Understanding the Returns to Pharmaceutical Innovation in Personalized Medicine

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Roughly half of the return to pharmaceutical innovation comes not from the production of new molecules, but comes from innovations that deliver existing molecules more effectively or to a different subpopulation (see Hult, 2015). For example, the success of HIV/AIDS treatments starting in the late 1990s was largely the product of modifying existing molecules in ways that created treatments that were more efficacious, easier to administer, and expanded the number of patients who were able to receive treatment.

Precision medicine and pharmacogenomics is an emerging approach to medical innovation that takes the concept of incremental innovation—innovations that deliver existing molecules in new ways or to different patients—a step further. Innovations in precision medicine not only affect the efficacy and treatment options of large subgroups in the population, but take advantage of treatment heterogeneity across individual patients. For example, precision medicine can increase disease prevention, increase adherence by individualizing the dosage and administration method of a treatment, increase the number of patients on treatment by reducing drug resistance and interactions between the treatment and other medical conditions, and increase efficacy.

My research builds on my previous work in incremental innovation to understand the returns to innovation in personalized medicine. I start with a theoretical analysis that looks at how differentiated treatments with heterogeneous treatment outcomes affects the health impact of innovations. I discuss how characteristics of treatments in different disease classes impact the value of heterogeneous treatment. I specifically discuss the effects of disease progression, treatment resistance, the number of treatment options, and comorbidity focusing on treatments in cancer, multiple sclerosis, and HIV/AIDS.

Next, I measure the value of previous incremental innovations that acted similar to precision medicine, but for subgroups of patients instead of individual patients. I combine my empirical findings with my theoretical analysis to estimate the potential health impact of new innovations in personalized medicine. These results measure how much impact treatment heterogeneity can add to new innovations.

Finally, I discuss the incentives for firms to engage in personalized medicine and discuss scenarios where firms may not have the incentive to produce personalized medicine innovations compared with more traditional innovations.

Reference

Hult, Kristopher J. "Incremental Innovation and Pharmaceutical Productivity." (2015).