

National capability to catch-up: Lessons for India*

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The current literature on a nation's capability to catch-up with the developed world, or National capability to catch-up is reviewed here. Catch-up requires rapid generation of wealth in sectors that offer the scope of increasing return to scale, which in turn is achieved through technological innovations. With the case of Japan and Korea, it is argued that successful catch-up requires framing economic policies around a core of scientific and technological capability. The article indicates that India missed this perspective because of overemphasis on distribution of wealth (in USSR pattern) that overshadowed the importance of generation of wealth.

Keywords: Catching-up, economics of catch-up, rapid growth in Japan and Korea, technology leadership, technology achievement.

Is India capable of catching-up with the developed world? Rosenberg¹, after examining the relative failure of R&D in India, wrote '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'. This article argues that the study of catch-up policies of Japan and Korea actually indicates much stronger role of science and technology. Instead of being complements, it is argued here, that science and technology have to be the core around which the shells of economic policies have to be planned. Together then, they would constitute the effective national capability to catch-up.

Core of catch-up

In economic terms, catch-up would mean achieving economic growth (GDP as one of the indicators) at a rate that enables the country to raise the standard of living of its people comparable to that of developed countries. A stylized graphical description of catch-up is shown in Figure 1, where catching-up means the ability to climb the steepest portion of the curve, i.e. P1, P2. The mainstay of the strategy for steepest climb is: increase productivity and strengthen the competitiveness of the produce in the world market, and hence boost exports.

The strategy, however, is not a new discovery by Japan or Korea. As early as 1844, Friedrich List, as a keen observer of the economic development of England, described the English catching-up process, 'The principle *sell manufactures, buy raw material* was during centuries the English substitute for a (economic) theory'³. Economists were in agreement that the scope of increasing return to scale, intrinsic in the manufacturing activities, makes the 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)⁴⁻⁸. Choice of productive activities with scope of increasing return to scale, therefore, is the key to quick changes in the economic fortune of a country; or in other words, the trick to climb the steepest part of the catch-up curve⁹. 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

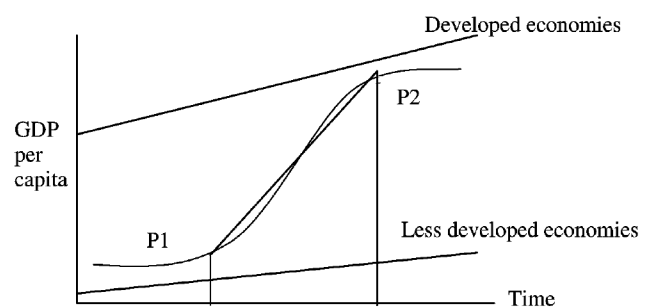


Figure 1. Stylized process of catching-up. Source: Adapted from Rodrigo².

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manufactured in Italy. The rest is history. The Crown had taken up proactive policies to promote the establishment of textile-manufacturing firms, and created the scope for textile machinery. The consequence of this course of action was waves of mechanization that extended from wool to other areas of manufacturing.³

The core of catch-up strategy, therefore, is made up of the quest for technological capability building that ensures increasing returns to scale in certain manufacturing activities. These may be called superior economic activities, and identification of these activities and to create the advantage of imperfect competition through technological inputs are the tasks that lay the road from P1 to P2.

But what has been easy for England in the 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.'³

Economic principles to policies

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 were also 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 competitive³. The growth of competitive textile industry had its cascading effects on all other industries, services and also on the primary sector. Japan and later Korea followed the English wisdom only with more extensive and intensive drives, where the government played the most critical role through a series of policy initiatives.

Policies to catch-up

The main constituents of the policy packages of Japan¹⁰⁻¹² and Korea^{13,14} were the following:

- Anti-monopoly and anti-economic concentration law that saw the end of domination of Zaibatsu (Japanese business conglomerates). The Chaebol (Korean business conglomerate) in Korea were not disbanded in the same way. Instead the Korean government used the Chaebols to invest in enterprises the way the government wanted them to do.

- Japan Development Bank was established with a national fund to make provision for low interest fund for capital and equipment to key industries. Similarly, Japan

Export-Import Bank was established to provide funds to exporting firms. The Korean government took full control of all the banks and other financial institutions and credit system; and followed a policy of preferential lending to industries and firms of the government's choice.

- In Japan, 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. In Korea, investment priorities of the government were tightly entangled with trade policies. Both industrial license and subsidized financing were available (for big firms and small firms, young firms and old firms, Chaebol and non-Chaebol) on condition of export commitment.

- In both the countries, as part of the industrial policy, the government will provide support and guidance during industrial recession through a series of fiscal, monetary and management initiatives as part of the industrial policies. In case of incurring loss in export, the government compensated the losers by inflating the prices in the domestic market.

- In Japan, on the basis of the broad direction growth targets along with policy directions from the government, the Ministry of International Trade and Industry (MITI) was responsible for identification of economic activities according to assessed growth potential. Identified industries would enjoy protection from import, and also preferential allocation of foreign exchange till the time they become internationally competitive.

In Korea, the Economic Planning Board (EPB) was to plan the investment requirement (five-year plan initiated from 1962) over the targeted industries. The government would use industrial licensing and subsidized credit facilities to promote firms in the selected industries.

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 EPB controlled the price of passenger cars. Two passenger car companies, therefore, had to compete in terms of product differentiation, services, efficiency, etc. in both domestic and export market.

- In Japan, the Act for Research Association was passed to promote research and development, resulting in the establishment of unified public and private R&D along with priority grants of subsidies for experimental research. In Korea, in response to the growing need for technological advantage, a set of policies was taken up to stimulate R&D activities. For technology-intensive firms a lower tariff for R&D equipment and machinery was introduced. Firms were advised to set aside a reserve fund for R&D. Such funds were tax-exempted for a fixed pe-

riod. The 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 the government to address technological issues in the targeted industries.

- Japan was heavily investing on development of infrastructure and revamping its education system. The share of education in the general account expenditure increased from 3.3% in 1950 to 12.6% in 1975. Similarly, accounts for development of road, transportation, etc. show a share as high as 14.8% in 1950, rising to 19.2% in 1965, and averaging to 14.3% in 1975.

For Korea, this was the period of heavy investment in infrastructure development in areas like electricity, gas, railroads, highways, irrigation, etc., the share of which in the GDP became doubled between 1964 and 1970. Most of the foreign debt during 1966–71 was used to finance exports, import of capital goods, import substitution in heavy industries and infrastructure development.

The result was restructured economies (as shown in Tables 1 and 2) of Japan and Korea with quick economic growth that caught-up with the developed world and also caught the fancy of the rest of the world.

It is to be noted from Table 1 that in Japan by 1975, export of machinery and transport equipment rose from a 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 re-

placed 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 the skill of complex project management, to high tech–high value final products like automobiles and ships involving complex manufacturing process; it was also accompanied by development of heavy industries and chemical industries.

Table 2 is self-explanatory for economic resurgence of Korea. According to Kim¹⁴, ‘...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’.

Lessons for India

Table 3 shows where India stands in the process of catching-up¹⁵. Column 2 in Table 3 shows that lower technology achievement index value is closely associated with a share of technology export in total export, which is as high as 80.8% for Japan and only 16.6% for India. Similarly, the share of manufactured export in total export is around 96 and 94% for Japan and Korea, and 77% for India. Column 5 in Table 3 elaborates further on the share of hi-tech export as a percentage of manufactured export for 1990 and 2003.

In the following we try to match the Indian experiences with the salient features of the cases of the Japanese and Korean catching-up.

Table 1. Changing economic configuration of Japan since 1950s

Year	Food, fuel, raw material (%)		Chemical products (%)		Machinery, transport equipment		Other industrial products (%)	
	Export	Import	Export	Import	Export	Import	Export	Import
1950*	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

*Export data are only for major items. **Shows only export of textiles.
Source: Constructed from Nakamura¹⁰.

Table 2. Changing economic configuration of Korea since 1950s

Year	Export (USD millions) at current price	Structure of GDP (per cent 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	17,504.9	14.7	28.2	46.4	53.6
1990	65,015.7	12.5	29.3	34.1	65.9

Source: Constructed from Kim¹⁴.

Table 3. Economic characteristics of catch-up

Country	1	2	3	4		5	
				1990	2003	1990	2003
Japan	25	0.70	81	96	93	24	24
Korea	16	0.67	67	94	93	18	32
Singapore	21	0.60	75	72	85	40	59
Kuwait	17	–	7	6	7	3	1
India	22	0.20	17	71	77	2	5

Column 1, GDP per capita in 1999 ('000 US\$).

Column 2, Technology achievement index value.

Column 3, High and medium technology export (as percentage of total goods export 1999, rounded).

Column 4, Manufactured exports (as percentage of merchandise exports, rounded).

Column 5, Hi-tech export (as percentage of manufactured export, rounded).

Source: Human development reports¹⁵.

1. If government intervention is the core of the catching-up, India had that in place much before Japan and Korea. In fact, government intervention in India, in many cases, went much deeper than the other 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.

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

3. In the case of India, the importance of the manufacturing sector was lost in the confusion between small-scale and large enterprises. The ruling perception has been that the small enterprises needed financial, technological and marketing support from the government. There was no policy road-map on when the support system would be withdrawn. 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 became technologically obsolete. The same was the fate of many large-scale private sector enterprises that survived through repeated import of technologies.

4. 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 at protecting domestic industries, and was never used as an instrument for technological competitiveness.

5. 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 wonders in Japan and Korea, made Indian enterprises laggards. The

best example of this is the Indian automobile industry that rolled out its first car in 1948, and Japan in 1952. Both began with borrowed technology and protected domestic market, but Japan swept the US market by 1971, when only Toyota's production was more than the total Indian production since 1948 to 1985. Korea began in 1962 and emerged as an important player in the world auto market by 1980.

6. 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 to 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.

7. Unlike Japan and Korea, the structure of the Indian industry has evolved on its own and it is predominantly a long-tail structure, where a large number of small firms coexist with a small number of large firms under the condition of highly segmented market and price competition^{16,17}.

8. 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.

9. In the case of India, the government intended to invest for establishing heavy industries presuming that private investment would shy away from those 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, the government turned out to be a competitor of the private sector¹⁸.

10. Global market and technological competitiveness were never the driving factors of government intervention in India. Hence although similar instruments were used for

government interventions, they gave entirely different outcomes.

11. 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 islands of excellence that could face challenges at global level and were underutilized at domestic level. The state of general education at the primary and secondary levels demands radical improvements.

12. In the absence of pressure for technological competitiveness, in-house R&D was not aggressive enough. As far as government-funded industrial R&D is concerned, as one researcher has observed, the chain of laboratories was created much before the objective conditions of technology-driven industries were in place¹⁹. As a result, the laboratories were not groomed to match the grueling work culture that characterized industrial research.

13. India ranks too close to the bottom in the world ranking of both social (education and health) and economic infrastructure and communication network to match the experience and practices of Japan and Korea.

Discussion

The Soviet type of socialist regime had more emphasis on distribution, rather than generation of wealth. The result was poor technological progress in the production and manufacturing sector, co-existing with spectacular success in space technology in the then Soviet Union. Many scholars see this as the main crisis of the Soviet system²⁰. As a nascent economy, India was greatly influenced by the Soviet success in space technology that opaqued its poor records in the production sector. Unlike Japan and Korea, the Indian endeavour has been indigenization through technology transfer. Technology leadership in the chosen production activities had never been a policy option among Indian planners. Technology obsolescence, therefore, was the main ailment of the Indian economy, the solution for which was in repeated technology import. Overall emphasis on distribution of wealth was reflected in the overwhelming presence of the government¹⁸. Emphasis on generation of wealth on the other hand, led both Japan and Korea to the development of technological might that could wrest even the most sophisticated international market from traditional leaders, and that too within a span of a decade. The Indian economy is presently growing at about 9%. Sustenance of this growth impetus would need commensurate development in social and economic infrastructure. If the experience of Japan and Korea is to be emulated, India has to revamp its infrastructure,

and human resource development initiatives. The latter would require a rejuvenated education and health system.

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