Chapter 34

SCIENCE AND TECHNOLOGY SYSTEMS IN LESS DEVELOPED COUNTRIES
Identifying a Threshold Level and Focusing in the Cases of India and Brazil

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Abstract: Patent and scientific publication data offer useful information for the analysis of key features of national systems of innovation of less developed countries. However, the use of these statistics should be subjected to careful evaluation. This chapter uses data for 120 countries (patents, scientific papers, and GDP), investigating different patterns of interactions between science and technology according to different levels of development. Later this chapter focuses on the data for India and Brazil, investigating interactions between science and technology in three dimensions: inter-sectoral, inter-regional, and inter-temporal.

1. INTRODUCTION

As discussed in previous chapters of this Handbook, developed countries have systematic activities in science and technology and systematic and well organised data on these activities. This is not the case of a broad set of countries identified as ‘less developed countries’ (LDCs henceforth).

In the case of LDCs the difficulties to find reliable data are not trivial. These difficulties have pushed scholars as Coe, Helpman and Hoffmaister (1995) in their study on “North–South” technological diffusion to use “trade openness” as a proxy for access to international R&D: they have argued that there are no reliable data on R&D for LDCs. Furthermore, broad samples as those provided by the Penn World Table do not use indicators of science and technology (Barro et al., 1995).
This chapter suggests ways of dealing with S&T data for LDCs. At least two indicators are under-utilised: statistics from the United States Patent and Trademark Office (USPTO henceforth) patents and from the Institute for Scientific Information (ISI, henceforth) scientific papers. Both statistics are available on the Internet (www.uspto.gov and www.isiknowledge.com) and researchers may prepare databases suitable for multifarious research purposes. Naturally, these indicators have pros and cons. The pros and cons of patent and scientific paper statistics have been broadly discussed (Griliches, 1990; Patel and Pavitt, 1995; Grupp, 1998). Notwithstanding, for less developed countries more problems must be considered: different levels of development, and different levels of maturity of national systems of innovation (NSIs henceforth) are reflected in the ability of these statistics to capture all innovations relevant for a given country in a (relatively) more backward level of development. The specificities of these statistics for LDCs are discussed in the next section.

Why have these data been under-utilised? Probably because there is a ‘mantra’: statistics of patents and scientific papers are neither relevant nor useful for investigations concerning LDCs. This chapter shows that, on the contrary, patents and scientific papers statistics are relevant for LDCs. Moreover, these statistics have been powerful indicators of successful catching up processes.

Another problem concerning studies of LDCs is the procedure to group all LDCs as if they were all the same. Although ordinary rankings prepared by the World Bank or by the United Nations Development Programme disaggregate LDCs in different categories (low and middle income countries, and lower middle and upper middle income countries), it is not unusual for researchers to discard these differences and to deal with LDCs as if they were the same thing. S&T data may contribute to avoiding this inaccuracy. Science and technology data, for instance, help to differentiate India and China from the other ‘low income countries’ in the World Bank rankings (World Bank, 1997).

This chapter suggests a preliminary differentiation of LDCs using USPTO patents and ISI indexed papers statistics. This suggestion may be seen as a dialogue with Amsden’s (2001) elaboration. Amsden divides the LDCs into two broad sets: the ‘rest’ and the ‘remainder’. It is an interesting division, but it could be improved. In the ‘rest’ Amsden ranks South Korea, Taiwan, India, Mexico and Brazil, amongst others. However, as catching up countries, South Korea and Taiwan probably have left the ‘rest’ during the 1980s and the 1990s. Indeed, the data on patents and scientific papers may help to differentiate the trajectories of catching up countries and the ‘rest’.

This chapter later focuses on two countries (India and Brazil) and investigates them using USPTO patents and ISI indexed papers.