# *Unpacking the International Technology Transfer Debate: Fifty Years and Beyond*

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*Working paper*

**June 2012**

ICTSD
International Centre for Trade and Sustainable Development

Published by

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**Acknowledgments**

The authors thank Taffere Tesfachew, Director, Division on Africa and the LDCs, UNCTAD and Ahmed Abdel Latif, Senior Programme Manager, ICTSD for detailed comments on an earlier draft of this paper.

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Citation for the Working Paper:

Gehl Sampath, Padmashree and Roffe, Pedro; (2012); *Unpacking the International Technology Transfer Debate: Fifty Years and Beyond*; ICTSD Programme on Innovation, Technology and Intellectual Property; Working Paper; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org



ISSN 1684-9825

**TABLE OF CONTENTS**

## LIST OF TABLES



## LIST OF FIGURES



## LIST OF BOXES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| ACTA | Anti-Counterfeiting Trade Agreement |
| CIPIH | Commission on Intellectual Property Rights, Innovation and Public Health |
| COP | Conference of the Parties |
| CTCN | Climate Technology Centre and Network |
| FDI | Foreign Direct Investment |
| GATT | General Agreement on Tariffs and Trade |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |
| GSPOA | Global Strategy and Plan of Action on Public Health, Innovation and Intellectual property |
| ICT | Information and Communication Technologies |
| IP | Intellectual Property |
| IPRs | Intellectual Property Rights |
| LDCs | Least Developed Countries |
| MEA | Multilateral Environmental Agreement |
| PTAs | Preferential Trade Agreements |
| R&D | Research and Development |
| S&T | Science and Technology |
| TEC | Technology Executive Committee |
| TM | Technology Mechanism |
| TRIPS | Trade-Related Aspects of Intellectual Property Rights |
| UN | United Nations |
| UNCTAD | United Nations Conference on Trade and Development |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNGA | United Nations General Assembly |
| WIPO | World Intellectual Property Organization |
| WHO | World Health Organization |
| WTO | World Trade Organization |

## ABSTRACT

On the occasion of fifty years of the international technology transfer debates and twenty years since the Rio Summit, this paper attempts to capture the political economy of technology transfer negotiations since the 1960s. It seeks to juxtapose issues of technological capacity, innovation and economic development with international technology transfer negotiations over the past decades. In doing so, the analysis places a particular emphasis on the technology transfer-intellectual property rights (IPRs) nexus which in many ways, has been at the heart of the international discourse on technology transfer.

This paper aims to broaden our understanding of two key issues. First, do international negotiations on technology transfer and results achieved thereunder correspond to country level technological needs, and to the growing insights on how technological change takes place? Second, how and through what ways can international discussions on technology transfer be made to reflect both the lessons of different developing countries in building technological capabilities as well as the changing global environment for knowledge and technology globally? The authors conclude by identifying the main issues that remain outstanding in this discourse and propose some thoughts for the way forward.

This work, in its current working paper format, is intended to generate constructive dialogue on technology transfer and technology accumulation for development.

## 1. INTRODUCTION

The year 2011 marked the 50th anniversary of the introduction of technology transfer debates at the multilateral level. Technology transfer was first tabled as an international issue in 1961 as part of a request to the United Nations Secretary General by some developing countries to commission studies to ascertain the role played by international treaties in promoting the protection of intellectual property rights in developing countries. With time, the debate has grown in proportion and permeated different processes and institutions. Looking back in hindsight, the importance of the issue of technology transfer gained prominence because developing countries felt the need to revise international treaties dealing with intellectual property on the one hand, and to have a specific framework on technology transfer that ensured their access to technology. Both of these attempts failed to materialize by the mid-1980s. Notwithstanding the failure, the fundamental issues raised fifty years ago continue to influence and polarize international debates to a very large extent even today.

In these fifty years, many developments have occurred in the international political economy of technology transfer negotiations, and at the same time, our understanding of the processes and institutions that influence technological change has evolved. From a situation where we had little understanding of the locus of technological change (Rosenberg 1983), immense progress has been made to highlight its determinants within and amongst countries over the past five decades. Not only do we have a better understanding of technology and its sources of origin today, but we have also been moving towards deciphering the critical relationship between technology, innovation and development, both in terms of field evidence and policymaking.

What we know up until now can be summarised into a set of stylized facts. First, technology and access to technology plays a central role in catch up growth; a process of closing the gap between those countries that produce new knowledge (industrial countries) and others that are learning to produce products and processes that are new to their contexts but not necessarily to the world at large.[1] Second, technological change of this kind is not about innovating at the frontier most times, but rather about how the structure of production can be changed to achieve higher levels of productivity. This makes technological change a fundamental component of capital accumulation and structural change within countries. Third, despite the fact that a large amount of technology is already available in the public domain, accessing these technologies and channelling them into processes of knowledge accumulation and innovation within countries is neither automatic or costless.[2] Using already

[1] See for example, Ocampo et al. (2007), Cimoli et al. (2009), among others.

[2] Gerschenkron (1962) notes that for the "latecomers", there exist untapped opportunities offered by globalization through which they can access unprecedented degrees of information and knowledge that is either available through the market or already in the public domain.

existing technology in the public domain calls for the existence of technological capacity amongst actors.

Despite these insights on the important role of technological change for development, the world has been witnessing a widening technological divide emerging not only between the technologically developed and the developing world, but also within the developing countries themselves. Globally there has been a greater divergence amongst the developing countries themselves, wherein several countries are well on their way to catching up[3] and converging with the industrialized countries and many others are stagnating or even regressing in technological terms (Ocampo & Vos 2009).[4]

Against this backdrop, the examples of the developing countries that have succeeded, such as first and second tier Asian economies[5] and now the newly emerging countries of the South, raise many relevant questions. What can be made out of the examples of the countries that have succeeded? How can countries, sectors and firms tap into the plethora of existing opportunities, in realistic terms? What are the main impediments to technological change within countries, and how can these be alleviated?

At the international level, ways to address these issues have since long been coded in terms of technology transfer from the technologically advanced countries in the industrialized world to the technologically disadvantaged countries of the South. Since its debut in the 1960s, transboundary technology transfer has been constantly an issue of increasing importance in negotiations between countries. Beginning with several key negotiations including the UN Convention on the Law of the Sea; the discussions and deliberations reached a peak in the 1980s with the UNCTAD negotiations on an international Code of Conduct on the transfer of technology.

Although the Code negotiations failed, the discussions on technology transfer has become a standard component in deliberations and negotiations in a variety of international fora: starting with the landmark Earth Rio Summit of 1992 and the ensuing multilateral environmental agreements (MEAs) particularly the emblematic case of climate change in the UNFCCC, followed by the trade and intellectual property related negotiations in the WTO and WIPO and the public health negotiations under the WHO-CIPIH. Most of these discussions and debates have centred around how countries can acquire, use, and embark on learning and using technologies that already exist and are constantly being produced at the industrial frontier. In parallel with these international deliberations on technology transfer over the past five decades, developing countries have also been experimenting with

[3] Economic catch up is commonly understood as the process of closing the gap between developing countries and their industrial counterparts.

[4] It is estimated that the number of least developed countries have doubled over the past three decades.

[5] First described as the 'East Asian Miracle' by World Bank (1993), the first tier Asian economies are understood as comprising Japan; South Korea, Taiwan, Hong Kong and Singapore, followed by Malaysia, Thailand, and Indonesia (as the second tier newly industrializing economies).

different forms of policy incentives and initiatives for technology acquisition, technology transfer and knowledge accumulation at the national levels. Some of these have succeeded and many others have not, focusing attention back to how internationally binding obligations for technology transfer can be structured.

On the occasion of fifty years of the debate, and twenty years since the Rio Summit, this paper attempts to capture the political economy of technology transfer negotiations since the 1960s. It seeks to juxtapose issues of technological capacity, innovation and economic development with the ongoing technology transfer negotiations, placing a particular emphasis on the technology transfer-intellectual property rights (IPRs) nexus which in many ways, has been at the heart of the international discourse on technology transfer.

The underlying aim of the analysis is to broaden our understanding of two key issues. First, do international negotiations on technology transfer and results achieved thereunder correspond to country level technological needs, and to the growing insights on how technological change takes place? Second, how and through what ways can international discussions on technology transfer be made to reflect both the lessons of different developing countries in building technological capabilities as well as the changing global environment for knowledge and technology globally? In an effort to answer these questions, we trace the negotiations and debates on transfer of technology to show that right from its inception, the discourse on technology transfer has been struggling to find ways to best respond to country level technology needs. This remains true, although it may not have been explicitly manifested at all times.

The analysis in the paper is structured into three broad time zones: the 1960s and the 1970s, the 1980s and the debate on an International Code of Conduct for Transfer of Technology (hereafter, the Code), and the 1990s and beyond. The paper, by contrasting policy changes and initiatives at the international level with country level facts and social science thinking, derives the most pertinent issues that we have faced in this topic over the course of the past five decades. In highlighting these issues, the authors take due note of the fact that international negotiations and positions taken by countries respond in most cases to strategic considerations and coalitions in the pursuit of broader policy objectives. This paper however, does not speculate on these questions.

## 2. TECHNOLOGICAL CAPACITY AND TECHNOLOGY TRANSFER: THE GENESIS OF THE DISCOURSE

How best to promote industrial growth was a familiar question that several developed countries had grappled with much before the 1960s. As early as the 18$^{th}$ century, Alexander Hamilton, the first US secretary of treasury promoted the debate on industrialization arguing for rapid development of local industries and a ban on imports coming into the United States from the Great Britain in 1791 (see Hamilton, 1971). The same ideas prevailed in the discourse and Frederich List proposed the

infant industry development arguments based on these ideas in Germany in 1841 (List, 1841). These ideas not only had to do with how industries within countries need to be protected in their initial/ nascent stages of origin from international trade or exports, as they are often misunderstood (Shafaedin, 2005). But rather, they had innate implications of how and through what means industry within countries can be fostered to become competitive, within which technology was a central component.

In the aftermath of the Second World War and the efforts to promote a new international order, when the question of promoting equitable global economic development became an issue, the primary academic and policy interest was in explaining uneven economic development in order to be able to find ways to address it. Issues of technological change were viewed within this broader conundrum. On the whole, the emphasis on economic development post World War II in the 1950s assumed the "industrial countries" as advanced and the developing countries as 'latecomers', thereby essentially equating economic development with industrialization (Shafaedin, 2005). This focus and emphasis is laid out bare in the works of Myrdal, Streeten, Hirschman, Singer, Penrose, Machlup and numerous other prominent scholars of the time.[6]

Technology, within the broader conundrum of industrialization, was seen at that time as already available through the industrial revolution efforts in the industrialized countries that needed to feed into the development processes of developing countries. This view, influencing policy debates, led to a large-scale emphasis in developing countries in the 1960s and the 1970s on building science and technology capacity, the pathways to achieve this and the potential impediments to technological change in a latecomer context were not clearly established. The technology transfer discourse, framed thus, was largely structured around the 'transfer' of technology from the industrial to the developing world.

Convinced that the emerging emphasis on IPRs in the industrial countries of the time (for instance, the re-emerging interest in strengthening the classical intellectual property Conventions of Paris and Berne) was not a positive development in favour of industrialization in the latecomers, some of the early insights of social science thinking on technology's impact for development suggested that developing countries could not expect to fully benefit from the protection of IPRs and therefore need to view the institution with caution (see for instance, (Penrose 1951) and Machlup (1958).[7] This view was not only emphasized upon because developing countries could not make use of intellectual property, but also due to the concern that the IPRs system could lay hurdles for developing countries seeking to access technology for their industrialization processes.

[6] Myrdal (1957), Myrdal (1958), Hirschman (1958), Singer (1964), Lall & Streeten (1977), Penrose (1951).

[7] Machlup (1958) states: "…that states having a patent law underwent a rapid technical progress does not imply that their progress would have been slower without patent laws. N o empirical evidence available to us and no argument brought forward to date can support or contradict the view that the patent system decisively promoted technological progress and economic productivity."

Technology transfer, as a result, became a key term in the policy debate on how to best address economic development issues of the developing world without a clear understanding of what the process of transfer entails, how and between which kinds of actors such technology transfer can occur, and how the IPRs-technology transfer interactions can be structured. We discuss these aspects in detail here.

## 2.1 Early insights on technology generation and diffusion

Early discourse on sectoral performance and structural change emphasized upon production and factor utilization of assets within countries. Development economists studied the issues broadly as three central issues: promoting technological innovation, fostering capital accumulation and inducing changes in structure of production within economies. Technological advance was posited as the basis for economic growth (see Solow (1956) for instance), but the emphasis on technological change was not based on a clear, cogent understanding of where the sources of technological advance lie, within sectors and within countries.[8] While many theories of development (and subsequently policies) shied away from exploring the importance of innovation in the process (see for example, Kuznets (1966) and Clark (2006)), in several other explorations, technology had a role to play, but this was not clearly articulated. For instance, Rostow's widely debated theory on structural transformation had two key elements, a sharp increase in the rate of capital accumulation, and second, the emergence of a leading sector which would change the fundamental production structure of the economy of a country, catapulting it into industrial leadership.[9] Although technological change is a precondition inherent in this theory for the emergence of the lead sector, its role was not explored to the fullest. Other path-breaking insights stressed on innovation, amongst which Schumpeter's work in the context of entrepreneurship stressed on the importance of fostering competition as a means of innovation.[10]

At the same time, parallel to these developments, a second perspective on how to promote industrial development in the developing countries gained momentum, at least in the industrialized world. Influenced by insights in neoclassical economics and information economics, which we call the 'dominant perspective', its emphasis was on the generation of information, as opposed to knowledge, as we know it today.[11] In

[8] Even within those writings that stressed upon the understanding of technological progress, little was known on how it occurs within firms and ways in which it could be influenced. Rosenberg (1983) represents a seemingly path breaking work in this regard, shifting perceptions, towards exploring this more clearly.

[9] Rostow (1960), Chapter 2, "The Five Stages of Growth--A Summary," pp. 4-16

[10] See Schumpeter, 1961, chapter 2 in particular.

[11] Recent theorizing about the nature of knowledge has moved away from this view of the firm as merely the 'profit maximizer' or 'information processor' to 'knowledge processor' and 'dynamic entrepreneur' (Fransman, 1994). The firm therefore is the locus of knowledge production, usage, selection, dissemination and adaptation (Penrose, 1959; Kogut and Sander, 1992; Amin and Cohendet, 2004). This shift in the conceptualization of knowledge within the firm has brought to the fore discussions about other important and complex characteristics of knowledge. These relate to the view that knowledge is a pure 'public good', knowledge is cumulative, it is non-excludable and non-rival, the differences between codified and tacit knowledge, knowledge is increasingly being driven by

this perspective, the generation of socially useful information was seen as the main challenge to technological advances in society. Arrow (1962) was amongst the first economists to identify the problem of creating technological knowledge (narrowly framed as information) in a perfectly competitive market. In sum, it was attributed to the economic concepts of indivisibilities, inappropriability and uncertainty (Arrow, 1962).[12] The policy solution to this issue was to somehow bridge the divergence between individual and social gains inherent to the creation of technological knowledge. Two forms of policy solutions were advocated: providing incentives, such as IPRs, which were second-best solutions to promote inventors to produce socially useful information, or to resolve this gap through direct public intervention by the state, through some form of primary financing of scientific research (Archibugi & Bizzarri, 2004).[13]

There was however, an under-emphasis placed on the contextuality of technological progress at this time, partly because too little was known about it but largely because of the view that technological change and progress could be replicated with ease.[14] That is, the relevance of social, cultural, historical path-dependent factors in countries and societies on the development of innovation capacity (that calls for the ability to make commercially viable and competitive products using inventions) was not the focus.

## 2.2 The notion of transfer

Within both perspectives on promoting technological development, technology was viewed as external to the firm/ enterprise/ organisation: as an input that could easily be transferred and put to use. But structuring such transfer raised several questions. Should technology be transferred to local firms or multinational firms (or their subsidiaries) based in developing countries. What are the most appropriate incentives to promote 'transfer'? Could it accrue directly as a result of foreign direct investment, or other such economic activities? Does it entail financing of any kind?

The ineffectiveness of early efforts to promote technology transfer led to a review of the factors that facilitate/ impede its transfer and use. Explorations of why technology transfer was not working began to focus on difficulties faced by

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ICTs, the clear distinctions between what is individual and what is organizational knowledge, and the importance of clarifying what is practical/functional knowledge and which forms of knowledge are abstract or theoretical knowledge.

[12] Indivisibility denoted the fact that the use of knowledge and its demand were both indivisible in the absence of some form of property right to the creator. Inappropriability stems from the fact that information as a resource is both non-exclusive and non-rivalrous in nature. Uncertainty denotes the situation where people have to make decisions without knowing for certain what the consequences of their decisions will be (See Katz and Rosen, 1998).

[13] The works of Arrow (1962) and Nelson (1959) pioneered the subsequent literature that started "treating information itself as a resource", which need to be allocated through the market, apart from influencing policy making on R&D rents and intellectual property rights.

[14] It can be argued that this perspective derived from the wider ignorance of the process of economic development that permeated a large number of economic and policy initiatives at that point of time under the generic 'Washington consensus' ideology.

recipients of technology to apply them. Particularly, one aspect began to gain attention, namely, the low levels of capacity in developing country actors to use technologies. However, at this time, this was attributed to the low levels of human skills in developing countries. As a result, fostering technology capacity began to take on a unilateral focus on science, wherein the key issue was seen as one of creating adequate supply of scientists, researchers or engineers in developing countries. This conception of technological capabilities cemented views that technological advancement were largely dependent on the generation of scientific information, and flows from basic science in a relatively smooth progression from the laboratory to the market. The so-called 'linear model of science', which was based on this understanding, gained considerable currency and proposed that innovation proceeds on a well charted straight and sequential path originating from science (establish a research laboratory), to development (of product/process, pilot plants) and finally to production and marketing. Such a conceptualization of innovation put science, the initiating point of the process, as the most critical activity.

### 2.3 Creating incentives for the 'transfer' of technology

In the 1960s and the 1970s, countries, industrialised as well as developing, were placing emphasis on technology acquisition under better and more competitive terms, but the modus operandi was clearly different. Developing countries focused on the building of science capacity for R&D with the help of agencies such as UNESCO. These efforts, aimed at stimulating the evolution of formal system of innovations in developing countries, could be said to have intensified in this period, when countries embarked on the establishment of Research and Development Institutions (also known as public research institutes) as a means of promoting public R&D capacity. This was done in tandem with the setting up of policy institutions such as 'national research councils' for Science and Technology (S&T) or ministries of S&T. When viewed in terms of numbers and range of research and development institutions, it would appear that considerable progress was made across developing countries.[15]

At the same time, IPRs began to be accepted widely as a key incentive for technological growth in developed countries as a result of the stage at which industrialized societies had reached by the 1970s (Chang, 2002) and the consolidation of WIPO as a specialized agency of the UN in the mid 1970s. As a result, notwithstanding the criticisms and reservations towards international conventions and to the role in general of patents in developing countries, formal patents laws spread to most of the developing world particularly to newly independent countries that confirmed regimes predominant before independence.

[15] Within Africa, for instance, national research councils were established in Ghana, Mali and Niger. Ministries of S&T were set up in Senegal, Burkina Faso and Nigeria; Ethiopia and Tanzania had commissions for S&T; an Academy of Scientific and Technological Research was established in Somalia, while Sudan had a national research council. Between 1974 and 1987, these bodies grew from 4 to 28 for Africa only, with a consequent increase in the number of research personnel. See Oyelaran-Oyeyinka & Sampath (2010).

This is illustrated by the spate of ratifications to the Paris Convention on Industrial Property Protection (1883) by African countries by mid 1970s. Alongside, the widespread scepticism on IPRs is reflected in the actions of several Asian and Latin American countries that sought to implement their own policies in this regard (See Table 1).

This dominant IPR narrative considers that technology transfer and technology dissemination is an inherent 'positive' feature of the patent system. Patent rights, when granted, encourage technology transfer by providing owners with legal certainty and thus enabling technology licensing. Technology dissemination takes place through disclosure and patent information. Hence, enhancing these features of the system for the benefit of developing countries requires technical assistance to adopt IPR regimes, expand their access to patent information and to better negotiate licensing agreements.[16]

Such a view was clearly opposed by most developing countries, which considered that technology transfer and technology dissemination is not a 'natural' result of the granting of IPRs/patents because of insufficient disclosure in patent applications and possible restrictive licensing conditions. Developing countries, therefore felt that there was a need to ensure that diffusion of technological knowledge did indeed take place through a variety of ways within and outside of the patent system and that it was made more accountable. Best mode disclosure, local working requirement, screening of technology licensing agreements, compulsory licensing and competition related policies were seen as prominent means to remedy the possible barriers posed by IPRs.

These divergences gradually led to what became largely the north-south orientation of the technology transfer discourse.

### 2.4 The nexus between technological change, technology transfer and IPRs protection

A range of developing countries, faced by the increasing emphasis on IPR protection internationally, began to introduce technology transfer laws in an effort to control and target technology flows to address their industrialization goals. This reflects not only the critical and ambiguous views on patent regimes at that time in the developing world, but also highlights the importance placed on technological acquisition in these countries already in the 1950s and the 1960s. A large source of inspiration for technology transfer regimes at that time was the Japanese model, which as part of its main features prioritized licensing arrangements over FDI. In their incipient forms, these policy attempts in developing countries tried to mirror competition policies of the North by subjecting agreements to a close examination of their potential anticompetitive effects or developmental implications, as stated in number of these laws and regulations.

[16] See WIPO, Report on the International Patent System SCP/12/3, 2009, paragraphs 41-46.

Table 1 presents a timeline of key policy developments both IPRs related and technology transfer related since the 1960s in an effort to trace and document the policy developments. The timeline presented in table 1 below shows, among others, that between the mid-1960s and early 1980s a number of countries in Latin America, Asia, Africa and Portugal and Spain adopted similar regimes dealing with transfer of technology. It should be also noted that the USA and the countries of the EU had at that time, adopted stricter guidelines on transfer of technology agreements fundamentally with the aim of encouraging more transparent transactions free of provisions that could have anticompetitive effects. The table also shows the pace of accession to the Paris Convention amongst countries, which was one of the classical treaties dealing with the treatment to be provided to foreign patents and trademarks.

**Table 1: Key policy developments on IPRs and technology transfer (1961-2010)**

| Year | IPR-related developments | Dual developments | ToT-related developments |
|---|---|---|---|
| 1961 | | UNGA resolution 1713 (XVI), "The Role of Patents in the Transfer of Technology to Underdeveloped Countries" | |
| 1963-1967 | Algeria, Argentina, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo, Cote d'Ivoire, Gabon, Madagascar, Niger, Nigeria, the Philippines, Russian Federation, Senegal, Uganda, Uruguay, Tanzania, Togo, Trinidad and Tobago, Zambia: acceding to the Paris Convention | | |
| 1964 | | UN Report: "The Role of Patents and the Transfer of Technology to Developing Countries." | |
| 1967 | | | Colombia: Decree 444 on International Exchange Regulations relating to the approval and registration of contracts for the transfer of technology |
| 1968 | Germany: introduction of patenting of pharmaceutical products | United Kingdom: Restrictive Trade Practices Act | |
| 1969 | | | Japan: Antimonopoly Act Guidelines for International Licensing Agreements |
| 1970 | | | France: Decree 70-441 concerning contracts made with foreign parties for the acquisition or transfer of rights in industrial property, or of any intellectual matter of scientific or technical assistance |
| 1971 | | Andean Community: Decision 24 on the common treatment of foreign capital movement, trade marks, patents, licences and royalties | |

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|---|---|---|---|
| 1971-1973 | -Bahamas, Jordan: acceding to the Paris Convention<br>-India: The Patents Act (Act 39 Of 1970) | | Colombia: Decree 1234 concerning the content of contracts for the transfer of technology, and establishing criteria for the approval of such contracts |
| 1973 | | Republic of Korea: Capital Inducement Law | -Spain: Decree 2343 regulating the transfer of technology<br>-Portugal: Regulations Governing Transfer of Technology, Decree 53/77<br>-Spain: Ministry of Industry Order regulating the entry of contracts for the transfer of technology in the Register established by Decree 2343 |
| 1974 | WIPO a specialized agency of the UN | USA: Trade Act linking IP to trade | Andean Group: Decision 85 of the Commission of the Cartagena Agreement on Industrial Property |
| 1975 | USA: The Nine No-No's of the Justice Department | -UN report: The Role of the patent system in the transfer of technology to developing countries | -Brazil: Normative Act 015, establishing basic principles and norms for the registration of contracts involving the transfer of technology and related agreements<br>-Venezuela: Decree 746 on the registration of existing transfer of technology agreements |
| 1976 | -Ghana: acceding to the Paris Convention<br>-Italy: introduction of product patent protection for pharmaceuticals<br>-Japan: introduction of product patent protection for pharmaceuticals | | Portugal: First transfer of technology law, establishes Foreign Investment Institute |
| 1977 | -WIPO Declaration on the Objectives of the Sixth the revision of the Paris Convention<br>-Switzerland: introduction of product patent protection for pharmaceuticals<br>-Establishment of the African Intellectual Property Organization (OAPI) | -Portugal: Foreign Investment Code<br>-Zambia: Industrial Development Act | -Pakistan: Guidelines for determining rates of royalty and technical fee<br>-Portugal: Decree 53/77, Regulations governing transfer of technology<br>-Venezuela: Decree 2442, regulating Decision 24 on Transfer of Technology |

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|---|---|---|---|
| 1978 | | | -Dominican Republic: Law 861, Foreign Investment and Transfer of Technology<br>-The Philippines: Rules and Regulations and creation of the Technology Transfer Board<br>-Yugoslavia: The law on long term cooperation, business and technical cooperation and the acquisition and assignment of natural rights to technology between organizations of associated labour and foreign persons |
| 1979 | | | -First session of the UN Conference to draft an international code of conduct on transfer of technology<br>-Nigeria: Decree 70 National Office of Industrial Property, setting up principles on transfer of technology contracts |
| 1981 | First session of WIPO Diplomatic Conference for the Sixth Revision of the Paris Convention | -Republic of Korea: Public Notice 50, Scope and Standard of Unreasonable Concerted Activities and Unfair Trade Practices in International Contracts - Nepal: Foreign Investment and Technology Act 2038<br>-Ghana: Act 437, Investment Code | -Mexico: Law for the Control and Registration of Transfer of Technology and the Use and Exploitation of Patents and Trade Marks<br>-Peru: Regulations establishing rights and obligations of licensors and licensees of technology, trademarks and foreign patents<br>-Argentina: Law 22.426 on transfer of technology<br>-Peru: Technology regulations on rights and obligations of licensors and licensees of technology, trademarks and foreign patents<br>-General Assembly of the United Nations adopts the Set of Multilaterally Agreed Equitable Principles and Rules for the Control of Restrictive Business Practices |
| 1982 | | | India: Guidelines for Industries |

| | | | |
|---|---|---|---|
| 1984 | -China: first patent law<br>-Last session of the 6th revision Conference of the Paris Convention | | European Union: Regulation (EEC) No 418/85 of 19 December 1984. This regulation was the predecessor of Commission Regulation (EC) No 772/2004 of 27 April 2004 on the application of Article 81(3) of the Treaty to categories of technology transfer agreements<br><br>USA: Waxman-Hatch Act |
| 1985 | China: acceding to the Paris Convention | Vienna Convention for the Protection of the Ozone Layer | Last session of UN Conference to draft international code of conduct of transfer of technology |
| 1986 | Punta del Este Declaration: Launching of the Uruguay Round negotiations | | |
| 1987 | | The Montreal Protocol on Substances that deplete the Ozone Layer to the Vienna Convention | |
| 1988 | | | Entry into force of the Vienna Convention for the Protection of the Ozone Layer is a Multilateral Environmental Agreement. |
| 1989 | Malaysia: acceding to the Paris Convention | | |
| 1991 | -Chile: acceding to the Paris Convention and introducing patent protection for pharmaceutical products first time in the Americas<br>-Bangladesh, Uzbekistan: acceding to the Paris Convention | | |
| 1992 | Greece, Spain, Portugal: introduction of patenting of pharmaceutical products | Rio de Janeiro, Earth Summit, Principle 9 | |
| 1993 | | Entry into force of the Convention on Biological Diversity (CBD) | |

| | | | |
|---|---|---|---|
| 1994 | Adoption of the TRIPS Agreement | -Entry into force of UN Convention on Climate Change<br>-Entry into force of the UN Convention on the Law of the Sea | |
| 1994-1996 | Albania, Costa Rica, Colombia, Comoros, El Salvador, Estonia, Guyana, Honduras, Lithuania, Montenegro, Namibia, Nicaragua, Pakistan, Panama, Peru, Paraguay, Santa Lucia, Singapore, United Arab Emirates, Venezuela: acceding to the Paris Convention | | Antitrust Guidelines for the Licensing of Intellectual Property, U.S. Department of Justice and the Federal Trade Commission |
| 1996 | -WIPO Internet Treaties<br>-Brazil: introduction of product patent protection for pharmaceuticals | Entry into force of the United Nations Convention to Combat Desertification | |
| 1997 | -Sierra Leone: acceding to the Paris Convention | Kyoto Protocol to the UNFCCC | |
| 1998 | -USA: the Digital Millennium Copyright Act (DMCA) criminalizing, among others, the act of circumventing an access control, whether or not there is actual infringement of copyright itself.<br>-India: member of the Paris Convention<br>-Directive 98/44/EC of the European Parliament and of the Council on the legal protection of biotechnological inventions<br>-Cambodia, Jamaica: acceding to the Paris Convention | | |

| | | | |
|---|---|---|---|
| 2001 | European Union passed the Copyright Directive or EUCD, which addresses some of the same issues as the US DMCA. | Doha Ministerial Declaration on Public Health and TRIPS | WTO Working Group on Trade and Technology Transfer |
| 2002 | | CIPR (UK) report | |
| 2002-2005 | Andorra, Djibouti, Namibia, Pakistan, Saudi Arabia, Seychelles: acceding to the Paris Convention | | European Union: Commission Regulation (EC) No 772/2004 of 27 April 2004 on the application of Article 81(3) of the Treaty to categories of technology transfer agreements |
| 2005 | India: The Patents Act (Amendment) | | Entry into force of the Kyoto Protocol to the United Nations Framework Convention on Climate Change aimed at fighting global warming |
| 2007 | | WIPO: Development Agenda recommendations | |
| 2010 | | | Cancun: UNFCCC decision to establish a new Climate Change Technology Mechanism |

While developed countries explored stronger IPR protection, a number of developing countries began to experiment with new legal and institutional mechanisms to achieve similar goals. The Andean Group of countries, for example, adopted a common set of policies which were based on the central concept of a common regime for the original six countries on FDI, industrial property and transfer of technology (see Box 1).[17] The Indian model included guidelines on foreign collaboration agreements to regulate technology transfer transactions. The other countries which enacted similar laws included Argentina, the Dominican Republic, Ghana, Nepal, Nigeria, Mexico, Portugal, Spain, Yugoslavia and Zambia (UNCTAD, 1982, p.2).

These technology transfer regimes had important similarities, including (a) their scope of application, which extended mainly to international contracts; (b) their control mechanism, which was mainly centred on prior approval and registration; (c) their primary interest areas, namely, pricing, restrictive practices and duration of arrangements; and lastly, (d) the consequences for non-compliance that was prescribed within each regime.

In addition to this, a comparison of the substantive technology transfer emphasis of the laws shows that all the regimes introduced in developing countries placed a common emphasis on:[18] (a) communication of know-how; (b) technical assistance, technical consultancy and services of a technical nature;[19] (c) industrial collaboration.

An early assessment of the impact of the national regimes on technology transfer conducted by UNCTAD (1982) at that time concluded that the regimes had an important positive effect in three key areas: (a) reducing the explicit prices of the technology within technology transfer agreements, (b) eliminating restrictive clauses in technology transfer agreements and in (c) shortening the terms the duration of the agreements.

Therefore, in their own ways, national technology transfer regimes tried to address issues such as the need to ensure local firms are the key actors in the technology transfer process, the need to promote know-how in order that local firms can learn to use technologies that are transferred and also the need to counter the growing focus on IPRs use and enforcement by the industrialized countries. It was particularly interesting to note the linkages between technology transfer and IPRs that some national regimes established. India, for example, was not a member of the Paris Convention until 1998. It predominantly sought to develop a model that aimed at building local capacity through government established enterprises and public sector institutes. Patents in this respect were meant to fit into a broader model of industrial

[17] See Roffe (2010) and Patel et al (2001).
[18] See UNCTAD (1982), table 1 on p.6.
[19] In the case of Mexico and Venezuela, the laws also covered the exchange of administrative and managerial services and in Nigeria, the scope of the law covered the exchange of plant and machinery.

development, facilitating reverse engineering skills through imitative efforts of local firms.

A sector where this model resulted in resounding success in India was the pharmaceutical sector, where technological capacity was built primarily by (a) limiting patenting rights on pharmaceutical products (product patents were not allowed and process patents were limited to seven years only), (b) establishing government-established public enterprises for production and public research institutes and (c) creating an overall research infrastructure and policy environment that facilitated local production. In this respect India, as well as other developing countries, follow the same trajectory of many developed countries, which as Table 1 illustrates, introduced full protection of pharmaceuticals at a very advanced stage of their development paths.

Most Latin American countries were similarly not members of the Paris Convention. Argentina, for example, only became a member in 1967. This was clearly in response to a critical view of how the international system has been operating and thus the origin of the request made in 1961 at the UN on the revision of international conventions.

Box 1
**The Policies Adopted by the Andean Group**

The Andean group makes a poignant case of the type of policies advocated at that time by developing countries. These policies were based on the central concept of a common regime for the original six countries (Bolivia, Colombia, Chile, Ecuador, Peru and Venezuela) on FDI, industrial property and transfer of technology. In broad terms, the policies on FDI were rigorous favouring flows of investment in sectoral areas considered relevant for the region and with an important motivation to bring foreign technology.

With respect to industrial property reform, the common regulations of the Andean Decision delineated the legal rights that ownership of patents could confer. For example, patents could not be granted for certain types of products, such as pharmaceuticals – as was the case in an important number of countries such as Brazil and the case of India underlined above – and, in general, inventions affecting the development of the country. Patent applications needed to include "a clear and complete description of the invention enabling a person skilled in the art to carry it out." Patents could be granted for a maximum period of 10 years with renewal and proof of exploitation required after the first 5 years from the grant. The patent conferred on the owner the exclusive right to work the invention in the recipient country, to grant licenses for its exploitation, and to receive royalties or compensation for its exploitation. At the same time, patents did not confer to the rights' holder the exclusive right to import a patented product or a product manufactured under a patented process. By excluding the right of importation—today recognized in TRIPS as an inherent right of patent holders—the Andean polices encouraged the local working of a patent.

Working of the patent was defined as "the permanent and regular use of the patented processes or the manufacture of the product covered by the patent in order to put the end result on the market under reasonable marketing conditions, provided that such acts have occurred on the territory of the Member Country which granted the patent".[20] The local working requirement was called for to ensure the production of the goods in-situ within the country that granted the patent monopoly in order to ensure technology spillovers especially know-how related to the production process.

Compulsory licenses were a means to further emphasize upon the working or exploitation of the patents that thus were available in the following cases:
(a) when the patented invention was not worked in the country; (b) when the working of the invention was suspended for more than one year; (c) when the working of the invention did not meet the demand of the national market on reasonable terms as to quantity, quality, or price; and (d) when the patentee did not grant contractual licenses on reasonable terms to meet the demand of the national market on similar reasonable terms (Article 34 of Decision 85).

Particularly for technology transfer policies, the Andean Group regulations provided both the institutional structure and provisions related to the management and commercialization of technology. For the importation of technology, national agencies were established to execute common policies in coordination with those on FDI. One principal function was to evaluate and approve transfer-of-technology contracts against a number of criteria that included their contribution to regional development and the ability of the recipient firm to use the technology without conditions attached. On the management and commercialization of technology, the common policies addressed issues such as those of imperfect information regarding prices of goods (spare parts, accessories, components) and services provided by foreign firms that should be in line with international pricing. Restricted guidelines were provided with respect to the capitalization of technology that was not permitted, and royalties between related firms were not allowed. Equally, a closer scrutiny of restrictive practices in technology-transfer contracts was established inspired in many respect on policies already in existence in developed countries. Thus an important pillar of the Andean Group policies at that time was the goal of improving transaction conditions that would translate in improving the bargaining position of local firms, improve their technological capacity and strengthen the capacity of those firms to compete internationally.

[20] Articles 30 and 31, Decision 85, May 1974, of the Commission of the Cartagena Agreement.

## 3. THE 1980S AND THE CODE OF CONDUCT ON TRANSFER OF TECHNOLOGY

The difficulties being faced in addressing national technological needs led to an intensification of the international debate on transfer of technology in the 1970s. To a large extent, one could conclude from a review of the political-economic history of the time that the Andean group's experiences with technology transfer policies critically influenced the international debate. To a large extent, the paradigmatic case of the Andean Group serves to illustrate both the political sentiments and the dominant policy perspective of countries in Latin America itself and in different regions of the developing world. These national initiatives precipitated an active process of domestic patent reform in favour of technology transfer as a component of international economic collaboration agreements including FDI and trans-boundary licensing agreements.[21] The international debates of those days, thus, mirrored developments taking place at the national level and echoing the sentiments that national measures on technology transfer were insufficient. Countries felt that these national measures needed to be fortified with a unified articulation of transfer of technology from developed to developing countries at the international level.

The clear-cut link between intellectual property and technology transfer however, originated at the international level in 1961 as part of an initiative launched in the United Nations General Assembly (UNGA).[22] This initiative pioneered by Brazil prompted the debate on the relationship between IPRs, transfer of technology and the economic development in developing countries that still resonates in the international discourse. As a result of the 1961 initiative, a study was commissioned by the UNGA on the effects of patents on the economies of underdeveloped countries. For Brazil and the supporters of the initiative, this report was meant to address the question of whether existing international conventions should be revisited in order to ascertain the role they play in advancing the technological needs of developing countries. Brazil, along with other developing countries at the time, had already aired concerns about the trend of weakening the local 'working' requirement contained in the Paris Convention, which was one crucial component of the instrument at the time of its inception.[23] From this perspective, the claim by developing countries for transfer of technology from the North was largely related, as noted, to the process of erosion of the working requirement occurring in the various revisions to the Paris Convention.

The Report of the United Nations in response to the 1961 request made a number of recommendations mainly on the need for technical assistance. It did not delve into the question of revisiting the international conventions as advocated by Brazil and others. The Report did not satisfy the expectations of the developing countries

[21] See, for example, Vaitsos (1972).
[22] See for instance, Menescal (2005).
[23] The weakening of the local 'working' requirement was a move towards reinforcing the IP system by certain industrial sectors that were more dependent on IP protection, but was clearly to the detriment of technology followers.

during the 1961 initiative, as a result of which these concerns were raised again on the occasion of the Third UNCTAD Conference held in Santiago, Chile in 1972. The Conference agreed at this time to request the UNCTAD secretariat, in cooperation with the permanent Bureau of WIPO, to revisit the report published in 1965 (United Nations, 1965). This time, the 1975 Report on *The Role of the Patent System in the Transfer of Technology to Developing Countries* came forward with some incisive conclusions.

In the main, the 1975 Report acknowledged that the set of practices of the international system and its specific impact on the developing countries called for a revision of patent laws and administrative practices in those countries. It advocated that the purpose of any such revision "will have to be that of making patent laws and practices capable of effectively complementing other instruments of policy for national development." In this respect, it highlighted the following issues: the rights conferred by a patent; policies concerning the subject of patentability; the duration of patent grants; adequate and effective provisions to prevent and correct abuses resulting from the exercise of the rights conferred by the patent; introduction of utility models, and other relevant means for promoting national scientific and technological capabilities.

Following this, the proposed revision to the Paris Convention was followed up in WIPO. In 1977, a Declaration was adopted to guide future work of a Diplomatic Conference on the sixth revision of the Paris Convention later convened in 1981. The 1977 Declaration of Objectives was certainly inspired in the 1975 report linking patent protection to the issues of access, transfer of technology and dissemination of knowledge.[24]

### 3.1 The Key Milestones in the Code of Conduct on Transfer of Technology

As important as the revision of international conventions on intellectual property, developing countries considered that parallel work needed to be undertaken with respect to transfer of technology as a subject by itself, mirroring their efforts - and their limitations - of legislating at the domestic level on these same questions. They were of the view that internationally agreed principles and norms were indispensable to close the gaps and the perceived flaws in dealing with the question of technology transfer, which was a transnational matter, solely at the national level.

The adoption of an international code of conduct on transfer of technology was considered to be the appropriate means to reach these goals and provide better conditions for 'effective international cooperation on this issue' (UNCTAD, 1982). Such a framework for cooperation, it was perceived, would lay the general principles that should guide international technology transactions, including the use of fair

[24] See OMPI, Diplomatic Conference For The Revision Of The Paris Convention: Basic Proposals, PR/DC/3, 25 June 1979

terms and conditions in contractual relationships.[25]

Negotiations on the Code began in 1976 – one year before the adoption of the WIPO's Declaration on the Objectives of the revision of the Paris Convention - and continued relentlessly for almost ten years. Although a number of attempts were made to overcome the unresolved questions, the draft Code was never adopted.[26] However, as reviewed in the subsequent sections of this paper, the issues raised by the Code and the unresolved questions that led to its collapse often reverberate in almost all subsequent international negotiations and discussions on technology transfer.

The negotiations were structured on a strict North-South divide with clear scepticism prevailing in major technology producing countries on the final consequences of such endeavour. The Code, thus, encountered numerous obstacles precisely due to this lack of consensus on the utility of such an instrument. A flavour of the ambitious and controversial nature of the endeavour is echoed in the intensely negotiated provisions on the objectives and principles of the Code in their final consensus form (extracts reproduced in Box 2).

Box 2

**Draft International Code Of Conduct On The Transfer Of Technology [1985 Version]**

2.1. Objectives

(i) To establish general and equitable standards on which to base the relationships among parties to transfer of technology transactions and governments concerned….

(iii) To encourage transfer of technology transactions, particularly those involving developing countries, under conditions where bargaining positions of the parties to the transactions are balanced in such a way as to avoid abuses of a stronger position and thereby to achieve mutually satisfactory agreements…

(v) To facilitate and increase the international flow of proprietary and non-proprietary technology for strengthening the growth of the scientific and technological capabilities of all countries, in particular developing countries, so as to increase their participation in world production and trade.

(vi) To increase the contributions of technology to the identification and solution of social and economic problems of all countries, particularly the developing countries, including the development of basic sectors of their national economies.

(vii) To facilitate the formulation, adoption and implementation of national policies, laws and regulations on the subject of transfer of technology by setting forth international norms…

[25] UNCTAD, "Draft International Code of Conduct on the Transfer of Technology as of 5 June 1985" (TD/CODE/TECHNOLOGY TRANSFER/47, 1985), referred to in this paper hereafter as the draft code. For the 1980 version of the draft code, see ILM 1980, vol. XIX, no. 3, May, pp. 773-812. There is a vast literature on the UNCTAD draft code. See, for example, Bizec & Daudet (1980), Fikentscher (1980), Yusuf (1984) and Patel et al (2001).

[26] See UNCTAD (1995), See also Susan Sell (2000) at p. 151. See also Vaitsos (1972).

(x) To set forth an appropriate set of responsibilities and obligations of parties to transfer of technology transactions, taking into consideration their legitimate interests as well as differences in their bargaining positions.

2.2. Principles

(i) The Code of Conduct is universally applicable in scope.

(ii) States have the right to adopt all appropriate measures for facilitating and regulating the transfer of technology, in a manner consistent with their international obligations, taking into consideration the legitimate interests of all parties concerned, and encouraging transfers of technology under mutually agreed, fair and reasonable terms and conditions…

(iv) States should co-operate in the international transfer of technology in order to promote economic growth throughout the world, especially that of the developing countries…

(vi) Mutual benefits should accrue to technology supplying and recipient parties in order to maintain and increase the international flow of technology.

(vii) Facilitating and increasing the access to technology, particularly for developing countries, under mutually agreed fair and reasonable terms and conditions, are fundamental elements in the process of technology transfer and development.

(viii) Recognition of the protection of industrial property rights granted under national law.

(ix) Technology supplying parties when operating in an acquiring country should respect the sovereignty and the laws of that country, act with proper regard for that country's declared development policies and priorities and endeavour to contribute substantially to the development of the acquiring country. The freedom of parties to negotiate, conclude and perform agreements for the transfer of technology on mutually acceptable terms and conditions should be based on respect for the foregoing and other principles set forth in this Code.

In retrospect, the Code was not only ambitious when compared to other initiatives of the same nature, but also tried to resolve perhaps the most important issues on the subject. These issues are so central to the question of technology transfer that they continue to impede consensus building even in the current international context. One such important question was the attempt to conceptualize the notion of 'transfer of technology'. On this topic, the draft Code agreed that: "Transfer of technology … is the transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend to the transactions involving the mere sale or mere lease of goods."

Based on this definition, the draft Code further elaborated on the specific transfer of technology transactions falling under its scope.[27] But countries failed to agree on

[27] For the purpose of the Code, "transfer of technology transactions are arrangements between parties involving transfer of technology, particularly in each of the following cases: (a) The assignment, sale and licensing of all forms of industrial property, except for trade marks, service marks and trade names when they are not part of transfer of technology transactions; (b) The provision of know-how and technical expertise in the form of feasibility studies, plans, diagrams, models, instructions, guides, formulae, basic or detailed engineering designs, specifications and

how the instrument would categorize or define the international transfer of technology transactions, which was essential to the scope and impact of the provisions dealing with anticompetitive restrictive practices.

In hindsight, the process of negotiations leading to the Code needs to be seen in a broader and more objective perspective. Compared to subsequent discussions on these issues, the Code resulted from long and thoughtful negotiations and finally came out in 1985 as an instrument that did not include any binding commitment to transfer technology to the developing world. Its sole purpose was to set up principles and rules on fair and equitable commercial transactions, free of undue restrictions and with the aim of reinforcing local capabilities in recipient countries. The incipient competition principles embodied in the instrument were later captured in the WTO's TRIPS Agreement. Furthermore, a serious analysis of the contents of the draft Code of 1985 also dismisses the critiques made at that time that the instrument had a directorial approach. On the contrary, the draft Code established, alongside the principles of fair and equitable dealings, free of anticompetitive practices that the freedom of contracts prevails.

In sum, the Code did not impose mandatory transfers of technology, recognized the centrality of a firm/ enterprise as the depository of its know-how and technical expertise needed to transmit that knowledge. It emphasised, further, the need to build capacities in the developing countries to absorb, adapt and better use those technologies as well as the need to improve their bargaining positions in those processes. All of these were quantum leaps in integrating existing evidence on technological change into policy making.

### 3.2 The Time of Verdict: Country-Level Experiences In The Latecomers Since The 1980s

Side by side with the failed negotiations on the Code, the end of the 1980s marked the stellar technological performance and industrial leap amongst the first set of countries clubbed as the East Asian Miracle.28 Expanding assessments based on evolutionary and innovation economics29 began to help piece together the key issues of promoting technological change and innovation capacity in the context of developing countries. A second-tier of Asian economies lunged ahead (Malaysia,

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equipment for training, services involving technical advisory and managerial personnel, and personnel training; (c) The provision of technological knowledge necessary for the installation, operation and functioning of plant and equipment, and turnkey projects; (d) The provision of technological knowledge necessary to acquire, install and use machinery, equipment, intermediate goods and/or raw materials which have been acquired by purchase, lease or other means; (e) The provision of technological contents of industrial and technical co-operation arrangements."

[28] As explained earlier, this term was coined by the World Bank (1993) to denote Japan, South Korea, Taiwan, Hong Kong and Singapore (as the first tier Asian newly industrializing economies), and Malaysia, Thailand, and Indonesia (second tier newly industrializing economies).

[29] See Nelson (1993), Edquist (1997), and other innovation scholars for the first national innovation systems studies of developing countries.

Thailand and Indonesia) lending strength to several conclusions on the nexus of technology, innovation, IPRs and development.

Studies of countries that began performing well showed that industrial strategies that simultaneously targeted a range of institutional factors were important to overcome the conventional impediments to development, including the distortions induced through aid and loan conditionalities, technical assistance programs and technological acquisition (Felipe, 2009). These institutional factors are inter-linked and condition the impact of trade openness and lower trade barriers (through liberalization, promotion of FDI and other measures) on economic growth. In order to benefit from newer opportunities that arise from increasingly globalized patterns of exchange, other pieces of the puzzle are simultaneously required to fall in place, including infrastructure, human capital, financial investment, and a favourable technological regime that is geared towards creating greater opportunities for access to and absorption of technologies. As Rodrik notes, "Countries whose economies grow fast typically also become more open; but the converse progression – from greater openness to faster growth is much less apparent."[30]

What particularly stood out from the so-called East Asian successes is that while an important number of developing countries embarked upon ambitious industrialization strategies in the 1960s and 1970s, the focus of these strategies was largely on movement of labour between sectors (sectoral composition of GDP) and capital accumulation, just as development theories advocated at that time. Technology, the third pillar of industrialization, was perceived mainly in the form of technology transfer – something that could be simply moved from the industrial countries to developing ones, through technology transfer policies. Such influx of technology was expected to jumpstart the process of technology capacity within countries.

The East Asian countries focused precisely on this issue differently: the focus of their technology policies was on building technology capacity from the inside. Technology transfer was seen as a means that could possibly feed into this process, but not the necessary precondition.

### 3.3 Innovation Systems, Technological Change and Dynamic Capabilities

It is becoming increasingly relevant to view these results from a much broader perspective of inclusive economic development. It would not be wrong to say that the narrow relationship between technological intensity and export sophistication of countries, which is only a part of the structural transformation process, has been the main focus of several studies on the East Asian success. Viewed more holistically, structural transformation is achieved through the ability to upgrade production and export structures, industrialize and diversify economic activities. Technological change, although central to this process, relies on other factors that link learning to a

[30] See Rodrik (1999) and Rodrik (2012).

virtuous cycle of demand and supply on the one hand, and favourable public investment on the other.[31]

Other empirical comparisons of technological experiences of countries, seeking to draw lessons from those that succeeded to the many that are falling behind have been focused on how comparative results could lead to deriving policy conclusions applicable to other contexts of late development.[32] The studies and insights generated therein show that an overarching focus on technological capabilities is critical, than a simplistic understanding of inventive activities, IPRs and information (table 2 below). These studies also show that while there have been considerable increases in the number of institutions and agencies focused on R&D in most other developing countries with some success in manufacture, the qualitative impact of the exercise remains, arguably, little, in the industrial sector. The emphasis on R&D and science capacity mainly in policy terms within countries implied that science establishments were not well-linked and coordinated with the development of the enterprise sector. This lag began to show gradually in the ability of countries to move research from the laboratory to the market place.

**Table 2: A dual narrative on knowledge and technological change**

| Conventional Theory | Alternate Perspectives |
|---|---|
| 1. Information and knowledge is a stock subject to a linear process of information processing.<br>2. Information, particularly of relevance to inventive activity and capabilities is easily transferable in a codified form. IPRs help to protect this.<br>3. Information is universally available and freely accessible to all as public good, including patent information.<br>4. Accumulation of knowledge through already available information is a simple and relatively costless process.<br>5. Economic agents possess certain resources or assets that allow them to absorb external information (equated to knowledge) and learning is endogenous. | 1. Capabilities formation is a heuristic process that is different from information gathering.<br>2. Capabilities formation calls for knowledge, which has both a codified and a tacit nature, and the tacit domain is often as important, if not more.<br>3. Such knowledge is embedded in historical, economic and cultural contexts and for this reason local knowledge is important.<br>4. Accumulation of knowledge requires explicit investment into technological learning and is time-consuming.<br>5. Knowledge is a social process that grows in a process characterized by a wide variety of learning mechanisms, access to patenting may be one of them. |

Source: authors.

[31] There is a unanimous agreement in the innovation literature on the point that the countries that are "falling behind" did not have a favourable mix of institutional factors that could help induce the positive effects of trading opportunities on technological change.

[32] See for instance, Amsden & Chu (2003), Amsden & Tschang (2003), Oyelaran-Oyeyinka & Gehl Sampath (2010).

A second important result is that technological learning is domestically induced through a range of proactive policy choices, which are critical to explain the technological underpinnings of export success stories that one sees in these economies. National capabilities are not simply built on the basis of R&D and science capacity, but are fostered through linkages of economic and non-economic agents within the economy. Such a policy framework therefore involves purposive sets of actions by national governments to promote innovation capacity. These policy actions are aimed at strengthening linkages and collaborative bonds between a variety of actors and networks in the economy. Policy measures can vary, ranging from those for secondary and tertiary education, infrastructure, public sector science, technological acquisition and technology transfer, R&D promotion, IPRs, foreign direct investment (FDI), among others.[33]

Viewed such, the concept of 'innovation' that determines the ability of actors to search, discover and apply technological know-how in local contexts does not attend only to activities of the firm, but the interaction between economic and non-economic actors, and that policies and institutions that matter to facilitate these interactions.[34] There is interdependency between these policies as a result of which they need to be coordinated. For instance, investments in infrastructure, especially in the industrial sector, have significant growth enhancing effects in countries with lower levels of development (Ocampo & Vos, 2009). Such state-led development (Lall, 1991 among others), also called 'capabilities building', is a modern concept that is validated by empirical experiences of a range of developing countries and is very similar to List's initial ideas of industry-led development.

Third, as opposed to the primal emphasis placed on IPRs by this time, the East Asian success also showed that IPRs could be calibrated to suit national needs. Particularly, many of the East Asian countries, for instance, South Korea, utilized IPR protection creatively to foster technology transfer and incremental innovation in their local contexts (see for example, Kim, 2002).

Fourth, national and sectoral policy measures assume importance because institutional contexts of countries vary and impact profoundly on the ability to usher in technological change. No technology, no matter how simple or complex, can be fully expressed in terms of its material value or its components that can be put to use (Nelson 1993). The unwritten, tacit, not easily embodied knowledge of applications accounts for the fact that when two producers in different parts of the world use the same technologies, there is always a discrete set of possibilities that they may branch out into, thereby producing completely different results. This focuses attention to a critical causal relationship between the availability of technologies and the importance of social and economic contexts that undergird

[33] A large amount of literature on national systems of innovation has analyzed how these investments in building up what we now refer to as "systems of innovation" involves purposive actions of governments in the deliberate creation of organizations and incentive mechanisms to foster the creation, transfer, adoption, adaptation, and diffusion of knowledge.

[34] See for example, (Edquist 1997).

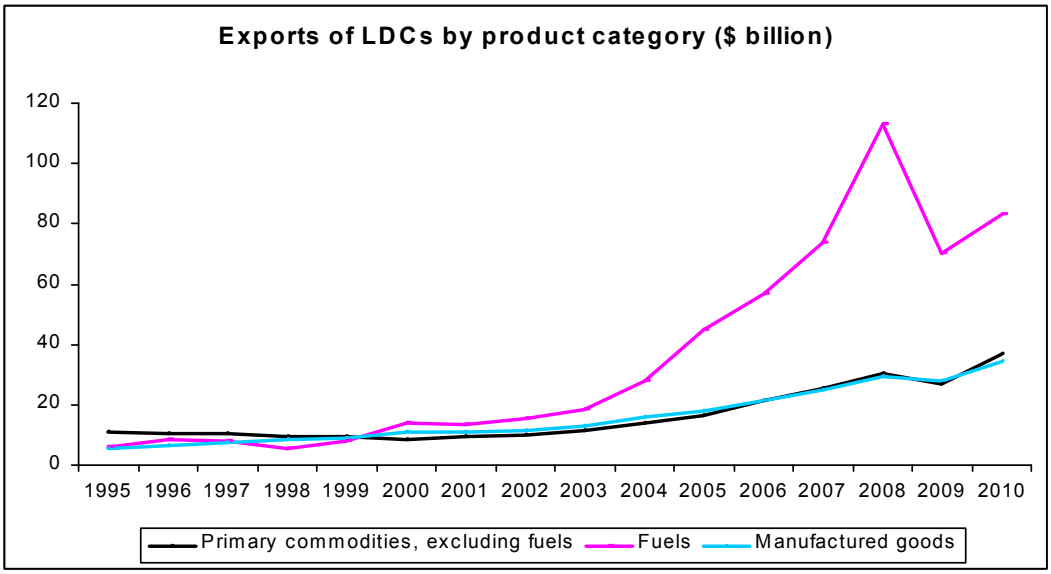
technological learning within countries. The Code of Conduct, in this respect, was extraordinarily forward looking in its definition. By defining technology transfer to include "…systematic knowledge for the application of a process", it not only focused on tacit-knowhow, but also on the fact that innovation was not only product-related, but process or service related.

Fifth, technological change and technological learning is not only dependent on access to technology (see table 2). It depends on how the access to technology is provided, and what the other overarching constraints and opportunities are. In other words, the story on technological progress and structural change is not as straightforward as one would imagine. Recent evidence points to the fact that at low levels of per capita income, economies tend to diversify but as the income rises, the focus shifts to patterns of specialization (See Felipe (2009) and Imbs & Wacziarg (2003)). Although some forms of specialization are more conducive for economic growth than others, patterns of specialization that countries embark onto are idiosyncratic in nature, determined as much by trading opportunities and global demand, as by internal technological capabilities of sectors and firms.[35]

Whereas countries tend to change the basket of exports constantly based on relative specialization in the early stages, the export choices are not only determined by factor endowments (as classical theory dictates) but by the gains of technological learning in international transactions (Hausmann et al. 2007). In this context, some specialization patterns are clearly more conducive to technological upgrading than others; but current patterns of global integration of developing countries tend to reinforce those that do not promote upgrading. Figure 1 shows for instance the range of exports of least developed countries by product category over the past fifteen years, which remain non-technology intensive. Moving away from such specialization to those that are more conducive to technological learning calls not only for access to technologies, but also for a change in international trading patterns (see box 3).

[35] See Hausmann et al. (2007) who establish a link between specialization patterns of economies and income levels.

**Figure 1: Exports from least developed countries: 1995-2010**




Source: Calculated by authors using UNCTAD Database.

Excluding the examples of some economies such as China and India and some other Asian countries, growth trends in many developing countries and almost all least developed countries over the past decade have been accompanied by little changes in their productive structures (see figure 1).[36] Globalization and opportunities created therein have not only failed to create the requisite conditions for structural change in most developing countries, McMillan & Rodrik (2011) for example, note that this has resulted in moving labour from more productive to less productive activities, including into the informal sectors of the economy. The ongoing divergence is characterized by an increasing technological divide, with a large number of countries experiencing technological downgrading and focusing on commodity exports (in the case of most developing countries) or concentrating on lower ends of global value chains (several developing countries). These patterns of integration are technologically diminutive and create perverse locking-in effects and simply providing access to technology, or pointing countries in the direction of already available technologies is not sufficient to promote technology-led development. Technology never works alone; it works only in conjunction with a set of wider factors, of which trade-related opportunities for developing countries, investment (including FDI) and trade integration remain key.

Box 3

**Technological Progress, Specialization Patterns and development**

Hausmann & Klinger (2006) and Felipe (2009) propose the idea of "proximity", implying that countries with similar capabilities, technologies and infrastructure are more likely to manufacture similarly sophisticated products. Linking this to the often quoted comparative advantage argument, they conclude that the development of comparative advantage in new products is affected by the kinds of products that are

[36] See United Nations Conference on Trade and Development (2006).

being currently produced; i.e., achieving comparative advantage for newer products will depend on how well positioned a country is in the technologically interdependent range of products that are currently on offer internationally.[37]

This also helps explain how some developing countries are currently on the peripheries of product spaces where they find it hard to diversify whereas others have positioned themselves in product spaces where they can easily switch between different products, exploring technological and economic gains in the process. Upgrading and accumulating more capabilities is not always an easy process and countries have only been able to assume product spaces internationally only when some or the other aspects of "capabilities" was already readily available. Furthermore, it is easier to move up in terms of technologically mastering a product where the firms have already some limited knowledge in that particular technological domain, when compared to moving to newer products where they have no production capabilities at all. Felipe (2009) demonstrates this in the case of Malaysia, noting that in 1975, Malaysia had comparative advantage on a few products that were mostly on the peripheries including, oil, forest products and garments and a slight presence in electronics. By the year 2000, it had moved to developing a well-positioned product space in electronics, and advanced production capacity for forest products.[38]

## 4. THE 1990S AND THE INTERNATIONAL CHARACTER OF INTELLECTUAL PROPERTY RIGHTS

These gains of integration through export sophistication and technological change, pointed out in the previous section, remain elusive to most developing countries today. At the same time, the deeper specialization patterns created by trade opportunities into primary commodities, weak systems of innovation, and the knowledge economy have led to a wider technological gap between countries than ever before. Processes of knowledge accumulation, transfer and use have gained a new meaning in recent years with the advent of the information and communication technologies and knowledge-based economies (see box 4 below).

[37] Authors Hausmann & Klinger (2006) explore this in the context of forests, monkeys and space between trees, and show that the key to ensure that a country is well on its way to export sophistication is to position it technologically in a well-connected part of the forest so that it can move to other products easily.

[38] Felipe, (2009) at p. 171.

Box 4

**IPRs and the new knowledge economy**

An ever-increasing service component in the global economy, with an emphasis on knowledge acquisition, have both led to a shift in focus from ownership of tangible assets to intangible intellectual property as part of goods and services, and transactions there in. IPRs, especially markets for patents, copyrights and trademarks, now dominate the commercial exchanges domain, accounting for a large amount of GNP of the western countries.[39] The proliferation of patents on software, databases, life forms and most recently, business methods/ financial innovations are apposite examples of this trend. However, most developing countries are still lagging behind to a very large extent in their ability to participate and leverage the advantages of the new knowledge economy.

The 1990s have ushered in a newer age of innovation, where technological advances have begun to mark out strategic advantages for the holders of such technologies, knowledge-based economies thrive on innovation-based competition. Investments in intangible assets such as research and development (R&D), IPRs, marketing strategies and management expertise are important drivers of innovative advantages.

Underscoring the importance of knowledge-intensity of economic activity, the share of high technology exports within global trade has remained steadily at an average of 40%, and is expected to expand in the coming decades. At the same time, a large number of developing countries have remained stagnant or even regressed technologically over the past few decades, resulting in an increased technological divide not only globally, but also within developing countries themselves. The new, emerging 'South', made up of the more dynamic southern countries that are slated to catch-up with the technological leaders, are leading to a gradual reconfiguration of global innovation activities.[40] The new 'South' has once again, refocused attention on the importance of innovation capacity for sustained economic growth and development.

### 4.1 The advent and aftermath of TRIPS

The growing importance of intellectual property and its importance to define and protect strategic interests led to the incorporation of IPRs as a key pillar in the GATT negotiations and the WTO set of agreements. Already in 1986, over 26% of American

[39] For example, as of 2001, the copyright industries contributed to $535.1 billion to the US economy, accounting for 5.24% of total GDP (Siwek, 2002). For similar trends on a global scale, see early estimates in OECD (2000).

[40] There is an increasing divergence, as noted earlier in the paper, between the South itself, wherein the past thirty years have witnessed a doubling of the countries qualifying as LDCs (from 25 to 49).

exports contained intellectual property components when compared to 10% when the GATT was negotiated in the post World War II period (Gadbaw, 1988). In a recent report by the WIPO secretariat it is highlighted that -based mostly on empirical studies on the relationship between innovation and productivity high-income economies and manufacturing sector only- "as early as in the mid-1990s, the economic literature suggested that innovation accounts for 80 percent of productivity growth in advanced countries; whereas productivity growth, in turn, accounts for some 80 percent of gross domestic product (GDP) growth. More recent studies at the country-level demonstrate that innovation – as measured by an increase in R&D expenditures - has a significant effect on output and productivity" (WIPO, 2011).

In this historical transition, the adoption of the TRIPS Agreement in 1994 constituted an important signal that IPRs are a critical element of trade relations in a world of globalized technology and investment flows. In order to garner support for the Agreement, a powerful argument was made at the time that TRIPS would lead to increased levels of investment, technology transfer and innovation in developing countries, reinforcing the pro-IPR view prevalent since the 1970s.

To further this, Article 7 of the Agreement that seeks to balance the two seemingly opposed goals, IPRs and technology transfer, by providing that:

> "The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."

Soon after the adoption of TRIPS, and contrary to the expectations of its fervent supporters, a period of turbulence began as differences emerged regarding its implementation and the interpretation of the rights and obligations of Member States under the Agreement. Despite the limitations imposed by theoretical assumptions, country level data and focus, there is a broad consensus on three important impacts of IPRs on the global economic landscape and on its nexus with transfer and development of technology.

1. TRIPS and economic catch-up: The TRIPS Agreement limits the extent to which developing countries can learn and incrementally innovate, by limiting their ability to reverse engineer. It also expands the scope and application of IPRs to newer areas and subject matters (a trend that was ongoing before TRIPs). This circumscribes their ability to promote technological and economic catch-up.

(a) TRIPS and the expansion of IPRs to newer subject areas (e.g., life forms, software, protection of undisclosed information and database protection), entwine these rights with economic activity more profoundly than ever before. In the case of patents, for instance, patent protection of minor variations of existing products and newer subject areas that were earlier not considered

relevant for patenting, have both been proliferating.[41] Accompanied by the expansion of patenting to newer areas, such as business and financial innovations in the USA,[42] the boundaries of what can be patented are being redefined for sometime now. Whether or not this is indeed in the broader public interest remains to be seen.[43]

(b) Shift in focus from only protection of inventive activities to commercial/ strategic gains in business: The wider landscape of patenting has been gradually shifting from inventive activity interpreted as notions of "flash of creative genius"[44] or "a function never before performed, a wholly novel device or one of such novelty and importance as to mark a distinct step in the progress of art",[45] which were commonly placed demands for the grant of patents over the last two centuries globally. The grant of a patent, more generally, is no longer for generation of information over a technology, but rather for the generation of scientific information that pertains to methods of processing or producing an output simply conferring commercial advantages to the person who possesses the information (Reichman, 2000, p.1750 ).

As a result of these developments, the space and margin left for followers and newcomers from developing countries are constantly being narrowed down. IPRs and particularly patents are not playing the traditional role of opening opportunities to "stand on the shoulders" of earlier innovators in order to improve, find new solutions, alternatives and develop on their own new innovative products and services. Thus, the dissemination and diffusion function of the system is being gradually diluted with consequences for followers and newcomers.

2. IPRs have a far greater reach on domestic policy environments: Common comparisons of harmonization of trade rules under the WTO and the harmonization of IPRs as part of the TRIPS Agreement tend to usually focus on similarities of IPRs and trade rules, they overlook some fundamental differences. Whereas trade restrictions are border measures that inherently discriminate between home and foreign interests, the partial harmonization of IPRs makes no distinction between the domestic and foreign domains, thereby extending the reach of the WTO rules directly into domestic financial and business regulations (Maskus, 2000). WTO trade rules are designed to harmonize rules of trade for products, without factoring in the processes through which these products are created. The TRIPS Agreement,

[41] These trends were primarily enabled by the legal regimes in several industrialized countries; especially in the USA -and to some extent in the EU- where the inventive step requirement has experienced decreasing exigencies. See for instance, Boldrin & Levine (2008), Jaffe & Lerner (2006), among many others.

[42] See the Bilski case, In re Bilski, 545 F.3d 943, 88 U.S.P.Q.2d 1385 (Fed. Cir. 2008). Also see Lerner, 2000 and 2006.

[43] See Reichman & Hasenzahl (2003), Jaffe & Lerner (2006, for just a discussion on the USA); and (Gallini & Scotchmer 2002) among others that explore the issue of whether the recent surge in patenting is beneficial for technological progress and economic growth.

[44] *KSR International Co vs. Teleflex Inc*., 550 U.S. 127 S. Ct. 1727. A similar ruling was made in 1851 Supreme Court decision of *Hotchkiss vs. Greenwood*, 52 U.S. (11 How.) 248 (1851).

[45] *Westinghouse vs. Boyden Power Brake Co.,* 170 U.S. 537, 561-62 (1898*).*

however, sets minimum standards that directly relate to how production processes are structured and organized. The rise of IP provisions within regional agreements shows how developing countries, who often initiate such agreements in an effort to find mutually agreeable terms of trade are enticed to accept a gradual proliferation of stronger IPR standards and stringent enforcement rules in their domestic regimes in return for favourable access conditions to developed country markets (see infra).

3. Intellectual property has gained value for litigation purposes: In recent years, IPRs but mostly patents have acquired a critical function in the strategies of firms particularly through practices aimed at blocking other firms from patenting, creating a thicket of defensive patents around a valuable invention enhancing patent portfolios for cross-licensing negotiations. (See box 5) Some firms also use patents to block fellow competitors or to extract rents from other firms; non-practicing entities in particular have emerged which are said to litigate against other firms based on their patent portfolios. According to a recent WIPO report, econometric evidence suggests that dense webs of overlapping patent rights – so-called patent thickets – can indeed slow or even forestall cumulative innovation processes. High transaction costs have made it difficult for some – especially small – firms to obtain the licenses necessary for prior and complementary technologies; the latter include patented research tools that, for example, are of special relevance to biotechnology research. "Finally, strategic patenting affects the nature and intensity of competition in product markets, in turn affecting innovation incentives." [46]

Box 5
**IPRs as strategic assets**

The strategic function of patents and the impact on transaction costs can be illustrated by recent cases reported in the media, in July and August 2011: Apple and RIM paying $4.5 billion USD for a portfolio of 6,000 Nortel patents; and Google acquiring Motorola Mobility for $12.5 billion USD to reinforce Android mobile phone software against possible lawsuits from rivals. Motorola's patents portfolio is of the range of 17,000 patents. To illustrate further this emerging feature, more recently (30 March 2012), the media reports that Microsoft has filed a motion in US District Court to get a temporary restraining order and preliminary injunction against Motorola Mobility in order to try to prevent the handset maker from getting Microsoft's products banned from use in Germany until a US court also rules on the matter. To make it right, Microsoft says that it will offer up a $300m bond to guarantee any lost revenue Motorola might incur by allowing the software company's products to remain available. Motorola is suing Microsoft, arguing that the latter infringes its video standard H.264 patents in Windows 7, the Xbox 360 and Internet Explorer. According to Mueller, the German court is expected to rule on the issue on 17 April and is likely to side with Motorola. [47]

[46] See WIPO (2011) at p. 92.
[47] See http://www.zdnet.co.uk/news/intellectual-property/2012/03/30/microsoft-puts-up-300m-in-motorola-injunction-battle-40154924/

This spiralling up of the sphere of influence of IPRs has not been accompanied by any increased trends or conclusive evidence on the impact of the TRIPS Agreement on transfer of technology. In fact, existing evidence is largely inconclusive and most studies show that there is no direct influence of IPRs protection on promotion of transfer of technology in developing countries and LDCs (See for example, UNCTAD 2007; Maskus and Reichman, 2006). Many of these studies also show that the stronger use of IPRs as strategic assets can be a large impediment not only to the use and availability of technologies to firms from the developing world, but also serve as an important market barrier for new emerging firms in the global market.

## 4.2 Beyond TRIPS: The discussions on technology transfer

*From WTO to PTAs and the WIPO Development Agenda*

One of the components of the so called TRIPS "grand bargain" was the objective of the Agreement, as spelled out in Article 7, in terms of a broad understanding that the protection and enforcement of intellectual property would contribute "to the promotion of technological innovation and to the transfer of and dissemination of technology".

For a number of countries the TRIPS grand bargain has been ephemeral and a major disappointment for many. The policy debates tend to stress on the rights and obligations contained in the global IP regime (notably parallel imports and compulsory licensing) which are limited in scope;[48] and many countries have, in varying degrees, forgone these flexibilities through "TRIPS-plus" regimes in the form of preferential trade agreements (PTAs), entered into with major technology exporters (see below). This shrinking policy space, particularly in the case of the least developed countries, is daunting in the light of a lack of successful implementation of the commitment made by developed countries to in favour of the least developed countries (Article 66.2, TRIPS). The adequate implementation of this provision continues to be an outstanding issue in the deliberations on the implementation of the Agreement. In the case of Article 66(2) of TRIPS, contrary to other international treaties such as those dealing with the environment, the instrumentalities to be used to facilitate the transfer of technology are clearly laid out. They consist of providing incentives and other measures to organizations and entities under their jurisdiction for the purpose of promoting and encouraging technology transfer to assist the recipient countries in building their technological base. Here, TRIPS was perceptive and genuine in attempting to tackle the core problems in those countries by targeting precisely the need to reinforce the technical capabilities of the least developed countries. Despite this, progress has been slow and elusive.[49] (See Box 6)

[48] Generally referred to as "flexibilities" within the TRIPS Agreement. Flexibilities in the TRIPS Agreement are provisions that can be used to nuance the impacts of IPRs on domestic regimes for technological learning and industrial development. Several such flexibilities exist in the TRIPS Agreement, and for a discussion of the key TRIPS flexibilities and how they can be used, see for example, Reichman (2000), UNCTAD-ICTSD (2005). See also the Doha Declaration on TRIPS and Public Health, 2001.

[49] See Moon (2011) among others.

Box 6

**What is technology transfer: Article 66(2) TRIPS**

The extent to which the technology transfer obligation contained in Art 66(2) of the TRIPS Agreement this has materialized in practice has become a matter of intense dispute. There are no exhaustive empirical analyses on whether and to what extent this provision has resulted in a greater transfer of technologies to LDCs currently. Very few reviews exist that examine whether Article 66.2 has resulted in an increase in business between developed countries and LDCs (Moon, 2008 and 2011). Based on country self-reports to the TRIPS Council between 1999 and 2007, and focusing mainly on the public policies and programmes that developed countries undertake to encourage their organizations/ enterprises to engage in such technology transfer, the study comes up with two important results. It concludes that a lack of definitional clarity in key terms such as "technology transfer" and "developed country" render it difficult to conclude as to which WTO Members are obligated to provide incentives, of what form and towards what ends. Pointing towards the irregularity of the country reports submitted to the WTO (since many countries did not submit the reports regularly to the council and those that submitted did so irregularly), the review concludes that of 292 programmes and policies reported, only 31% specifically target LDC WTO Members. Of these, approximately a third of the programmes that do target LDCs do not actually promote technology transfer. Thus, out of the 292 programmes, only 22% involve technology transfer specifically targeted to LDC WTO Members (Moon, 2008, p.9). In order to generate more evidence on the issue, the group of the like-minded developing countries[50] has recently called for a study on extent to which Article 66.2 of TRIPS has been fulfilled at the Fourth Session of the Committee on Intellectual Property and Development (CDIP) of the WIPO in April 2010.

In the context of the WTO proper, parallel to the 66.2 discussions, transfer of technology again has been the main subject of attention in a Working Group set up in 2001 at the Ministerial Conference in Doha at the insistence of middle income countries that unsatisfied by the expected promises of TRIPS were of the view that transfer of technology should be an important component of the expansion and liberalization of trade and thus work should be undertaken in order to take adequate adjustments in existing agreements.[51] The Group has produced no concrete results and has been mainly a talking place and probably distractive of the work that the Council for TRIPS might undertake not only with respect to Art. 66.2 but in general with respect to related aspects of the Agreement that could enhance the transfer and dissemination of technology.

[50] The like-minded countries mainly include the African Group, the Arab Group, Brazil and India.

[51] According to the official WTO website, the Working Group on Transfer of Technology was established by the Ministers in Doha and aims to examine the relationship between trade and the transfer of technology from developed to developing countries, and ways to increase the flow of technology to developing countries. See : http://www.wto.org/english/tratop_e/devel_e/dev_wkgp_trade_transfer_technology_e.htm

*The TRIPS-Plus: Foregone Flexibilities?*

Taking the form of varied modalities, preferential trade agreements (PTAs) have proliferated in recent years across the global landscape. While the main aim of PTAs is to expand trade liberalization in goods and services and improved market access conditions, most agreements include also a number of trade-related rules on investment, intellectual property and government procurement. With respect to intellectual property, these trade agreements elaborate further on the TRIPS minimum standards, representing a strong trend towards further expansion and strengthening of IPRs. In many respects, intellectual property chapters in PTAs translate into asymmetric processes, resulting in the transposition of legal systems or regimes of the major trading partners.

This importation of regimes, however, does not fully take into account the difference in situations between the standard imposing countries and the standard adhering countries. Such differences include the lack of appropriate safeguards to strike adequate balances between private and public interests in the recipient countries and broader considerations prevailing in weaker economies, such as, inadequacy of institutions, and a shortage of experienced and well trained adjudicatory bodies. Human skills, especially professional managerial and trained intellectual property expertise, that is important to negotiate and deal with the effects of such agreements is still in a formation phase in many developing countries. Recent PTAs have therefore altered in a significant way the TRIPS original "grand bargain" that was achieved at the end of the Uruguay Round. What stands out is that the important flexibilities, including transitional adjustment periods, policy space in implementation, and the underlying public policy objectives of national systems, including developmental and technological objectives, are now largely foregone in different ways as a result of the PTAs.

But, need to be underlined that this process has not been unexpected. It finds its roots in the minimum standard principle of TRIPS. At the same time, PTAs for a number of countries has been an opportunity to modernize their IPR regimes and institutions and use the available space to exercise their rights under the new obligations that they assume (Roffe and Genevesi, 2010).

Some group of countries have also used the opportunity presented by PTAs to raise concerns on innovation and transfer of technology. This has been the case of the CARIFORUM agreement with the member countries of the EU that has succeeded in placing provisions on IPRs in the context of a chapter titled 'Innovation and Intellectual Property' denoting the concomitant emphasis on innovation issues (Spence, 2010). The rights and obligations related to IPRs are inserted in the objectives, among others, of: Promoting "the process of innovation, including eco-innovation, of enterprises located in the Parties"; fostering "competitiveness of enterprises" particularly micro-, small and medium-sized firms"; "facilitate the production and commercialisation of innovative and creative products"; "contribute

to the promotion of technological innovation and to the transfer and dissemination of technology and know-how"; "encourage, develop and facilitate cooperative research and development activities in science and technology"; "encourage, develop and facilitate cooperative production and development activities in the creative industries".

When one reviews the competition related provisions, looking back at what were the aspirations of developing countries at the time of the Code negotiations, PTAs, in general, reiterate the provisions of TRIPS by acknowledging that matters of competition and related abuses of IPRs should be left to each Party to regulate. Again in the case of some of the EU signed PTAs there are features worthwhile highlighting. In the case of the CARIFORUM and in the recently PTA with Central American countries, it is provided under the provisions related to transfer of technology that parties shall take measures, to prevent or control licensing practices or conditions pertaining to IPRs, which may adversely affect the international transfer of technology and that constitute an abuse of intellectual property rights by right holders. This also extends to "an abuse of obvious information asymmetries in the negotiation of licences." The latter point is an important recognition of the difficulties facing countries with weaker economies in technology transactions. This is directly related to their differential stages of development and to the asymmetries inherent in these agreements.

*WIPO Development Agenda*

Transfer of technology, intellectual property and innovation have been important themes in recent work under the aegis of WIPO particularly with respect to the implementation of the WIPO Development Agenda. In the Development Agenda processes, developing countries have again raised the issue of interaction between intellectual property protection and transfer of technology in ways that specifically pertain to the issues raised in our narrative of the last five decades.

For the promoters of the Development Agenda, "…IP protection is a policy instrument the operation of which may, in actual practice, produce benefits as well as costs, which may vary in accordance with a country's level of development. Action is therefore needed to ensure, in all countries, that the costs do not outweigh the benefits of IP protection." In their view promoting the absolute benefits of intellectual property protection "without acknowledging public policy concerns" undermines the very credibility of the system.

Fundamentally, the initiative takes up in essence the main themes of economic, industrial, cultural and social development that were at the origin of the international IPRs system. In other words, the main concerns or the central themes of the emerging countries have been: differentiation; the promotion of innovation at the core of the system and as a result the actual working of inventions; and again, reverberating the main theme of our narrative: the improvement of the conditions

for transfer of technology and promoting greater accountability in the technology transfer process.

Cluster C of the WIPO Agenda and the recommendation therein deal with Technology Transfer, Information and Communication Technologies (ICT) and Access to Knowledge. Recommendation 28 calls for policies and measures to promote transfer and dissemination of technology to developing countries.

### 4.3 The search for a thematic approach to the transfer of technology conundrum

It seems appropriate to view the WTO and WIPO processes on technology transfer as follow-ups of the discussions on the Code of Conduct with some specific differences in orientation. In their own ways, the PTAs also deal with the issues around transfer of technology and its nexus with IPRs in a generic nature, struggling to deal with the issue across the board and across all sectors. A more recent distinctly phenomenon has been to tackle these related questions under the umbrella of a particular subject area. The most notorious cases have been that of health and of climate change.

*WHO's Global Strategy and Plan of Action (GSPOA)*

In the context of the WHO, a Global Strategy and Plan of Action on Public Health, Innovation and Intellectual property (GSPOA) was adopted in May 2008 emphasizing once again the linkages between intellectual property and transfer of technology.

The aim of the GSPOA is to promote new thinking on innovation and access to medicines and to provide a framework for essential health research and development relevant to diseases that disproportionately affect developing countries. With emphasis on intellectual property, the Strategy recognizes that IPRs are an important incentive for the development of new products; but, this incentive alone does not meet the need for the development of new products to fight diseases where the potential paying market is small or uncertain.

The Strategy encourages governments to consider new ways to stimulate research and development into health treatment for diseases that disproportionately affect developing countries (element 2) and also to promote transfer of technology (element 4). Examples of potential instruments that need to be explored, according to the Strategy, include prizes to reward drug development, a biomedical research and development (R&D) treaty, and patent pools, in which patent holders share technology to provide a common platform for further innovation.

*Transfer of technology and intellectual property as a recurrent theme in multilateral environment agreements: the case of climate change negotiations*

Inspired by Principle 9 of the 1992 Rio Declaration on Environment and Development[52], almost all multilateral environment-related agreements include a commitment by developed countries towards facilitating the transfer of technology to the developing countries with the view of enabling them to fulfil their obligations under the respective agreement. The United Nations Framework Convention on Climate Change (UNFCCC) offers a paradigmatic case. Since its entry into force in 1994, the demand in this respect by developing countries has been reiterated and proclaimed as one of the most controversial aspect of the agreement and of its successful implementation. At the same time the role of IPRs in the production of and access to mitigation and adaptation technologies and the rapid development and diffusion of these technologies have also been important issues in member states' discussions on forging a global response to climate change (See UNEP et al, 2010).

Technology transfer is one of the pillars of the UNFCCC, the overall framework under which international climate negotiations have taken place in recent years. Article 4.5 of the Convention –mirroring other MEAs- requires developed countries to "take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to environmentally sound technologies and know-how to other Parties, particularly developing country parties to enable them to implement the provisions of the Convention."

The Bali Action Plan of 2007 reaffirmed the centrality of technology development and transfer emphasizing the need for effective mechanisms for "scaling up of the development and transfer of technology to developing country … in order to promote access to affordable environmentally sound technologies".[53]

The 2010 Cancun conference of the Parties sought to implement this objective in concrete terms and to that effect agreed to create a new Technology Mechanism for enhancing the transfer of climate-friendly technologies, particularly to developing countries. The Mechanism is composed of two main bodies: the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). Nevertheless, the agreement to establish the Technology Mechanism represents an important milestone in the ongoing efforts to implement the technology transfer provisions of the UNFCCC and the Bali Action Plan. It has the potential to become a springboard for developed and developing countries to work together in order to accelerate the deployment and transfer of technologies for climate change mitigation and adaptation.

[52] Principle 9: States should cooperate to strengthen endogenous capacity building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies.

[53] Paragraph 1(d), Bali Action Plan, UNFCCC (2007).

The Technology Mechanism is a recent development in this long march to untangle the transfer of technology conundrum. Here we could witness an attempt to delink the discussion from the divisive issue, at least in multilateral forums, of IPRs, notwithstanding the fact that IPRs have traditionally been seen as the primary policy mechanism for encouraging private investments in innovation, including for the production of mitigation and adaptation technologies as particularly advocated by industry. But in the context of the UNFCCC negotiations, not only has no agreement been reached in this area, but also the path to a constructive and meaningful discussion continues to be elusive.[54]

## 5. RECONCILING TECHNOLOGY TRANSFER WITH THE CURRENT GLOBAL REALITY

At the outset of our analysis, we raised two fundamental questions: do international negotiations on technology transfer and results achieved thereunder correspond to country level technological needs, and to the growing insights on how technological change takes place? And, how and through what ways can international discussions on technology transfer be made to reflect both the lessons accruing from the experiences of developing countries in recent times as well as the changing global environment for knowledge and technology in times to come?

The analysis in the paper shows that the international discourse on technology transfer has been permeated by the North-South dichotomy since its inception. From our analysis in previous sections, one could list out several reasons for this. Of the many, it would not seem wrong to conclude that IPRs protection has been one of the most important factors. The gradual but definite emphasis on the global protection of IPRs has been accompanied by divergent political aspirations of countries on the issue of technology protection and technology access. A closer look at the evolution of technology transfer negotiations suggests that developing countries' claim for better access and technology transfer has perhaps been a reaction to developed countries' emphasis on stricter standards of protection and enforcement of IPRs.[55]

Against the new realities, both empirical (as what we now know of the links between trade, technological change and development opportunities) and policy oriented, the issue of technology transfer has certainly acquired new dimensions. In this newer dimension, technology transfer is not simply a political rhetoric voiced in return for IPR protection, but a real concern to narrowing policy space in developing countries to promote opportunities for economic catch-up.

In the current global reality, technological divide manifests as a developmental divide, and the implications of intellectual property and TRIPS-plus developments on economic development as illustrated by recent bilateral and plurilateral trade agreements (e.g. PTAs and ACTA), is well beyond what policy makers could have imagined in the 1960s. Acknowledging the new and important relevance of the issue of technology transfer in the global landscape, one is all the more forced to ask the

[54] See Abdel Latif et al (2011).
[55] See Maskus & Okediji (2010).

critical question: does the technology transfer discourse, in form and content, as it stands today caters to the needs of the countries and to global welfare as a whole?

### 5.1 The incorporation of empirical country-level insights into policy discussions on scope and content of 'technology transfer'

On the positive side, there is definitely some newer thinking evident within the technology transfer discourse on the meaning and scope of what constitutes 'transfer'. This critical assessment of what actually constitutes transfer and how it can be defined and measured is influenced to a large extent by emerging empirical evidence on how sectors and firms access knowledge and how technological change does in fact occur. A summary of ongoing discussions shows that the definition of transfer of technology has gradually expanded to include tacit-know as a clear and important component, thus moving away from the older, arcane discussion on technology in the form of machinery, equipments and blueprints.

Technology transfer thus understood would be wide enough to encompass transfer of technical information, tacit know-how and performance skills, technical materials or equipment, jointly or as individual elements, with the intent of enhancing the technological capacity of the recipients (WIPO, 2010). Such transfer can take place within a variety of configurations, including public and private, institutional and individual, formal and informal, through partnerships and joint ventures, and within and across national borders.

But at the same time, many issues remain. How does one measure technology transfer, and what of these activities constitute technology transfer as opposed to mere scientific cooperation? Ways and means to measure such tacit know-how exchange remains a very controversial issue. These are evident in some of the controversial discussions in the various international processes analysed in this paper. This important question is yet to be tackled.

Another important aspect that has not been considered is articulating the precise role of technology transfer in building innovation capacity within countries, and in alleviating impediments to technological learning and diffusion at the national levels. In its defence, it should be acknowledged that this has been a difficult task, since it calls for interfacing the international with the national domains. One could always argue that how technologies transferred interact within national systems to build learning and innovation capabilities are not an international issue. However, it is the main issue that has occupied countries: How can technologies be transferred *with the intent of* building local technological capacity? If there is no way through which one could ascertain how particular activities on technology transfer facilitate the goal, how can such activities be designed and measured? It is time to recognise that there is a very important link between international efforts to gain traction on technology transfer and national efforts to build innovation capacity.

The East Asian experiences for instance, carried this very important lesson – their success was possible, among other reasons, as highlighted earlier on in the paper, through efforts that aimed at building national technological capacity. Technologies transferred fed into this process that was already ongoing. This essential insight is however not factored into the earlier discussions on the Code, and now the more recent debates particularly in WTO, WIPO and climate change.

Worrisomely, technology transfer still continues about internationally ensuring an obligation to transfer technology excluding facilitating its active and important inter-linkages with national innovation capacity. Building innovation capacity and addressing the impediments to technological learning and diffusion calls for policy action at various levels – from improving education and human resource endowments to promoting enterprise development, to collaborative learning – many of which will take decades. Not only are some of these hard to monitor from an international perspective, they also entail problems that span beyond simply the transfer of technology (Gehl Sampath, 2012). But at the same time, technology transfer has to fit into a broader scheme of building technological capacity and therefore has to be understood in more dynamic terms. While acknowledging the importance of technology exchange through well-established means - including imports of machinery and equipment, trade in goods, licensing and scientific collaboration such as joint research and research partnerships – it should clearly fit within the broader aim of support national innovation systems in developing countries.

### 5.2 From generalities to practicalities: the key outstanding issues

Given that technology transfer remains as important if not more to the developing countries, it is really critical to draw lessons and find constructive ways to move the policy dialogue forward. The development divide is pervasively influenced by technological deprivation and the urgency to address technological access and innovation issues of relevance to the poorer countries cannot be emphasized enough.

A review of the international political economy of technology transfer negotiations as conducted in this paper shows that fifty years since its introduction, the international community is still grappling to come to terms with some of the key issues in the technology transfer discourse. Our efforts to trace back the key polarising factors leads us to conclude that there are (and have been) two separate narratives on technology transfer. The first one focuses on whether technology transfer should be viewed as an international, multilateral issue. A second narrative on technology transfer has been linked to and promoted by the growing proliferation of IPRs. The recurrent argument made by industrial countries, as discussed in this paper, is that providing an appropriate enabling environment through the protection of IPRs is a better alternative than a moral, binding agreement. With the growing importance of IPRs, technology transfer has become a key issue in a variety of global forums, on issues including health and climate change.

On the first key narrative, which poses the question of the multilateral or national domains, this paper shows that technology transfer is clearly both an international and national issue. It has been often the failing of technology transfer approaches in the past that the focus has been on simply providing 'access' to technologies without facilitating aspects of such improved access, namely, promoting know-how exchange and the development of indigenous technological capabilities. The success of the technology transfer processes lie not in how many international obligations exist for the purpose, binding and non-binding, but rather on how the international obligations are structured around ground realities of technology acquisition and use processes. Financing of technology transfer is also a very critical aspect, which is often not considered in its entirety. The technology mechanism under the UNFCCC does incorporate some of these aspects, thereby signalling a new hope, but moving towards operationalizing the technology mechanism has been an uphill task mainly due to the tendency to lapse into bureaucratic language on the question of technology transfer (see box 7 below).

Box 7

**The new approach to technology transfer in the climate change technology mechanism**

For the first time, the technology mechanism seeks to address and incorporate some of these important realities of technology development, chiefly the importance of know-how for development of endogenous capabilities to promote diffusion, adaptation and innovation in climate change technologies. Some of the key terms in this undertaking are 'technological needs', 'transfer of technology', 'diffusion', 'technology action plans', 'development of endogenous capacities', 'know-how', 'collaboration', 'network', 'adaptation' and 'innovation'.[56] The notion of technology development and transfer enshrined in the technology mechanism spans 'different phases of the technology cycle' from the key phases of acquiring information, assimilation and absorption of technological knowledge, to adaptation to local conditions, to absorption of subsequent improvements and the dissemination of the transferred knowledge, thereby jointly account for the complex process of technology transfer.

Owing to this longstanding bias to brand technology transfer as either a 'national' or 'multilateral' issue, a large part of these debates tend to focus on technology transfer in the static, old-fashioned sense. Little attention has been paid to how it can correspond and help promote technological change in the recipient countries.

On the second narrative on technology transfer that has focused on IPRs, truly, the new, somewhat fluid boundaries of IPRs carry profound implications for economic catch-up of developing countries. IPRs can limit catch up possibilities by (a) promoting patenting of incremental innovations that simply extend patent life on

[56] Paragraphs 113 to 121 of Decision 1/CP.16 of COP 16 on the Outcome of the work of the Ad Hoc Working Group on long-term Cooperative Action.

products and processes without an emphasis on the presence of 'inventive' activities and/ or by (b) increasing the subject areas over which such exclusive rights can be granted, and (c) raising issues of how technology of relevance to their development can be accessed and technological capacity of countries can be promoted.

## 6. WAYS TO MOVE FORWARD: SOME CONCRETE SUGGESTIONS

In order to move forward with the discourse in a constructive way, a starting point would be to acknowledge that these issues cannot be discussed in polarized terms of providing technology transfer in return for ongoing trends in global IPR protection, or simply granting IPRs in the hope of eventual technology transfer. Currently, this remains the case, as demonstrated for instance, by the notion of 'flexibilities' in the IPRs discourse. Focusing exclusively on IPRs, the idea is that countries wishing to promote local industrial development can use 'flexibilities' in the system. If the notion of IPRs is a 'rights-based' notion, it remains unclear as to why the 'flexibilities' are also not addressed and given the same importance as rights. In a rebalanced world, 'flexibilities' would not be viewed as concessions but as rights of countries to ensure economic development similar to how IPRs are currently viewed. This would also be in spirit of Article 7 of the TRIPS Agreement.

The critical linkages between technology transfer, IPRs and economic development are three-fold and need to be internalized into the existing political economy of technology transfer.

First and foremost, technology transfer is both a multilateral and national issue and needs to be addressed at these dual levels. Multilateral obligations and state commitments are important because the private sector does not have automatic incentives to transfer technology to developing countries. At the same time, it calls for national coordination and action because no amount of technology transfer from the outside can promote national capabilities without creating the requisite conditions for technological learning and absorptive capacity within countries.

Second, any effort to unpack the current intellectual property system for technology transfer needs to refrain therefore from tackling technology as a static and independent issue. In many ways, there is a need to address and answer the issues that remained unanswered in the Code negotiations. International negotiations in all areas of global public interest such as health, agriculture[57] and more recently, climate change as discussed in this paper all stand to reach an impasse on the same issues today as they did during the Code negotiations:

a. how can we define technology transfer?
b. how can technology transfer be measured and assessed?
c. how can developed countries/ industrially advanced countries be held accountable in fulfilling their obligations relating to technology transfer?

[57] Discussions under the UPOV Convention (1991) Version, the rights of farmers in developing countries and the sui generis option under Article 27(3)(b) of the TRIPS Agreement.

Some aspects of the Code seem highly applicable to the reality of technology accumulation and change even today and call for how these can be integrated into the current discussions without lapsing back into ideological frontiers that have undermined this discourse. Of note among these are the aspects of the Code that dealt with how technology transfer is indeed the "…systematic knowledge for the application of a process", thereby focusing on tacit know-how, and on the fact that innovation was not only product-related, but process or service related.

Currently, as evidenced by the Climate Change negotiations on the Technology Mechanism (TM), the difficulties in resolving these issues at a broad general level, has led to the segmenting of these issues into sectoral terms. The progress made in the TM in resolving several of these issues of definition and scope lend strength to the hope that such a result is possible more broadly as well. Moving ahead with a more balanced view of rights of all countries in enabling technological capabilities building at the multilateral level will also further strengthen the efforts and the promise of these sectoral initiatives, such as the TM.

Finally, there is a critical link between international trade and technological development. Countries tend to benefit from IPRs as they integrate themselves into competitiveness-based trading patterns. In other words, greater IPRs protection is useful because they engage in more international trade and not vice-versa.[58] This in our view is the most important issue that needs to be tackled. For a large number of developing countries, globalization and trading opportunities therein have not induced the requisite conditions for structural change of a productivity enhancing nature across all developing countries; contributing to an increase in the technological divide. Even when they trade, they do not trade goods that are proprietary in nature, and hence do not benefit from the knowledge economy.

Most developing countries have especially managed to penetrate low technology manufactures and medium technology manufactures to a large extent over the past decade but high technology manufactures still remains the forte of a few developing countries concentrated in the South East Asian region.[59] Many other developing countries are faced with a middle income trap as a result of the inability of economies to constantly technologically upgrade and innovate from middle to high technology domains. These patterns of integration are technologically diminutive and create perverse locking-in effects, especially for those countries that are stuck in natural resource exports or low technology manufactures because these markets are not dynamic.[60]

[58] Lerner (2002) notes this in a review of the shortcomings of current economic approaches.

[59] Ocampo & Vos (2009) in this context note that already as of 2000, developing countries accounted for 50% of all global low value manufactures. While participation in medium technology manufactures increased, this was concentrated in the South East Asian and Latin American developing countries and high technology manufacturing was accounted for mostly by the South East Asian developing countries (including China).

[60] See United Nations Conference on Trade and Development (2010) for a discussion on the technological downgrading evident in LDCs over the period 2000-2008 with an increased concentration on commodity trade and low end manufacturing within global value chains.

Therefore it is imperative that all discussions on technology need to be conducted in conjunction with trade and IPR issues. Technological access and upgrading, as our analysis shows, is not only dependent on availability of technologies, but on availability of trading opportunities and export patterns which are important in shaping structural transformation of countries. Furthermore, technological access and transfer is not only an issue of ensuring a moral/ level obligation in policy. Ultimately, it has to occur with extensive involvement of the productive sectors in both the developed and developing countries. A balance between trade, technology access and IPR protection is the only way forward.

We are of the view that there is no better occasion that the 50$^{th}$ anniversary of the UN debates on technology transfer to review the past and derive lessons for the future. A most important lesson that emerges is that all actors need to engage in taking a leap forward in closing the circle and inaugurating a new chapter in advancing solutions that lead us to a common goal: bridging the technological gap for a prosperous tomorrow for all.

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