

investment rate rises. In Lucas' 1988 model,¹¹ externalities arise from increases in human capital because investment in human capital enhances the productivity of both the recipients of such capital and the society at large. Hence, policies that enhance public and private investment in human capital affect long-run economic growth. Endogenous growth models clearly show that macroeconomic and microeconomic policies can affect long-run economic growth through their effects on physical and human capital accumulation.

It is now generally recognized that human capital development enhances economic growth. Indeed, endogenous growth models have shown that the decision of individuals to invest in human capital enhances technological progress, thus providing a link between human capital accumulation and growth of per capita output in the steady state. Therefore, policies that promote human capital development would be expected to contribute to per capita growth. Technological advance can result from purposive R&D activity and may even be rewarded by some form of ex post monopoly power. If there is no tendency for the economy to run out of ideas, then growth can remain positive in the long run. Because of distortions related to the creation of new goods and methods of production, the long-term growth rate can also depend on governmental actions such as taxation, provision of infrastructure and protection of intellectual property rights.

Further work by Romer, Grossman and Helpman, Aghion and Howitt assume that there is a separate technology sector in the economy that supplies the other sector(s) with new technologies. Producers buy the new technology from the technology sector, and in return they receive an exclusive right to the use of the technology. These producers must charge a price above marginal cost for what they produce, i.e., there is imperfect competition, because otherwise they would not generate enough income to cover their costs, including the initial investment in new technology. However, in addition to the private, proprietary component, innovation also has a public component (externality) that facilitates--raises the productivity of--all subsequent innovation projects. This counteracts the tendency toward decreasing productivity of new investments in innovative activity, and allows innovation--and hence growth--to go on. In these models, the rate of growth depends on the amount of resources devoted to the innovation activity (R&D), the degree to which new technology can be privately appropriated (degree of monopoly), and the time horizon (degree of patience) of investors. High growth also implies high growth in physical capital, but in these models this is a result, not

¹¹ Robert E. Lucas, "On the Mechanisms of Economic Development", Journal of Monetary Economics, Vol. 22 (1) (July 1988).