Samuel Neaman Institute
For Advanced Studies In Science And Technology

India-Israel Collaborative Business Innovation: An examination of its potential and the forces that shape it

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(Program performed 2004 – 2009)

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TABLE OF CONTENTS

Abbreviations

BIRD, Israel–US Binational Industrial R&D Fund; **3IP**, India Israel Innovation Program; **ICT**, Information and Communication Technology; **IP**, Intellectual Property; **I4RD**; India- Israel Industrial Research and Development Cooperation Initiative; **OCS**, Office of the Chief Scientist of the Ministry of Industry, Trade and Labor; **R&D**, Research and Development; **SNI**, Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion, Israel Institute of Technology; **STE**, Science, Technology and the Economy (a SNI program); **VC**, Venture Capital.

MANAGEMENT SUMMARY FOR 3 IP REPORT

Introduction and background

This paper summarizes the rationale, outlines, and interim findings of a research program at the Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion – Israel Institute of Technology (SNI) that was dedicated to the study of the potential for collaboration between Israeli and Indian business partners. The fundamental issue addressed by this program is the formation of collaborative business structures among economic entities of asymmetric economies, namely, India and Israel, as well as the processes and the disciplines that structure the behavior of tiny and specialized economies in a global web of economic clusters. The program places particular emphasis on the processes and public policies within which international links and bilateral agreements are formed, established, and maintained and the forces that facilitate their formation or inhibit their success.

Main Findings and achievements

It lays the rationale for the India Israel Innovation program, initiated by SNI in 2004. Through 2009, when the main effort of the project ended, the groundwork was laid. A network was built, comprising individuals from academia, industry, government and organizations in both countries and in the US. Two workshops were held, one in each country. Visits were made by individuals and delegations. Information was disseminated via publications, the internet, public lectures and meetings. The program contributed to the creation of important links between Israel and India.

The program provided information and benefits to both countries and an important opportunity and platform for key practitioners and decision makers from India to acquaint them with the Israeli innovation system and to personally meet key people in Israel, and to make use of this information in their work in India. It is not possible to quantify the impact of this increased familiarity, but we assess it to be significant.

What's Next?

This report can be viewed as a complement to wider work performed later independently with SNI, entitled “Israel 2028: Vision and Strategy for Economy and Society in a Global World”, submitted to the Government of Israel in March 2008. The 3IP program was an attempt to work towards an important national task

mentioned in the 2028 report, namely to develop policy guidelines within the context of the globalization of R&D, and specifically for Israel-India cooperation.
In view of the importance of accelerating the India Israel scientific and industrial collaboration, we plan further work in the near future in cooperation with the Israeli government.

SYNOPSIS

1. Background

A Free Trade Agreement (FTA) is currently being negotiated between Israel and India. Both sides forecast that the FTA will potentially triple the trade from the current level of $5 billion to $15 billion within four-five years.

It will be a huge challenge to both countries to meet this target of $15 billion annual trade. The challenge is even larger because a large part of the existing trade is in diamonds; it will be far more complex to achieve higher levels of trade in non-diamond areas.

We consider that in order for Israel to meet this challenge – and huge opportunity for economic expansion – it will be very beneficial that there be active and close cooperation between the sectors of the Israeli economy: industry, government, academia and supporting organizations, and, of course close collaboration with parallel entities in India.

Many of the leading industrial countries are rushing to build and expand their relationships with India. In this competitive environment, Israel should not fall behind.

2. 3IP: India-Israel Innovation Program

The above is a key part of the rationale for the India Israel Innovation program initiated by SNI in 2004. Through 2009, when the main effort on the project ended,

the groundwork was laid. A network was built, comprising individuals from academia, industry, government and organizations in both countries and in the US. Two workshops were held, one in each country. Visits were made by individuals and delegations. Information was disseminated via publications, the internet, public lectures and meetings. The program contributed to the creation of important links between Israel and India.

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As can be seen from the references section and Appendix E, there are a large number of reports and publications about India produced all over the world. However, there is still a large information gap regarding Israel, in India, such as that country's economic, scientific and technological status; potential areas for cooperation; obstacles which need to be overcome to realize such cooperation; and platforms available to do this. Multiple players and programs are needed to fill this large gap.

3. What Can Israel and India Do?

Leveraging comparative advantages and synergies between countries is complex and requires various platforms and infrastructure which in turn are complicated to define and configure. This is all the more true because the economies of Israel and of India are so different.

While the GDP of India is far bigger in absolute terms, GDP per capita (PPP) in India is $3,700 and in Israel $31,000 (2011 figures). The bulk of India's high tech exports comprises various sophisticated forms of IT services and business process outsourcing. Indian firms practice process innovation to reach extremely high levels

of efficiency, and several firms have attained the highest possible international quality standards. Product innovation is less pervasive. Compared to that situation, a large proportion of Israel's exports originate from indigenous product innovation, often involving "cutting corners", and based on an innovation eco-system which is recognized as being unique worldwide. (The publication of "Start-Up Nation: The Story of Israel's Economic Miracle" in 2009 has brought world-wide attention to that phenomenon). In India, for the most part, there is little cooperation between government and industry. In Israel, on the other hand, the close relationships between government and industry are a key feature of the Israeli innovation eco-system. Israeli government programs for the commercialization of industrial R&D, directed by the Office of the Chief Scientist, are the envy of many countries around the world. International R&D cooperation is managed for the OCS by Matimop. (Just how unique is Israel's success with these programs has been shown by Prof Josh Lerner from Harvard in his book "Boulevard of Broken Dreams: Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed – and What to Do about It"). In India, most R&D is performed inside government labs. The task of commercialization of that University research ("technology transfer") is difficult, and relatively rare. In Israel, on the other hand, technology transfer is a well trodden path relatively, e.g. several blockbuster drugs have emerged from such cooperation. Israeli firms have to be global from day one because almost the entire market for any product, in a country of 8 million, lies overseas. The Indian local market, by contrast, is huge. Israeli firms excel in innovation but are generally unable to grow beyond a certain size. Indian firms, by contrast, can scale up very easily, and are in many cases already in strategic partnerships with Fortune500 companies, and have global reach. Universities in both countries are world class. However whereas the Indian system produces hundreds of thousands of engineers a year, in its 378 Universities and 18,064 colleges, Israel produces only a tiny fraction of that number, in its 7 Universities and some 60 colleges. The Israeli VC industry is well developed, the Indian VC industry at a different stage of development, given the different needs and path India has chosen.

In fact, the two countries have found many areas for cooperation, as described in the working paper. This can partly be traced to the fact that both countries perceive the relationship with the other to be "non-threatening", and that both see opportunities to grow in tandem.

Regarding similarities, sometimes these can be quite surprising. For instance, the World Economic Forum found, in its 2008 – 2009 Global Competitiveness Report, that, amongst the top three most problematic factors for doing business, Israel and India had two factors in common, namely (a) inadequate supply of infrastructure and (b) inefficient government bureaucracy. So perhaps the countries have more to learn from each other – based on several shared problems (which could be addressed in partnership) than was previously thought.

Indeed, in remarks made in 2008, Prof Manuel Trajtenberg, at that time Chairman of the National Economic Council, Prime Minister's Office, gave a strong endorsement of the subjects being addressed and the work being undertaken in the India Israel Innovation Program.

4. Israeli Stakeholders

Industry: In the final analysis, the sector that stands to gain most from cooperation with India is the private sector. Government initiatives have an important role in "setting the table" so that private firms can realize the benefits of cooperation based on the comparative advantages of each side.

Government: the Israeli government – like many other governments - spends the vast majority of its time and resources on day to day issues and has traditionally found insufficient time for long term planning and strategizing for forecasted new economic developments. The ascent of India over the last decade as a power in science, technology and industry and the opportunities/challenges for Israel in that connection are such a new economic development, calling for special attention. It would be beneficial were the government – the policy maker - to embrace further ways to partner with non-governmental actors such as universities and public policy think tanks, to better deal with such challenges. Many of these NGOs are eager to work with government – under government leadership - to help reach such national goals.

True, until now Israeli high-tech has been successful without widespread, explicit cooperation between stakeholders. Historically, Israel lacked a clear, explicit strategic

level of policy together with an appropriate governance infrastructure as is present in some other countries. Innovation was driven by dynamic entrepreneurs in the private sector - and government provided critical support, without which little would have been achieved. However it is now generally held that this approach should be revisited and updated in the competitive global marketplace.

Academia: As noted above, the differences between Israel and India are very significant, and the changes in the world system with the ascent of India (and China) momentous. This is a good opportunity for new forms of cooperation between government, academia and industry to come into play. The study on technological incubators in Israel and India, performed under the project, is one concrete example of such research collaboration.

5. Highlights of Findings from the India Israel Innovation Program

5.1 Collaboration between India and Israel

Engaging with the East (including India) is far different than engaging with the US and Europe and far more complex, because of deep cultural differences and different ways of doing business.

The world is in the midst of great change, with the center of economic, scientific and technological power shifting from the West to the East. The Israeli elite, who has been, for the most part, educated and trained in the US and Europe, has until now been somewhat reluctant to recognize the magnitude of this change. It appears that this is now changing. (The major industrial powers have reacted in much the same way, as the former President of the World Bank, James Wolfensohn, remarked in 2009). This situation has been recognized by other organizations in Israel, such as the Israel-Asia Center, which stated in 2009 "However, Israel is disturbingly behind in its preparedness for a future in which its partners will not only lie in the West. Israel's increased economic and diplomatic interactivity and dependence on the Asian region necessitates more careful understanding of the peoples, cultures, economic systems and political and social structures of its future Asian partners as it adapts to new geopolitical realities."

A more general call for action was made at the 2009 Caesarea Forum conference in the paper "The Future of Growth Promotion in Israel: A Return to Boosting Avant-Garde Industries and Scientific-Technological Innovation". After reviewing the vast achievements of Israel, from the 1980s through the 1990s, the paper stated: "This leading position of the knowledge-intensive industries…engendered the illusion among policymakers (currently) that the Israeli knowledge-intensive industry was "omnipotent" and served as a "magic bullet" with which it would be possible to break free of any economic crisis…in other words, the prevalent assumption is that this industry is self-sufficient and not dependent upon policy and regulatory factors. In practice, however… the success we have experienced in recent years cannot be taken for granted. The source of the erosion process is the lack of an ongoing process of developing and building suitable infrastructure…it should be noted that the erosion is taking place against the backdrop of mounting global competition, as states such as India…are constantly upgrading their development infrastructure and support systems for knowledge-intensive industries."

During the program we held a number of different events in Israel – mainly public lectures, as well as the workshop held in Haifa in 2005, to promote dialog and disseminate information to interested parties. Several events were held in India – a workshop in 2006 attended by a delegation led by S. Neaman Institute; and two major presentations, at the University-Industry Council Symposium, one held in May 2008 and one held in November 2008 in India. The presentation at the May meeting highlighted the "secrets" of Israeli innovation, with emphasis on the role of universities, as a hopeful basis for Israel-India cooperation. The presentation at the November meeting focused on issues of technology transfer.

5.2 The workings of binational cooperation

Israel is renowned worldwide for the success it has had in establishing and operating binational funds. Such funds exist for binational commercial R&D, for binational scientific research and for binational cooperation in agriculture. The best known of all the funds is BIRD, the Israel-US Binational R&D Foundation, established in 1977 and

having an endowment of $110 million (see Appendix D). The success of BIRD has indeed been exceptional: the cumulative sum of direct and indirect sales of products co-funded by BIRD currently exceeds $8 billion.

India and Israel wish to have a binational R&D fund of a size which is commensurate with the opportunities available. Such a fund, I4RD was established in 2005; however the funds available were extremely limited. Following a visit of the Minister of Industry, Trade and Labor in India, The Office of the Chief Scientist has recently requested that the Israeli government budget NIS 200 million to expand I4RD, hoping that the Indian side would provide the same amount. Should these funds be forthcoming, this will be a development of historic proportions. In 2011 an agreement on a $40 million fund is in final negotiation.

The building of an effective binational industrial R&D fund between India and Israel will by no means be straightforward. The (original) BIRD model is very much part and parcel of the unique Israeli innovation eco-system. Clearly, in other countries "the BIRD model" must be adapted to the conditions, needs, aspirations and decision making structure of that country, as well as to the current international context.

For India, I4RD was a novel concept which had no significant precedents. Our partners in Indian government and academia were acutely aware of that. The 2005 workshop held in Israel included a visit to BIRD and later a meeting with the founding Executive Director. Further discussions were held during the 2006 workshop in India.

How can the building of such a fund be effectively promoted? The project did not undertake a detailed study of this question; however some general observations can be made, based on our discussions with key stakeholders in Israel during the program. Again, Prof Josh Lerner's book serves as a useful guide to the successes and (mainly) failures of such government-backed efforts world-wide.

(a) Regarding binational cooperation, certainly it will not be enough for the two governments to simply sign an agreement and provide funds. As an example - officials and other stakeholders in each country must be firmly "brought on board" and this will be a long process. In fact this process is still ongoing – with difficulties - after 5 years. Israel's competitors have moved ahead in that time. Within the framework of I4RD, the two governments had decided to establish five subcommittees to evaluate the strengths and weaknesses of the industries of the two countries, to jointly design and plan the mutual steps and means required and to generate a common roadmap of activities for the mutual benefit of the two economies. The five technological fields are: biotechnology; nanotechnology; space; water and renewable energy. However, the work of these committees has not proceeded as planned so far. Should the Israeli government approve the request for a vastly increased budget for I4RD, as mentioned above, this would give a welcome boost to all of these efforts.

The Israeli Minister of Finance made a statement in October 2009 about the need to preserve the leadership position of Israel's high-tech, science and technology. He spoke of the importance of re-directing Israel's exports to Asia, particularly to India and China and stated "it is not enough (for the governments) to sign agreements or to establish a binational investment fund, what is needed is to change orientation." Indeed, the recently appointed Director General of the Ministry of Finance is taking concrete steps in this regard.

In our meetings throughout the project we proposed a "double-barreled" effort in which the governments would work with NGOs in the pre-establishment stage of a binational fund and if that is found to be beneficial, perhaps in subsequent stages as well. Such an approach was successful in the BIRD case in the 1970's. In fact, in the I4RD case, various Indian government officials expressly requested that SNI be involved in the efforts to establish and secure I4RD. To broaden the point: the Indian government attached importance to the "science dialog" (their term) led by SNI, even coining it a "test bed" which would, inter alia, help them convince their own government of the necessary steps.

(c) One of the Indian officials with whom we were working in 2005 even went so far as to state that in order for such a novel program to succeed, it would be necessary to expand the discipline of the economics of technological innovation in India. That discipline has existed in Israel for 40 years. Indeed, Profs Manuel Trajtenberg and Morris Teubal are recognized leaders.. Our workshops in Haifa and Bangalore and meetings in New Delhi provided the opportunity for in-depth exchanges on this subject, and the relevant S. Neaman Institute publications were distributed.

(d) Over the last 18 years, many agreements have been signed between the two governments to promote cooperation. In fact no fewer than nineteen such agreements are listed in the appendix to the working paper (see Appendix C). However, actual cooperation on the ground has not developed to the extent expected, and relative to the size of the opportunity. We are hopeful that with the recent spate of reciprocal visits and a new awareness in Israel of the importance of the East, that cooperation will increase. .

(e) During the project, we were asked by the Israeli Ministry of Industry Trade and Labour to help identify some key factors inhibiting such cooperation in binational R&D. Our findings were incorporated into the Joint Study Group Report, adopted by both governments in 2005. Factors included inadequate knowledge in each country of the capabilities of the other; and lack of a support system to bring interested companies of the two countries together and to facilitate their work. Some work has been done since 2005, and much remains to be done to reach the high targets set by both countries.

5.3 Governmental policy making

One of the original aspirations for the India Israel Innovation Program was that the program be a sort of an "incubator" which would make a contribution towards the consensual development of new innovation policy alternatives for Israel. This was discussed with the Chief Scientist of the Ministry of Industry and Trade, who is responsible for Israel's R&D policy, in 2004. It was clear to all concerned in 2004 that the international landscape faced by Israeli high-tech had changed. Maybe this was a good time for some innovation in the way in which Israeli innovation policy was developed, and indeed perhaps in the governance structure itself? A global marketplace called for a new – global – approach to innovation policy making in Israel. After all, at the time of the last major innovations in Israeli innovation policy – in the early 1990s – the international landscape was completely different. Furthermore, in 2004 it was thought that Israel had likely utilized "the ICT wave" extensively, and that it would be necessary to develop new drivers for the next waves of expansion of Israeli high-tech. Indeed, leading academic and industry leaders in Israel supported such an approach and were part of the team who conceived the project.

It seemed that a good place to start would be with the Israel-India relationship, and that a process of mutual learning with India would facilitate and irrigate that thought process.

Later on, Prof Manuel Trajtenberg found that India suffers from a "dual economy" at least as much as Israel does. In fact he considers that India is a "triad economy", in that: (i) 70% of the population is rural; 40% illiterate, living below the poverty level and cut off from the mainstream economy; (ii) The urban population have a much higher degree of literacy, but there is a high rate of unemployment, or the employment is in traditional sectors; (iii) a tiny percentage are employed in the Information and Communication Technology (ICT) sector (notwithstanding that this sector has achieved outstanding world status). He finds that India and Israel are facing some similar challenges, although clearly there are huge differences between the countries: (i) how to leverage the capabilities of the local ICT sector to "lift" the rest of the economy; (ii) how to keep the ICT sector growing, in view of tighter global

competition; (iii) how to improve the primary and secondary education system to produce the human capital necessary for the first two; (iv) how to structure the higher education and the research system, to serve both human capital formation and science and technology (S&T) innovation; (v) ways in which India and Israel could collaborate for mutual benefit in meeting these challenges. In summary, Prof Trajtenberg finds much room for cooperation, such as: (i) combining the large numbers of qualified Indian personnel and access to world markets with Israel's unique experience in high-tech and S&T prowess; (ii) identifying and promoting opportunities to grow in tandem, given the non-threatening relationship for both countries; (iii) much room for cooperation in R&D. He finds that the exchange of ideas and the exposure to diverging points of view nurtures creativity, as does the recombination of existing ideas.

In conclusion: In its 3rd October 2009 edition, The Economist highlights the key role of policymakers worldwide in rebuilding the world economy. We hope that this work and the ideas put forward for further work, have already assisted and will further assist policymakers in Israel and in India in their promotion of innovation and trade.

5.4 Topics upon which work was performed and topics identified for further work by academia and government

(a) Research entitled "Critical Success Factors for Entrepreneurial Projects within Incubators: A Comparative Study of Israel and India" by Prof Shlomo Maital, Prof DVR Seshadri, Shmuel Ravid and Alon Dumanis was published. The authors state that although business incubators are found all over the world, no viable integrative theory of effective business incubation exists. Their research outlines a grounded theory of incubation, driven by case studies, empirical results and field work, based on three main principles that generalize across countries and cultures.

(b) Framework for Studying Strategic National Innovation Policies. This work is being performed by Prof Morris Teubal (Israel) and Prof YS Rajan (India). The objective of the research is to generate a general framework concerning the nature of the changes in both the policy portfolios of both countries and in the underlying

policy processes and policy institutions.Results of this work were recently published by Morris Teubal and Odeda Zlotnick.[1]

(c) Development of rural India: opportunities for cooperation with Israel. Under the initiative and leadership of Dr Martin Sherman, a study was conceived to guide and facilitate policy and cooperation, and a brainstorming session held with about 30 potential Israeli stakeholders in 2008. In 2009 an unrelated program ("Shavit") was launched by the two governments specifically targeting – inter-alia – the agri-business sector.

(d) Affordable drugs. We see the potential for the two countries to collaborate towards the development of affordable drugs for the worldwide market. The originator of the idea was Prof Samir Brahmachari who is currently Director General of the Council of Scientific and Industrial Research, Government of India. Potential partners in this research project were identified in Israel, India and the USA and a series of meetings held. One hopes that the start we made will be pursued in future years.

(e) Identifying effective ways of managing intellectual property rights (IPR). During the activities of the India Israel Innovation Program we found that IPR is to some extent deterrence to the creation of new ventures. Greater attention by companies to the cultural differences relating to legal matters in the two countries will help reduce this deterrence. We find a need for research, e.g. to put forward and promote discussion about guidelines and models that companies could follow to prevent IPR issues from holding up commercial negotiations. Potential partners in this research project were identified in Israel and the USA and several meetings held.

(f) The following goes beyond the context of Israel and India, although the study would directly and indirectly benefit India-Israel cooperation as well. We have seen that despite the striking differences between them, beneficial forms of cooperation through R&D have been conducted between Israel and India. In fact, Israel – in the person of the Office of the Chief Scientist - is currently successfully conducting binational R&D cooperation with more than twenty foreign countries. As stated above, Israel has a unique record worldwide in this respect. Naturally, there will always be differences in background and characteristics between the

[1] "Strategic Innovation Policy". STE Working Paper 44, 2011. S. Neaman Institute.

two countries in any binational partnership. It would be useful to analyze the ways in which binational cooperation is affected by these differences. The core of such a study could analyze the variety of cooperation across the twenty or so cases currently ongoing. The insights from such research could serve Israeli policymakers and others, as well as practitioners in other countries. A key point of reference in such a study would be to refer to the success of the original model of all Israeli binational R&D cooperation, namely BIRD, the Israel-US Binational R&D Foundation. All the other binational funds are in effect "clones" of that original fund. This study – as others – would ideally be performed as a joint effort, with the Government, and with BIRD.

(g) Studies at the level of the firm and the industry. Examples: (i) Variations in the division of labor in business collaboration between an Israeli and an Indian firm. This subject was addressed by Prof Shlomo Maital and Prof DVR Seshadri in their work within the context of the project. (ii) Approaches to the management of multi-cultural teams in global companies. We provided some assistance to a team of Israeli academics who are researching this subject.

(h)

(i) (h) A sophisticated approach is necessary, for cooperation between the Israeli government and NGOs (e.g., academic and other organizations) to be effective. It would be well for this subject to be investigated by joint working teams. At the very general level, one relationship which has been praised for its effectiveness is that between the Government of Israel and the Jerusalem-based Myers-JDC-Brookdale Institute, on subjects of social welfare. Another pertinent subject for research is to map ways in which cooperation between NGOs themselves can be encouraged. Such cooperation is often necessary to create a critical mass of effort. Furthermore, such inter-NGO cooperation can be useful where the scope of the work is multi-disciplinary and goes beyond the core expertise of a specific NGO. It would be ideal for such a study to be conducted as a joint effort with the government.

INTRODUCTION

1. Background

Innovation is the ever intensifying preoccupation of business people, national economists, and policy makers today. One intriguing source of innovation is the re-shaping of business processes and activities to take advantage of the tidal wave of *globalization*. While globalization may take on different practical meanings, our focus here is on *global arbitrage*, namely the transformation of distinct resource availability somewhere in the world into competitive advantage for a firm, regional, and/or national economy. There is a widening recognition that no economic activity today can be fully understood, designed, and managed without proper consideration of its global context.[2]

The Israeli perspective on globalization highlights an interesting question, namely, the Israeli economy has become a **world-class, recognizable, and distinct,** yet, **small** player with perhaps a unique value proposition in the leveled economic field of the flat world. It is a very small economy – an "economic condition taker" – in a world dominated by a few huge economies, the US, European Union, China and India (*Chindia*). Indeed, *Chindia*, as the block of countries which colloquially defines *globalization*, forms the focal point of many studies of the significance and practical ramifications of globalization. Yet "the world" (for whatever it may mean) values Israel as a proven and reliable source of technological innovation and seeks ways to tap into its distinct reputable resources.

This paper summarizes the rationale, outlines, and interim findings of a research program at the Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion – Israel Institute of Technology (SNI) that was dedicated to the study of the potential for collaboration between Israeli and Indian business partners. The fundamental issue addressed by this program is thus the formation of

[2] Worldwide economic conditions have changed dramatically since the start of the 3IP India-Israel Innovation Program in 2004 – namely a worldwide recession and the start of a recovery, with a "reshuffling of the globalization cards". We believe that this makes the work performed under the program or identified as future work all the more relevant.

collaborative business structures among economic entities of asymmetric economies, namely, India and Israel, as well as the processes and the disciplines that structure the behavior of tiny and specialized economies in a global web of economic clusters. The program places particular emphasis on the processes and public policies within which international links and bilateral agreements are formed, established, and maintained and the forces that facilitate their formation or inhibit their success.

The particular context of the program is the economic relationships between India and Israel. These ties have grown dramatically since the establishment of diplomatic relationships between the countries more than 18 years ago. Yet there is a widely held perception that these relationships should be examined within, say, a 5 year time-window, a closing window of opportunity for Israel to establish the sustainability of its value proposition viz. the Indian economy. Further, there is a widening belief that missing that opportunity may adversely affect the well being of the Israeli economy. This belief is held even more strongly in the post-2008 world.

A Free Trade Agreement (FTA) is being negotiated between Israel and India. Expectations are that the signing of an FTA will potentially triple the trade from the current level of $5 billion to $15 billion within four-five years. The challenge of meeting those ambitious figures presents another concrete context within which the program can be viewed.

The above identifies a need for an informed basis to support the formulation of public policy as well as national incentive schemes, both in Israel and in India. There is a need to identify and study possible corresponding "market failures" in the collective response of individual businesses to the above opportunities and threats. In particular, the accumulated opportunistic response of individual enterprises to the new global economic conditions may miss the required repositioning of the Israeli economy viz. India.

In that light, the India-Israel Innovation Program, launched by the Samuel Neaman Institute (SNI's "3IP" or, simply, the program or the project), is an independent research effort that seeks to help pave the way to developing a national interest into elements of a sustainable action plan involving business, government, and academia

in both countries, in support of India-Israel business collaboration in the context of the globalization of research and development (R&D).

The work performed under this program in some ways complements other work performed independently at SNI, entitled "Israel 2028: Vision and Strategy for Economy and Society in a Global World", submitted to the Government of Israel in March 2008. The 3IP program attempts to work towards an important national task mentioned in the 2028 report, namely to develop policy guidelines within the context of the globalization of R&D, and specifically for Israel-India cooperation. [3]

When we conceived and later set out on the project in 2004, we sought cooperation with the Office of the Chief Scientist (OCS) at the Ministry of Industry, Trade and Labor. Although the OCS and SNI agreed to work cooperatively on this program, formal agreement was never reached, and in 2006 SNI proceeded to implement the program on its own resources.

2. Structuring Collaborations and Interdependencies in the Flat World

Underlying the decision to launch the program in 2004 was a keen understanding that the impact on the world economy as a result of the growth of India (and China) is enormous, and that, furthermore, never before in history has an underdeveloped country – India, in this case – become a central player in global markets of advanced technology products in such a short time, without having progressed through the various development stages, as did Western European countries, Japan, and the USA.

"The likely emergence of China and India, as well as others, as new major global players – similar to the advent of a united Germany in the 19th Century and a powerful United States in the early 20th Century – will transform the geopolitical landscape, with impacts potentially as dramatic as those in the previous two centuries."[4]

[3] See also Manuel Trajtenberg, "Innovation Policy for Development: an Overview", Science, Technology and The Economy Program (STE) Working papers Series STE-WP-34-2006, July 2006.
[4] "Mapping the Global Future": Report of the CIA National Intelligence Council's 2020 Project", December 2004

Tom Friedman has *de facto* defined the contours of the globalization discourse. In *The World is Flat,* he recognizes the following *flatteners*:

- The collapse of the geopolitical order in 1989
- The commercialization of the internet from 1995
- The development of work flow technologies
- The change in relationships between center and periphery in networked organizations
- The growing sophistication of re-division of labor ("outsourcing" and "insourcing")
- The broadening of the scope of search for outsourcing opportunities ("offshoring")
- The holistic and integrative approach to the management of enterprise resources ("supply-chaining")
- The dramatic change in access to, search and discovery of and consumption of information
- The dramatic change in the extent of being digital, mobile, personal, virtual

In a 2004 article entitled "Losing Our Edge?"[5], Tom Friedman writes: "I was just out in Silicon Valley…I did detect something I hadn't detected before: a real undertow of concern that America is losing its competitive edge vis-à-vis China, India, Japan and other Asian tigers…; we are actually in the middle of two struggles right now…a competitiveness-and-innovation struggle against India, China, Japan and their neighbors…we are completely ignoring the latter". Friedman concludes hoping that Congress would start thinking about a national competitiveness strategy.

We believe that if this is true for the US, it is doubly true for Israel. This trend has only accelerated since 2004; for example see the report by the Information Technology and Innovation Foundation in February 2009 entitled "The Atlantic Century: Benchmarking EU and US Innovation and Competitiveness", which argues that the competitive edge of the US has eroded sharply over the last decade.

[5] New York Times, April 22, 2004

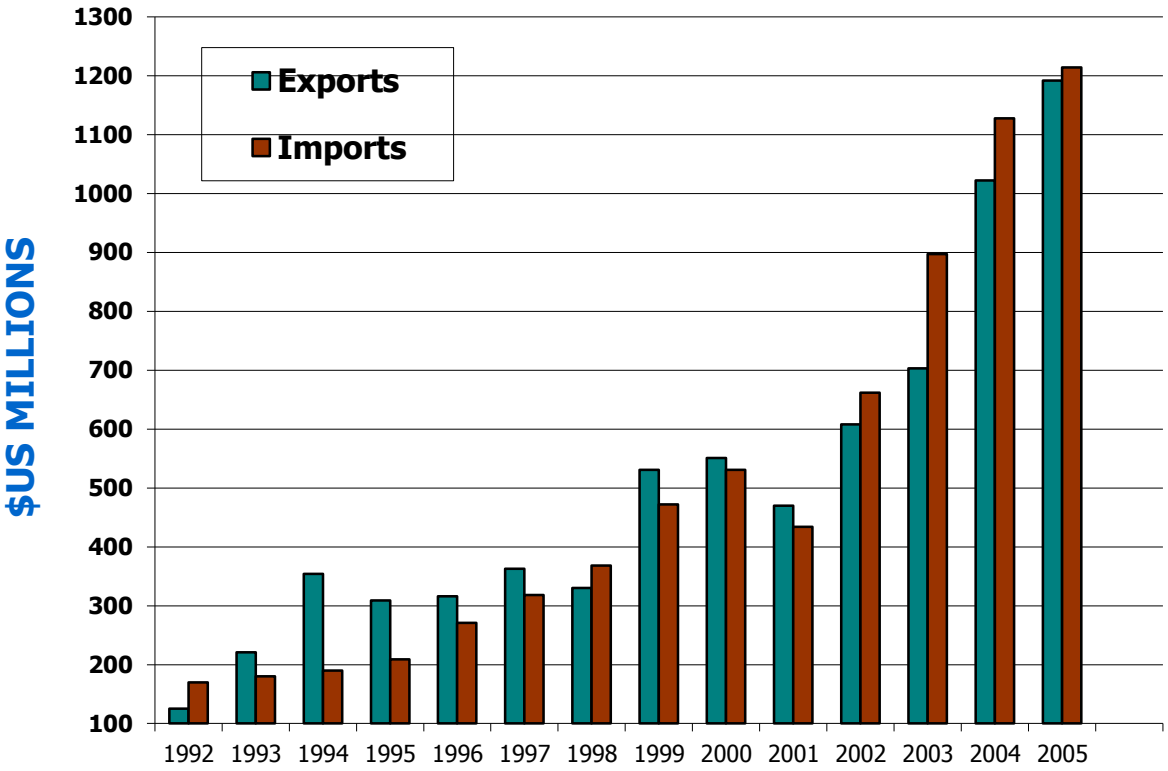
3. India and Israel Business Cooperation

India is one of the world's largest economies, with a gross domestic product (GDP) for 2009 of $1,468 billion and purchasing power parity (PPP) of $3,876 billion. In terms of size, India dwarfs Israel, whose GDP for 2009 of $199 billion with a PPP of $207 billion. For a fuller comparison of the economies of Israel and of India please see Appendix A1 (World Economic Forum Global Competitiveness Report for India 2008-2009) and Appendix A2 (World Economic Forum Global Competitiveness Report for Israel 2008-2009).

The huge future potential of India and the huge obstacles it must overcome to reach that potential have been described in detail elsewhere; see for example, Global Economics Paper No. 169 by Goldman Sachs from 16 June 2008.

The development of trade relations between India and Israel is evident from the rapid growth in bilateral imports and exports, as shown in the following chart.

The Development of Israel-India Trade Relations[6]



There is already a great deal of business cooperation between India and Israel, however, a large percentage of that is represented by diamonds. There is room for far more non-diamond trade. Some notable cases of the existing cooperation that indicate its range and depth are:

Information and Communication Technology (ICT)

- Aladdin Knowledge Systems (with CIITE) (internet security). Aladdin Knowledge Systems is now a fully owned subsidiary of SafeNet Inc.
- Amdocs Ltd. (billing systems)
- Comverse (telecommunications systems)
- ECI Telecom (telecommunications systems)
- FTK Technologies (with C_DAC): virtual computer keyboard
- Gilat Satellite Networks (satellite systems)
- Magic Software Enterprises (enterprise software)
- NDS Israel (digital pay TV access systems). Cisco has announced its intention to acquire NDS Group Ltd.

[6] Source: Ministry of Industry, Trade and Labor, Foreign Trade Administration.

- Ness Technologies (information technology (IT) services)
- SKY Mobile Media (telephony software systems)
- Tata Consultancy Services (Israeli subsidiary) (IT services)
- Tower Vision (wireless telecommunications systems)
- Veraz Networks (Voice over Internet protocol (VoIP) systems)

Pharmaceuticals and biotechnology

- Target-In (biotechnology-based pharmaceutical products)
- Teva Pharmaceutical Industries Ltd. (generic pharmaceuticals)

Chemicals, Agriculture and Water, Environment and Rural Development

- IDE Technologies Ltd. (desalination)
- NaanDan Jain Irrigation
- Netafim Drip Irrigation
- Plasson (plastic pipe fittings)
- Tahal Group (water resource engineering and planning)

Miscellaneous

- Alliance Tire Company
- Baharti dance show (entertainment)

Defense (not included)

The relative strengths and complementarities of the Israeli and the Indian clusters suggest many areas of potential collaboration. Until the worldwide economic crisis which started in 2008, many deals were already underway in the various categories. This has now been reduced. Areas of collaboration include: finance and venture capital; insurance; real estate; infrastructure in the areas of energy generation, transport, health (hospitals, medical clinics and nurses' colleges), commercial and residential property, and retailing; logistical centers; movie industry; entertainment; education and training at all levels; aviation and aeronautics; space technologies and services; direct retail operations; health care and medical equipment and services; and the food and dairy sectors.

A detailed report on the areas of cooperation and of the impediments to cooperation can be found in the Israel-India Final report of the Joint Study group, 10th November 2005, also available on the website of the Indian Embassy in Tel Aviv at www.indembassy.co.il

INITIATION OF THE 3IP INDIA-ISRAEL INNOVATION PROGRAM

While the origins of the 3IP India-Israel Innovation Program as an organized effort can be traced to the Science, Technology and the Economy (STE)[7] Program of SNI and to the work of Prof. Morris Teubal, it evolved in the context of developing diplomatic and economic relations between India and Israel.

Israel and India established diplomatic relations on January 29, 1992. Over the following two years, a number of agreements were signed to initiate cooperation in diverse areas including the economic, academic, and cultural realms, and the fields of science, technology, health, medicine, agriculture, telecommunications, and post. In 1996, the level of commercial and financial cooperation between the two countries was expanded, with agreements to promote and protect investments, to avoid double taxation and prevent tax evasion, and to cooperate in customs matters. That year also saw a work program signed for cooperation in science and technology, and an umbrella agreement reached on cooperation in R&D. In 2002, technological cooperation was further expanded with several memoranda of understanding signed concerning cooperation in the areas of electronics, information technology, and peaceful uses of outer space. These interactions reached their peak with the visit to India by the Prime Minister of Israel, Ariel Sharon, in September 2003 and with the signing of the Delhi Statement on Friendship and Cooperation. The Delhi Statement of 2003 was followed by more meetings between senior representatives and officials from the two countries through 2004. At the end of that year, the two countries signed

[7] STE is a core program, aimed at developing national policy alternatives for key issues lying at the interface between science, technology, and the economy by harnessing and focusing academic expertise on current policy issues.

a Statement of Intent to establish the India-Israel Industrial R&D Cooperation Initiative (I4RD).

A detailed list of the key milestones in relations between India and Israel from 1992 to the present is given in Appendix B.

Against this background, Prof. Manuel Trajtenberg, who headed the STE program at SNI from 1999-2006, recognized the need for a program of mutual learning of national R&D strategies between Israel and other countries to meet "the looming challenges ahead…globalization and the rise of the new Asian economic giants, China and India, [which] mean that Israel can hardly afford to 'go solo' and to rely on 'plain vanilla R&D'. Indeed, we have to find ways to link up with the new global players, keep climbing up the technology ladder and reposition ourselves accordingly." This statement[8] summed up what was to become the rationale for 3IP.

In early 2004, with negotiations taking place between the governments of India and Israel towards I4RD, Naftali Moser suggested that SNI initiate such a mutual learning program. The fact that previous S. Neaman Institute STE programs had successfully impacted on national R&D policy making in Israel[9] encouraged the belief that the proposed program could also have a tangible policy impact and served as a catalyst for the preparation of the project proposal.

In a series of meetings in February 2004 with Prof. Zehev Tadmor (Chairman of SNI), Prof. Nadav Liron (Director of SNI), and Dr. Orna Berry (a member of the SNI Advisory Council), the parameters of the project were conceived. The details of the program had been "incubated" with Prof. Morris Teubal (Hebrew University, Jerusalem), and during the monthly meetings of the STE program. As a result, a

[8] This statement later appeared in the SNI Annual Report : "R&D in Israel: Prospects and Perils" [SNI Annual Report 2005-2006].

[9] Previous impacts of STE programs on national R&D policy making in Israel include: (i) incorporation into the new Israeli R&D law (2005) of the notion that the rationale for government support to R&D lies primarily in the fact that innovative activities generate spillovers and therefore there will be underinvestment in R&D– this understanding was a major motif in many of the research projects supported by STE; (ii) the Chief Scientist of the Ministry of Industry and Trade adopted a proactive policy of support for innovation in traditional sectors – again, this issue has been championed by the STE program. It is worth noting that in both cases, the impact was made only after a protracted period of continuous activity by members of the STE program.

document was prepared, bearing the title "Initial Draft Plan for a Joint Project with the Office of the Chief Scientist for a Series of Conferences, Research and Cooperation between Israel and Several Foreign Countries: High-Tech Development Strategies for National Development and Global Competitiveness".

The plan was submitted to SNI in May 2004, and it was decided to focus on the Israel-India space. The program would later be given the name 3IP: India Israel Innovation Program.

Professor Morris Teubal shared his work and opened his international circle of colleagues to the program. Among them was Professor Rishikesha (Rishi) Krishnan at IIMB, the Indian Institute of Management in Bangalore, who described the Indian situation in a conversation in 2004 as follows:

(a) India's main challenge is to establish a sufficient number of high-tech businesses to develop and commercialize innovative products for world markets
(b) There is always room to improve the effectiveness of the implementation of policies. Given the vastness of India, new government policies do not always "translate" as needed into executable programs in the field. The perception in India is that Israel is more effective in this regard; India seeks to learn from the Israeli experience.
(c) India seeks better methods to evaluate Government programs.

These insights and many others helped as background in designing the program, and we found key expert contacts in India. With the benefit of the accumulated expertise about the development of Israeli high-tech over 30 years, the plan was based on consultations with key Israeli academics and one Indian academic (Professor Krishnan); the Ambassador and the Economic Counselor at the Embassy of India in Israel; officials from the OCS and the Ministry of Industry and Trade; key Israeli and Indian industrialists and venture capitalists; and heads of industry associations and Chambers of Commerce in Israel and India.

SNI’s choice of India received further vindication from statements such as those made by Dr. Shuki Gleitman (Managing Partner, Platinum Neurone Ventures and a former Chief Scientist, who later became the Chairman of the 3IP India Israel Innovation

Program Steering Committee) in a meeting of the Science and Technology Committee of the Knesset on 19 May 2004. In the course of a committee hearing on the subject of the challenges Israel's technology industry faces given the rise of China and India, Dr. Gleitman made the following points:

(a) Countries in the East are determined to perform innovative R&D, not just production. Israel's development strategies should take note of this huge challenge. Israel should concentrate on the areas in which it has a comparative advantage. Israel should deploy its finite and relatively small high-tech workforce on objectives that are attainable, and to maximize spillovers.

(b) For Israel to achieve the above, there is a clear and great necessity for thinking, planning, and proposing solutions to issues in a systematic way; and to produce objective information which government decision makers can use. In this regard we informed the meeting that such work was being undertaken in the framework of the India Israel Innovation Program.

(c) The last major R&D policy reforms in Israel took place in the early 1990s, at a time when India and China were not a force in global high-tech markets. The world was very different then; it is time for further reforms.

HIGHLIGHTS OF THE 3IP INDIA-ISRAEL INNOVATION PROGRAM

Following the launch of 3IP (see Appendix C for its key milestones) in May 2004, a series of visits by business and industrial delegations from the two countries took place. In preparatory meetings with the then Economic Counselor at the Embassy of India in Tel Aviv in the lead-up to the first visit by an Indian delegation, we reviewed the history of recent scientific and technological cooperation between India and Israel.

In July 2004, an Indian delegation, led by Prof. Ramamurthy, Secretary of the Indian Department of Science & Technology, visited Israel for meetings with the Israeli Ministry of Science and Technology in the framework of the Sixth Joint Biennial Committee Meeting, with the Office of the Chief Scientist (OCS), Ministry of Industry, Trade and Labor, and with Samuel Neaman Institute.

Following Prof. Ramamurthy's visit to SNI, the Indian government decided to appoint the Technology Information, Forecasting and Assessment Council (TIFAC) to be SNI's Indian counterpart organization.

During 2004 and 2005, we held an intensive series of meetings with officials of the OCS and Ministry of Industry and Trade, Israel, to understand their view regarding India-Israel ties via industrial R&D and the role of national innovation policy; and to negotiate a cooperation agreement between OCS and SNI. In addition, a Project Steering Committee was established by SNI, comprised of industry leaders, representatives of SNI and the OCS, and chaired by former Chief Scientist Dr. Shuki Gleitman, in order to provide a flexible forum for discussions. In parallel with these efforts, the Israeli Ministry of Trade and Industry/OCS was negotiating an agreement with the Indian Department of Science & Technology that would culminate in the establishment of I4RD, the India-Israel R&D Cooperation Initiative.

Regarding subjects of relevance to Israel-India cooperation, we received positive reinforcement and important inputs "from the marketplace" – from a large number of industry and academic conferences, consultations and meetings, including meetings with the OCS, and participation in hearings at the Knesset Science & Technology Committee.

In May 2005, SNI organized and hosted the first workshop to advance the 3IP project. As an indication of the importance which the Indian side gave to these activities, the Indian delegation was led by the Indian Minister for Science and Technology, Mr. Kapil Sibal. Details of the proceedings of the workshop are presented in this paper and are available in full on the S. Neaman Institute website.

The second 3IP workshop, organized by Prof. Krishnan and SNI, took place at the Indian Institute of Management, Bangalore in February 2006. An Israeli delegation, led by Prof. Nadav Liron from SNI, attended this workshop, which was followed by a series of meetings in Delhi with, among others, the Embassy of Israel, the Department of Science & Technology (DST), TIFAC, the National Association of Software and Service Companies (NASSCOM), the Institute of Genomics and Integrative Biology,

and the Confederation of Indian Industry. Indeed, the Confederation of Indian Industry later became an anchor point in the orientation of 3IP.

We also worked closely with the Embassy of India, in Tel Aviv. The Embassy of India advocated the benefits of the "science policy dialogue" led by the S. Neaman Institute, which we took as a welcome sign of the utility of our project. Through close cooperation with the Embassy, we were able to start forming links with India very quickly. Meetings with visiting Indian business people, Confederation of Indian Industry delegations and Indian government ministers followed very quickly, with some key contacts in India also visiting Israel. One of the highlights at the time was the visit of our colleague, Prof. D.V.R. Seshadri, to Israel in May 2006, including lectures in Haifa and Tel Aviv, and in particular, the visit of the Chief Operating Officer of Infosys, Mr. S. Gopalakrishnan, in that year. In the meantime, the OCS made its own visits to India in August 2005 and November 2005, aided by insights it received at our May 2005 workshop in Israel.

The climax of 2006 occurred during the Globes Business Conference, in which invited guest Prof. Y.S. Rajan addressed over 200 people at the plenary session we organized on the subject of cooperation between India and Israel. Israeli Minister of Industry and Trade Mr. Eli Yishai addressed the session. Meetings with members of Indian delegations and presentations to Israeli audiences continued throughout 2007.

In 2008, we continued to initiate new contacts and activities. The most notable such meeting was held in early 2008 with the former President of India, Dr. A. P. J. Abdul Kalam. Dr. Kalam and Prof. Y.S. Rajan are the authors of "India 2020 – A Vision for the New Millennium". In his meeting with the India Israel Innovation Program, Dr. Kalam, one of India's most distinguished scientists, presented his vision for the development of India and for India-Israel cooperation. This was followed by a discussion around the studies that have been initiated and how this work can inform, guide, and promote such cooperation.

At the beginning of 2008, Dr. Gilead Fortuna, an experienced senior pharmaceutical industry executive, with a huge experience in establishing industrial cooperation in

India, was appointed Senior Research Fellow at SNI and agreed to lead the India Israel Innovation Program during 2008.

FINDINGS AND DISCUSSION OF THE 3IP INITIATIVE

1. Researching Appropriate Cooperation Patterns for the High-Tech, Biotech and other Sectors

From the outset of the 3IP project, Prof. Manuel Trajtenberg observed that there is great potential for cooperation between Israel and India. He saw joint R&D as only the first step. He saw that for Israel, India also represents a gateway to the rest of Asia. Together, Indian and Israeli companies can target Asian as well as other global markets. In addition, Israeli companies can partner with Indian companies to manufacture there. Because of the size of Israel and the size of Israeli companies, Indian companies typically do not see Israeli companies as a threat, in contrast to their view about American companies.

However, in cases where policy changes are called for, on major subjects such as cooperation with Asia, difficulties arise. Governments are typically inward-looking. Policy research institutes can play a useful role in this regard. The first step could be to arrange opportunities for "mutual learning". For example – in the case of 3IP - through the exchange of knowledge, the two countries would be better able to appreciate each other's comparative advantages and complementarities. Once each side establishes the ways it differs from the other side, areas of cooperation would become apparent. Prof. Trajtenberg viewed the SNI 3IP project as a vehicle for enabling such mutual learning.

Binational R&D cooperation is a challenging process. The vast differences (in terms of culture, mentality, economic predicament and others) between India and Israel must be addressed. Platforms can be effective to facilitate this. Barriers to information flow are significant, even inside a small country like Israel (for that matter even inside a given organization and certainly between organizations); therefore the value of platforms is so significant.

As stated above, Prof. Trajtenberg found strong indications that both countries can benefit a great deal by joining forces in high technology ventures for global markets. However, in order for that to happen in a timely fashion and on a sufficient scale, he saw a wide array of issues which need to be addressed, so as to facilitate the processes of identifying complementarities, establishing links, coordinating policies, spreading information on each other, and the like. These issues require serious, academic-based research to inform and guide the laying out of feasible cooperation patterns. Such research needs to be highly focused on well defined, practical goals.

Early in the 3IP India-Israel Innovation Program – in March 2006 - eight such research goals were identified by Prof. Trajtenberg.:

i. Identify the relative strengths and comparative advantages of each economy in science, R&D and innovation, and the ensuing viable patterns of bilateral collaboration between firms;
ii. Identify appropriate forms of bilateral government support to R&D/Innovation projects undertaken jointly by Indian-Israeli firms, so as to help expand and enhance the I4RD India Israel Initiative for Industrial R&D;
iii. Identify effective ways of managing intellectual property rights;
iv. Determine financing mechanisms for new R&D ventures;
v. Explore possible patterns of collaboration in the pharma/biotech sector;
vi. Collaborate in the area of higher education and training;
vii. Leverage ICT for traditional sectors;
viii. Development of rural India: opportunities for cooperation with Israel.

Certain work, some published or in preparation, has been undertaken to advance these goals, as described below in subsections 1.1-1.8. Subsection 1.9 describes overall observations concerning the research process. Some of the work was performed under 3IP. Some of the work was performed completely independently; however it is included here mainly because of the close working ties between those who performed the work and SNI. In most cases, those who performed the work were members of the Steering Committee of the 3IP program.

1.1 Identifying the relative strengths and comparative advantages of each economy in science, R&D and innovation, and the ensuing viable patterns of bilateral collaboration between firms

It is clear that Israel is strong in engendering high tech startups that come up with innovative solutions and products in cutting edge fields, particularly in ICT. However, those same tech entrepreneurs are not as good at turning their ventures into sustainable firms that could become major players in their fields. India, on the other hand, has produced major global players such as Infosys and Wipro, but does not have a thick pipeline of exciting startups. Obvious differences in terms of local markets and access to global markets can also play an important role in complementing the capabilities of each country.

1.1.1 Strawberries and Cream

In a presentation entitled "India-Israel Business Cooperation – Strawberries and Cream?" delivered at the Confederation of Indian Industry (CII) Symposium – University – Industry Council at IIT Bombay on May 10, 2008, Prof. Shlomo Maital[10] addressed this issue. Each year the Swiss business school IMD publishes the World Competitiveness Yearbook, ranking 70-80 countries and assigning a global competitiveness rank based on their findings. In the 2008 global competitiveness ranking, Israel ranked 21st and India 27th. Hence both Israel and India are rising stars in the fiercely competitive global markets (albeit, India's rise in global competitiveness has been much more dramatic than Israel's, namely from 42nd place in 2003 to 27th place in 2008, compared to Israel's rise from 29th in 2003 to 21st in 2008). Analyzing the competitiveness profiles for the two countries for 2008 for 20 key variables, Prof. Maital showed that Israel's and India's competitiveness profiles are highly complementary, with strengths in one country balancing and complementing weaknesses in the other. India's relative strengths lie in its domestic economy (specifically, large labor market, enabling rapid "scaling up"), and in its prudent tax and fiscal policy. Israel's relative strengths lie in its scientific, technological, health, and educational infrastructure. This is not to deny that India's Institutes of Technology, for instance, are counted among the best in the world. It

[10] Prof Shlomo Maital is a Senior Research Fellow at SNI, a member of the 3IP Steering Committee, and served as Academic Director, Technion Institute of Management

simply indicates that, for the economy and society as a whole, Israel's technological infrastructure ranks higher according to the IMD panel of experts.

According to Prof. Maital, the "unique value proposition" for Israel-India cooperation could be to integrate Israeli knowledge-based innovations and startups with India's world-class ability to scale up rapidly, creating powerful export-driven global companies. Both countries would gain from such cooperation. Israel would gain by building companies "built to last", thus creating long-term benefit for ordinary Israelis, in the form of jobs, income and exports. India would gain by acquiring the culture and know-how of innovation, which when coupled with India's global scalability will outpace India's rival, China, in world markets.

1.1.2 Incubators

A comparative study of business incubators was undertaken. It focused on university-sponsored or linked incubators and was undertaken under the 3IP program by A. Dumanis, S. Maital, and S. Ravid (Israel) and by D.V.R. Seshadri (India)[11]. Case studies of successful and unsuccessful incubated projects and companies in both countries were included and the results were published.

The old adage that science is about people was proven again on this incubators project, which was an expansion of a pre-existing collaborative research relationship between Prof. Shlomo Maital and Prof. D.V.R. Seshadri. Thus, personal connections were critical and the role of 3IP was to provide the organizational umbrella within which to perform the research.

The study's three main findings of general relevance across countries and cultures were:

i. The paradox of market emulation. Successful incubators both emulate market conditions and shield their

[11] The friendship and collaboration between Prof Shlomo Maital (Israel) and Prof D.V.R. Seshadri (India) led to the production of a book, "Innovation Management: Strategies, Concepts and Tools for Growth and Profit" (Sage Publications, 2007). One hopes to see many further books written collaboratively by Israeli and Indian academics.

"infants" from them. Managing this paradox is fraught with difficulty, not least because it is often not explicitly recognized.

ii. Resolving the key make-or-break constraint.
The authors found that in every country, there are many constraints that hinder the ultimate business success of incubator projects, but there is always one key constraint that dominates the attention of project managers. In India this constraint is funding. In Israel, where the Venture Capital (VC) industry is mature and liquid, funding is less of a constraint (although, as always and everywhere, raising money is a major challenge), while experienced managerial capacity is the dominant constraint. Hence, a theory of incubation should include principles that guide identification of the key constraints and provide direction toward reducing or eliminating them.

iii. Alignment with local and national cultures.
In national studies of incubation, it is strongly evident how powerfully national culture acts as a mediating variable between, for instance, incubator operations and processes and the national and global business environment. Hence, a theory of incubation should include answers to the following question: How can incubator processes align well with elements of national and local culture in order to: (a) reinforce those aspects of the culture that act positively to help incubator projects attain success; and (b) mitigate or eliminate those aspects of culture that act negatively and lead to failure?

1.1.3 Opportunities Knock

In an article entitled "Opportunities Knock: The Case of Hi-Tech Cooperation between India and Israel"[12], Dr Orna Berry (Venture Partner at Gemini Israel Funds and a former Chief Scientist) describes her "eureka moment" when she realized that India and Israel were ideal hi-tech partners, and that encouraging cooperation could help both countries maintain their leading positions in global markets. In 2004, while collaborating with Alok Aggarwal and others on a Job Migration and Globalization Task Force project for the Association of Computing Machinery (ACM), Dr. Berry noted the cultural and behavioral similarities between Indians and Israelis, observed

[12] Published by the Embassy of India in Israel, 2008, to commemorate the 15th anniversary of the establishment of diplomatic relations between the two countries ("India-Israel: Potential Ahead")

that they enjoy working together, and found that there was considerable opportunity for co-adjutancy, especially in software, as the technology sectors of the two countries have complementary characteristics. She felt that the two nations could harness these qualities by working together and learning from each other, with the respective governments having important facilitative roles to play.

In addition, Dr. Berry proposed that a notional 'Binational Cooperation Toolbox" could include the use of a triangular approach. Organizations such as the American Jewish Committee are committed to such three-way initiatives and are actively promoting them. For example, in a triangular joint venture involving India, Israel and the US, operations would be located in India and Israel with finance coming from the US and the returns shared between all three countries. In fact, some firms are using this model to mitigate financial constraints during the current worldwide crisis.

In Dr. Berry's article, Mr Ajoy Mallik, Global Head of Venture Capital and the TCS-Co-Innovation Ecosystem at Tata Consultancy Services (TCS), observed that, since Israeli companies often design products for developed markets and Indian companies innovate for developing markets, it makes sense for them to work together, because the two markets will eventually converge. Mr Mallik went on to state that, while Israeli companies are a leader in explorative, disruptive and market-changing innovation, they could greatly benefit by learning from India's expertise in "sustaining innovation", i.e. increasing return on investment by exploiting current knowledge.

Subsequently, in our meetings, Dr. Berry raised several key policy issues relating to appropriate cooperation patterns for the high-tech and biotech sectors that 3IP could address.

i. *What is the appropriate size for a binational R&D fund with India?* Dr. Berry felt that a relatively small fund, similar in size to others Israel established in the 1990s, would be insufficient and of questionable efficacy. Reference was made to the Israel–US BIRD Foundation (see Appendix D) with an endowment of $110 million, as a useful model. From the perspective of 2010, we are hopeful that this wish will be fulfilled.

ii. *Exploring binational R&D cooperation as a key foreign policy tool.* Science and technology are the *lingua franca* of the globalized world. Small countries with excellent science and technology (such as Israel) can partly overcome size and geo-political limitations and succeed globally using science and technology-based international collaboration.

iii. *The need for a focus on binational industrial R&D cooperation* Binational industrial R&D cooperation is harder to trigger and sustain than purely academic cooperation, which has much lower entry barriers, and projects such as 3IP should ideally focus on the more ambitious objective.

The program did not specifically address (i) above. This subject should stand high on the agenda for future research.

1.2 Identifying appropriate forms of bilateral government support to R&D/Innovation projects undertaken jointly by Indian-Israeli firms, so as to help expand and enhance the I4RD India Israel Initiative for Industrial R&D established by the two governments in 2005.

In our meetings with the representatives of the Government of India in Israel, the Indian side expressed interest in expanding cooperation with Israel to the institutional level. The Indians were particularly interested in establishing a binational R&D fund with Israel, which would support the development of innovative new products by teams of Indian and Israeli companies. As Professor Rishikesha (Rishi) Krishnan (of IIMB, the Indian Institute of Management in Bangalore) explained to us in 2006, expenditure by the Government of India to support commercial innovation represents about 1% of total spending on government R&D; there is no critical mass or focus in this expenditure; the funds are mainly provided to existing institutions rather than new ones; and there are many schemes and projects and a preference for existing companies rather than startups. Furthermore, India had never established a binational R&D fund before, either at the federal or state level. Therefore, the Indian side sought answers to questions regarding the structure and the form of binational funds; the way in which the government and private sectors interact in such a fund; and wished to learn about Israeli policies and Israeli experience with such funds, in particular BIRD, the Israel–US Binational Industrial R&D Fund, in whose workings the members of

the Indian delegation were especially interested. BIRD (see Appendix D) is known around the world as a very successful model for cooperation between two countries, based on industrial R&D, and many countries are eager to emulate BIRD for their own bilateral cooperation with Israel by establishing a fund similar to BIRD between themselves and Israel.

Dr. Berry also considers the BIRD model to be highly relevant to India and Israel. She recommended that the BIRD approach and the BIRD model which Israel has used be analyzed to capture their 'spirit' and so yield insights into how the impact of I4RD could be increased on the ground. If in future years the I4RD fund initiative would be even partly as successful as BIRD, it would become an important example of how a partnership between government and the private sector can be efficacious.

Another avenue for collaboration could be the establishment of a bi-national "Magnet"-type program; that is, the support of consortia made up of both firms and academic institutions from both countries to develop generic pre-competitive technologies, thus also addressing the issue of technology transfer.

In this context a related point should be made about when, within a country's development process, it is reasonable to expect such R&D joint ventures to flourish. For example, in the Israeli case, in the ICT industry (medical instrumentation is a separate case), R&D joint ventures between Israeli and US companies only started to flourish from the mid-1980s, after such Israeli companies had first acquainted themselves with the US market, often through performing subcontracting work on defense contracts.

Related to that subject we note a further point. Defense cooperation between India and Israel is reportedly growing. For example, one such deal was reportedly signed in 2009 between Israel Aerospace Industries (IAI) and the Indian Government for $1.4 billion. As part of that deal, Israel is reportedly committed to a buy-back arrangement with India for $400 million. For this purpose, a new company was established between IAI and Tata. We see the value of research which could analyze the various ways in which such defense cooperation could provide a laboratory or learning ground for companies from both countries to learn how to cooperate with their

partners on civilian projects, and for these lessons to be diffused in industry - to bring about greater and more effective non-defense cooperation between the private sectors of India and Israel.

Comparisons can be made to the Israel-US case. In the case of Israel and the US in the 1970s and 1980s, one of the major ways (in fact, one of the only ways open to them at that time) in which very young and inexperienced Israeli companies could gain first-hand experience of the US market was through their subcontracts or through cooperation with US defense companies in those years, under the Foreign Military Sales (FMS) and other programs. After some years of performing R&D as a subcontractor or a minor partner on one of those contracts for the military, those very same young Israeli companies gradually "climbed up the ladder" and were able to start developing their own novel and innovative non-defense products for the US market.

It will be useful to see how cooperation between Israeli and Indian companies on defense projects in the 21st century could help to pave the way and facilitate more effective and successful cooperation between firms from the two countries in non-defense areas[13].

1.3 Identifying effective ways of managing intellectual property (IP) rights

A key issue that arises when setting up collaborative R&D projects is how to manage IP rights. This is true within any given country, and certainly when it comes to joint ventures between countries. The aims are to identify in advance effective ways of managing the IP involved in the venture (existing and to be created) so as to minimize the risk of friction between the parties and of costly legal confrontation. We found that, at present, this issue is to some extent a concrete deterrence to the creation of new joint ventures. We brought together an Israeli expert and a US expert on this subject and convened several meetings; however the research project was not launched. This is an important subject for further research. We do note, however, significant differences in the approach to contracts in India and in Israel, partly based

[13] Examples of Israeli companies who trod that path into the US in the 1980s include: (a) Orckit Communications Ltd.; (b) Gilat Satellite Networks Ltd.; (c) NICE Systems Ltd.

on cultural factors. We surmise that one way of managing the legal process more smoothly is to have a greater mutual awareness of such cultural factors.

1.4 Determine financing mechanisms for new R&D ventures.

Finance, of course, is a prominent issue everywhere, since traditional channels of finance do not work well for innovative projects (because of particularly acute problems of moral hazard and asymmetric information). Two main forms of finance for startups have emerged, primarily in the US: angel investors and VC funds (the latter are very active in Israel as well). However, VCs target only a very narrow segment of possible new ventures, and hence cannot constitute the main source of finance for them; moreover, their goal is to exit after a preset number of years, and not to provide continuing finance to growing enterprises. Thus, new forms of finance are called for, which would combine the advantages of VCs (e.g. the provision of managerial expertise, networking, etc) with the evolving and varied needs of a growing tech-based sector, and moreover, that would do so for joint Indian-Israeli ventures. Prof. Trajtenberg proposed that finance should be sought from new sources, such as international philanthropic organizations and from international economic organizations.

1.5 Explore possible patterns of collaboration in the pharma/biotech sector.

The pharma/bio sector is very different from the ICT sector (the mainstay of high tech in both countries) and requires special attention, in view of the relative strengths of each country in this respect. Thus, for example, India has already developed a well established pharma sector, as well as a growing sector of clinical trials, in addition to a rich amount of research in universities, government labs, and elsewhere. Israel has the leading global generic pharma company, Teva Pharmaceutical Industries Ltd., and a bio-tech sector with a growing number of startups, as well as VCs focused on this sector. We also note that, historically, the Israeli biomedical/medical instrumentation sector was one of the very first sectors of the Israeli economy to achieve global success – already in the 1970s. Today, Israeli universities and hospitals are performing a great deal of basic and applied science in this field. Technology transfer to industry is already well entrenched and indeed several block-buster drugs have

been produced based on research performed in Israeli Universities. Furthermore, Israel possesses an internationally unique computerized health delivery system, which could be turned into a valuable research resource. The challenge is how to leverage these and other assets in both countries for the mutual benefit of both economies.

A start was made on research on this subject. We approached Prof. Samir Brahmachari, Director, Institute for Genomics and Integrative Biology. Following meetings in India and Israel, the idea for an "affordable drugs" project was conceived. The idea was that drugs could be developed, manufactured, and sold at a completely different price-point than is customary today in the industry. It was thought that the identification, development, testing, production, and distribution of such affordable drugs – and the identification of new models and processes by which all of this could be performed in order to reach the new price-points – may serve as an archetypical example in demonstrating the intricate nature and potential of India-Israel collaboration. Potential partners in this case study and research project were identified in Israel, India, and the US and a series of meetings were held. Actual work on this subject of "affordable drugs" did not commence. In 2007, Prof. Brahmachari was promoted to a senior government position. One hopes that the meetings and talks we had will produce fruit in future years.

1.6 Collaboration in higher education and training.

Each country has its own strengths and weaknesses in this field, and it seems that both could benefit from collaborating: thus, India has a few top institutions (i.e. the IITs, IISc and IIMs), but the rapid growth of its high tech sector demands increasing numbers of high quality graduates, which the current system would be hard-pressed to deliver. Ambitious plans have been laid to establish large numbers of new Universities in India. Israel has world-renowned, research-oriented universities, but they were experiencing an acute financial crisis even before the global financial crisis: to put it succinctly, frontier scientific research is too expensive to be shouldered on too-narrow a student base. This suggests much room for mutual learning about the structure and financing of higher education systems and exploration of ways in which the two countries can collaborate.

We found great interestin the lecture by Prof Richard Levin, President of Yale, given at the Royal Society in London in 2010 entitled "The Rise of Asia's Universities" and we also note "The Great Brain Race: How Global Universities Are Reshaping the World" by Ben Wildavsky.

1.7. Leverage ICT for traditional sectors

Both countries seem to suffer from the syndrome of "dual economies", that is, on the one hand, fast growing high tech sectors and, on the other hand, stagnant traditional sectors. Moreover, in both cases it would seem that the capabilities developed in the high tech sector, and in particular in ICT, are not deployed nearly enough so as to contribute to the development of traditional sectors. Neither can the high-tech sector on its own provide sufficient growth for the entire economy of Israel and most certainly not for the entire economy of India. Since leveraging ICT for traditional sectors is a fundamental issue, it should be the subject of in-depth research for the benefit of both countries.

1.8 Development of rural India: opportunities for cooperation with Israel

Under the initiative and leadership of Dr. Martin Sherman, a new study was conceived in 2008 to guide and facilitate policy and cooperation between the two countries in the development of the Indian rural sector, and the opportunities that presents for Israel. A brainstorming session for the Israeli side was held in July 2008. Following the brainstorming, it was decided not to proceed with implementation of this initiative. One hopes that such a program can be implemented in the future by others. Indeed, in an unrelated development in 2009, the Governments launched the "Shavit" program.

1.9 Overall observations regarding the research process

A number of observations can be made regarding the overall functioning of the 3IP research process. Firstly, at the outset we considered that it would be best if the research outlined in subsections 1.1-1.8 above would be performed by joint teams of Israeli and Indian researchers, however: (a) we were plagued by a severe shortage of

young Israeli researchers interested to work in these areas (a recurring problem in Israel even in neighboring subject areas); and (b) we did not find the right Indian organization to be the counterpart to SNI.

Secondly, the 3IP research was not solicited by any Israeli government agency. SNI launched and performed the project at its own initiative, in response to what SNI considered to be a national need and consistent with the SNI mission. However the government did not endorse or underwrite the program.

Thirdly, we find that there is a large information gap waiting to be filled regarding the subject of economic cooperation between Israel and India, because only a small amount of relevant research is currently being undertaken in Israel. We see much room for joint research, faculty and student exchange. We believe that as this work is performed and as relationships mature, both governments might embrace non-government actors more warmly, with their new ideas and policy perspectives.

2. Some Observations at the National and Operational Levels

2.1 Framework for Studying Strategic National Innovation/R&D Policies

Prof. Morris Teubal (Israel) and Prof. Y. S. Rajan (India) found that the enormous changes taking place in the global environment[14] presented the opportunity and the need to conduct joint research relating to the strategic policy level in each country. To this end, they initiated a research project entitled "Towards a Systems Evolutionary Framework for Comparative Analysis of National Innovation/R&D Policies: the Cases of India and Israel" that is currently ongoing. The project's objective is to generate a general framework concerning the nature of the changes in both the policy portfolios of both countries and in the underlying policy processes and policy institutions. Despite the differences between India and Israel, and perhaps given the diversity of experiences, it is possible to create an overarching framework on the basis of which specific variants of policy products and policy processes/institutions can be

[14] The changes observed were associated with globalization and the expansion of the financial markets. The current worldwide recession makes the need for policy studies between India and Israel even more relevant to both economies.

identified in a form useable by other countries as well. This research is expected to result in a published manuscript.

2.2 Technology Transfer at the Operational Level and its Possible Implications for the National Level

Attempts at partnership between non-government and government players within Israel have been less successful than academic partnerships. In this regard, some remarks[15] on technology transfer and R&D made by Dr. Gilead Fortuna, Head of the 3IP Program in 2008, may be also relevant. Dr. Fortuna found that direct academia-industry cooperation has rarely been effective in the past and specific measures and attentions were needed in order to achieve effectiveness.

Reflecting on his career in few leading industries in Israel and also in the USA Dr. Fortuna found that although some employees were performing great research and others were performing great on the design and operational side, there was not enough effective communication between them. Later he realized that in the national level the same problem existed. There were few large national institutes that were each the R&D center for all the technological sector activity in Israel. The research institutes were supposed to transfer technologies to all the operating companies. This transfer did not work. It was necessary for each of the production companies to perform some own R&D in order to be cooperative and it was also essential for the R&D institute to understand operations and not pure R&D.

Dr. Fortuna concluded that there is an inherent difficulty to technology transfer from outside laboratory to production. He observed that it is a people issue stemming from the different attitudes of different people, and compounded by a "not invented here" syndrome whereby people resist information and ideas that they did not generate or at least participated themselves.

[15] Dr. Fortuna made these remarks in two presentations to the 3rd University Industry Council Symposium, 21-22 November 2008 at Pondicherry University, Puducherry, India.

Since people issues are widespread across sectors, collaboration requires leadership, motivation, and management commitment for the process to succeed. Dr. Fortuna found, interestingly, that collaboration is easier with newly born technologies because, in that case, the element of competition with existing technologies does not exist and people do not raise objections based on a "not invented here" mindset.

Perhaps when dealing with the complexities and challenges of orchestrating successful cooperation between government and non-government players – for example, between government and academia in public policy institutes – we can derive some insights and some lessons from the attempts to form cooperation between academia and industry, for instance in the context of technology transfer.

Certainly, according to Dr. Fortuna the blessed SNI initiatives could not be effective without getting the Israeli government and the OCS on board from the beginning.

One of the results of this approach may be that one would approach the task of creating collaboration between government and non-government with better organization, greater patience, a wider range of tools, a readiness for coalition building, and an appreciation of the inherent differences between the sectors.

In his remarks, Dr. Fortuna used the term "technology inflection point". For instance, in the development of a new system, as long as the existing technology is good enough to achieve the product specification, it can be used, but beyond the inflection point, new technologies and approach must be developed. Then people are open to changes. But we cannot wait until it happens but trigger the thinking and the actions much ahead.

The parallel in the public policy field, e.g., in the context of Israel's global positioning, is that when Israel is faced with a game-changing external situation – namely, a completely different global marketplace – new approaches should be used in order to be successful. We submit that one of these new approaches is collaboration between government and non-government actors.

In his remarks, Dr. Fortuna also related to his career in the Israeli pharmaceutical industry (at Teva Pharmaceutical Industries Ltd). One of the ways in which Teva achieved international success despite the huge challenges on every front (technology, markets, finance…) was to create dependency across the lines, i.e. throughout the company. Dr. Fortuna remarked that this dependency was an enhancement for people motivation and probably increases the chances of success. Again, one can reflect whether and how creating dependency could be an effective approach in the context of government and non-government collaboration.

We note that in fact in the 1990s, the OCS pioneered the internationally unique and successful Magnet program which supports the formation of consortia made up of private industrial companies together with academic institutions, to jointly develop generic, pre-competitive technologies. Having so successfully broken new ground in this respect, one is optimistic that the OCS could successfully embrace other opportunities for institutional innovations of various types, including experimentation with new forms of government-non-government cooperation. We note that several new and important initiatives are underway. (Regarding the importance of institutional experimentation and transitional states, see the work of Professor Teubal).

In 2009 Dr. Fortuna has asked to summarize the program, decided to stop it in the original context and to look for better communication with the OCS Office, Matimop and the Ministry of Industry Trade and Labor.

We believe that the program was an effective support to the national efforts and we wish that we would be able to further support and collaborate in the applying the goals together with the Israeli government and agencies.

FINAL REMARKS

During 2008 we received a strong verbal endorsement of the 3IP India Israel Innovation Program from Prof. Manuel Trajtenberg, who had been appointed Head of the National Economic Council at the Prime Minister's Office, Israel, in 2006. In his

remarks, Prof. Trajtenberg underlined three main worldwide economic trends. The policy implication he drew from all of these trends is that it is imperative for Israel to focus more on Asia (and South America) in its trade and economic relations. The three trends are: (a) The center of gravity of worldwide economic activity is moving to the East, mainly to India and China, which have huge populations and high growth rates (consistently above 8% p.a.). A small, export-dependent country like Israel must adjust its trading patterns accordingly. (b) Increased prices of commodities, oil and food: this is a long term trend. This trend offers huge opportunities for those countries nimble enough to take advantage. (c) The US economic crisis and the fall in the value of the dollar. It is imperative for Israel to increase the amount of trade it performs with non-dollar regions such as Asia – India – and others. India is particularly attractive for Israel because of its size; its technological sophistication; the English language; and its economic openness (compared, e.g. to China). The Government of Israel regards this as a high priority.

Prof. Trajtenberg's prescient remarks were made in July 2008, three months before the dramatic crisis in world markets, and the recognition that the world was in recession and that economic relationships are changing in fundamental ways. The currently developing reality makes his insights even more pertinent.

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World Economic Forum, Global Competitiveness Report and other publications

APPENDICES

A. Global Competitiveness Reports 2008-2009 (World Economic Forum)

A1: India

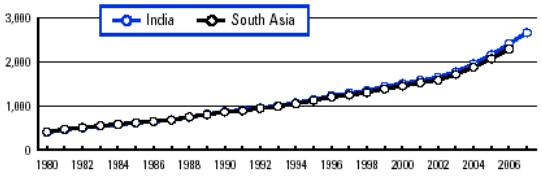
A2: Israel

India

Key indicators

Total population (millions), 2007	1,135.6
GDP (US$ billions), 2007	1,098.9
GDP per capita (US$), 2007	977.7
GDP (PPP) as share (%) of world total, 2007	4.58

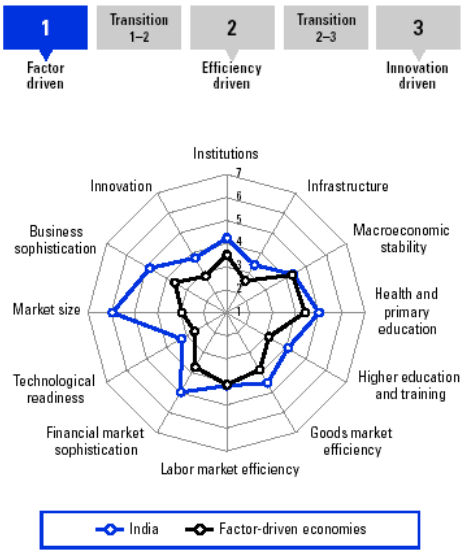
GDP (PPP US$) per capita, 1980–2007



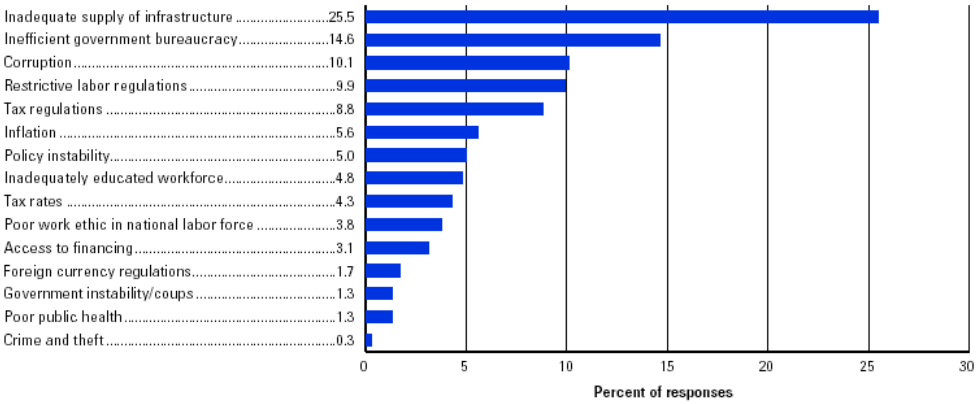
Global Competitiveness Index

	Rank (out of 134)	Score (1–7)
GCI 2008–2009	**50**	**4.3**
GCI 2007–2008 (out of 131)	48	4.3
GCI 2006–2007 (out of 122)	42	4.5
Basic requirements	**80**	**4.2**
1st pillar: Institutions	53	4.2
2nd pillar: Infrastructure	72	3.4
3rd pillar: Macroeconomic stability	109	4.3
4th pillar: Health and primary education	100	5.0
Efficiency enhancers	**33**	**4.5**
5th pillar: Higher education and training	63	4.1
6th pillar: Goods market efficiency	47	4.5
7th pillar: Labor market efficiency	89	4.2
8th pillar: Financial market sophistication	34	5.0
9th pillar: Technological readiness	69	3.3
10th pillar: Market size	5	6.0
Innovation and sophistication factors	**27**	**4.3**
11th pillar: Business sophistication	27	4.8
12th pillar: Innovation	32	3.7

Stage of development



The most problematic factors for doing business



Note: From a list of 15 factors, respondents were asked to select the five most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The bars in the figure show the responses weighted according to their rankings.

India

The Global Competitiveness Index in detail

■ Competitive **Advantage** ■ Competitive **Disadvantage**

	INDICATOR	RANK/134	
	1st pillar: Institutions		
1.01	Property rights	52	■
1.02	Intellectual property protection	57	■
1.03	Diversion of public funds	55	■
1.04	Public trust of politicians	84	■
1.05	Judicial independence	43	■
1.06	Favoritism in decisions of government officials	58	■
1.07	Wastefulness of government spending	62	■
1.08	Burden of government regulation	90	■
1.09	Efficiency of legal framework	42	■
1.10	Transparency of government policymaking	55	■
1.11	Business costs of terrorism	106	■
1.12	Business costs of crime and violence	53	■
1.13	Organized crime	71	■
1.14	Reliability of police services	62	■
1.15	Ethical behavior of firms	61	■
1.16	Strength of auditing and reporting standards	30	■
1.17	Efficacy of corporate boards	45	■
1.18	Protection of minority shareholders' interests	33	■
	2nd pillar: Infrastructure		
2.01	Quality of overall infrastructure	90	■
2.02	Quality of roads	87	■
2.03	Quality of railroad infrastructure	21	■
2.04	Quality of port infrastructure	93	■
2.05	Quality of air transport infrastructure	66	■
2.06	Available seat kilometers*	10	■
2.07	Quality of electricity supply	108	■
2.08	Telephone lines*	107	■
	3rd pillar: Macroeconomic stability		
3.01	Government surplus/deficit*	127	■
3.02	National savings rate*	19	■
3.03	Inflation*	77	■
3.04	Interest rate spread*	69	■
3.05	Government debt*	113	■
	4th pillar: Health and primary education		
4.01	Business impact of malaria	107	■
4.02	Malaria incidence*	100	■
4.03	Business impact of tuberculosis	92	■
4.04	Tuberculosis incidence*	99	■
4.05	Business impact of HIV/AIDS	98	■
4.06	HIV prevalence*	68	■
4.07	Infant mortality*	105	■
4.08	Life expectancy*	105	■
4.09	Quality of primary education	80	■
4.10	Primary enrollment*	94	■
4.11	Education expenditure*	77	■
	5th pillar: Higher education and training		
5.01	Secondary enrollment*	104	■
5.02	Tertiary enrollment*	98	■
5.03	Quality of the educational system	37	■
5.04	Quality of math and science education	17	■
5.05	Quality of management schools	12	■
5.06	Internet access in schools	60	■
5.07	Local availability of research and training services	32	■
5.08	Extent of staff training	34	■

	INDICATOR	RANK/134	
	6th pillar: Goods market efficiency		
6.01	Intensity of local competition	11	■
6.02	Extent of market dominance	19	■
6.03	Effectiveness of anti-monopoly policy	28	■
6.04	Extent and effect of taxation	28	■
6.05	Total tax rate*	117	■
6.06	No. of procedures required to start a business*	108	■
6.07	Time required to start a business*	77	■
6.08	Agricultural policy costs	82	■
6.09	Prevalence of trade barriers	69	■
6.10	Trade-weighted tariff rate*	131	■
6.11	Prevalence of foreign ownership	69	■
6.12	Business impact of rules on FDI	61	■
6.13	Burden of customs procedures	72	■
6.14	Degree of customer orientation	45	■
6.15	Buyer sophistication	38	■
	7th pillar: Labor market efficiency		
7.01	Cooperation in labor-employer relations	44	■
7.02	Flexibility of wage determination	54	■
7.03	Non-wage labor costs*	69	■
7.04	Rigidity of employment*	48	■
7.05	Hiring and firing practices	104	■
7.06	Firing costs*	85	■
7.07	Pay and productivity	45	■
7.08	Reliance on professional management	24	■
7.09	Brain drain	49	■
7.10	Female participation in labor force*	122	■
	8th pillar: Financial market sophistication		
8.01	Financial market sophistication	33	■
8.02	Financing through local equity market	8	■
8.03	Ease of access to loans	42	■
8.04	Venture capital availability	27	■
8.05	Restriction on capital flows	83	■
8.06	Strength of investor protection*	26	■
8.07	Soundness of banks	51	■
8.08	Regulation of securities exchanges	25	■
8.09	Legal rights index*	29	■
	9th pillar: Technological readiness		
9.01	Availability of latest technologies	43	■
9.02	Firm-level technology absorption	26	■
9.03	Laws relating to ICT	38	■
9.04	FDI and technology transfer	20	■
9.05	Mobile telephone subscribers*	115	■
9.06	Internet users*	84	■
9.07	Personal computers*	96	■
9.08	Broadband Internet subscribers*	92	■
	10th pillar: Market size		
10.01	Domestic market size*	4	■
10.02	Foreign market size*	5	■
	11th pillar: Business sophistication		
11.01	Local supplier quantity	4	■
11.02	Local supplier quality	37	■
11.03	State of cluster development	24	■
11.04	Nature of competitive advantage	83	■
11.05	Value chain breadth	28	■
11.06	Control of international distribution	29	■
11.07	Production process sophistication	41	■
11.08	Extent of marketing	28	■
11.09	Willingness to delegate authority	25	■
	12th pillar: Innovation		
12.01	Capacity for innovation	35	■
12.02	Quality of scientific research institutions	27	■
12.03	Company spending on R&D	29	■
12.04	University-industry research collaboration	45	■
12.05	Gov't procurement of advanced tech products	88	■
12.06	Availability of scientists and engineers	3	■
12.07	Utility patents*	57	■

* Hard data

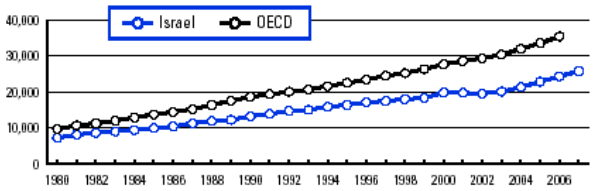
Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Israel

Key indicators

Total population (millions), 2007	7.0
GDP (US$ billions), 2007	161.9
GDP per capita (US$), 2007	22,475.1
GDP (PPP) as share (%) of world total, 2007	0.29

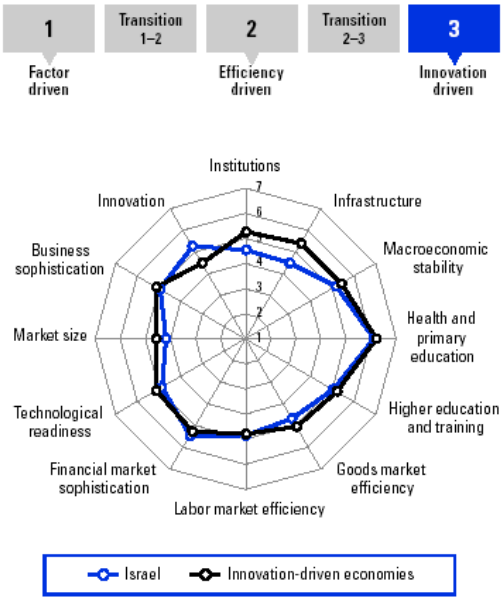
GDP (PPP US$) per capita, 1980–2007



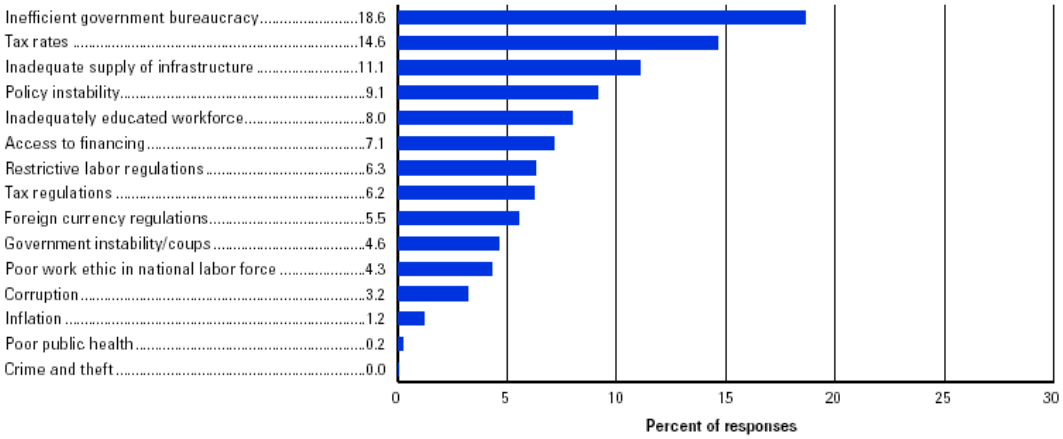
Global Competitiveness Index

	Rank (out of 134)	Score (1–7)
GCI 2008–2009	**23**	**5.0**
GCI 2007–2008 (out of 131)	17	5.2
GCI 2006–2007 (out of 122)	14	5.3
Basic requirements	**41**	**5.1**
1st pillar: Institutions	47	4.5
2nd pillar: Infrastructure	37	4.5
3rd pillar: Macroeconomic stability	59	5.1
4th pillar: Health and primary education	25	6.1
Efficiency enhancers	**23**	**4.8**
5th pillar: Higher education and training	24	5.0
6th pillar: Goods market efficiency	36	4.7
7th pillar: Labor market efficiency	20	4.8
8th pillar: Financial market sophistication	15	5.5
9th pillar: Technological readiness	25	4.9
10th pillar: Market size	49	4.2
Innovation and sophistication factors	**13**	**5.1**
11th pillar: Business sophistication	23	5.0
12th pillar: Innovation	6	5.3

Stage of development



The most problematic factors for doing business



Note: From a list of 15 factors, respondents were asked to select the five most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The bars in the figure show the responses weighted according to their rankings.

Israel

The Global Competitiveness Index in detail

■ Competitive **Advantage** ■ Competitive **Disadvantage**

	INDICATOR	RANK/134	
	1st pillar: Institutions		
1.01	Property rights	49	■
1.02	Intellectual property protection	39	■
1.03	Diversion of public funds	40	■
1.04	Public trust of politicians	61	■
1.05	Judicial independence	20	■
1.06	Favoritism in decisions of government officials	46	■
1.07	Wastefulness of government spending	60	■
1.08	Burden of government regulation	36	■
1.09	Efficiency of legal framework	48	■
1.10	Transparency of government policymaking	37	■
1.11	Business costs of terrorism	130	■
1.12	Business costs of crime and violence	43	■
1.13	Organized crime	48	■
1.14	Reliability of police services	76	■
1.15	Ethical behavior of firms	46	■
1.16	Strength of auditing and reporting standards	29	■
1.17	Efficacy of corporate boards	33	■
1.18	Protection of minority shareholders' interests	18	■
	2nd pillar: Infrastructure		
2.01	Quality of overall infrastructure	42	■
2.02	Quality of roads	45	■
2.03	Quality of railroad infrastructure	40	■
2.04	Quality of port infrastructure	53	■
2.05	Quality of air transport infrastructure	39	■
2.06	Available seat kilometers*	43	■
2.07	Quality of electricity supply	28	■
2.08	Telephone lines*	26	■
	3rd pillar: Macroeconomic stability		
3.01	Government surplus/deficit*	72	■
3.02	National savings rate*	65	■
3.03	Inflation*	5	■
3.04	Interest rate spread*	19	■
3.05	Government debt*	115	■
	4th pillar: Health and primary education		
4.01	Business impact of malaria	17	■
4.02	Malaria incidence*	1	■
4.03	Business impact of tuberculosis	5	■
4.04	Tuberculosis incidence*	16	■
4.05	Business impact of HIV/AIDS	3	■
4.06	HIV prevalence*	23	■
4.07	Infant mortality*	10	■
4.08	Life expectancy*	5	■
4.09	Quality of primary education	58	■
4.10	Primary enrollment*	33	■
4.11	Education expenditure*	13	■
	5th pillar: Higher education and training		
5.01	Secondary enrollment*	53	■
5.02	Tertiary enrollment*	28	■
5.03	Quality of the educational system	45	■
5.04	Quality of math and science education	66	■
5.05	Quality of management schools	24	■
5.06	Internet access in schools	23	■
5.07	Local availability of research and training services	14	■
5.08	Extent of staff training	32	■

	INDICATOR	RANK/134	
	6th pillar: Goods market efficiency		
6.01	Intensity of local competition	32	■
6.02	Extent of market dominance	83	■
6.03	Effectiveness of anti-monopoly policy	32	■
6.04	Extent and effect of taxation	78	■
6.05	Total tax rate*	40	■
6.06	No. of procedures required to start a business*	9	■
6.07	Time required to start a business*	80	■
6.08	Agricultural policy costs	34	■
6.09	Prevalence of trade barriers	26	■
6.10	Trade-weighted tariff rate*	53	■
6.11	Prevalence of foreign ownership	23	■
6.12	Business impact of rules on FDI	48	■
6.13	Burden of customs procedures	32	■
6.14	Degree of customer orientation	54	■
6.15	Buyer sophistication	37	■
	7th pillar: Labor market efficiency		
7.01	Cooperation in labor-employer relations	49	■
7.02	Flexibility of wage determination	80	■
7.03	Non-wage labor costs*	20	■
7.04	Rigidity of employment*	32	■
7.05	Hiring and firing practices	36	■
7.06	Firing costs*	108	■
7.07	Pay and productivity	49	■
7.08	Reliance on professional management	26	■
7.09	Brain drain	37	■
7.10	Female participation in labor force*	18	■
	8th pillar: Financial market sophistication		
8.01	Financial market sophistication	24	■
8.02	Financing through local equity market	14	■
8.03	Ease of access to loans	33	■
8.04	Venture capital availability	8	■
8.05	Restriction on capital flows	34	■
8.06	Strength of investor protection*	5	■
8.07	Soundness of banks	34	■
8.08	Regulation of securities exchanges	48	■
8.09	Legal rights index*	8	■
	9th pillar: Technological readiness		
9.01	Availability of latest technologies	16	■
9.02	Firm-level technology absorption	11	■
9.03	Laws relating to ICT	31	■
9.04	FDI and technology transfer	18	■
9.05	Mobile telephone subscribers*	6	■
9.06	Internet users*	48	■
9.07	Personal computers*	37	■
9.08	Broadband Internet subscribers*	15	■
	10th pillar: Market size		
10.01	Domestic market size*	48	■
10.02	Foreign market size*	50	■
	11th pillar: Business sophistication		
11.01	Local supplier quantity	53	■
11.02	Local supplier quality	27	■
11.03	State of cluster development	32	■
11.04	Nature of competitive advantage	11	■
11.05	Value chain breadth	18	■
11.06	Control of international distribution	27	■
11.07	Production process sophistication	19	■
11.08	Extent of marketing	30	■
11.09	Willingness to delegate authority	23	■
	12th pillar: Innovation		
12.01	Capacity for innovation	10	■
12.02	Quality of scientific research institutions	3	■
12.03	Company spending on R&D	8	■
12.04	University-industry research collaboration	18	■
12.05	Gov't procurement of advanced tech products	5	■
12.06	Availability of scientists and engineers	9	■
12.07	Utility patents*	5	■

* Hard data

Note: For further details and explanation, please refer to the section "How to Read the Country/Economy Profiles" at the beginning of this chapter.

Appendix B. Key Milestones in Relations between India and Israel

29 January 1992	Diplomatic Relations established between India and Israel
17 May 1993	Agreement between India and Israel on Economic Cooperation, Science, Technology and other fields, signed by the Indian Minister for Commerce and Civil Supplies and the Israeli Foreign Minister
18 May 1993	Agreement between India (Ministry for Human Resource Development) and Israel (Ministry of Foreign Affairs) regarding academic and cultural activities
9 September 1993	Agreement between India (Ministry of Health and Family Welfare) and Israel (Ministry of Health) on Cooperation in the Fields of Health and Medicine
24 December 1993	Agreement between India (Indian Council of Agricultural Research) and Israel (Agricultural Research Organization) regarding agriculture
November 1994	Agreement between India and Israel on Telecommunications and Post
21 December 1994	Agreement between India (Ministry of Commerce) and Israel (Ministry of Industry and Trade) on Trade and Economic Cooperation
29 January 1996	Agreement for the Promotion and Protection of Investments. Convention for the Avoidance of Double Taxation and for the Prevention of Fiscal Evasion with Respect to Taxes on Income and Capital Bilateral Agreement regarding Mutual Assistance and Cooperation in Customs Matters

August 1996	Work Program of Cooperation in Science & Technology between India and Israel signed
30 December 1996	Umbrella Agreement on the Development of Cooperation in the Field of Industrial and Technological R&D between India (Department of Scientific and Industrial Research) and Israel (Ministry of Industry and Trade) Agreement between India (Ministry of External Affairs) and Israel (Center for International Cooperation-Mashav) on Technical Cooperation (mainly related to agricultural subjects)
January 2002	Memorandum of Understanding between India (Ministry of Information & Technology) and Israel (Ministry of Industry and Trade) concerning Cooperation in the Area of Electronics and IT, particularly to promote Joint R&D for commercial products and services
2002:	MOU signed between Indian Department of Information Technology and Government of Israel
28 October 2002:	Agreement on Cooperation in Peaceful Uses of Outer Space
2003	Agreement between Government of India Department of Industrial Science & Research and Government of Israel Office of the Chief Scientist. Israeli Ministry of Science and Technology cooperation agreement with India
8-10 Sept. 2003	Visit of Prime Minister Ariel Sharon to India. Delhi Statement on Friendship and Cooperation.

9 September 2003	Agreement on Cooperation in the field of Health and Medicine Agreement on Cooperation in the field of Protection of the Environment
January 2004	Negotiations underway between the Governments on R&D Cooperation in the India-Israel Industrial R&D Cooperation Initiative.
July 2004	Visit to Israel of Secretary, Department of Science and Technology, Prof. Ramamurthy. Sixth Joint Biennial Committee Meeting between Indian Department of Science & Technology and Israeli Ministry of Science and Technology. Meeting between Prof. VS Ramamurthy and Office of the Chief Scientist (OCS), Ministry of Industry, Trade and Labour.
8 December 2004	Israel's Deputy Prime Minister and Minister of Industry and Trade Ehud Olmert visits India accompanied by the Chief Scientist. A Statement of Intent is signed to establish the India-Israel R&D Cooperation Initiative (I4RD)
February 2005	Launching of the Joint Study Group report to be jointly written by India and Israel.
30 May 2005	Visit of Indian Minister of Science & Technology, Mr Kapil Sibal to Israel. Signing of a Memorandum of Understanding on Industrial R&D Initiative with the Israeli Ministry of Industry and Trade.
August 2005	Visit of Chief Scientist Dr. Eli Opper to India
November 2005	Joint Study Group report released First visit of Agriculture Minister Shri Sharad Pawar to Israel Visit of Commerce and Industry Minister Kamal Nath to Israel

December 2005	Minister of Trade and Industry Ehud Olmert visits India. Publication of the First Call for Proposals on the I4RD
May 2006	Publication of the Second Call for Proposals on the I4RD Second visit of Agriculture Minister Shri Sharad Pawar to Israel
10 May 2006	Inter Governmental Work Plan on Agricultural Cooperation
November 2006	Indian Government Department of Science & Technology (DST) and Confederation of Indian Industry (CII) sign a Memorandum of Understanding to set up the Global Innovation & Technology Alliance (GITA). GITA later serves for a time as the Indian counterpart for the I4RD agreement with Israel.
December 2006	Deputy Prime Minister and Minister of Trade, Industry and Labour Eliyahu Yishai visits India
August 2007	Visit of Minister for Industry Ashwani Kumar to Israel
February 2008	Visit of Former President of India, Dr. A. P. J. Abdul Kalam, to Israel

C. Key milestones in the development of the 3IP India-Israel Innovation Program

2002 – 2003 At the STE Forum and at conferences in Israel much attention is given to the rapid economic growth of India (and China) and the consequences for Israel. Under the leadership of Prof. Morris Teubal with Mr Naftali Moser, a network is formed to address the issues and collect information, in the context of the Center for High Tech, Biotechnology and Globalization Studies at the Hebrew University. Initial meetings are held with the Office of the Chief Scientist, Ministry of Industry and Trade. Workshop on "Globalization, High Tech Growth and R&D Policy" is held at Hebrew University.

February 2004 An initiative for a project of mutual learning of national R&D strategies between Israel and other countries is prepared by Mr Naftali Moser for S. Neaman Institute. SNI – Prof. Nadav Liron, Director decides to launch a program focusing on Israel and India. The network is enlarged by adding interested experts from academia, industry and government in both countries. This was followed by a series of visits by Indian companies and organizations to Israel.

April 2004 Visit to India by delegation from IVA Israel Venture Association, coordinated by Confederation of Indian Industry (CII).

July 2004 Meetings with delegation led by Prof. Ramamurthy, Secretary, Department of Science & Technology, Government of India at S. Neaman Institute. Indian decision to appoint TIFAC, Technology Information, Forecasting and Assessment Council as the counterpart organization to SNI

August 2004 Meeting between SNI and OCS regarding cooperation

November 2004 Meeting between SNI Director Prof. Nadav Liron and Department of Science & Technology (DST) in India expediting SNI-TIFAC (Technology Information, Forecasting and Assessment Council (DST) cooperation and expediting the discussions between the governments on the R&D framework

February 2005 SNI writes a section to the Joint Study Group Report prepared by the governments of India and Israel. The "Policy Seminar" proposed by SNI is seen by the Indian side as a key element in improving the level of cooperation between the countries related to industrial R&D

May 2005 First 3IP project workshop held in Israel at SNI, attended by an Indian delegation led by Minister for Science & Technology Mr Kapil Sibal

February 2006 Second project workshop held, at Indian Institute of Management in Bangalore, followed by a series of meetings in Delhi, with DST, TIFAC, NASSCOM (National Association of Software and Service Companies), IGIB (Institute of Genomics and Integrative Biology), CII (Confederation of Indian Industry) and others. The latter has been an anchor point in the orientation of the soon to be declared 3IP at SNI.

June 2006 Professor Gadi Ariav of Tel Aviv University is appointed Academic Coordinator.

December 2006 The program hosted distinguished guests from India in various forums within Israeli academia and organized a session focusing on Asia as part of Globes' Israel Business Conference 2006, as well as the publication of background materials in a special Globes supplement. Guests included Mr S. Gopalakrishnan, COO of Infosys; Prof. D.V.R Seshadri, Indian Institute of Management,

Bangalore; and Prof. Y.S. Rajan, Principal Advisor, Confederation of Indian Industry.

January 2007 — A follow-up visit to India was made by Prof. Ariav, to review the structure of 3IP with the program's partners, as well as discussing particular research efforts and recruiting Indian researchers in Kolkata, Gurgaon and Bangalore for the 3IP Academic Network. As a result, four specific studies were conceived, namely the Affordable Drugs study (06/2007), the IPR Management study (10/2007) and the Rural Development study (12/2007), as well as the establishment of affiliation with the BGU study of the management of virtual teams [Mallach-Pines and Zeidman, Ben Gurion University].

February 2008 — Former President of India, Dr. APJ Abdul Kalam visited Israel and a meeting was held with members of the India Israel Innovation Program.

March 2008 — Dr. Gilead Fortuna was appointed Senior Research Fellow, S. Neaman Institute and Head of 3IP India Israel Innovation Program

September 2008 — Dr. Gilead Fortuna decided to summarize the work and later stop the current project.

Appendix D. BIRD, the US – Israel Binational R&D Foundation

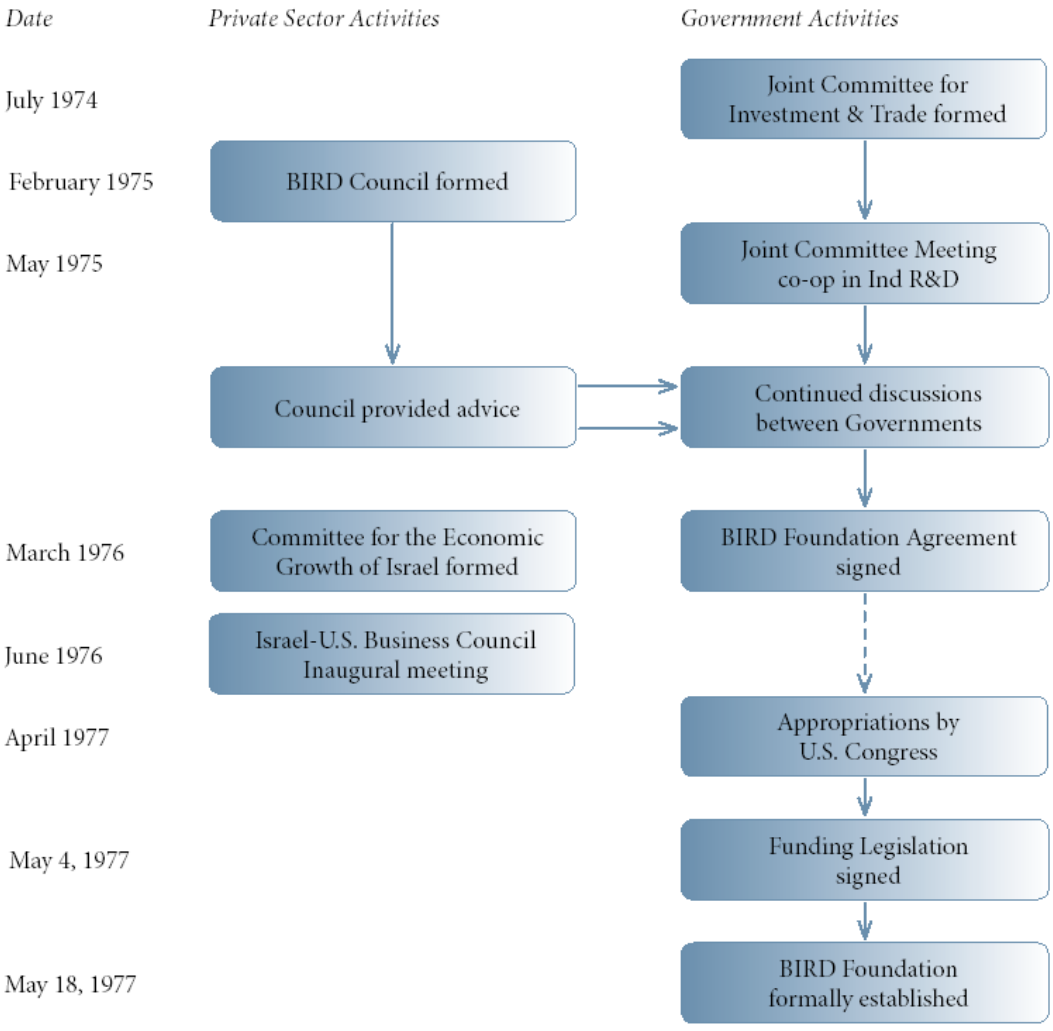
The mission of **the US-Israel Binational R&D Foundation (BIRD)** is to stimulate, promote, and support industrial R&D of mutual benefit to the US and Israel. Activities include matchmaking services between Israeli and American companies, including startups and established companies, and the provision of funding, in the form of a conditional grant for product development and commercialization costs. BIRD takes no equity in the joint projects and all BIRD services are free of charge.

BIRD itself was established by the US and Israeli governments in 1977. Each government provided $55 million for the BIRD endowment, which totals $110 million. The program supports approximately 20 projects annually, with a total investment of some $11 million per year. Since 1977, BIRD has invested over $245 million in 740 projects, which have produced sales of over $8 billion. Since 1977, the accumulated repayments to BIRD have totaled $82 million. Any pair of companies, one Israeli and one US-based, may apply jointly so long as they can demonstrate the combined capabilities and infrastructure to define, develop, manufacture, sell, and support an innovative product based on industrial R&D. The companies may be simply cooperating on an ad-hoc basis, linked through a corporate joint venture, or commonly owned (in whole or in part). The key criterion is that each company shall have the ability to carry out its part of the joint development and commercialization. BIRD funds up to 50% of each company's expenses. Repayments are due only if commercial revenues are generated. If a project fails, BIRD claims no repayments.

While BIRD was never studied by us in the manner suggested by Dr. Berry, the historical development of the BIRD foundation (see chart below[16]) sheds some light on the types of activities and actors required to achieve success. The chart is comprised of two columns, Private Sector Activities and Government Activities. We note that, starting in 1974, three separate private sector initiatives (BIRD Council; Committee for Economic Growth of Israel, and Israel-US Business Council) had a role in supporting and expediting the Government Activities which eventually culminated in the establishment of BIRD in 1977. Thus, the said Private Sector Activities were necessary for the establishment of BIRD.

[16] Background information is available in "Partnering for Progress: BIRD: 30 Years of Collaboration 1977 – 2007" published by the BIRD Foundation.

Historical Development of the BIRD Foundation



Appendix E. Useful Information Resources

E1. Resources and Websites - Israel

American Jewish Committee: www.ajc.org.il

BIRD: Israel–US Binational Industrial Research and Development Foundation: www.birdf.com

D&A High-Tech Information Ltd.: www.dainfo.com

Efraim Inbar, "Israel's Strategic Relations with Turkey and India", in Robert O. Freedman, (Ed.), "Israel: Political, Economic and Security Challenges", Boulder, Contemporary Westview Press, 2008

Embassy of Israel in India: www.delhi.mfa.gov.il

Globes Newspaper www.globes.co.il

Haaretz Newspaper www.haaretz.co.il

India Israel Initiative for Industrial Research & Development (I4RD): www.matimop.org.il

Israel Association of Electronics Industries: www.iaei.org.il

Israel Association of Software Houses: www.iash.org.il

Israel Export and International Cooperation Institute www.export.gov.il

Israel Venture Association: www.iva.co.il

Israel Venture Capital Research Center: www.ivc-online.com

Knesset, Science and Technology Committee, Israel: www.knesset.gov.il/science

Matimop: www.matimop.org.il

Ministry of Foreign Affairs, Israel Bilateral Agreements (listing of agreements with India): www.mfa.gov.il

Ministry of Industry, Trade and Labour, Office of the Chief Scientist: www.tamas.gov.il

Ministry of Science and Technology, www.most.gov.il

Samuel Neaman Institute www.neaman.org.il

Standard & Poors Israel: www.standardpoors.co.il

E2. Resources and Websites - India

All India Management Association (AIMA); AIMA Journal of Management & Research www.aima-ind.org and see "India's New Opportunity – 2020: 40 Million New Jobs; $200 Billion Annual Revenue, Report of the High Level Strategic Group, AIMA, Boston Consulting Group, Confederation of Indian Industry

Confederation of Indian Industry: www.ciionline.org

Consortium for Indian Information Technology Education: www.ciite.org

Embassy of India in Israel: www.indembassy.co.il

Embassy of India in Washington, DC: www.indianembassy.org

Federation of Indian Chambers of Commerce and Industry: www.ficci.com

Forbes, Naushad, "Higher Education, Scientific Research and Industry: Reflections on Priorities for India", prepared for conference on India's Economic Reforms at the center for Research on Economic Development and Policy Reform, Stanford University, 5-7 June 2003

GIAN, Gujarat Grassroots Innovations Augmentation Network. www.gian.org

Gopalakrishnan, R., "The Case of the Bonsai Manager", Penguin Portfolio 2007 (with a forward by Ratan N. Tata)

Government of India, Department of Science & Technology (DST): www.dst.gov.in

Government of India Directory: http://goidirectory.nic.in

Government of India, Ministry of External Affairs: http://meaindia.nic.in

Government of India, National Knowledge Commission "Innovation in India", June 2007. www.knowledgecommission.gov.in

Government of India National Manufacturing Competitiveness Council. www.nmcc.nic.in

Honeybee Network, India. www.sristi.org/honeybee.html

India Brand Equity Foundation: www.ibef.org

"India in Business": www.indiainbusiness.nic.in

"India: Economic Survey" (Hebrew), Israeli Export Institute, March 2009.

Indian Council for Research on International Economic Relations. Website contains a very comprehensive list of research organizations in India and worldwide: www.icrier.res.org

Indian Institute of Management, Bangalore (IIMB): www.iimb.ernet.in

Indian Venture Capital Association: www.indiavca.org

Institute of Economic Growth: www.iegindia.org

Institute of Genomics and Integrative Biology: www.igib.res.in

Krishnan, Rishikesha, "In Search of an Innovation Paradigm", Center for the Advanced Study of India online publication India in Transition, November 2008. www.casi.ssc.upenn.edu/iit/krishnan

Krishnan Rishikesha, "Transforming Grassroots Innovators & Traditional Knowledge into a Formal Innovation System: A Critique of the Indian Experience", Globelics Conference 2005

Kumar, R., M. Joseph, D. Alex, P. Vashisht, D. Banerjee, "Indian Economic Outlook 2008-09 and 2009-10", Working Paper No. 234, Indian Council for Research on International Economic Relations, March 2009. www.icrier.org

Management Development Institute (MDI), Gurgaon: www.mdi.ac.in

National Association of Software and Service Companies (Nasscom): www.nasscom.org

National Council for Applied Economic Research: www.ncaer.org

National Entrepreneurship Network. www.nenonline.org

National Innovation Foundation, India. www.nif.org.in

PanIIT Alumni India (organization of IIT alumni). www.iit.org

PanIIT Alumni India, “IIT Alumni Impact Study – 2008”.

Planning Commission, Government of India: www.planningcommission.nic.in

Research and Information System for Developing Countries www.ris.org.in
www.newasiaforum.org

Seshadri, D.V.R. and James A. Narus, "Value Chain Migration at Infosys (A case study)" February 2004

"SiliconIndia Newsletter": www.siliconindia.com

Society for Research and Initiatives for Sustainable Technologies and Institutions. www.sristi.org

The Indus Entrepreneurs: www.tie.org

Technology Information Forecasting and Analysis Council (TIFAC): www.tifac.org.in

Vikalpa: The Journal for Decision Makers, www.iimahd.ernet.in/vikalpa

E3. Resources and Websites – Other Countries

ACM Association of Computing Machinery www.acm.org

American Jewish Committee www.ajc.org

Aspray, William, Frank Mayadas, Moshe Y. Vardi, Editors, "Globalization and Offshoring of Software (2006), A Report of the ACM Job Migration Task force, Association for Computing Machinery www.acm.org

Atkinson, Robert D. and Andrew S. McKay, "Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution", The Information Technology & Innovation Foundation, March 2007 www.innovationpolicy.org

Business Week, Special report on India and China, August 22–29, 2005.

Business Week, "Whiz Kids: Inside the Indian Institutes of Technology's Star Factory", pp 28-34, 7 December 1998

Center for the Advanced Study of India: www.sas.upenn.edu

CIA National Intelligence Council's 2020 Project – "Mapping the Global Future", December 2004. www.cia.gov/nic

Council on Competitiveness: www.compete.org

Dutz, Mark A., Ed, "Unleashing India's Innovation", World Bank, 2007.

Economist Newspaper, "A bigger world: A special report on globalization", 20th September 2008.

Economist Newspaper: www.economist.com

Financial Times Newspaper: www.ft.com

Goldman Sachs, Global Economics Papers No. 99, 1 October 2003 "Dreaming with BRICS: the Path to 2050" and Paper No. 152, 22 January 2007. www.gs.com

India Observatory, London School of Economics and Political Science, www.lse.ac.uk

Information Technology and Innovation Foundation: www.innovationpolicy.org

"InnovateAmerica": www.innovateamerica.org

Institute of Technology & Innovation Management, Hamburg University of Technology (TUHH), www.global-innovation.net

IMD World Competitiveness Center: www.imd.ch

Indo-US Science and Technology Forum, www.indousstf.org

Intellectual Property Research Institute of Australia (IPRIA): www.ipria.org

Kauffman Foundation: www.kauffman.org

Larta Institute: www.larta.org

Leadbeater, Charles and James Wilsdon, "The Atlas of Ideas: How Asian Innovation Can benefit Us All", Demos UK, 2007 www.demos.co.uk

Lowy Institute for International Policy: www.lowyinstitute.org

Lynn, Leonard and Hal Salzman, "New Horizons for a Flat World", National Academies of Science, Issues in Science and Technology, 2005

Maital, Shlomo and D.V.R Seshadri, "Innovation Management: Strategies, Concepts and Tools for Growth and Profit", Response Books 2007

National Academy of Sciences, National Academy of Engineering and Institute of Medicine, "Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future", November 2005. www.nationalacademies.org

National Dialog on Entrepreneurship www.publicforuminstitute.org

National Endowment for Science, Technology and the Arts (NESTA), "UK Global Innovation: Engaging with new countries, regions and people", October 2008. www.nesta.org.uk

National Intelligence Council USA, “Global Trends 2025: A Transformed World”, November 2008. www.dni.gov

New York Times, multiple issues www.nyt.com

Rand Corporation: www.rand.org

Seshadri D.V.R "India and Israel: Synergies & Complimentarities in Innovation: Various Perspectives", presentation available on www.neaman.org.il

Sherman, Martin, "The India Israel Imperative", the Indian National Interest review, June 2008 and March 2009.

Sheth, Niraj, "India's high-technology industry faces sharp slowdown in growth", Wall Street Journal Europe, August 21, 2008.

Shorenstein Asia-Pacific Research Center (APARC): www.aparc.stanford.edu

Sirkin, H, J. Hemerling, A. Bhattacharya, “Globality: Competing with Everyone from Everywhere for Everything”, Grand Central Publishing, June 2008

Stanford India Biodesign, www.biodesign.stanford.edu

Stanford Institute for Economic Policy Research (SIEPR): www.siepr.stanford.edu

Sumatra Sen and Francine Frankel, Eds "India in Transition: Economics and Politics of Change - India's Strategy of IT-Led Growth", Center for the Advanved Study of India. www.sas.upenn.edu/casi

The Public Forum Institute: www.publicforuminstitute.org

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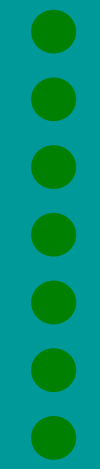

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