

Catching-up from behind: Lessons for India

A report prepared for
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Caption

By

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Executive Summary

1. The note prepares a consolidated perspective of the growth strategies of Japan and Korea. Beginning with the question *if catch-up is possible* the note proceeds on to examine the means and ways adopted by Japan and Korea.
2. A comparison of the broad economic structures of the successful catch-up countries and India shows that ability to **export technology intensive manufacturing goods** distinguishes the former from the latter.
3. It is argued that the importance of the manufacturing sector lies in its intrinsic characteristics of **increasing return to scale** and scope of taking the advantage of **imperfect competition through technological innovations**. Scope of imperfect competition is created by careful **choice of activities** that offers the best scope for innovation.
4. Again when compared the sources of growth for high and low growth countries, it has been observed that contribution of capital was more or less the same across the countries and differed in terms of the total factor productivity (TFP). In addition to **physical capital**, economists identify **Human Capital, Physical Infrastructure Capital and Social Capital** as major contributors to economic growth.
5. While **historical evidence** also indicate the superiority of the manufacturing sector as source of economic growth, countries like England also followed a regime of import restriction and export promotion for **protection of the domestic infant industries** till the time they were adequately competitive in the world market. This was coupled with preferential government financing to enterprises that took up ventures in the '**chosen activities**'.
6. Both Japan and Korea precisely followed the same policy. They had chosen the activities like heavy industries (steel, power), automobile industry, and electronic industry. Made a determined effort to build up **technological capability to match the best in the world and also to keep pace there after**.
7. They **restructured the financial institutions** to redirect investment to chosen activities, established **R&D institutions for specific technology** areas, and developed **human resources in the targeted areas** through revamping formal education and also vocational education and training. Made heavy **investment for infrastructure development** and increasing **efficiency of the government administration**.
8. Both **trade (import restriction, FDI, export) and industrial (licensing) policies** have been used to **protect and guide the domestic industries** to become competitive at the global level.
9. Government intervention has been the key to successful catch-up of these countries. **MITI, in case of Japan, and EPB in case of Korea were most powerful government arms** to visualise, plan and direct the economy to catch-up. Except in rare cases, government intervention was always through directing the private enterprises towards desired end.

(i)

10. India **never had catch-up as the driving force**. Hence although all known kinds of government interventions, and policy instruments for protecting domestic industries were in use, **none of them was geared to develop competitiveness at global scale**.
11. **Technology obsolescence** was not a major consideration. Once technology was imported for industries like steel there was no strategy to be and remain at the frontier of technology. **Repeated import of technology**, therefore, could not be avoided.
12. India had passenger car industry much before Korea and even before Japan. All started more or less the same way; importing technology from one of the world leaders. **Indigenisation was the Indian strategy; the Japan and Korean counter part were global leadership**. India took two decades to indigenise in 1971, Japan became one of the global players in the same year; Korea a decade latter.
13. The same is true for Indian industrial R&D initiatives that date back to 1940's with the establishment of CSIR. **Industrial R&D was general in nature and never targeted for reaching the frontier in target areas. As a result many successes also faded soon through obsolescence**.
14. For human capital development, India has created **islands of excellence**. In the absence of the challenge of catch-up, **resources thus developed remained mostly under-utilised**.
15. According to a recent World Bank study, the **business friendliness** of the Indian administration is just better than Bhutan and Afghanistan. UNDP **ranking in terms of HDI** places India in 127; Japan and Korea being 9 and 30 respectively.
16. **Lesson** that can be learnt from Korean and Japanese example is that **catch-up is possible**. What it needs is doing many **right things together at a right time**. Choice of right activities, directing resources to the chosen activities, investment in physical infrastructure, and development of human resources. **Policy package** that can orchestrate the entire act together depends on the ground reality and **cannot be uniform** across the nation and over the time and state of social and economic development.
17. Government plays the critical role in this game of turning around the economy. The distinction between the role of state in the socialist countries and the catch-up countries is that in the latter case the **state executes its planned development through private enterprises**, and keeps its own involvement in running enterprises to the minimum.
18. The role of government is essential because nation's interest is not the sum of the interests of the enterprises. In fact an **enterprise's interest could be in conflict with the interest of the nation**.
19. The **functional arms of the government**, therefore, have to be highly efficient. In fact this is considered as **the key to successful catch-up**.

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The author, however, is responsible for interpretations and views expressed in the report.

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Preface

The report **Catching-up from behind: Lessons for India** is fallout of the concern expressed by Hon'ble Minister for Science and Technology and Earth Sciences to have an in-depth understanding of the growth pattern or phases of the development of select countries over a period of time such as Korea, Japan, USA, etc. in comparison to India. The objective being to examine the role of the Government in S&T related investment and initiatives for promoting the development in such countries and to draw appropriate lessons for India.

Accordingly, the division identified Shri Pradosh Nath, Scientist, NISTADS to undertake the aforementioned assignment. Subsequently it was followed by a series of discussions with Secretary DST, officials of NSTMIS Division, DST and the Principal Investigator.

The report broadly covers the strategies that helped Japan and Korea to successfully catch-up with the developed world, role of government in these countries in defining and executing strategies, and compare their experiences with Indian development plans.

The findings of the report provide interesting insights and have useful implications for management and public policy to frame S&T led growth for the country.

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Catching-up from behind: Lessons for India

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Catching-up from behind: Lessons for India*

I

Introduction

Is catching-up possible? That is developing countries catching-up the developed countries in terms of the standard of living and general level of welfare of the average population of the developed countries. In simple arithmetical terms rate of economic growth of the developing countries have to be substantially higher than that of the developed countries within a reasonable time period, say one decade. At various points of time in history all the countries that constitute today's developed countries, including recent cases of newly industrialised countries, went through this process. How did they achieve it? Or first of all how do we know that they have achieved it? The second question is more about the indicators of economic (and social) achievements. GDP (Gross Domestic Product) and Per-capita GDP, the growth of them over the years, are two most popular indicators, notwithstanding the limitation in reflecting social benefits accompanying GDP growth.¹ Comparative growth of GDP's of selected countries over the years can tell us the progress of economic activities in the countries being compared. Faster movement of GDP and GDP per-capita of a country that was laggard, compared to the countries having high GDP would indicate whether the former is in the process of catching-up. Table 1 is an

* The author acknowledges the gains from discussion with the members of the research group on S&T and Globalisation Studies at NISTADS. The author would like to specially acknowledge the contribution of N. Mrinalini in sharpening the concepts and sourcing the material.

¹ The Human Development Reports, published annually, of UNDP have attended much of this problem. Another problem with GDP is statistical comparability over time and countries. There are various dimensions of statistical comparability of GDP. Current year GDP of different countries can be made comparable by using a common currency (usually USD) for conversion to the same unit. To study the movement of GDP of a country over the years, GDP for different years have to be normalised with reference to a base year. The comparability is sensitive to the choice of base year. For comparison of GDP over countries over the time period, data of each country for each year has to be normalised, preferably by purchase power parity (PPP) derived using a common currency (usually USD).

example how GDP can indicate the comparative progress of economic activities in different countries. It is to be noted that till 1950 Japan was far behind UK, USA, Germany and France in terms of GDP per capita, and by 1998 it surpassed others and was closing USA's. On the other hand India lagged far way behind.

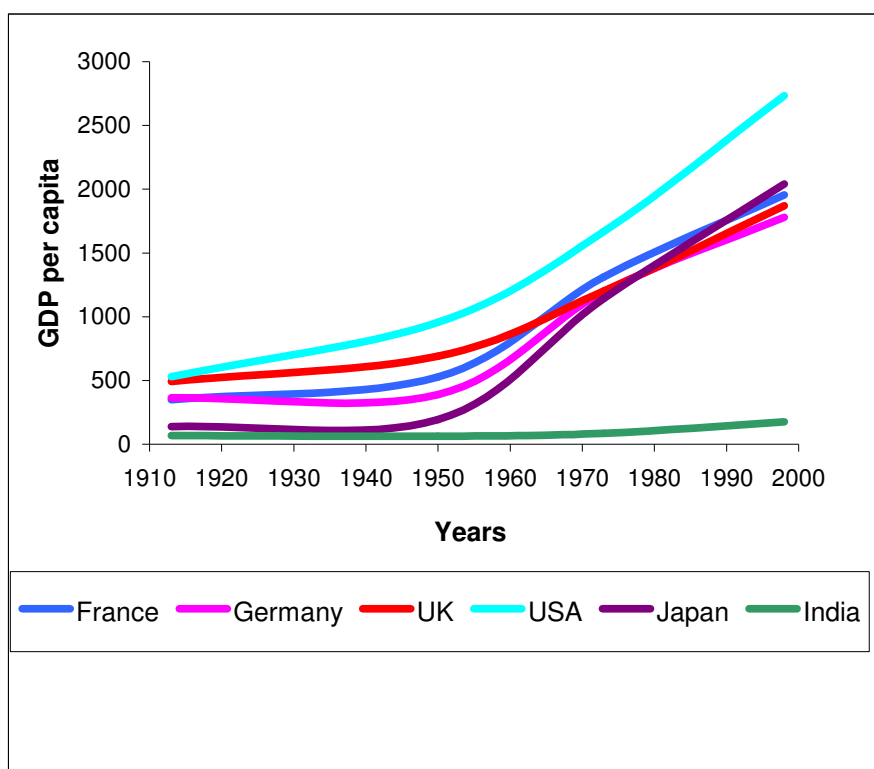
Table 1: Per capita GDP of select OECD countries and India

Country	Per capita GDP (PPP)				
	Years	1913	1950	1973	1998
France		3484.77	5270.39	13123.39	19557.53
Germany		3648.01	3881.09	11965.59	17799.42
UK		4920.54	6906.86	12022.50	18714.11
USA		5300.73	9561.35	16689.34	27330.6
Japan		1386.7	1926.30	11438.7	20412.7
India		672.5	619.0	853.2	1746.4

Source: Constructed from "The World Economy: A millennium perspective", Angus Maddison, OECD, 2001.

India's per capita GDP in 1998 was close to that of Japan in 1950. Comparison with other developed countries of Europe and USA will not bear much meaning because as we can see even in 1913 France's GDP per capita (lowest among today's developed countries) was more than double of India's in 1998. This comparison is based on historical data normalised by PPP or Purchasing Power Parity. Similar comparative data are not available for countries like Korea and China. But the picture does not change much if we use GDP per capita at current prices for more recent years and include Korea and China.

Graph 1: Per capita GDP at PPP from 1913 to 1998

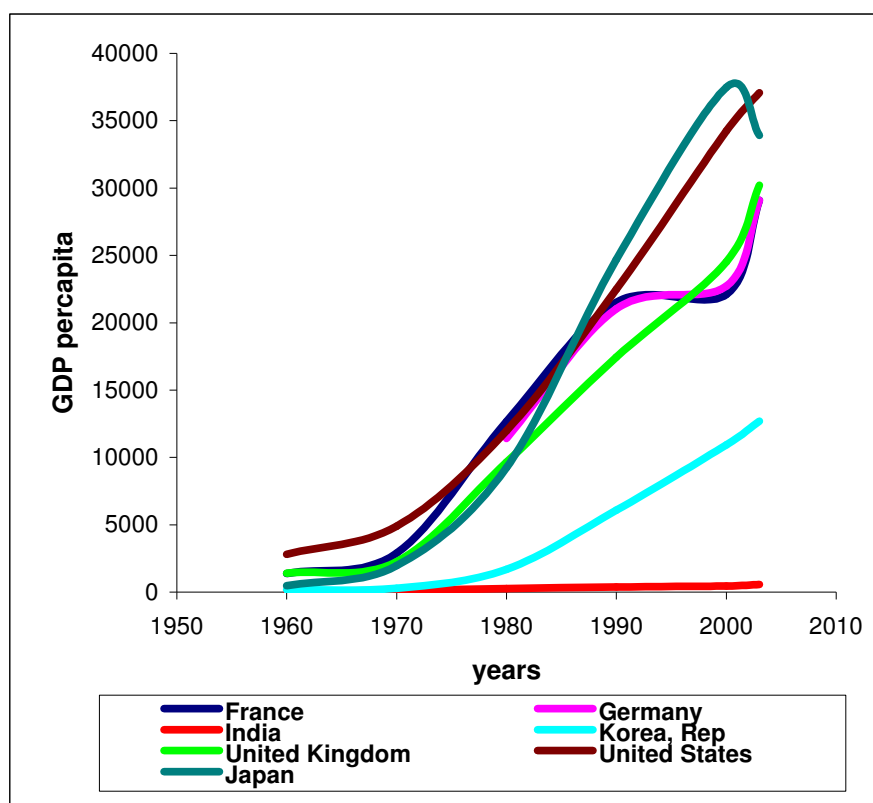


What Japan achieved in 1950's, Korea repeated the same in 1970's onward. In terms of current US Dollar India's GDP per capita was half of Korea's in 1970's, and became one twenty third (1/23) of Korea's in 2003.

Table 2: GDP per capita in current USD

	1960	1970	1980	1990	2000	2003
France	1372.5	2895.3	12657.8	21503.5	22092.6	29096.8
Germany	11406.5	21024	22726.7	29099.4
India	81.6	108.8	264.2	374.5	449.4	562.2
Korea, Rep	158.8	284.1	1686.6	6088.3	10932	12683.4
United Kingdom	1401.9	2261.5	9652.4	17441.6	24536.1	30210.5
United States	2793.3	4902.2	11969.2	22486.2	34245.3	37069.4
Japan	479.3	1984.1	9246	24689	37470.3	33919.8
China	93.4	110.2	188.2	307.3	846.9	1081.1

Graph 2: GDP per capita at current price USD

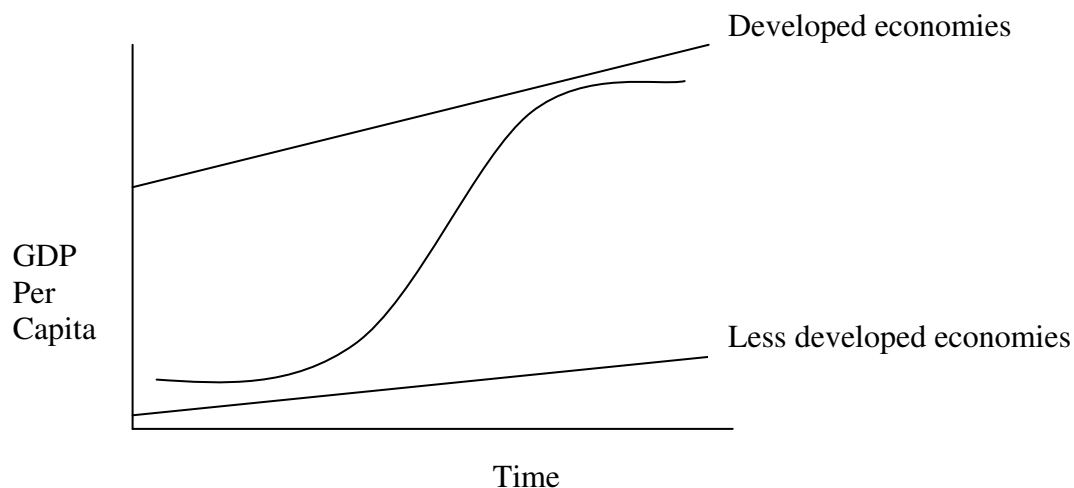


If we add the cases of Singapore and Taiwan catching-up from far behind does not appear to be a historical accident, but a feat that is quite attainable. Graph 3 presents the stylised version of the catching-up achieved by these countries. The gap between the two lines signifies the comparative level of economic development.

From the literature on catching-up policy pushes can be broadly divided in to three categories: i) Pragmatic trade and industrial policies, ii) Technology and innovation policies, and iii) Policies for development of social capital. In the context of catching-up these broad policies have to be seen in terms of directions and actions. We shall, therefore, try to achieve the following. 1) We shall try to draw broad economic distinction between Japan and Korea and India. Such distinctions would tell us what to achieve, and also the required direction of the policies for achieving the

same. 2) Direction of the policies thus derived, we shall try to identify the exact policies and actions that could provide the big-push. 3) We try to draw lessons for India to catch-up from the practices and experiences of the countries that were successful in catching-up. Since such experiences and practices are never exactly imitable, and actually conditioned by socio-political and cultural nuances of the countries, we shall try to discern the generic aspects of the policies and actions to derive actionable part of their experiences.

Graph 3: Stylised process of Catching-up



Source: Adapted from G. C. Rodrigo, Long-term perspectives on economic reform and industrial restructuring, in, P. R. Scholtes (ed), Industrial Economics for countries in transition, UNIDO and Edward Elgar, 1996.

The rest of the report is organised in the following sections. In the second section we try to capture the broad economic characteristics of the countries that could successfully catch-up with the developed countries, namely, Japan and Korea alongside India. We also include Kuwait to make the point that although per capita GDP of Kuwait is higher than that of Korea why it is not the country that has to be emulated for successful catch-up. Economic characteristics of the successful catch-up countries would suggest the direction of policies and actions for less developed

countries that aspire to catch-up. The third section details the trade and industrial policies adopted by the successful countries in achieving what they achieved. The fourth section throws light on the innovation and technology policies of these countries and compares the same with that of India's. The fifth section takes up the issues of social capital that is considered by scholars as important ingredient to successful catch-up and develops a comparative scenario for India. The last section draws the lessons and action points for India.

II

Economic characteristics of catch-up

We shall concentrate mainly on Japan and Korea, because outside the developed block in Europe and America (who attained economic leadership in 19th century), these are the two countries that achieved fastest growth in last four decades, and therefore, being most recent they are more relevant. We also include Singapore and Taiwan to argue that, although often dismissed as too small a country to be considered as an example for successful catch-up country, it shows characteristics similar to Japan and Korea. From the tables 2 and 3 above, we see that Japan in 1970's, and Korea in 1980's had been successfully climbing the steepest portion of the catch-up curve shown in graph 3. What were the changes in economic activities during climbing the steepest part of the catch-up? Since similar comparable data is hard to find we present snapshots separately for both the countries.

Japan was devastated during Second World War. Major cities were brought down to rubbles. The wartime economy, which was mainly oriented towards war needs, was shattered leaving huge unemployment, and scarcity of essentials. Japan's recovery through changes in economic structure is presented in table 3.

Table3: Changing economic configuration of Japan since 1950

Years	Food, fuel, raw material (%)		Chemical products (%)		Machinery, transport equipment		Other industrial products (%)	
	Export	Import	Export	Import	Export	Import	Export	Import
1950 ¹	5.9	94.0	2.0	2.6	8.8	0.8	48.7*	1.2
1955	12.9	86.6	4.7	4.7	12.3	5.2	70.0	3.4
1965	7.4	74.8	6.5	5.2	31.2	9.6	54.3	10.3
1975	10.4	79.6	7.0	3.6	49.2	6.6	39.2	9.7

* Shows only export of textiles.

1) Export data is only for major items.

Source: Constructed from tables used by Takafusa Nakamura: The post-war Japanese Economy, 1981, Tokyo University Press.

Table 3 provides interesting insights on what was happening inside Japanese economy during post-war reconstruction to the 1970's when Japan emerges as one of the important economies in the select club of developed countries. The basic dynamics of reconstruction during this period has been promotion of export to balance the perpetual dependence on food, fuel and raw material. It is to be noted that although Japan has never been a major importer of industrial products, it has successfully restructured its export basket to strengthen its foothold in the international market. By 1975 export of machinery and transport equipments rose from paltry 8.8% to 49%, while export of other industrial products, which mainly used to be textiles sharply came down to 39.2%, out of which textiles constituted only 5%, a sharp decline from 48.7% in 1950. Textile was replaced by export of steel, which constituted about 34% by 1960, but subsequently fell to 10% being gradually replaced by export of machinery and transport equipment, particularly ships and automobiles. The change in the composition of the export basket actually meant a shift from low tech-low value items (textiles), to high tech-low value items (steel) requiring skill of complex project management, to high tech-high value final products like automobiles and ships involving complex manufacturing process, and was

accompanied by development of heavy industries and chemical industries. As we know now 1970's onward there was another major export achievement by the electronic industry of Japan. Around the same period Japanese goods have earned the reputation of quality, standard, and value for price in the international market.

The Korean story was not much different from that of Japan. The upswing of Korean economy becomes most visible from 1970 onwards. Table 4 presents the change in the structure of the Korean economy during the upswing.

Like Japan, Korean mantra of catching up was the same; expand manufacturing sector, build up high tech capability, drive for export, and expand the share of manufactured goods in the growing export market. In a matter of two decades Korea established itself as an advanced industrial power. As one observer wrote, 'No nation has tried harder and come so far so quickly, from handicrafts to heavy industry, from poverty to prosperity, from inexperienced leaders to modern planners, managers, and engineers' (as quote by Kim from Ezra Vogel, *The four Little Dragons: The Spread of Industrialisation in East Asia*, Harvard University Press, 1991).

Table 4: Changing economic configuration of Korea since 1950's

Year	Export (USD millions) at current price	Structure of GDP (% Contribution of sectors)		Structure of Manufacturing sector	
		Primary	Manufacturing	Light industry	Heavy industry
1953	39.6	47.3	9.0	78.9	21.1
1960	32.8	36.8	13.8	76.6	23.4
1970	835.2	26.6	21.0	60.8	39.2
1980	17504.9	14.7	28.2	46.4	53.6
1990	65015.7	12.5	29.3	34.1	65.9

Source: Constructed from Linsu Kim; *Imitation to Innovation: The Dynamics of Korea's Technological Learning*, 1997, Harvard Business School Press.

When Herbert Simon wrote in 1985, "We know that the poverty is a solvable problem, for it has been largely banished from Western Europe, Japan, the United

States ...” he did not mention Korea in the list. We now know from the Korean experience that it is solvable quickly as well.

Export structure and technology achievement are the two key elements of the catch-up story of Japan and Korea. Where does India now stand compared to these countries? A comparison with India with respect to these two broad indicators would reveal the task ahead. Table 5 presents technology and export structure related data for Japan, Korea and India along with a few other high GDP per capita countries. The table uses indicators developed and published by World Development Reports of UNDP. We have included Singapore, another successful country to emphasise the point that path to catch-up appears to be the same. We have also included Kuwait to draw attention to the point that although Kuwait is high GDP per capita country, sustainability of its economy is suspect because of overwhelming dependence on its natural resources, and alarming absence of enterprises based on technological capabilities. Even with much lower GDP per capita, Indian economy is less vulnerable and more sustainable compared to Kuwait.

Table 5: Economic characteristics of catch-up

Country	1	2	3	4		5	
				1990	1999	1990	1999
Japan	24898	0.698	80.8	3	3	96	94
Korea	15712	0.666	66.7	6	8	94	91
Singapore	20764	0.585	74.9	27	13	72	86
Kuwait	17289	-	6.8	94	80	6	20
India	2248	0.201	16.6	28	22	71	76

Source: Human Development Reports, 2001, 2003; UNDP

1. GDP per capita in US\$ 1999
2. Technology Achievement Index (TAI) Values
3. High and medium technology export (as % of total goods export 1999)
4. Primary exports (as % of merchandise exports)
5. Manufactured exports (as % of merchandise exports)

Column 2 of table 5 gives technology achievement index (TAI) of the selected countries. It is to be noted that Kuwait does not figure anywhere in the index, and India is far below the countries like Japan, Korea, and Singapore. Lower value for TAI is closely associated with share of technology export in total export, which is as high as 80.8% for Japan and only 16.6% for India; Kuwait being at 6.8%. Similarly share of manufactured export in total export is around 94% for Japan and Korea, and 76% for India. It is to be noted that Kuwait has only 20% manufactured export in 1999, which is up from 6% in 1990. Table 5 shows the characteristic difference between the economies of Japan and Korea with that of India. Kuwait on the contrary, although bracketed with developed countries in terms of GDP per capita reveals all the characteristics of the laggards.

Table 6 elaborates further the manufactured export (as shown in table 5) of the selected countries. The table shows the share of hi-tech export as percentage of manufactured export for 1990 and 2003.

Table 6: Share of hi-tech export in manufactured export.

Country	Manufactured export as % of merchandise export		Hi-tech export as % of manufactured export	
	1990	2003	1990	2003
Japan	96	93	24	24
Korea	94	93	18	32
Singapore	72	85	40	59
Kuwait	6	7	3	1
India	71	77	2	5

Source: World Development Reports, 2001, 2003; UNDP

Table 6 shows that both Kuwait and India are more or less at the same level in terms of the contribution of hi-tech export in their respective total export, although India has significantly high share of manufactured goods in her total export.

III Manufacturing is the key

The strategy that brought success to both Japan and Korea is quite evident. Manufacturing has to be the mainstay of the economy, and within manufacturing there has to be a move towards more knowledge intensive or technology intensive activities. Such a strategy increases productivity and strengthens the competitiveness of the goods in the world market, and hence boosts exports. The strategy, however, is not a new discovery by these countries. As early as 1844, Friedrich List as a keen observer of the economic development of England, described English catching-up process, ‘The principle *sell manufactures, buy raw material* was during centuries the English substitute for an (economic) theory’ (as quoted in E. S. Reinert, *Catching-up from way behind: A third world perspective on first world history*, in, *The Dynamics of Technology Trade and Growth*, ed. Jan Fagerberg, Bart Verspagen, and Nick Von Tunzelmann, Edward Elgar, 1995). In fact it has been argued that Japan learnt the efficacy of the manufactures for superior productive power from the German teachers who flowed in Japan from 1883 onward (Reinert). In post World War economic reconstruction, Japan strongly rejected the strategy of specialisation in economic activities using comparative advantage of cheap labour (13.1 million unemployed after the war). Instead carefully chosen activities that began with textiles, followed by steel and then automobile and ship; and also electronic industry as emerging technology area (particularly in the home electronics market), and thereby setting a steep learning curve for the economy. Korea and other newly industrialising countries like Singapore, Hong Kong, and Taiwan followed the same strategy.

What is so intrinsic in manufacturing that it forms the core of the growth strategies of the successful catch-up countries? The answer to this question can be found in the general principle of economics of return to scale. Between agriculture

and manufacturing, the former is dependent on land the availability of which is limited. It is more so in the cases of Japan and Korea. As a result agricultural activities are subjected to diminishing returns more quickly than it is in the manufacturing activities where requirement of land is negligible compared to agriculture. New technological inputs, as argued by Ricardo, can only defer the onset of diminishing return in agriculture, cannot reverse it. The manufacturing sector on the contrary, can enjoy increasing return to scale by infusion of new technological knowledge, both in machine and human embodied forms. It is the scope of increasing return to scale that makes manufacturing sector special in terms of quick growth of factor productivity and also the benefit of imperfect competition (along with short run and long run barrier to entry).

Given the relation between return to scale and economic activities, as it is briefly described above, the task for growth seeking countries is to look for the activities that offer the best scope of increasing return to scale. Thus in early 15th century a poor country like England could quickly change its fortune and catch-up with the Italian economy by carefully choosing the downstream production activities of manufacturing wool and woollen clothes, gradually replacing the age old practice of export of raw wool and import of woollen products manufactured in Italy. The rest is history. The Crown promoted establishment of textile manufacturing firms, created the scope of textile machinery, followed by waves of mechanisation that extended from wool to other areas of manufacturing.

What has been easy for England in 15th century, is a formidable task in today's world. 'Today, locating these superior activities concentrated in any broad industrial category, as in the past, is difficult. Almost all activities and industries, even the most pedestrian ones, have some segments offering the winning combination of innovation

and imperfect competition' (Reinert, 1994). Japan and Korea had followed the most pragmatic path.

Japanese textile industry was doing good business catering to the huge demand for cheap cloths during post World War period. It also provided the employment cushion needed for large number of unemployed population in war-shattered economy. Japan already had significant textile machinery industry. The reconstruction drive of the war-damaged infrastructure witnessed a sharp demand of steel world over. Japan had cashed in these opportunities. By 1960 steel was occupying 34% of Japan's export. Within a short period Japan shifted its choice of economic activities to most promising areas like products with application of electronics, and machinery and equipment industry that was changing fast towards automation through potential application of new technology based on electronics. At the higher end of the machinery and equipment industry was automobiles and ship building; areas where Japan established its global supremacy by the end of 1970's. What is to be noted in the choice of the manufacturing activities by Japan is the potential for technological innovations. On the one hand choosing industries that have high value products as well as high value applications across the industries, on the other hand developing capabilities in application of electronics, together provided the scope created by the combination of innovation and imperfect competition.

Korean effort was much more narrowed down. Korea targeted automobiles, electronics, and semiconductor chips, and made a determined effort to create competitive edge through intensive and targeted R&D initiatives. Like Japan, Korea also chose industries with potential technological innovations. In electronics Korea successfully ventured in to home appliances differentiated with new features. In

semiconductor chips it competed with Japan and USA to catch up at the right time to share the rising demand in the world market.

Economic growth, however, does not automatically follow from the appropriateness of the activities chosen. Choice of appropriateness itself is a complex process. None of the catch-up countries left it to so called 'market forces'. As it is known now, in Japan, Ministry of International Trade and Industry (MITI) played critical role in controlling and directing the process of industrialisation. In Korea, as Linsu Kim writes, "...one of the most conspicuous characteristics of the industrialization of Korea is the strong government and its orchestrating role. The government held the wheel and supplied the fuel, while private firms, particularly chaebols, functioned as engines (Linsu Kim, *Imitation to Innovation*, 1997. Harvard Business School Press)." In both the cases respective governments steered the growth process through series of policies. Before we review the salient features of those policies we shall elaborate sources of economic growth related to the catch-up process. This would help us to organise government policies in relation to economic objectives.

IV

Sources of economic growth in catch-up countries

Econometric studies have disaggregated the economic growth achieved by countries over a long period. Studies on both comparative and long-term growth of a country have brought about a few useful insights. For a long time economists used to believe that productivity increase in an economy is achieved through capital accumulation. The celebrated study by Solow, and subsequent contributions by many others, has shown that only a small portion of productivity increase is actually explained increase in capital stock. The residual has been attributed to technological

changes. This, however, does not mean that capital accumulation is not important. In fact large-scale capital investment is also necessary to make the new technology work. The table 6 presents the World Bank study on sources of growth in catch up country and some of the other Asian economies experiencing productivity growth.

**Table6: Sources of Growth in selected Asian countries
(Average over 1960-1989)**

Country	GDP growth per capita (%)	Growth from investment (%)	Residual TFP growth (%)
Taiwan	7.0	3.5	3.5
Hong Kong	5.8	2.3	3.5
Indonesia	3.2	2.0	1.2
Japan	5.5	2.0	3.5
Malaysia	4.0	2.9	1.1
South Korea	6.6	3.4	3.2
Thailand	4.6	2.2	2.4

Source: The Asian Miracle, World Bank (1993); adapted from Scholtes

Catch-up countries like Japan, Hong Kong, Taiwan and Korea show higher overall GDP growth compared to Indonesia, Malaysia and Thailand. In fact all the catch-up countries have sustained the rate of growth for a longer time compared to other countries in the table. Contribution of capital investment in the GDP growth is quite similar. This is expected because of the similarity in capital goods used in similar lines of production. On the contrary, in the column of residuals of the productivity growth, Catch-up countries show much higher figures compared to other countries. Economists suggest many factors to explain the residual. These factors can be broadly divided in to four groups:

- a) Physical capital: Machine and equipments. This also includes machine embodied part of technology;
- b) Human capital: It is the skill level of the workforce. Level of education is one measure of the human capital. Other critical aspects of human capital are skill

acquired through work, training, R&D etc. This constitutes human embodied part of technology.

- c) Physical infrastructure capital: Roads, transport, electricity etc. that facilitate production, trade and transactions, both national and international.
- d) Social capital: Essentially includes efficiency and competence of the state administration that collect tax, control trade, issues licences, mediate disputes and conflicts, and assures law and order.

All these factors are called capital because they can be accumulated and also they depreciate like the traditional notion of capital (Rodrigo).

From the above table and accompanied discussion we now know that these factors together distinguish the catch-up countries vis-à-vis others. The state of development of these factors, their relative level of accumulation and depreciation can indicate the national capability to catch-up (let us call it NCC).

V

Government role in developing National Capability to Catch-up (NCC)

While planning to catch-up, England did take a few important measures. It provided finance to the firms taking up manufacturing of woollen goods. Financing was for building-up new factories and also for imported plant, machinery and equipment. Many firms in the growing industry were sending their selected workforce for training in other countries and also were inviting experts from other countries for learning new production technology. It also restricted export of raw wool and import of manufactured woollen textiles. Restriction continued till the English manufacturing became competitive. The growth of competitive textile industry had its cascading effects on all other industries, services and also on primary sector. Japan and later Korea followed the English wisdom only with more extensive and intensive drive.

Like England, neither Japan nor Korea had the Crown's corpus to fund the business. Both the countries reorganise their respective economic institutions (both financial and non-financial) to revitalise the domestic market, to create competition among enterprises, to push the industries to the frontier of production efficiency and technology to make them globally competitive. And all these were done through direct intervention from the respective governments.

Government and catch-up in Japan

In Japan at the very first instance, during the post-war period major reform measure was the breaking up the Zaibatsu.² The members of families of Zaibatsu were even prohibited from financial business. This was accompanied by anti-monopoly and anti-economic concentration law. The result was rise of new enterprises and intense competition in all industries.

Policies for promotion of capital accumulation was the mainstay of the industrial reconstruction of Japan that began in 1950's. To facilitate this, national fund was employed to establish Japan Development Bank whose mission was to provide low interest fund for capital and equipment to key industries. Similarly Japan Export-Import Bank was established to provide fund to exporting firms. Financing was complemented by several tax benefits and preferential foreign exchange allocation for firms investing in new plant and machinery and thereby in imported technology.

Generally such benefits would go to industries earmarked or targeted by the government. As a result from 1950 to 1970, industries like steel, electric power, shipbuilding, electrical machinery, electronic equipments, automobiles, petrochemicals and synthetic fibres, witnessed steady flow of state of the art, in some

² Zaibatsu was business conglomerate controlling Japan's industry and finance, and used to enjoy preferential treatment from government. Zaibatsu had been seen as major bottleneck for growth of independent entrepreneurship in Japan, and also considered responsible for hindering the growth of domestic market through low wages and concentration of profit.

cases even yet to be proven technologies. During the same period annual private investment increased more than tenfold, and stock of capital in private hands by more than five folds. Typically, while encouraging capital accumulation government would hold the floor during industrial recession providing support and guidance through series of fiscal, monetary and management initiatives as part of industrial policies.

Identification of economic activities with growth potential used to be taken up by Ministry of International Trade and Industry (MITI), where as the broad direction of development and growth targets along with policy direction used to come from the economic planning body. MITI's role in the miracle of Japanese catch-up is well documented.

The example of electronic industry would suffice to make the point. First to be noted the series of various Acts. The Provisional Act for the promotion of Electronic industry was passed in 1957. This was followed by the Provisional Act for the promotion of Specified Machinery and Electronic Industries in 1971 and further changed to the Provisional Act for the promotion of Machinery and Information Industries in 1978 - all provisional laws that were to be changed with the progress of the industry. Thus, in the early phase Japanese companies dominated the world market with calculators and watches, in the later phase as the Act of 1971 suggested attention was on consolidation of machinery and electronics in one for development of robotics, CNC machine and flexible manufacturing system etc. Availability of funds coupled with other financial measures was directed through Japan Development Bank for promotion of enterprises in these areas. Simultaneously, the Act for Research Association was passed to promote research and development resulting the establishment of unified public and private R&D along with priority grants of subsidies for experimental research.

Promotion of carefully selected industries will accompany provisions for protection from import till the time industry becomes internationally competitive. The foreign exchange allocation system was used for protection of domestic industries from time to time.

Parallel to the drive for promotion of industries and accompanying technological capability building through targeted R&D initiatives, government was heavily investing on development of infrastructure and revamping education system. Percentage share of education in the general account expenditure increased from 3.3% in 1950 to 12.6% in 1975. Similarly account for development of road, transportation etc shows a share as high as 14.8% in 1950, rising to 19.2% in 1965, and averaging to 14.3% in 1975.

Government and catch-up in Korea

There is no difference in the essence of the policies followed by Korea and Japan. There are, however, differences in specifics. Like Japan economic restructuring began with a shake-up of the traditional business conglomerates. The Chaebol in Korea were not disbanded the way Zaibatsu has been treated in Japan. Instead the Korean government used the Chaebols to invest in enterprises the way government wanted them to do. At the core of economic growth was overwhelming intervention of the Korean government. As one observer wrote, “.....almost all important tasks (of running an enterprise) are themselves transformed as a consequence of government intervention.” (Alice H. Amsden; *Asia’s Next Giant: South Korea and Late Industrialization*, Oxford University Press, 1989, PP. 81).

The Korean government took full control of all the banks and other financial institutions and credit system³. On the other hand the Economic Planning Board was to plan the investment requirement (five year plan initiated from 1962) over the targeted industries suggested by the Economic Planning Board. The government would use industrial licensing and subsidised credit facilities to select and promote firms in the selected industries. Private firms of Korea were heavily dependent on government for investment fund. During 1963-73, internal financing of the private firms was only 20% compared to 32.5% in Japan, and 65% in USA. Again investment priorities of the government were tightly entangled with trade policies. Both industrial license and subsidised financing was available (for big firms and small firms, young firms and old firms, chaebol and non-chaebol) on condition of export commitment. There were exceptions made for industries like automobiles that required longer period to become competitive. In case of incurring loss in export, the government compensated the losers by inflating the prices in the domestic market.

A few points need to be mentioned regarding the government's role as investor in Korea's economic growth. Government was heavily dependent on external borrowing for financing increasing demand for investment as the economy was heading toward heavy industries and diversification plans. From 1962 to 1982 in most of the years government investment exceeded available savings. Much of the deficit was met through foreign loans. This was the period of heavy investment in infrastructure development in the areas like, electricity, gas, railroads, highways,

³ As the first move for economic restructuring, along with full control on Chaebols, the government nationalised the banks, albeit most of them were on the verge of bankruptcy. This along with Foreign Capital Inducement Law of 1962, empowered the government 'to determine where, when and how much to invest in which industries' through providing government guarantees to lenders eliminating the risk of default and exchange rate depreciation. This was coupled with high rate of domestic rate of interest (resulting fast growth of national saving) that made real cost of borrowing from abroad negative in most of the 1960's and 70's. Government having full control over borrowing from abroad was equipped well to not only favour particular industries, but also firms, that government thought as potential industry leaders, through industrial licensing-cum- subsidised credit allocation on a discretionary basis.

irrigation etc, share of which in GDP became doubled between 1964 and 1970. Most of the foreign debt during 1966-1971 was used to finance exports, imports of capital goods, import substitution in heavy industries and infrastructure development.

The economy was managed extremely efficiently to use the debt productively to generate high level of output. The capital accumulation increased to 30.95% of GDP in 1984 from 13.95% in 1962. The growth of labour productivity averaged to 13% during the same period. With the growth came concentration of economic power in the hands of a few business houses. Korean industry is more highly concentrated than that of Japan. In 1982 about 31.4% of all commodities were being manufactured under competitive competition, rest was being produced either under monopoly (11.4%) or oligopoly. Within the heavily concentrated industrial structure there was fierce competition among oligopolists. Since most prices used to be controlled by the Economic Planning Board, the nature of competition was based on non-price factors, like, the soundness of the investment projects for new licenses, export performance, license for foreign technical inputs, quality assurance, technological achievements etc. For example, the Economic Planning Board controls the price of passenger cars. Two passenger car companies, therefore, compete in terms of product differentiation, services, efficiency etc. in both domestic and export market.

The secret of high productivity gain was building up technological capabilities. Korea had adopted all known means of technology acquisition. In the physical capital embodied form, Korea imported modern capital goods from USA and Japan; the latter being the major source. It sourced technology through licensing agreement from western European countries, USA, and Japan. Total technology licensed rose to 668 in 1982-83 from 318 during 1962-71. Again Japan was the largest source of technology for Korea. Foreign technologies were adopted through short

term independent technology consultant, manpower trained abroad on imported technology, and also through educated technical manpower from colleges and universities. Revamping of the education system through sizeable investment facilitated the process of generating technical manpower employable for the rising demand in the manufacturing sector, heavy industries, and also the emerging areas like electronics and biotechnology.

In response to the growing need for technological advantage a set of policies were taken up to stimulate R&D activities. For technology intensive firms a lower tariff for R&D equipments and machinery was introduced. Firms were advised to set aside a reserve fund for R&D. Such fund used to be tax exempted for a fixed period. Government had also established venture capital fund for technology oriented start-up firms. All these were in addition to purpose specific R&D institutes set up by government to address technological issues in the targeted industries.

The example of the development of electronic industry of Korea epitomises the story narrated above. When the Korean government decided to promote electronic industry in 1966, Korea was ten years behind Japan in terms of technological capability. In 1977 government identified 77 areas, including TV and computers, for intensified promotion. The Korean government supported the development of the industry for 20 years from 1966 to 1986. During this period government established an industrial estate for the production of semiconductors and computers; established Electronics and Telecommunication Research Institute in the estate for product development; protected domestic market against foreign competition; restricted direct foreign investment in electronics, but allowed joint ventures with major business groups like, Hyundai, Daewoo, LG, and Samsung. As stated earlier these companies were competing with each other through new product development, getting in to new

technology areas and moving towards frontier areas. In the end Korean companies were in the same footing with Japan and USA for development of 256M DRAM.

VI

Lessons for India

Do we also want to catch-up? Answer to this question may not be as easy as it appears in the first instance. The catch-up that we have discussed here is with the west, more precisely the development style of Europe and USA. Even in the Western world there are voices that demand for less resource intensive, less energy intensive and less wastage prone economic development. This note has not addressed those issues. The note instead examines the cases of catch-up countries and tries to draw lessons for India, in case India wants to catch-up in the western style. In the following we try to match the Indian experiences with the salient features of the cases of Japanese and Korean catch-up.

1. First point to be noted that both the countries had taken similar path. In fact other successful catch-up countries like Taiwan, Hong Kong and Singapore also followed the same path. They differed only in details of policies.
2. Governments of both the countries had taken proactive initiatives to define the course of development, chosen the actors, and guided them through.

If the government intervention is the core of the catch-up, India had that in place much before Japan and Korea. In fact government intervention in India, sometimes, went much deeper than these two countries. Indian policy for economic development has been dubbed as the ideology of mixed economy where government run enterprises were to be complementary to the private enterprises. For development

of heavy industries, instead of relying on the private sector large enterprises were established under government ownership.

3. It was MITI in Japan and Economic Planning Board (EPB) in Korea who as government arms enjoyed enormous authority to steer the planned process of development.

India visualised a planned economy much before these countries. Planning Commission of India was set up for guiding the course of economic development. The Planning Commission of India did not have the authority that was enjoyed either by MITI or EPB.

4. Manufacturing sector has been chosen as the source of quick growth. Even within manufacturing sector, areas were selected on the basis of potential for growth through technological means. Alongside was built-up the core industries like steel, power, chemical etc. More precisely, manufacturing for export was the growth mantra for both the countries. The mantra needed acquiring technological capabilities to compete in the export market.

In case of India the importance of manufacturing sector was lost in the confusion between small scale and large enterprises. The ruling perception has been that the small enterprises needed financial and technological supports from government. Technology support system for small-scale units has been institutionalised through agencies under central government down to state and local governments. Also there were packages for financial help, marketing and raw material supplies. The support system was general in nature and was the same across the industries and was not particularly geared to technological competitiveness of national and international levels. There was hardly

any recognition to the fact that small scale was to grow big through technological upgradation, new product and process development etc.

The scale was taken as structurally fixed.

On the other hand the heavy industries and other large-scale industries under government ownership began with a bang with foreign technological collaborations. In the absence of any action plan for determined technological catch-up, most of them faced bad time with technological obsolescence. The same was the fate of many large-scale private sector enterprises that survived through repeated import of technologies.

5. Both the countries had twin policy of import substitution and export promotion, implemented simultaneously, along with policies of protection of domestic industries (through tariff and quota restrictions) till the time those became internationally competitive.

India had followed strong import substitution regime. It was replaced by increasing emphasis on export promotion. Import substitution was not coupled with export promotion. Import substitution was mainly aimed to protecting domestic industries, and was never used as an instrument for technological competitiveness.

6. Both the countries used fiscal and monetary instruments along with industrial licensing as sticks to control the behaviour of the domestic industries to become internationally competitive.

Protection of domestic industries, without matching commitment towards becoming internationally competitive, made Indian firms inward looking. Licensing and other monetary and fiscal instruments,

that worked wonder in Japan and Korea, made Indian enterprises cosier in the domestic market and crippled the drive for expansion. The best example of it is Indian automobile industry. The first passenger car was rolled out of Indian factory in 1948. In case of Japan it was 1952 and for Korea it was 1962. All three began with borrowed technology and protected domestic market. Total Indian production of passenger car from 1948 to 1985 was less than only Toyota's production in 1971 when USA was overwhelmed by Japan's export and was pressurising Japan for opening the passenger car market. By 1980 Korea emerged as an important player in the world auto market.

7. Mainly in Korea, but to a great extent also in Japan, prices were under government control. Firms were forced to earn profit through non-price competition. This led the firms looking for quality, standard, product diversification, services etc. as the main dynamics both in the domestic and foreign markets.

The concept of non-price competition as the dynamics of industrial growth was never perceived in India. Technology has never been a priority.

8. Oligopolistic competition in the domestic market has been the preferred organisational structure of the industry in both the countries.

Unlike Japan and Korea, the structure of the Indian industry has evolved on its own and it is predominantly a long tail structure where large number of small firms coexists with small number of large firms under the condition of highly segmented market and price competition.

9. As first step to restructure the economy both the countries began with total government control of the financial system, and curbing the hold of existing business conglomerates on the respective economies. While Japan went for total disbanding of Zaibatsu, Korean used chaebols to take up new ventures the way government wanted them to. Control of finance, along with other instruments armed the government to discipline, and guide the enterprises.

In India also financial institutions were under government control. These institutions were expected to run on commercial basis. Hence they chased investment opportunities offered by the large firms. There was hardly any government targeted development investment as it was in the case of Japan and Korea.

10. One important highlight of the catch-up process of these countries was that the highly interventionist governments, barring a few exceptions, did not establish, own or run any enterprise. Instead they promoted and guided the private enterprises to build-up modern enterprises.

In case of India government intended to invest for establishing heavy industries presuming that private investment would shy away from investment having long gestation periods. Gradually various compulsions had driven the government investment towards trivial activities like bakery and beverages. Instead of being the guide or complementary to private enterprise, government turned out to be a competitor of the private sector.

11. Although in different intensities, both the countries allowed private enterprises to seek foreign technological assistance, foreign technology licensing, help of foreign consultants, sending own technologists abroad for technology learning,

foreign investment, and also import of capital goods as means of technology acquisition. But all these have been allowed by the government based on proven track record of past achievements.

Global market and technological competitiveness was never the driving factor of government intervention in India. Hence although similar instruments were used for government interventions, they gave entirely different outcome.

12. Alongside, to address the rising demand for technical manpower government undertook heavy investment for revamping education system.

Inertia for technological competitiveness being perpetuated, the demand for technical manpower was also superficial. Technical manpower was needed for running industries that are laggards in international standard. Institutes like IITs and IIMs were island of excellence that can face challenges at global level and under utilised at domestic level. The state of general education at primary and secondary levels demands radical improvements.

13. On one hand government provided various fiscal and other incentives for R&D by enterprises, and on the other hand research laboratories were established for technology specific and industry specific capability building.

Various incentives for in-house R&D are in place in India as well. What has driven enterprises in Japan and Korea is the thrust on global competitiveness. Survival of the enterprises was dependent on that. In the absence of such a drive in India in-house R&D were more laid back than aggressive.

So far government funded industrial R&D is concerned, as one researcher has observed, the chain of laboratories were created much before the objective conditions of technology driven industries was in place. As a result the laboratories were not groomed to match the gruelling work culture that characterised the industrial research. The success of the laboratories, therefore, is much less visible in development of full set technology or product development. A few examples will clarify the point.

Colour TV circuit board design was developed and also commercialised through an extended arm enterprise of the laboratory with financial support from government. First the time taken for the development of the same and launch of the product was enough to make the technology obsolete by the time it was in the market. There was no determined drive, as it was the hallmark of the Japanese and Korean initiative, to strive to be at the frontier of the technology. The initiative therefore had a very short life.

The same was the fate of reprographic machine. The R&D was not directed to global level. It did not survive more than two years after it was launched in the market. Technology became obsolete within no time.

The other example is the project for development of CFC alternative. The project is claimed to be a success at technology level, but commercially it could not compete with the cheaper products from other countries. How did other countries produce it cheap? Why cannot

we achieve the same? In the Indian style of government intervention there is no way such a challenge can be taken up.

14. Massive government expenditure was undertaken for development of roads and highways, transport, power, and communication networks.

As we all know much is to be achieved in this regard to qualify for catching up. As per one international standard, road network should be 11% of the geographical area of a city. Delhi has the best road network in India, and the figure for Delhi is 8%. We can guess for the rest of the country.

15. As export grew very fast, both the countries were having positive trade balance vis-à-vis developed countries. There were pressures on both the countries to liberalise the economy particularly the restrictive trade regime. Both the countries went around such pressures to successfully evade the pressures by nominal liberalisation, in many cases kind of liberalisation that in fact indirectly protected their domestic industries.

This is a relevant issue in the context of WTO. Is a trade regime of export led growth with protected domestic market feasible under WTO agreement? The answer is both yes and no depending upon how cleverly a country can evade the pressure. There are many non-tariff and non-economic barriers that can be created to protect the domestic market. Even the developed countries try the same route.

16. Another issue that has been mentioned as an important factor but was not taken up for further discussion is the issue of 'Social Capital'. In brief it is the efficiency of the government and its functional arms implementing government programmes and decisions. One reason it was not elaborately

discussed here is the paucity of information and also appropriate indicators. The Human Development Index (HDI) developed by UNDP incorporates many of the issues that are included in 'Social Capital'. As per the latest HDI published by UNDP Japan's rank is 9, Korea's 13 and India's 127. This suggests that India has to have more intensive measures for creation of effective social capital.

From the above description the mis-match in use of government interventions by catch-up countries and India can be enumerated as follows.

1. India has used practically the same set of instruments that Japan and Korea had used for catch-up. India derived different results because catch-up was not the priority. In fact, before the East Asian miracle, possibility of catch-up was not generally believed by political leaders, policy makers and even researchers.
2. Achievements of the socialist block countries lent credentials to the belief that government enterprises were the key to development. It was found politically also more congenial for a new nation that was India.
3. The socialist type of approach that India had followed had more emphasis on distribution than generation of wealth. Technology, therefore, was not an issue, nor there was much understanding of technological obsolescence. The catch-up experience has taught us that generation of wealth needs as much attention as the distribution of it.
4. The collapse of socialist economies has raised question about the government enterprise as the path to development. Catch-up experience shows that strong government can indeed use the private enterprises for generation of wealth.

5. The catch-up experience also brings forth the fact that government intervention is important because interest of an enterprise may not match the interest of the nation. What is good for the companies may not be good for the nation. Hence enterprises have to be guided towards a match between national and company interest.
6. This brings in the question of nation. Successful catch-up is also based on strong nationalism, at least in the cases of Japan and Korea. This also contributes to shape up many aspects of social capital.
7. Over all what is learnt from the experiences of the catch-up countries is orchestration of different policies towards one goal with proper timing of the orchestration.

Rosenberg (1990), after examining the relative failure of R&D in India, writes, “History suggests that the countries that have managed to grow rapidly have done so by doing many things right, not just one or two things. With respect to such policies, it appears that potential pay-offs may be very high, but only if science and technology are perceived as complements to effective economic policies, not as substitutes.”

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