) **Rule of Law**: This variable includes several indicators which measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. Together, these indicators measure the success of a society in developing an environment in which fair and predictable rules form
the basis for economic and social interactions and the extent to which property rights are protected.

c) **Control of Corruption**: This variable measures perceptions of corruption, conventionally defined as the exercise of public power for private gain. The particular aspect of corruption measured by the various sources differs somewhat, ranging from the additional payments made to get things done, to the effects of corruption on the business environment, to measuring corruption in the political arena. Corruption is often perceived as an important measure of the quality of the business environment of a host country as corruption increases the transaction costs of doing business in a country. Most studies hypothesise a negative relationship with corruption. Bénassy-Quéré *et al.* (2007) showed that corruption has a negative impact on FDI. Wei (2000) highlighted that corruption influences both the volume as well as the distribution of investment.

5. **Openness of the economy**

The openness of the economy is measured as the proportion of imports & exports to GDP. Open economies are known to remove unnecessary restrictions on imports and exports thereby encouraging FDI flows. Organisations like UNCTAD and World Bank have increasingly advocated to the developing countries greater openness. Many studies have established the positive relationship between market openness and FDI (Chakrobarti, 2001; Gastanaga, *et al.*, 1998). Both the Indian and Chinese markets are classic examples highlighting the importance of market liberalisation. Both these countries proved to be unattractive destinations to foreign investment in their pre-reform period. But with the active reforms undertaken in the Post-1990 era characterised by reduction in import duties and increased foreign participation in FDI projects, the opening of the economy has facilitated jobs, trained workers, improved labour productivity besides reducing poverty and improving domestic competition (Diana and Adil, 2004). The economic development in China got a boost with the setting up of special economic...
zones (Rugman and Li, 2007; Buckley, *et al.*, 2007). Some studies have also studied at length the negative impact of tariff or non-tariff barriers that dampens trade. At the same time they also note that such barriers leave MNEs with no choice but to cover the markets thereby encouraging MNEs to invest abroad (Caves, 1996; Moran, 1998).

In the current study the openness of the host economy has been proxied by trade as a percentage of GDP of the host economy. The definition of this variable is given below:

**Trade:** Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

### 6. Cultural Factors

**a) Geographical distance between the home and the host country's capital:** Geographical proximity also has an important bearing on the direction of Indian overseas acquisitions as the costs relating to information dissemination, technology transfer to establish overseas entities and their management is likely to increase with distance (Leamer and Storper, 2001). Johanson and Vahlne (1977) have explained that firms, in their early stages of internationalisation prefer to invest into their neighboring countries closer to the home market having similar social, economic and political proximity to their home countries in order to develop more ownership advantages. As the firms begin to internationalise and gain confidence after these initial stages, they tend to target other advanced countries. The geographical pattern of the Indian OFDI has also followed this trend. During the Pre-liberalisation period, most of the Indian OFDI was in neighbouring and less developing countries while the post 1990s period, witnessed firms investing largely into developed countries. UNCTAD (2006) highlights the fact that the gaining prominence of south-south FDI into neighbouring countries is due to the political and cultural proximity besides the similarity in economic and social problems. Buckley *et al.*, (2007) found geographic distance to be significant but having negative influence on Chinese OFDI.
Different points of view have also been expressed by some researchers such as Cheng and Kwan (2000) who has explained that the FDI in United States is dominated by MNEs from EU and Japan which are at considerable distance from the United States of America. The current study hypothesises that the flow of FDI should negatively relate to the geographical distance.

b) Language: The cultural distance between home and host countries play an important role in determining a country’s OFDI (Kogut and Singh, 1988; Barkema, et al., 1996, Evans et al., 2000). By virtue of being a colony of Britain and India’s affinity to the English language, has resulted in a cultural closeness with USA and the UK which is reflected in the growing number of Indian acquisitions in both these countries. Non-resident Indians also account for one of the major minority groups in various countries. A common language also facilitates greater communication leading to a reduction in the transaction costs which are otherwise very high in cross-border business operations. A common language is one that is spoken by at least 9% of the population of both India and the host country.

6.3 Data Sources

The host country data on the independent variables has been sourced from the World Development Indicators (WDI) 2012. Data on GDP, corporate tax and GDP deflator and Trade as a percentage of GDP have been sourced from online World Development Indicators (WDI) 2012. Resident patent filings and applications for trademark have been obtained from the online patent statistics of the World Intellectual Property Organization (WIPO). The data on Secondary School enrolment ratio has been sourced from World Development Indicators (WDI) 2012. Variables such as Political stability, Rule of Law and Control of Corruption have been sourced from the World Governance Indicators. Information on the geographical distance between India and the host country’s capital (in kilometers) has been calculated following the great circle formula that uses latitudes and longitudes of the most important city (in terms of population) or of official capital and has been sourced from the CEPII
database. Information regarding the presence of a common language between India and the host country has also been sourced from the CEPII database.

6.4 Development of Hypothesis

The testing of hypothesis is concerned with determining whether the findings lend support to some hypothesised causal relationships between the dependent and explanatory variables. The null hypotheses contend that there is no such relationship while the alternative hypothesis postulates the existence of such relationship. Both the Null and Alternate hypothesis are listed below.

a) Market size: Hypothesis 1

$H_0$: The market size of the host country does not impact the number of Indian Pharmaceutical acquisition deals.

$H_1$: The market size of the host country has an impact on the number of Indian Pharmaceutical acquisition deals.

Hypothesis (1a)

$H_{0a}$: The GDP of the host country does not have a positive impact on the number of Indian Pharmaceutical acquisition deals.

$H_{1a}$: The GDP of the host country has a positive impact on the number of Indian Pharmaceutical acquisition deals.

b) Strategic assets: Hypothesis 2

$H_{02}$: The host country endowment of Strategic assets does not have a positive impact on the number of Indian pharmaceutical acquisition deals.

$H_2$: The host country endowment of Strategic assets has a positive impact on the number of Indian pharmaceutical acquisition deals.
**Sub hypothesis (2a)**

$H_2a_0$: The Patent applications of the host country do not have a positive impact on the number of Indian pharmaceutical acquisition deals.

$H_2a_1$: The Patent applications of the host country have a positive impact on the number of Indian pharmaceutical acquisition deals.

**Sub hypothesis (2b)**

$H_2b_0$: The trademark filings of the host country do not have a positive impact on the number of Indian pharmaceutical acquisition deals.

$H_2b_1$: The trademark filings of the host country do have a positive impact on the number of Indian pharmaceutical acquisition deals.

**Sub hypothesis (2c)**

$H_2c_0$: The Research and development expenditure of the host country does not have a positive impact on the number of Indian pharmaceutical acquisition deals.

$H_2c_1$: The Research and development expenditure of the host country has a positive impact on the number of Indian pharmaceutical acquisition deals.

**Sub hypothesis (2d)**

$H_2d_0$: The secondary school enrollment of the host country does not have a positive impact on the number of Indian pharmaceutical acquisition deals.

$H_2d_1$: The secondary school enrollment of the host country has a positive impact on the number of Indian pharmaceutical acquisition deals.
c) **Economic Environment: Hypothesis 3**

\[ H_0^3 : \text{Sound economic environment of the host country does not have an impact on the number of Indian pharmaceutical acquisition deals.} \]

\[ H_3 : \text{Sound economic environment of the host country has an impact on the number of Indian pharmaceutical acquisition deals.} \]

**Sub hypothesis (3a)**

\[ H_{3,a_0} : \text{The corporate tax rates of the host country do not have a negative impact on the number of Indian pharmaceutical acquisition deals.} \]

\[ H_{3,a_1} : \text{The corporate tax rates of the host country have a negative impact on the number of Indian pharmaceutical acquisition deals.} \]

**Sub hypothesis (3b)**

\[ H_{3,b_0} : \text{The GDP deflator (inflation) of the host country does not have a negative impact on the number of Indian pharmaceutical acquisition deals.} \]

\[ H_{3,b_1} : \text{The GDP deflator (inflation) of the host country has a negative impact on the number of Indian pharmaceutical acquisition deals.} \]

d) **Institutional Environment: Hypothesis 4**

\[ H_0^4 : \text{Sound institutional environment of the host country does not have an impact on the number of Indian Pharmaceutical acquisition deals.} \]

\[ H_4 : \text{Sound institutional environment of the host country has an impact on the number of Indian Pharmaceutical acquisition deals.} \]
**Sub hypothesis (4a)**

$H_{4a_0}$: Control of corruption in the host country does not have an impact on the number of Indian Pharmaceutical acquisition deals.

$H_{4a_1}$: Control of corruption in the host country has an impact on the number of Indian Pharmaceutical acquisition deals.

**Sub hypothesis (4b)**

$H_{4b_0}$: The absence of political stability does not have an impact on the number of Indian Pharmaceutical acquisition deals.

$H_{4b_1}$: The absence of political stability has an impact on the number of Indian Pharmaceutical acquisition deals.

c) **Geographical Distance: Hypothesis 5**

$H_{5_0}$: The geographical distance between India and the host country does not impact the number of Indian pharmaceutical acquisition deals.

$H_{5_1}$: The geographical distance between India and the host country has an impact on the number of Indian pharmaceutical acquisition deals.

**Language: Hypothesis 6**

$H_{6_0}$: The host countries speaking English language do not have a positive impact on the number of Indian Pharmaceutical acquisition deals.

$H_{6_1}$: The host countries speaking English language have a positive impact on the number of Indian Pharmaceutical acquisition deals.
f) Country Specific Advantage Ownership Variables: Hypothesis 7

$H_{70}$: The openness of the host country does not have a positive impact on the number of Indian Pharmaceutical acquisition deals.

$H_{7}$: The openness of the host country has a positive impact on the number of Indian Pharmaceutical acquisition deals.

Sub Hypothesis (7a)

$H_{7a0}$: The Trade as a percentage of GDP of the host country does not have a positive impact on the number of Indian Pharmaceutical acquisition deals.

$H_{7a}$: The Trade as a percentage of GDP of the host country has a positive impact on the number of Indian Pharmaceutical acquisition deals.

Conclusion

Based on the theoretical framework discussed in the earlier chapter and other empirical studies on the locational choice of emerging multinationals, the empirical model along with the estimation of the linear regression equation to be tested was specified. The variable description of both the dependent and independent variables and their data sources have been elaborated. The chapter concluded with the framing of the hypothesis.