achieved with small outlays. In others, innovations are "hard"; large investments upfront are required. In some industries, innovations are riskier than in others. These considerations, in theory at least, would call for an optimal patent system that tailors the patent term to suit the characteristics of each industry in the economy. In practice, authorities have generally opted for a common patent term in the economy. Nevertheless, taking the current 20 year term as an example, in a uniform patent term regime the patent system as applied in a given industry may or may not be economically efficient in an economy-wide sense. In industries where innovations are "easy" or the return on innovations is high, the commercial usefulness of patents turns out to be much shorter than the official 20 year life. The computer software industry is one case, where the effective life of innovations in the market place is not much longer than 6 to 8 years.

Empirical studies confirm that the propensity to engage in R&D as well as innovation performance vary across firms and across industries in the economy.[5] Consequently, there are very large differences, both among industries and within them, in the effectiveness of patents. Studies also show that patents were considered essential to developing and marketing inventions only in the chemical industry generally, and in the pharmaceutical industry in particular.[6]

Why are patents not deemed necessary for innovations by most industries? One explanation is that it may be true that profits in a perfectly competitive market are so small that they do not offset the R&D costs of innovations. Nevertheless, patent or no patent, most of the innovative products and processes are traded in imperfectly competitive markets.[7] Consequently, innovators may find super-normal profits earned in imperfectly competitive markets as an "adequate" return on their investment. From this view, two sorts of policy arguments can be drawn.

First, in imperfectly competitive markets, firms make above normal profits as it is, without any government grant of monopoly patent rights. Should the patent grant still top up those profits? True, R&D activity is risky and requires large investment. But much of

[5] Discussed in Giovanni Dosi, "Sources, Procedures, and Microeconomic Effects of Innovation", *Journal of Economic Literature*, 26, September 1988: 1120-71.

[6] Edwin Mansfield, "Patents and Innovation: An Empirical Study," *Management Science*, vol. 32, February 1986: 173-81. R.C. Levin, A.K. Klevorick, R.R. Nelson, and S.G. Winter, "Appropriating the Returns from Industrial Research and Development", *Brookings Paper on Economic Activity*, 3:1987: 783-820.

[7] In imperfectly competitive markets, there are only a few firms, each with some market power to set the price of its product. In perfect competition, there are numerous firms, each unable to set the price of its product; the price is determined in the competitive market itself.