ASAC 2006
Banff, Alberta

Shahadat Hossain (Student)
Uma Kumar
Vinod Kumar
Sprott School of Business
Carleton University, Ottawa

APPLICATION OF INTERNATIONAL BUSINESS EXPANSION THEORIES IN EXPLAINING CHANNELS OF INTERNATIONAL TECHNOLOGY TRANSFER

This paper studies the existing theories in international business expansion and relates them to the channels of international technology transfer (ITT). We synthesize the literature from ITT with the theories and then present the application and the factors that affect the choice of channel based upon each of the selected theory.

Introduction and Scope of Study

The studies conducted in technology transfer tend to follow the theory of multinational enterprise and its modes of entry based on theories of internalization and transaction cost. Kumar, Madanmohan, Cray, and Kumar (2002) noted that the theories used to explain international technology transfer (ITT) largely originate from studies of foreign direct investment and multinational enterprise. "Over the last decade most empirical research on entry mode has used the transaction cost approach and the eclectic framework," states Anderson (1997). A comprehensive study on each channel of ITT as affected by these and other theories, in international business expansion, would provide a systematic representation of technology transfer strategies. As it stands now, academics appear to employ any and all available theory to better understand (ITT). Reisman and Zhao (1991) claim that there has been no model or structure for the field and that people merely have strung information and insight on an invisible thread and hoped that the thread would continue to hold.

It is noted that firms can choose licensing to setting up a wholly owned subsidiary as part of their business expansion and technology transfer and is widely recognized that the primary agent of ITT is the multinational enterprise (Reddy and Zhao, 1990). Multinational enterprises have a choice of entry modes[1] when entering a new geographic market just as firms can choose many channels of ITT. This choice of entry mode has consequences in the process of strategy formation and thus should be carefully considered (Agarwal and Ramaswami, 1992). The firm's initial choice of a particular mode are difficult to change without considerable loss of time and money as there are varying levels of resource commitments involved with modes of entry. Furthermore, Reddy and Zhao, (1990) observed that "ITT is a complex subject and the findings, conclusions and contentions of what we know are fragmented along various specialties", making it an important area to study and understand further. We are also motivated to study the application of international business expansion theories to explain ITT as it has been suggested that international business research is "running out of steam", (Buckley, 2003).

Contractor and Sagafi-Nejad (1981) identified theory building as an area of research in ITT. They elaborate further to state that the problem involves integrating concepts in technology transfer with other bodies of theory like FDI, development and trade theories. In the reverse direction

[1] Entry Modes and Channels are used synonymously in the literature. Where ever possible, this study employs the term "Channels" when discussing ITT and "Modes of entry" when discussing business expansion strategy.

(receiving country perspective) they posit the need for a more rigorous application of economic, political science, organizational and other theories to technology transfer. Majumdar, (1980) points out the association between technology transfers and international trade. We are, thus, motivated to examine the issue of ITT from the international business theory perspective.

This study is limited to journal articles specifically related to channels of ITT. Our initial search was based on key word search of "Technology Transfer" on Business Source Premiere, Scholars Portal and other databases available through Carleton University library. We also included "Channels of Technology Transfer" and "International Technology Transfer" in our key word search. The result was a variety of articles spanning numerous scholarly journals. We then limited our search to include only those articles that specifically dealt with ITT and discussed any of our identified business expansion theories. Discussion on the theories itself are not limited to any specific journal, however, the major emphasis was on the Journal of International Business Studies. We have attempted to review only those theories that are most commonly cited in the ITT literature. There are other theories in international business, that had no significant reference in the ITT literature based on the literature reviewed in this study (i.e. appropriability theory, factor endowment theory, diversification theory, etc.). We feel that continued search in this field would not assist in our objectives. Thus, we have limited our study to the seven most commonly referred to theories in both the entry mode and channels of ITT literature. This study focuses only on formal channels of technology transfer that MNEs use and their underlying motives for choosing such channels.

Following the introduction and scope of the study, the paper discusses the various channels of ITT. Section three focuses on firm based theories of IBE. Furthermore, in this section the paper presents evidence of the use of these theories to explain channels of ITT. Having, provided evidence in support of our objective, the paper then presents the application and the factors that affect the choice of channel based upon each of the selected theory. The penultimate section discusses research implications. The study then concludes with final comments.

International Technology Transfer

ITT is a relatively new field of study. It has emerged as a field of study in the late 1960s and has since inspired a large body of literature (Contactor and Segafi-nejad, 1981; Spivey, et al.1990). Davidson and McFetridge (1985) state that it is a subject that has generated considerable research interest and activity. However, there still remain areas in the field that are yet to be clearly defined. "Knowledge concerning the transfer of technology is growing rapidly. As is often the case in an emerging area or discipline, its descriptive as well as normative theories and any available data are at best fragmented and disjointed" (Reisman and Zhao 1991).

Technology transfers need not (and do not) always cross, national boundaries, and they do not necessarily lead to multinational activity. Nevertheless, it is the theory of multinational enterprise (MNE), which provides the framework that encompasses the process of technology transfer. This is essentially because the theory of the MNE is not a theory of multinationality *per se,* but rather a theory of the multi-plant or multi-location firm, whose activities may straddle national boundaries, (Davies, 1995). Reddy and Zhao (1990) opine that the MNE is the primary agent of technology transfer from the home country. Technology transfer has been identified as an important factor for improving the competitiveness of MNEs enabling them to compete effectively in local markets (Madu, 1992). Other academics note that in recent times the multinational enterprise has become one of the most important agents in the production of technology and it plays a major role in the international diffusion of new technology, (Menzler-Hokkanen, 1995). Technology transfer has been defined as a process by which expertise or knowledge related to some aspect of technology is passed from one user to another for the purpose of economic gain. Kumar et al. (2002) posit that it takes place when an existing technique of production is moved from one location to another. The literature is replete with numerous other definitions that reflect the same ideas, the simplest of the definitions being offered by Teece (1977); the transfer of know how. The definitions include the entire gamut of technology, (material, design,

software, medium-ware, hardware and skill) and invariably pertain to transfer between firms or across geographic boundaries. The usual emphasis of transfer being; from developed to developing countries or by MNEs or a combination of all (i.e. MNE to subsidiary, another firm in developing country, etc.). An MNE consists of a group of geographically dispersed, goal-disparate organizations that include its headquarters and different subsidiaries abroad, (Luo, 1999). MNEs resort to a number of strategies in transferring technology ranging from licensing to setting up subsidiaries (Madu, 1992; Bell, 1993; Chen, 1996; Luo, 1999). Menzler-Hokkanen (1995) in giving an overview explains that technology may be transferred from one place to another by many different channels (including licensing, franchising, management contracts, marketing contracts, and technical service contracts), but in the post-war period, the multinationals have become the most powerful institutions for the spread of new technology. In fact the technology transfer literature as well as international business literature are replete with taxonomies of these strategies more commonly known as modes of transfer or channels of transfer. The international business literature focusing on global business expansion looks at the same entry modes as does technology transfer. In fact, both schools of studies appear to employ the same terminologies. This may very well be because they both follow the same strategies and theories.

Channels of International Technology Transfer

ITT consists of a process of transferring the know-how required from other nations and successfully utilising such know-how (Tidd and Trewhella, 1997).

It is generally agreed that there are many levels of technology transfer – starting from the simplest transfers of technical documents to the complex transfers involving personnel from both organizations, as well as equipment, (Balachandra, 1996). Thus, a number of channels of technology transfer have been identified and more recently classified into formal and informal channels (Chen, 1996). The informal channels include; reverse engineering, exchange of scientific and technical personnel, science and technology conferences, education and training of foreigners, commercial visits, open literature and industrial espionage. The scope of this study will focus mainly on the formal channels of international technology transfer; licensing, franchising, direct foreign investment, sale of turnkey plants, joint ventures (subcontracting, cooperative research arrangements, co-production agreements, etc.), and the export of high-technology products and capital goods. A firm can reach foreign markets by one of three methods – export, produce in the recipient country through a subsidiary or joint venture, or transfer the technology to an independent firm in the host country (Balachandra, 1996).

Joint venture and licensing agreement between a multinational company and a local entrepreneur is an increasingly predominant mode of entry into growing markets of the developing world (Lasserre, 1984). Licensing being the simplest form of transfer requiring the lowest resource commitment while joint venture the advanced form, also usually referred to as strategic alliance, requires substantial resource commitment that also falls under the category of foreign direct investment (FDI). FDI also includes wholly owned subsidiary. On the whole licensing and FDI essentially encompass all formal modes of transfer in varying degrees. In a recent study of technology transfer to China from the EU (Bennet, et al. 2001) the volume of FDI into China has been second only to that in the USA. The same study identifies government policy towards technology transfer that has played a key role in the emergence of China as an economic power.

International Business Expansion Theories

Trade between different groups of people across borders has taken place since 2000BC (Moore and Lewis, 1999) but it was not until the fifteenth century that people tried to explain why trade occurs and how trade can benefit both parties to an exchange (Wild, et al. 2003).

The classical trade theory followed mercantilism, primarily addresses the explanation of trade flows between at least two countries. However, the classical trade theory fails to answer what causes differences in relative advantage, an issue integral to the notion of international trade. Heckscker and Ohlin (1933) provide an explanation in the form of the factor proportions theory. However, in the

1960s critics felt that the theory to be deficient in explaining the patterns of international trade prevalent at the time (Morgan and Katsikeas, 1997).

Thus, paving the way for the firm based theories, with the earliest proponents being Hymer (in his dissertation on FDI in 1960) and Vernon (1966) with his product life cycle theory. These early works led to the proposition of numerous other theories culminating with the most recent and commonly cited eclectic theory proposed by Dunning (1980).
Since World War II, international business research has focused on the role of the firm rather than the country in promoting international trade.

Firm-based theories have developed for several reasons: (1) the growing importance of MNEs in the postwar international economy; (2) the inability of the country-based theories to explain and predict the existence and growth of intra-industry trade (trade between two countries of goods produced by the same industry); and (3) the failure of Leontif and other researchers to empirically validate the country-based Heckscher-Ohlin theory.

Table 1: Firm Based Theories of International Business Expansion

Theory	**Author(s)/ Proponet(s)**
Foreign Direct Investment	S. Hymer (1960/1976)
International Product Life Cycle	Vernon (1966)
Transaction Cost Theory	Williamson (1975)
Learning Theory	Johansson and Vahlne (1977)
Theory of Internalization	Rugman (1979)
Competitive Advantage	Porter (1980)
Eclectic Theory	Dunning (1980)

Unlike country-based theories, firm based theories incorporate factors such as quality, technology, brand names, and customer loyalty into explanations of trade flows. Because firms, not countries, are the agents for international trade, the newer theories explore the firm's role in promoting exports and imports. The study will focus on the main (the more commonly known and cited) firm based theories of international trade (Table1) and investigate the application of these theories in explaining ITT.

FOREIGN DIRECT INVESTMENT

Hymer (1960) was the first to explain foreign direct investment (FDI) as an international extension of industrial organization theory. According to Hymer (1960, 1976), MNEs that own and control foreign subsidiaries must possess firm-specific advantages that outweigh the disadvantages of being a foreign firm. This implies the existence of structural market imperfections, which Hymer (1960) called monopolistic advantages (based on market power), such as knowledge advantages, distribution networks, economies of scale, and product differentiation. Rather than sell these advantages to the host country, he asserts that firms take advantage of market imperfections in host countries by engaging in foreign direct investment. This enables the home country firm to compete against the foreign firms on their own turf, (Aliber, 1970).

Over the years there has been considerable debate, appreciation and critique of Hymer's FDI theory (Arpan, et al. 1981; Dunning, 1980; Dunning and Rugman, 1985; Fayerwather, 1982; Kindelberger, 1970, Morgan and Katsikeas, 1997). As a continued discussion on the criticism of Hymer and the FDI theory is beyond the scope of this study we limit our discussion to it's application in explaining ITT.

Hymer's (1960/1976) work formed the basis for a variety of hypothesis aimed at explaining the pattern of foreign direct investment and ITT (Reddy and Zhao, 1990). Davies (1977) opines that, it is

the monopolistic advantages that allow the transfer of production into foreign markets, not technology or technical information per se.

Hymer (1960) argued that the international firm is able to command higher revenues compared to local competition due to superior quality of the product made by the foreign firm affiliate, it's superior organization, international brand recognition, etc. (Contractor, 1984).

Boura and Cosmetatos (1996) in their study of the Greek exports and imports of manufactured food, beverage and tobacco products make significant reference to ITT. Of interest is their discussion on size of the firm. The authors refer to Hymer and Kindleburger's emphasis on size being a determinant in the technology transfer process between firms in the developed nations and those in the developing countries. Balachandra (1996) opines that, reflecting on the older days of technology transfer on an organized basis, the donor firms tended to be large MNEs.

FDI is often referred to as a channel of ITT, as evidenced by the work of Lan and Young (1996) where they view FDI from the financial perspective. That is, they posit; investment crossing national boundaries is always driven by the global exploitation of technology. Using the concept of technology ball as a framework, Lan and Young (1996) analysed technology transfer through FDI to Northeast China. They conclude that the positive experience of the high-performing Asian economies with FDI and technology have perhaps led to over-optimistic expectations of the contribution of foreign direct investment in developing countries. Contractor (1985) in his study of direct investment and licensing notes that the idea that a proprietary advantage possessed by a firm is the basis for foreign expansion via either investment or licensing is a concept that goes back to Hymer (1960).

On the subject of national policies toward FDI, Davidson and McFetridge (1985) argued that receiving country governments can preclude the internalization of technology transactions by placing restrictions on foreign equity holdings. They also note that foreign investment controls such as those found in India, Mexico and the Andean Pact countries, among others, can dictate the use of licensing agreements or join ventures. Thus, they posit that depending on the sector in these and other countries the use of joint ventures may be permitted.

INTERNATIONAL PRODUCT LIFE CYCLE THEORY

Vernon's (1966) international product life cycle theory is used to explain the change from the export option to the direct investment option based on relative shifts in demand and competitive factors from advanced to less advanced countries, (Goodnow, 1985). The international product life cycle consists of three stages called new product, maturing product, and standardized product. According to the theory, domestic production begins in stage 1, peaks in stage 2, and slumps in stage 3. Exports by the innovating firm's country also begin in stage 1 and peak in stage 2. By stage 3, however, the innovating firm's country becomes a net importer of the product.

Kotabe (1989) points out that the theory describes the stage like evolutionary pattern of the diffusion of a new product or technology across national boundaries and of production locations across time and space. However, he also opines that although the paradigm describes the initial international expansion of many firms it is not adequate in today's context as mature MNCs have succeeded in developing sourcing and marketing strategies for surviving and thriving in global competition.

Commenting on the theory Balachandra (1996) observes that firms in developed countries try to expand their markets by exporting the technology to developing countries as the markets in home countries approach maturity, while markets in developing countries are still in the growth stage of the product.

Reddy and Zhao (1990) in their review of the international technology transfer literature conclude that the most frequently cited theory for MNEs' choice of technology transfer is the early work of Vernon. Majumder (1980) in his study, of technology transfer and international

competitiveness in the electronic calculator industry, argued that the product cycle theory provides the only theoretical framework for analyzing international technology transfer; as it incorporates the dominance of labor as the product advances. However, the author then argued that the theory fails to explain fully in the case of high technology-based products. He concludes in his study that the theory fails to adequately explain the transfers of the electronic calculator technology and that technology transfer may not be unidirectional as suggested by the product cycle theory. Along the same line Balachandra (1996) also argued that the theory is not applicable in a number of situations. He elaborates by stating that the media and liberalized import laws in many countries have generated markets for latest products in most countries almost at the same time as they are introduced in the country of origin.

Contractor and Sagafi-Nejad (1981) in their study of major issues and policy responses in ITT opine that the theory implies a trend toward less market imperfection with maturity and product standardization and so more arms-length transfers.

Boura and Cosmetatos (1996) in their study (referred above) also draw upon Vernon's product cycle theory. They draw upon the theory to state that innovative firms in the large, affluent markets of the developed countries go abroad to protect their product innovations once technology becomes standardized, and competitors from other developing countries can adopt it and copy the new product. This is not and end in itself, as a whole new cycle of new products starts. The authors also suggest that according to the theory; only large firms with multinational aspirations were active in technology transfer. Balachandra (1996) supports the notion and suggests that innovative firms in large affluent markets of the developed countries go abroad to protect their product innovations once technology becomes standardized, and competitors from other developed countries can adopt it and copy the product.

TRANSACTION COST THEORY

Transaction cost economics developed by Williamson (1975, 1979), suggested that firms choose alternative arrangements that minimize the sum of production and transaction costs. Production costs consist of a variety of costs incurred during the transformation of various inputs (materials, components, labor, information, etc.) into product and services (Culpan, 1993). Bell (1993) points out that Williamson elaborates further, stating that, transaction costs are determined by three characteristics of transactions (asset specificity, uncertainty, and frequency) and two assumptions about human behavior (bounded rationality and opportunism). Kogut (1988a) explains; transaction costs refer to the expenses incurred for writing and enforcing contracts, for haggling over terms and contingent claims, for deviating from optimal kinds of investments in order to increase dependence on party or stabilize a relationship, for administering a transaction. Transaction cost theory predicts that strategic alliances are designed to achieve a minimum cost arrangement, (Culpan, 1993).

While discussing the channel of ITT Reddy and Zhao (1990) observed that a supplier firm's decision to transfer it's manufacturing technology by licensing or by investing in a facility involves an evaluation of the benefits and costs to the firm of each approach. Kumar et al.*(2002)* in their study of technology transfer channels, while discussing transaction cost theory, argued that the choice of a particular channel may be influenced by the bargaining power of the recipient and donor of the technology. This argument was built upon the notion of the high costs associated with technology transfer due to "the investment required in a legal, administrative and operating infrastructure". They surmise that the transaction cost focus helps market failures that can occur in a technology transfer.

Davies (1995) in his study of the intra-firm versus licensed transfers of machine-tool technology, posits that the choice of technology transfer channel depends on the overall profitability of alternatives, taking into account both production cost and transaction cost. He also opines that the transaction cost analysis emphasizes that the difficulties associated with licensing arise fundamentally from the combination of bounded rationality or uncertainty. This is turn prevents complete contracts from being written for technology transfers, with the possibility of opportunistic behavior on the part

of licensees. He further adds that had both these factors (uncertainty and opportunism) been absent a licensor could set out restrictions and payment terms for the technology which would guarantee that the returns from its use would be appropriated.

THEORY OF INTERNALIZATION

Rugman's explanation of the theory of internalization (1981, 1986) emphasizes the relationship between the directness of the mode of entry and the firm's desire to maintain control over proprietary elements in its international marketing mix. (Goodnow, 1985).
Internalization theory was developed to provide an economic rationale for the existence of MNEs. This theory rests on two general axioms (Buckley, 1988):

- firms choose the least cost location for each activity they perform;
- firms grow by internalizing markets up to the point where the benefits of further internalization are out weighed by the costs.

Table 2 demonstrates the reasons for internalization by MNEs (Rugman, Lecraw and Booth, 1985).

Both natural market imperfections and unnatural market imperfections induce internalization by MNEs (Rugman, Lecraw and Booth, 1985). Especially, intermediate markets with imperfections will be internalized, such as markets for knowledge (Buckley and Casson 1976; Hennart 1982; Rugman 1981). An interesting note on the theory of internalization is that many (e.g. Davies, 1977) view it as an extension of the theory of foreign direct investment. MNEs possess a comparative advantage when transactions are subject to a high degree of uncertainty and when transactions consist of long term exchanges of complex and heterogeneous products among a comparatively small number of traders (Buckley and Casson, 1976). Bell (1993) asserts that according to the original internalization theory, MNEs always avoid IJV since they are inferior to WOS, which allow the MNE to maximize the returns on its ownership-specific advantages.

Table 2: Reasons for Internalization

Natural market imperfections	Unnatural market imperfection
Pricing of public good, e.g. knowledge	Government-imposed, e.g.:
Transaction costs	Tariff
Buyer uncertainty	Foreign exchange control
Quality control	Regulations on FDI
Difficulty in making a contract	

On the issue of firm size Contractor (1984) notes that the proponents of the theory suggest that smaller firms, lacking the managerial and financial resources to make direct investment, would prefer licensing. Davidson and McFetridge (1985) argued that small and less sophisticated markets may tend to prefer relatively rudimentary technologies which, by virtue of their age, command relatively small rents. Thus, hypothesizing that the greater the extent to which a host country is expected to prefer low-rent technologies, the less likely it is that transactions to that country will be conducted on an intrafirm basis. From their empirical study they conclude that the probability of internal transfer is greater:
(i) for newer technologies; (ii) for technologies with fewer previous transfers, (iii) for technologies in the same three digit SIC class as the transferor's principal line of business; (iv) the more R&D intensive is the transferor; (v) if the transferor had an affiliate in the receiving country prior to the transfer; and (vi) for transferors with more prior technology transfers.

In his study of the intra-firm versus licensed transfers of machine-tool technology, Davies (1995) argues that the theory explains the existence of the MNE in terms of the factors that lead internalized governance to be preferred to contractual transactions. This in turn applies in converse to the licensing decision. With empirical evidence he concludes that both licensed and internalized transfers in the machine-tool industry occur with similar frequency and that the internalized transaction remains the preferred channel for the transfer of strategically significant information.

Davies (1995) also asserts that a company will prefer a cooperative venture (licensing) to a subsidiary if the net incremental benefit of the latter over the former is greater than the share of profits going to the partner. Contractor (1984) finds a positive relationship of licensing to the number of patents filed in a country and hypothesizes that patents increase revenues extractable from licensing and that they are an effective means of segmenting the international product market. He argues that if the hypothesis is accepted then a weakening of the patent system sought by some LDCs would only diminish international licensing and drive firms to greater internalization of technology in controlled equity affiliates. Davidson and McFetridge (1985) argued that joint ventures do not solve the underlying problems that lead many firms to internalize transfer of technology. They elaborate; local partners may be unwilling to place an adequate value on the technology or to pay an adequate return to the parent company. Also, once the local party has access to the technology it may attempt to alter the transaction terms in its favor.

LEARNING THEORY

The Scandinavian researchers Johanson and Vahlne (1977), commonly referred to as the Uppsala School, put forth a knowledge based model to explain the internationalization process. The model has a stage like approach to the internationalization process.

The authors' postulate firms start off with low risk entry options (exports) and overtime with increased market knowledge increase their foreign market commitment (subsidiary). Johanson and Vahlne (1977) explain that the time order of such a stage-like process is related to the psychic distance[2] between the home and the host countries.
"Increased market knowledge is supposed to lead to increased market commitment and vice versa" Anderson (1997). Anderson (1997) points out that the basic assumption of Johanson and Vahlne (1977), is that, performing activities creates firm internal assets such as skills and (experiential) knowledge has also been emphasized by others like Porter (1991). Also, Kogut and Zander (1993) suggest that tacit knowledge create competitive advantage that, in turn, can predict the entry mode. Anderson (1997) criticizes the model as not having included co-operative modes of entry in the establishment chain as well as being too deterministic (i.e. firm will start at point a, then it will go to b, etc.). The result being the firm is denied of strategic choice regarding appropriate modes of entry in overseas market.

Kumar et al.(2002) point out that despite empirical evidence the theory has been criticized for failing to take into account firm specific factors other than international experience. Here they argued, from the recipient firm's perspective, that resource endowments and slack would apply in a firm's choice of a particular channel of technology transfer. The authors also suggest that though the theory is useful from the donor's perspective, it falls short of explaining recipient behavior.

COMPETITIVE ADVANTAGE THEORY

A competitive advantage is defined as the advantage of a firm relative to another firm for a certain period of time (Porter, 1980). The strategic behavior approach concentrates on how strategic behavior influences the firm's competitive position (Kogut, 1988). In the strategic behavior approach, competitive advantages (monopolistic like advantages) are very important (Bell, 1993). Competitive advantages generally do not last forever and thus firms must attempt to benefit maximally from their temporary relative advantages (Buckley, 1990). The firm's competitive position is determined largely by its temporary competitive advantages and is short-term oriented (Bell, 1993). Given a relative advantage, MNEs will try to maximize short-term profits, perhaps at the expense of long- term

[2] The authors' define psychic distance as the difference in language, education, business practices, culture and industrial development; or the sum of factors preventing the flow of information from and to the market.

considerations, to prevent other firms from appropriating the MNEs relative advantage (Buckley, 1990).

Shan and Song (1997), in their study of the biotechnology industry, posit that if a firm's competitive advantage is derived from its unique resources, the advantage is lost when its capabilities become obsolete through constant technological changes. Majumder (1980) concludes that the pattern of competitive advantage in the industry was determined by the pattern of technology migration (i.e. USA to Japan and Japan to USA). Davies (1995), draws on the competitive advantage theory to suggest that the dangers of creating competition through licensing are so great that its use should be highly restricted.

ECLECTIC THEORY

Dunning, first put forward the eclectic paradigm at a Nobel Symposium in 1976 (Dunning, 1995). Dunning's eclectic theory[3] combines ownership advantage, location advantage and internalization advantage (OLI) to form a unified theory of FDI. According to Dunning FDI will occur when three conditions are satisfied: ownership advantage, location advantage and internalization advantage. Dunning revised the theory to reflect the rise of what he terms as "alliance capitalism" (1995). With the recent flattening of MNE organizational structures, significant increases in mergers and acquisition and strategic alliance activities by MNEs, Dunning has incorporated MNEs' increasing use of external sources to generate the ownership advantages internalized within the firms within the eclectic paradigm (Martinez-Solano and Phelps, 2003). The growth of such alliances has led to the blurring of the internalized and externalized modes of technology transfer in which MNEs are implicated, observes Martinez-Solano and Phelps (2003). In brief the theory states that a firm will undertake foreign activities and become multinational depending on the existence and arrangement of OLI advantages.

Kumar et al. (2002) in explaining why firms choose a particular mode of technology transfer also discuss the factors identified by the eclectic theory. Contractor and Segafi-Nejad (1981) referring to the theory argue that if we were to accept the hypothesis put forward by Dunning that ITT will, over time, move towards greater 'dis-internalization,' then international transactions are likely to receive even greater governmental scrutiny. Adding that; "paradoxically, greater dis-internalization would be a move toward a higher degree of perfection[4] in the international technology market". The authors opine that the theory implies a trend toward less market imperfection with maturity and product standardization and so more arms-length transfers. They also suggest that it is the same case for the product cycle theory. Castellani (2002) observed that a growing literature argues that MNEs set up foreign subsidiaries not only as a means to exploit their own technology but also to enrich it. Based on an empirical study of 2185 Italian firms, he suggests that MNEs can achieve some form of reverse technology transfer that can be expected to affect their technological trajectories. Martinez-Solano and Phelps (2003) in their study of the EU MNEs in Mexico investigated the role of skills of the workforce when transferring technology. The study revealed that the MNEs expressed concern that shortages of skilled labor and related deficiencies in research and educational infrastructure have limited their (MNEs') own efforts to transfer technology.

Application and Factors of Theories Affecting channels

After synthesizing the literature we find various conclusions drawn in the ITT literature based upon the more prominent theories of international business expansion. This we have discussed above

[3] Dunning regards it a (general) theory, Cantwell (1988) suggests it a paradigm and Itaki (1991) describes it as a taxonomy of various determinants of foreign direct investment.

[4] This is based on the authors' arguments on the reasons why the literature on technology transfer to LDCs deserves greater attention than their role as recipients might suggest. Furthermore, the authors point out that imperfections in the two markets (home and host) have been used in the literature as a justification for government intervention in technology receiving countries.

in the previous section of this paper. We present these conclusions in a tabular form (Appendix 1). We look at each of the theories and their major focus and then present the conclusions drawn in the ITT literature based on each theory. This presentation of our findings from the literature review depicts the extent to which ITT literature is dependant upon the International Business Expansion theories to explain and understand the phenomenon of ITT. We were also able to identify the factors that affect the choice of the channels based on each of the selected theories and provide a schematic representation of theses factors in Figure 1.

FACTORS EFFECT ON CHOICE OF CHANNEL

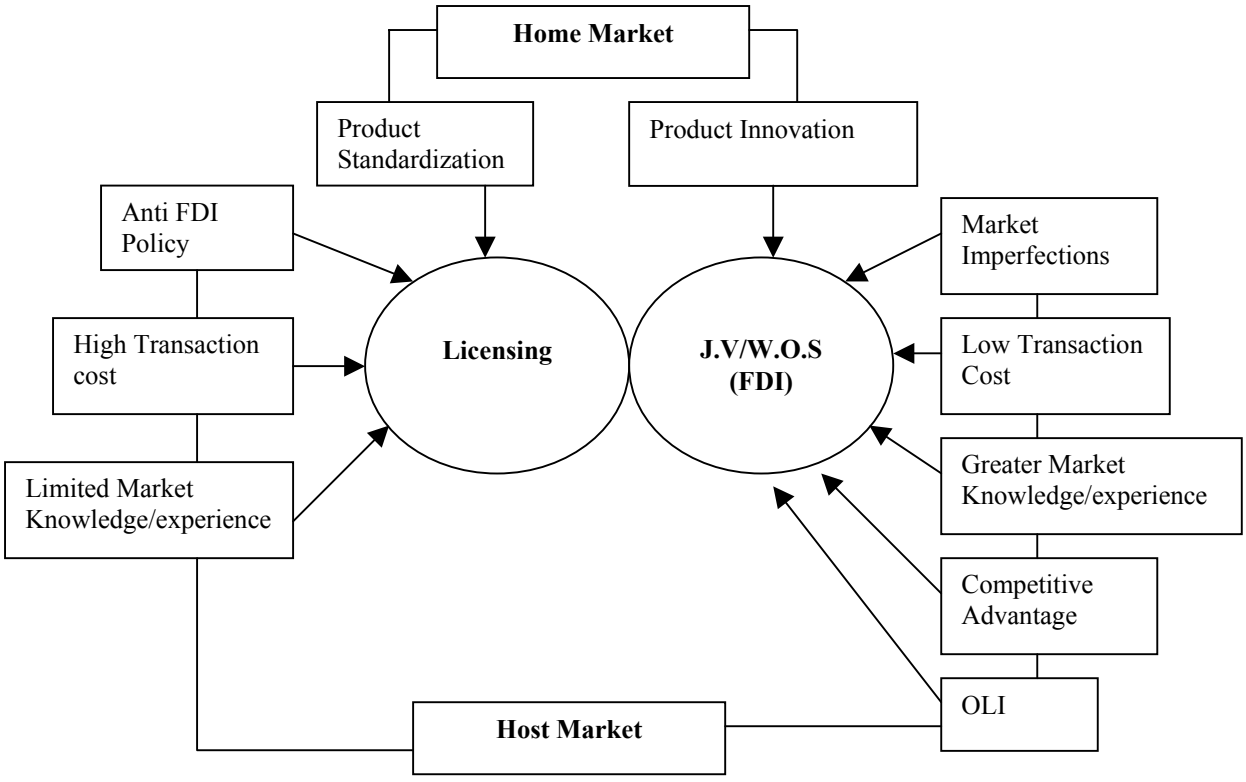
We have identified the references to the international business expansion theories to explain the choice of ITT. From the above synthesis of the literature we can conclude the dominant factors that motivate the choice of a particular channel.

According to the FDI theory proposed by Hymer, academics note that monopolistic advantages or market imperfections in host country market will induce direct investment (either by way of joint venture or setting up a wholly owned subsidiary). Contractor (1980) notes that the Japanese technology policy discouraged direct foreign investment and substituted this wherever possible with licensing as a means of obtaining the technology.

In the case of the International Product Life Cycle Theory, product innovation in the home market can lead to direct investment in the host country market, however, product standardization and less market imperfections will lead to licensing option as a channel of ITT.

With the application of the Transaction Cost Theory the motivation for direct investment lie primarily with the high transaction costs in the home market and lower costs in the host country market. Higher transaction costs in the host country market will motivate the licensing option.

Figure: 1 Home and Host Market Factors Affecting Choice of ITT Channels



According to the Internalization Theory, greater market imperfections in the host market will induce direct investment, which is in keeping with the theory of foreign direct investment.
Market knowledge and experience in the host market plays the pivotal role in determining the choice of channel according to the Learning theory. Greater the knowledge higher the chances of opting for direct investment channels.

As implied by its name, competitive advantage in host market will motivate the direct invest choice of channel according to the theory. Lack of competitive advantage in the host market will motivate the licensing option.

OLI factors play the decisive role in determining the choice of channel according to the eclectic theory. Greater the OLI advantages, higher, the likelihood of opting for the direct investment channel of transfer.

Future Research/ Research Implication

As it stands now, academics employ any and all available theory to better understand the process. This has created an extensive literature, although with common theme and findings. It is noted that firms can choose licensing to setting up a wholly owned subsidiary as part of their business expansion and technology transfer. It would be quite revealing to study MNEs that have gradually changed the mode of transfer with their increasing experience in the host country or *vice versa.* This would entail historical data of MNEs who have had a long presence in a developing country. The study would reveal the circumstances of changing the channel of technology transfer over time. These factors once identified would aid firms in formulating future strategies.

From our presentation of the home and host market factors that affect the choice of channel we find that although they are drawn from the literature no single empirical study exists that draw on all these factors. This in itself can be treated as a foundation to generate propositions and empirically test them. Such a study would entail data from various industries involving both the donor and recipient countries. The results would enable us to conclude the dominant factors that lead to the choice of international technology transfer channel.

Conclusion

Our study shows that there is no evidence of a difference in selection of theory across channels of international technology transfer. Although we are unable to generalize based on a literature review, alone, we can say that it is a strong indication that academics working in this area resort to anyone of the aforementioned theories. This also suggests that there is no preferred theory to explain the choice of channels in ITT.

Furthermore, it also allows the researcher sufficient materials to develop a theoretical foundation before conducting an empirical study. This then leads us to conclude that perhaps we can continue further research to develop a more appropriate theory to explain channels of ITT. We have presented a foundation for generating propositions towards this effect in Figure 4.1.

One limitation of this study is that we did not elaborate on the other channels of international technology transfers, namely; direct technology purchase and turnkey projects. This is primarily due to the limited number of studies we found that also incorporated any of the theories we were studying. Another limitation of this study is that we have not found any significant work in the area in the past two years. However, we feel we have been able to demonstrate a trend that has been in existence for the past two decades in explaining ITT. We also found that cutting edge technology is not usually transferred to developing nations as

evidenced by Bennett et al. (2001) study of technology transfer to China from EU. The study also suggests technology transfer through various channels continue to dominate the international business arena with licensing and joint ventures in their various forms constitute the majority of the channels of transfer. A number of factors have been identified for the choice of a particular channel of transfer. Both home and host market factors play pivotal roles in deciding the appropriate channel. Through understanding of these factors would enable managers to formulate appropriate strategies.

Appendix 1:

Application of IBE Theories in Channels of ITT

Theory	**Focus of Theory**	**Some Conclusions Drawn in Channels of ITT Literature Based on the Theory**
Foreign Direct Investment	Firms take advantage of market imperfections in host countries by engaging in foreign direct investment	(i) Firm is able to command higher revenues compared to local competition (ii) Size of firm is a determinant in the technology transfer process between firms in the developed nations and those in the developing countries. (iii) Donor firms tended to be large multinational enterprises. (iv) Investment crossing national boundaries is always driven by the global exploitation of technology. (v) Receiving country governments can preclude the internalization of technology transactions by placing restrictions on foreign equity holdings.
International Product Life Cycle	Explains the change from the export option to the direct investment option based on relative shifts in demand and competitive factors from advanced to less advanced countries. Has a stage-like approach.	(i) Most frequently cited theory for MNEs' choice of ITT (ii) Firms in developed countries (mature market) try to expand their markets by exporting the technology to developing countries (growth stage for products) (iii) Innovative firms in the large, affluent markets of the developed countries go abroad to protect their product innovations once technology becomes standardized. (iv) A trend toward less market imperfection with maturity and product standardization and so more arms-length transfers. (v) It incorporates the dominance of labor as the product advances. (vi) Fails to explain fully in the case of high technology-based products. (vii) Not applicable in a number of situations due to media and liberalized import laws in many countries leading to availability of latest products in most countries almost at the same time as they are introduced in the country of origin. (viii) More arms-length transfer.
Transaction Cost Theory	Firms choose alternative arrangements that minimize the sum of production and transaction costs.	(i) Firm's decision to transfer it's manufacturing technology by licensing or by investing involves an evaluation of the benefits and costs to the firm of each approach.

		(ii)	Choice of channel may be influenced by the bargaining power of the recipient and donor of the technology
		(iii)	Choice of channel depends on the overall profitability of alternatives, taking into account both production cost and transaction cost
Learning Theory	A knowledge based model to explain the internationalization process	(i)	Criticized for failing to take into account firm specific factors other than international experience
		(ii)	Falls short of explaining recipient behavior
Theory of Internalization	Internalization theory was developed to provide an economic rationale for the existence of MNEs. This theory rests on two general axioms : - firms choose the least cost location for each activity they perform; - firms grow by internalizing markets up to the point where the benefits of further internalization are out weighed by the costs.	(i)	Smaller firms, lacking the managerial and financial resources to make direct investment, would prefer licensing.
		(ii)	Small and less sophisticated markets may tend to prefer relatively rudimentary technologies which, by virtue of their age, command relatively small rents
		(iii)	Probability of internal transfer is greater:
		(iv)	(a) for newer technologies; (b) for technologies with fewer previous transfers, (c) for technologies in the same three digit SIC class as the transferor's principal line of business; (d) the more R&D intensive is the transferor; (e) if the transferor had an affiliate in the receiving country prior to the transfer; and (f) for transferors with more prior technology transfers.
		(v)	Internalized transaction preferred for the transfer of strategically significant information.
		(vi)	Weakening of the patent system sought by some LDCs would only diminish international licensing and drive firms to greater internalization of technology in controlled equity affiliates.
		(vii)	Joint ventures do not solve the underlying problems that lead many firms to internalize transfer of technology.
		(viii)	Prefer licensing to a subsidiary if the net incremental benefit of the latter over the former is greater than the share of profits going to the partner.
Competitive Advantage	The advantage of a firm relative to another firm for a certain period of time	(i)	Dangers of creating competition through licensing are so great that its use should be highly restricted.
		(ii)	Pattern of competitive advantage in the industry determined by the pattern of technology migration
Eclectic Theory	Combines ownership advantage, location advantage and internalization advantage to form a unified theory of FDI. Theory states that a firm will undertake foreign activities and become multinational depending on the existence and arrangement of these advantages.	(i)	Theory implies a trend toward less market imperfection with maturity and product standardization and so more arms-length transfers
		(ii)	ITT will, over time, move towards greater 'dis-internalization'.
		(iii)	(iii) Shortages of skilled labor and related deficiencies in research and educational infrastructure can limit MNEs' efforts to transfer technology.

References

Agarwal, S. and S.N. Ramaswami, "Choice of Foreign Market Entry Mode: Impact of Ownership, Location and Internalization Factors." *Journal of International Business Studies*, (1992), 1-27

Aliber, Robert Z, "A Theory of Direct Foreign Investment." The International Corporation. A Symposium edited by Charles P. Kindleberger. MIT Press, Cambridge, Massachusetts and London, England, 1970, 17-34

Anderson, O.), "Internationalization and Market Entry Mode: A Review of Theories and Conceptual Frameworks." *Management International Review*, 37, (1997), 27-42

Arpan, J.S., E.B. Flowers and D.A. Ricks, "Foreign Direct Investment in The United States: The State of Knowledge in Research." *Journal of International Business Studies.* 12:1, (1981).

Balachandra, R., "International Technology Transfer in Small Business: A New Paradigm." *International Journal of Technology Management.* 12:5/6, (1996), 625-638

Bell, John, "International Joint Ventures Versus Greenfield Investments: a Comprehensive Approach," *Research in Global Strategic Management*, Eds. Rugman, A. M. and A. Verbeke, JAI press Inc. Vol 4, 1993

Bennett, D., Liu, X., Parker, D., Steward, F. and Vaidya, K., "Technology Transfer to China: A study of Strategy in 20 EU Industrial Companies." *International Journal of Technology Management,* 21:1/2, (2001).

Boura, K. and Cosmetatos, G., "Tracing international competitiveness through official trade figures: the case of the Greek food, beverage tobacco industries," *International Journal of Technology Management,*12,(5/6), (1996), 639-650

Buckley, P.J. "The Limits of Explanation: Testing the Internalization Theory of the Multinational Enterprise." Journal of International Business Studies 19(2); (1988), 181-193.

_____ "Problems and Developments in the Core Theory of International Business." *Journal of International Business Studies* 21, (1990), 657-665

_____ "The Role of Management in Internalisation Theory." *Management International Review*, 33:3; (1993), 197-207

_____ "Is the International Business Research Agenda Running out of Steam?" *Journal of International Business Studies* 33 92), (2002), 365-373

Buckley, P.J. and Casson, M., *The Future of the Multinational Enterprise*, London: Macmillan, 1976

_____ "A Theory of Cooperation in International Business." in *Cooperative Strategies in International Business,* edited by F.J. Contractor and P. Lorange, Lexington, MA: Lexington Books. 1988.

_____ "Models of Multinational Enterprise." *Journal of International Business Studies*, 29, (1998), 21-44

Castellani, D. " Firms' Technological Trajectories and the Creation of Foreign Subsidiaries." *International Review of Applied Economics*, 16:3, (2002).

Caves, R.E. *Multinational Enterprise and Economic Analysis.* Cambridge: Cambridge University Press. 1982.

Chen, M. *Managing International Technology Transfer*, International Thompson Business Press, 1996.

Contractor, F. J. "Licensing Versus Foreign Direct Investment in US Corporate Strategy: An Analysis of Aggregate U.S. Data." (1985) in Chen, Min, *Managing International Technology Transfer*, International Thompson Business Press, 1996

_____ "A Generalized Theorem For Joint-Venture and Licensing Negotiations." *Journal of International Business Studies*, 23-50, (Summer 1985).

Contactor, F.J., and T. Segafi-nejad, " International Technology Transfer: Major Issues and Policy Responses. *Journal of International Business Studies,* 12:1, (1981), 113-135.

Culpan, R. *Multinational Strategic Alliances,* International Business Press, 1993.

Davidson, W.H., and D.G McFetridge, "Key Characteristics in the Choice of International technology Transfer Mode." *Journal of International Business Studies* (Summer 1985), 5-21

Davies, H.. " Intra-firm Versus Licensed transfers of Machine-tool Technology." *International Journal of Technology Management*, 10:7/8, (1995).

Dunning, J.H., I*nternational Production and the Multinational Enterprise.* London: Allen and Unwin. 1981.

_____ "Reappraising the Eclectic Paradigm in the Age of Alliance Capitalism." *Journal of International Business Studies*, 26, (1995), 461-91.

_____ "Location and Multinational Enterprise: A Neglected Factor." *Journal of International Business Studies*, 19,1 (1998), 45-66

Dunning, J.H., and A.M. Rugman "The Influence of Hymer's Dissertation on the Theory of Foreign Direct Investment." *American Economic Review.* AEA Papers and Proceedings. 75,2 (1985), 228-232

Farhang, M., " Managing Technology Transfer to China." *International Marketing Review*, 14:2, (1997). 92-106

Fayerweather, J., *International Business Strategy and Administration,*Cambridge; Ballinger, 1982.

Fu, S. and D.S. Perkins, " Technology Licensors and Licensees: Who They are, What Resources They Employ, and How They Feel." *International Journal of Technology Management*, 10:7/8, (1995)

Goodnow, J.D. "Developments in International Mode of Entry Analysis." *Journal of International Business Studies*, (Autumn (1985). 17-30

Hennart, J.F. *A Theory of Multinational Enterprise.* Ann Arbor: University of Michigan Press, 1982.

_____ "A Transaction Cost Theory of Joint Ventures." *Strategic Management Journal*, 9, (1988), 361-374

Hymer, S.H.. " The International Operations of National Firms: A Study of Foreign Direct Investment." Cambridge, MIT Press, (1960),1976

Itaki, M. “A Critical Assessment of the Eclectic Theory of the Multinational Enterprise,” *Journal of International Business Studies*, (1991), 29-53

Johanson, J., and Vahlne, J., “The Internationalization Process of the Firm – a model of knowledge Development and Increasing Foreign Market Commitment,” *Journal of International Business Studies,* 8, (1977), 23-32

Kindleberger, C. *The International Corporations,* Cambridge, Massachesetts, MIT Press, 1970.

Kogut, B. “Joint Ventures; Theoretical and Empirical Perspectives.” *Strategic Management Journal*, 9, (1988), 319-332

Kotabe, M., “’Hollowing-out’ of U.S. Multinationals and their Global Competitiveness: An Intrafirm Perspective,” *Journal of Business Research*, 19, (1989), 1-15

Kumar, V., Kumar, U., and Persaud, A., “building Technological Capability through Importing Technology: The Case of The Indonesian Manufacturing Industry,” *Journal of Technology Transfer,* 24, (1999), 81-96.

Kumar, V., Madanmohan, T., Cray, D., and Kumar, U., “Key Determinants of the Mode of International Technology Transfer: Evidence from India and Turkey,” *International Journal of Technology Transfer and Commercialization,*1:1/2, (2002), 122-145.

Lan, P., and S. Young. “International Technology Transfer Examined at Technology Component Level: A Case Study in China.” *Technovation*, 16:6 (1996), 277-286

Lasserre, P., “Selecting a Foreign Partner for Technology Transfer.” *Long Range Planning,* 17:6, (1984).

Lecraw, D.J., “Hymer and Public Policy in LDCs,” *American Economic Review,* AEA Papers and Proceedings. 75,2: (1985), 239-244.

Luo, Y., *Entry and Cooperative Strategies in International Business Expansion*, Quorum Books, Westport, 1999

Madu, C. (1992). “Strategic Planning in Technology Transfer to Less Developed Countries.” Quorum Books, New York.

Majumdar, B.A. “Technology Transfers and International Competitiveness: The case of Electronic Calculators.” *Journal of International Business Studies*, 11:2, (1980), 103-111

Martinez-Solano, L.E. and N.A. Phelps. “The Technological Activities of EU MNEs in Mexico.” *International Planning Studies*, 18:1, (2003), 53-75

Menzler-Hokkanen, I. “Multinational Enterprise and Technology Transfer,” *International Journal of Technology Management,*10(2/3), (1995), 293-310

Moore, K and D. Lewis., *Birth of the Multinational*, Copenhagen Business School Press, 1999

Morgan R.E. and Katsikeas C.S., “Theories of International Trade, Foreign Direct Investment and Firm Internationalization: A Critique,” *Management Decision,* 35/1, (1997), 68-78

Porter, M.E., *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* New York: The Free Press, 1980.

Porter, M.E., and M.B. Fuller. *Competition in Global Industries,* Boston: Harvard Business School Press, 1986.

Reddy, N.M., and L. Zhao (1990). International Technology Transfer: A Review." Research Policy. 19. 285-307

Reisman, A., and Zhao, L.,"A Taxanomy of Technology Transactions Types," *Journal of Technology Transfer,* 16:2, (Spring 1991) 38-42.

Root, F.R. *Entry Strategies for International Market*, New York: Lexington Books, 1994.

Rugman, A.M., *Inside the Multinationals: the Economics of Internal Markets,* New York: Columbia University Press, 1981

_____, "New Theories of the Multinational Enterprise: An Assessment of Internalisation Theory." *Bulletin of Economic Research*, (1986), 101-118.

Rugman, A., Lecraw, D., Booth, L., *International Business: Firm and Environment,* New York, McGraw Hill, 1985.

Shan, W. and J. Song, " Foreign Direct Investment and the sourcing of Technological Advantage: Evidence From The Biotechnology Industry." *Journal of International Business Studies*, (second quarter, 1997)

Spivey, W.A., J.M. Munson, and W.T. Flannery "Interest in Technology Transfer Across Academic Disciplines: Publication Trends, 1981 Thru 1989". *Technology Transfer.* Summer. 5:3, (1990) 13-20

Teece, D. J., *The Multinational Corporation and the Resource Cost of International Technology Transfer*, Cambridge Mass. Ballinger, 1977.

Tidd, J., and Trewhella, M. " Organizational and Technological Antecedents for Knowledge Acquisition and Learning." *R&D Management.* 27:4, (1997), 359-375

Tidd, J. and Brocklehurst, M.. "Routes to Technological Learning and Development: An assessment of Malaysia's Innovation Policy and Performance." *Technological Forecasting and Social Change.* 62, (1999), 239-257

Vernon, R., "International Investment and International Trade in Product Life Cycle," *Quarterly Journal of Economics,* 80 (May 1966), 190-207.

Wild, J.J., Wild, K.L., & Han, J.C., *International Business,* Prentice Hall, 2nd Ed., 2003.

Williamson, O.E., *Markets and Hierarchies:Analysis and Antitrust Implications,* New York, The Free Press, 1975.

_____ "Transaction-Cost Economics: The Governance of Contractual Relations," *The Journal of Law and Economics,* (October 1979), 233-261