1. Introduction

For development economists and policy makers, movement of productivity has been a matter of both curiosity and concern. Cross-country disparities in real incomes, growth rates and standard of living have been attributed to differences in productivity performance. Productivity is one of the key determinants of cost and price-competitiveness of firms and industries of a nation. This in turn determines the competitive edge of the exports of these firms and industries in the global markets. Policy makers are interested in productivity movements for yet another reason. The conduct of monetary and exchange rate policies cannot be determined in isolation from the productivity performance of the economy.

Although historically productivity improvement has been regarded as a contributory factor to economic growth, the credit for popularising growth accounting exercises in empirical literature can be given to Solow (1957). The classical theory of growth emphasised the role of physical capital accumulation as a determinant of growth, which in turn depended on the sacrifice which people are willing to make in terms of their current consumption. Keynesian theory of output highlighted the role of effective demand factors in explaining the level of output. Harrod-Domar model emphasised the role of physical capital and savings in explaining growth rate. Solow (1957) provided the framework within which the growth emanating from an increased application of factor inputs could be separated from that due to the residual factors. This residual has been designated as productivity factor. After this pioneering contribution, numerous studies highlighting the role of productivity in the growth process have emerged. These have encompassed mainly two issues: (i) to what extent does productivity contribute to growth; and, (ii) whether growth rates of countries tend to converge. The former is important to determine whether or not the growth process is sustainable. It has been argued (Krugman, 1994) in the context of east-Asian countries that since their growth was driven by increased application of factor inputs, it was not a miracle. Sustainability of growth process driven by increased application of factor inputs can be threatened by either limited availability of factor inputs in the future or diminishing returns to factor inputs. The development of literature on 'endogenous growth theory' bears testimony to the seriousness with which productivity has been treated as an engine of growth in the recent years.

The measurement of both the levels of productivity and the growth rate of productivity assumes critical importance for the obvious reasons stated above. Despite this, more often than not, there is hardly any consensus among different researchers on the magnitudes of levels and the growth rates of productivity obtained. This makes comparisons of productivity a difficult task. With regard to cross-country comparisons of productivity, the differences in the product-mix, the quality of products and the methodological differences complicate the matter. Yet another problem in productivity measurement is that many studies have concentrated merely on productivity growth and not on the levels of productivity. As a result, the initial levels of productivity gaps remain unidentified and unmeasured. However, two limitations to estimation of productivity have been identified in the recent literature (Hulten, 2000). *First*, comparison of productivity over time may not be very useful if the product composition of national income undergoes a major change. It has been argued in the recent literature that, the 'new knowledge based economy' cannot be compared to the 'old tangible product based economy'. *Second*,

productivity estimates may overstate economic performance by ignoring the environmental degradation which itself can limit the growth process in future.

This study is an attempt to update the estimates of productivity provided by the earlier studies and it also provides estimates of productivity by using alternative methodologies (single and double deflation) at industry levels. The industries have been selected on the basis of their contribution to India's export earnings and the availability of consistent time-series data. The time-span covered by this study is 1973-74 to 1997-98. The focus on industries with large contribution to manufactured exports is primarily because exports hold the key to managing the external sector of an economy. Export competitiveness depends critically on supply-side factors, such as, productivity and costs. While measures like 'devaluation' as a means of boosting exports have their limitations, increasing productivity and improving quality consciousness can provide a real boost to exports and make the firms and industries competitive. The manufacturing sector has figured prominently in India's development strategy and accounts for about three-fourths of India's export earnings (inclusive of software exports).

Against this back drop, the present study makes a modest attempt to empirically estimate productivity in the major manufacturing industries and also for the manufacturing sector. The database and analysis pertains only to the factory sector.

The organisation of this study is as follows. In Section 2, we discuss the theoretical issues pertaining to the concepts and measurement of productivity and also provide a synoptic view of the major studies on productivity carried out in the 1980s and the 1990s for the Indian economy and the manufacturing sector of the Indian economy. In Section 3, we provide the methodological details of the study and an empirical background to the estimation of productivity indices. This section deals with the rationale behind the selection of industries, the details of the data used in the study, the relative positions of the selected industries and the growth rates of real gross output and real value-added in the industries included in this study. Section 4 forms the core of this study, wherein, we report the estimates of productivity for the selected industries, *viz*., textile, metal, machinery and transport equipment, chemical, and leather. Productivity estimates for these industries as a group and also for the entire manufacturing sector have also been reported in this section. *First*, we have reported the levels of labour productivity and capital intensities for the various industry groups. *Second*, we calculate the two single factor productivity (SFP) indices, *viz*., labour and capital productivity indices. *Third*, in view of the controversy about the 'separability of material inputs' in the Indian context [Rao 1996a, 1996b], we estimate the total productivity (TP) and the total factor productivity (TFP) indices, within the growth accounting framework. *Fourth*, we have estimated TFP indices with both single (TFPS) and double deflation (TFPD) methods. This we expect will shed some light on the Ahluwalia [1991] and Balakrishnan-Pushpangadan [1994] controversy and examine the impact of changing relative input-output prices on the measurement of productivity. In Section 5, we present the international comparisons of productivity estimates and in Section 6, the concluding observations emanating from this study.

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