ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ
БЮДЖЕТНОЕ УЧРЕЖДЕНИЕ НАУКИ
ИНСТИТУТ ЭКОНОМИКИ И ОРГАНИЗАЦИИ
ПРОМЫШЛЕННОГО ПРОИЗВОДСТВА
СИБИРСКОГО ОТДЕЛЕНИЯ РОССИЙСКОЙ АКАДЕМИИ НАУК

АКТУАЛЬНЫЕ ВОПРОСЫ ЭКОНОМИКИ И СОЦИОЛОГИИ

Сборник статей по материалам XV Осенней конференции молодых ученых в новосибирском Академгородке

Под редакцией
канд. экон. наук О. В. Тарасовой, Н. О. Фурсенко

Новосибирск
2019

РАЗДЕЛ IV
УПРАВЛЕНИЕ ПРЕДПРИЯТИЯМИ И ИНВЕСТИЦИИ

УДК 338.1

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SOCIAL AND ECONOMIC EFFECTS OF HEALTH INNOVATION

The peculiarities and importance of innovation in healthcare are considered in the paper, along with the methods designed to calculate the cost-effectiveness of innovation. Moreover, the paper brings upwards a question of what the specialities of connection between innovation and costs in healthcare production are. Finally, the detailed description of strategies determining social and economic effect of health investment for pharmaceuticals.

Keywords. Health innovation; healthcare innovation effectiveness; social effects of innovation.

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ИННОВАЦИИ В ОБЛАСТИ ЗДРАВООХРАНЕНИЯ И ИХ СОЦИО-ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ

В работе коротко изложены особенности и важность инновационной деятельности в области здравоохранения, методы оценки эффективности затрат на инновации, а также сформулированы основные особенности связи между инновациями и затратами в здравоохранении и приведены стратегии вычисления социального и экономического эффекта инвестирования в здравоохранение для фармацевтической отрасли.

Ключевые слова. Инновационная деятельность; эффективность инноваций в здравоохранении; экономические последствия инновационной активности в здравоохранении.

Health improvements are mostly dependent on medical knowledge elaboration, key input for which is research and development process [7]. However, innovation by itself is a result of huge efforts, which include not only the process of its development, but also many other covariates, such as the need for it, its cost-effectiveness, possible ex post utilization, its ability to settle down and its possible effects on the environment, and future incentives.

In our work we will try to decry all of these stages of the innovation process in health care, paying more attention to the pharmaceutical market as more investigated one.

Patent is a key tool that allows innovators to recover their expenditures on R&D, and even more valuable provides an incentive for the future research. However, these instruments have its own pros and cons. According to the theory of industrial organizations, monopolist has less incentives for future investments in R&D than firms on the competitive market. Moreover, considering the cumulative (follow-on) innovations, they also have the shortcomings in terms of negative effect from the patents. Therefore, the main challenge for the policy makers is the tradeoff between incentives for further innovation development and the deadweight loss cost [13].

Many innovations are cumulative, i.e. next innovations are based on the previous ones, what raises questions about the optimal patent policy [6]. Some researchers argue that the effect of patents on the follow-on innovation is negative [3].

For example, cancer market has two specific features: drugs can be characterized by different types of cancer treated (stage of disease and affected organ); types of cancer are characterized by patients' survival rates. Figure 1 illustrates the relationships between number of clinical trials and survival rate. Thus, it can be seen that for early stage (localized) cancer there is almost 2 times lower number of clinical trials than for late-stage cancer (regional, metastatic).

However, analysis of correlation between commercialization lags and R&D investments must take into account 2 main difficulties:

- Commercialization lags could not fully explain this correlation, e.g. deficit of the scientific knowledge or lack of the consumers' demand for an early-stage cancer can lead to low R&D investments;
- Correlation should not be distorted by the social planner's policy, e.g. if public companies prefer R&D investments in projects that could be obtained quickly.

Solution of these two issues was supported by surrogate endpoints, which can be used as indicators of improvements in patients' health, pharmacologic responses to a therapeutic intervention for some types of cancer. Private companies react more negatively due to survival rate increase than public companies.

This evidence shows that firms analyze their optimal investment policy in R&D and prefer those with shorter commercialization rates (and lower survival rate) more. These estimates cannot confirm precisely the effect of changes in patent design on the incentives of firms to invest in one or another

projects. As investments in health care are the main source of innovations, public and private companies have strong need of precise cost analysis before implementing new technology. CE criteria concern maximizing the observed level of consumer surplus consistent with static efficiency, however dynamic efficiency arranges social costs and benefits of R&D. Therefore, consumer surplus cannot be the best measure to analyze optimal R&D investments. Surplus appropriation by innovators is the main measure of evaluation of the incentives for future investments and, hence, dynamic efficiency [12].

To sum up, while appropriation of the social surplus by producers is undoubtedly important for the future investments, there are still gaps in theory about precise estimation of the optimal appropriation: whether it should be encouraged by the government or 5% level is already enough to recover their initial expenditures on R&D and extract enough profit for future incentives for innovation. If not, what level at least is appropriate and how it changes depending on the company's size and type of innovations (process, product, structure). Probably, such levels are possible to receive only by analysis based on real evidence (survey data).

Pricing, of course, is very significant to raise availability of patented healthcare products in developing countries while supporting the initiative for innovation. On practice, innovation is not raising prices in other sectors of Economy, but in Health care it does [5]. For example, improvements in household appliances or mobile devices create a better-quality product while lowering its price. However, most of the leading health economists accept the idea that "The primary reason for the increase in the health sector's share of GDP over the past 30 years is technological change in medicine" [13].

Chandra and Skinner developed a model of patient's demand and behavior of supplier in order to interpret similar tendencies in innovational and cost growth. They showed that health care productivity relies on 'heterogeneity of treatment effects across patients, shape of health production function, and cost structure of procedures such as MRIs with fixed costs and low marginal costs' [5]. They divide innovations on three categories:

1) highly cost-effective innovations with little chance of overuse (anti-retroviral therapy for HIV);
2) treatments highly effective for some but not for all (e.g. stents);
3) treatments with uncertain clinical value such as intensive care units among chronically ill patients.

Accordingly, countries with prevailing first (1) and effective second (2) achieve greatest improvements in health, while with ineffective second and third get only great increase in cost. This issue partly explains huge expenditures on health care in US; range of treatments with different health

value compared to their cost and insurance system covering treatment inconsiderably of its effectiveness can be the reasons. Not technology, but its type is driving the cost increase.

Health innovation probably reduces health risks more than financial health insurance. The fact that health innovation can operate as an insurance device affects the additional value of alternative technologies. Lakdawalla, Malani and Reif (2016) focus on the fact that technologies treating mild types of illnesses are overvalued by traditional value criterion, while those that cure rare types are underestimated [8]. Thereby, cost-effectively reasonable innovation producing decisions contradict to public opinion. In particular, it appeared that patients, placing preferences to technologies with same cost effectiveness, valued treatments for rare illnesses higher than for mild ones, according to the survey [4].

The effect of innovations in pharmaceutical industry has been broadly studied both in developed and developing countries. Due to the various ways through which approval of new drugs affects different spheres of human's lives, we used the following strategy while identifying the causal effects:

- First, consider the effect of pharmaceutical innovations on health itself;
- Second, provide some evidence of causal effect between the outcomes measured at the first stage with the economic growth;
- Third, identify financial incentives for the firms to invest in their R&D studies.

Innovations are more often considered by investors, governments, insurers and providers in terms of their profitability and ex post benefits. However, value of innovations can be captured in other ways but monetary. Probably, not only money, but also more appropriate organization of the process, which can both reduce costs and make it more convenient for patients and doctors, is important.

Thus, it is difficult to promote a common design to estimate the accurate value for each type of innovation, because the effect of its implementation considering costs and benefits, ex post utilization, and future incentives may be different for different countries, insurance systems, private and public providers, and even patients. Moreover, even the ‘best’ innovation can appear unsuccessful only if environment or market is not ready for it. Implementation of a technology can be hard, but its distribution and consolidation can be even harder. Thus, it is important to improve existing methods of ex ante and ex post analyses in order to minimize all the possible risks.

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