

## The Knowledge Economy: Technology and Innovation

The World Bank's 1999 WDR on "Knowledge for Development" presents a four-dimensional framework that captures the fundamental "drivers" of a knowledge economy.

The drivers that defines a knowledge economy includes: total expenditures in R&D as % of GDP, total royalty payments, total number of patents granted, number of articles in technical-research journals, contribution of total factor productivity to GDP growth.

The main drivers" or "pillars" for inducing innovation/knowledge (i.e., the independent explanatory variable) include:

1. **Improving the Investment Climate:** A competitive business framework creates incentives that encourage and reward innovation; financial sector reforms can help develop the nonbank financial sector which plays a central role in financing innovative businesses; policies that promote trade and investment to encourage business innovation because of external competitive pressures and knowledge transfers in terms of best business practices; more flexible labor markets facilitate mobility and the employment of skilled personnel in the most dynamic firms; economic and institutional policies that provides incentives for the efficient creation, dissemination, and use of knowledge and technology and encourage entrepreneurship. (Indexes: Rule of law, regulatory quality, tariff and non-tariff barriers, government effectiveness, corruption, level of FDIs).
2. **Investment in Education:** An educated, creative, and skilled population that can create and use knowledge. (Indexes: literacy rates, secondary enrolments, university enrolments, workers training programs).
3. **Investment in IT Infrastructure:** A well-developed information, communication and internet infrastructure that can facilitate the effective communication, dissemination, and processing of information. (Indexes: No. telephones, computer/internet penetration per 1,000 people).
4. **Establish Links between Business and Research Centers/Universities/Consultants and other groups:** An effective innovation system with dynamic interaction between the world of science and technology and the world of business that can tap into the growing stock of global knowledge, adapt it to local needs, and transform it into products valued by markets. (Indexes: number of university programs with support/collaboration with businesses; percentage of university budgets financed by programs paid by business firms)

Other factor should include:

5. **Establish Technology Parks with government infrastructure support but managed by the private sector.** Technology parks managed by the private sectors have proven to be effective in stimulating the development of IT.

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***Box 3.5. India, from the Silicon Valley of South Asia to a Global Knowledge Superpower***

India does not rank very high in most indexes of technological progress. Its software industry, however, is recognized worldwide as a success. In the last few years, its software exports accounted for 14 percent of total exports with revenues of US\$ 6.2 billion and an annual growth rate 55 percent. This success is not only one of volume, but also of quality and technical excellence.

Bangalore and Hyderabad illustrate the cluster-based development process that took place. Bangalore's success is based on a business environment and a special legal framework that promotes scientific businesses. In addition, the state and central governments have tried to provide state-of-the-art facilities to attract and retain the most talented specialists. This shows that removal of a traditional planned economy bureaucracy releases the potential for economic growth.

Building on its regional successes, India has developed a strategy for becoming a knowledge superpower. Plans have been made to reduce illiteracy, to mobilize the broad, high-quality network of national technological and management institutes as a core training and research base, and to expand the ICT infrastructure, with a view to offering universal access with innovative, user-friendly technologies.

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***Box 3.4. Ireland***

Before the recent financial crises (created in Ireland by poor banking lending for real estate financed by excessive foreign capital), Ireland was doing quite well economically.

Indeed, Ireland has demonstrated that a country traditionally labeled one of the poorest members of the European Union, highly dependent on agriculture and low-end manufacturing, can successfully turn its economy into a provider of high-technology services.

Ireland's transformation is attributable to sustained and well-targeted investment in education and to a policy framework favorable to FDI, notably in the ICT sector. From 1995 to 2005, at 20 percent of GDP it had one of the world's highest net inflows of FDI, second only to Sweden.

Ireland has become one of the most dynamic knowledge-based economies in Europe and is the second largest exporter of software.

With an average rate of growth in GDP of 9.1 percent over the period 1995–2001, the “Irish miracle” is not attributable solely to the government's investment in education and its efforts to attract FDI. Ireland's success also stems from a stable macroeconomic and fiscal environment and significant openness to trade.

Substantial EU assistance has also helped Ireland to target investments relevant to a knowledge economy. Today, it is the headquarters of many European technology giants, and Dublin has taken advantage of its well-developed network infrastructure to become the hub for European telephone call centers. Ireland has thus come a long way from its traditional low-end manufacturing economy, but to become a full-fledged knowledge economy, it has to strengthen indigenous innovation.