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論 文 内 容 の 要 旨

The dissertation is composed of three studies of a different nature on the role of technology and human capital in the growth process. The first is a historical review of technology transfers in Japan from 1885 to 1930 and the role of knowledge accumulation in explaining their success or failure. I then consider the theoretical aspects of technological innovation and their political implications using a theoretical endogenous growth model. Finally, the empirical study combines these two aspects, measuring the role of education in explaining Japanese economic growth between 1960 and 1992.

The historical paper on Japan during the Meiji and Taisho periods sheds light on the central role of knowledge accumulation. In a developing country this essentially takes place through the introduction of foreign technology and it is in this process that the Japanese system was particularly efficient. The analysis of technology transfers shows that if factor endowments, whether capital, natural resources or skilled labour, are not taken into account, the transfer will fail as in the case of government subsidised mills. However, when new technologies were linked to traditional skills, they succeeded, as in civil engineering or weaving. Thus, human capital is essential to successful technology transfer, they are complements and should not be considered to be one and the same thing, as in a number of endogenous growth models. A high level of education facilitates the introduction of innovations and enables the work force to play a more active role in adapting, improving and carrying out research on new technologies. In turn, the diffusion of innovations is an essential factor in increasing the experience and knowledge of labour. This was sustained by a formal system of education that includes intra-firm training, learning-by-doing, and research and development (mainly absorptive rather than creative) as well as general education. Thus, Japan was able to change its factor endowment and attain a high growth rate. Two important lessons can be learnt from its system of human capital accumulation. First, an overall high level of education in needed to assimilate new technologies. A small group of highly qualified engineers is not enough. Secondly,

whereas specialised knowledge is useful for a given technology, only general education can sustain a dynamic growth path with the constant introduction of new ideas.

The theoretical paper presents a model of endogenous growth which sheds light on market imperfections and the role of economic intervention. I consider not only the positive effect of innovation, but also its destructive effect in a Schumpeterian-type model with overlapping generations. The model has three sectors —the final good sector and the research and development sector are competitive, whereas the intermediate sector is monopolistic. This leads to a complex set of distortions. The social planner's optimum is worked out and a term by term comparison of the optima helps shed light on the nature of the distortions and allows for a clear measure of their size. The monopolistic position of the intermediate sector is determined by the structure of the model. However, as the product of research is manufactured and sold by the intermediate good sector, the R&D sector is also distorted by a monopoly effect. This is true even though the R&D sector is price-taking. These two monopoly distortions work in opposite directions, the first leading to less intermediate good production and thus more research, the second to less research. The dynamic externality affects the discount rate. Although the effect of an innovation is everlasting, firms only consider the profits it generates over one period as it is then replaced by the following innovation. A social planner would consider the long-term effect of each innovation. Thus, in a decentralised market economy, the level of research is lower than optimal. The three distortions are thus working in different directions and, depending on their relative sizes, the level of research can either be sub-or supra-optimal in the decentralised economy relative to the social planner's equilibrium. These findings lead to the proposal of possible economic policies. Competitive pricing in the intermediate good sector clears all the monopoly distortions, but it must be coupled with research subsidies. The externality can be corrected for through either interest rate policy or a new property rights mechanism.

The last paper attempts an estimation of the importance of human capital (approximated by the level of education) in explaining growth and gains in total factor productivity in Japan since 1960. By taking advantage of the new Keio University dataset for 43 industries, from 1960 to 1992, with detailed information on the level of education of workers, we can carry out a cross-sector analysis. Education can affect growth both through the efficiency unit effect and the technology assimilation effect. The first is measured in a traditional production function in which labour is separated into skilled and non-skilled labour. This shows that the average annual contribution of skilled workers is 3.6%, compared to a negative input by unskilled workers (−1.4%) between 1960 and 1992. A number of sector-or firm-based studies using US data, as well as theortical work show that skilled labour also affects growth indirectly by facilitating the production or assimilation of new technologies. However, in the case of Japan, the share of skilled-labour does not appear to affect productivity. This result is surprising given the emphasis put on education in explaining Japanese economic growth, and I attempt to explain it.

論文審査の結果の要旨

本論文は、日本の経済成長に果たした技術進歩と人的資本投資の役割を分析している。研究開発がもたらす動学的外部経済と独占価格の歪みの間の trade off を理論的に分析し、戦後日本における高学歴化と生産性の向上に関する新しい知見を与えている。本論文は、博士（経済学）の学位を授与するのに十分な価値を有するものと判断する。