

Pharmaceutical Manufacturing Efficiency, Drug Prices, and Public Health: Examining the Causal Links

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There are important fundamental links between the efficiency of pharmaceutical manufacturing, drug prices, and public health in the United States. Our paper probes these links because recent research has shown substantial, unexploited opportunities exist to improve pharmaceutical manufacturing processes. For this reason it is important to consider (and undertake a first approximation of) the social benefits that might be generated from such improvements. To do this, we employ several quantitative techniques that are standard in contemporary economic analyses. Also, because there may be some disagreement with respect to firm behavior in the presence of significant improvements in manufacturing efficiency, two models are developed that consider multiple scenarios of improved manufacturing efficiency. The two models effectively bound the range of potential future benefits from improvements in pharmaceutical manufacturing.

Our first model uses recent estimates from the economics literature on the sensitivity of drug consumption to drug prices (the own-price elasticity of demand) in conjunction with an orthodox model of pharmaceutical pricing. As manufacturing costs decline, theory unambiguously predicts prices will also decline (all else held constant) and these lower prices will lead to gains in consumer surplus (the difference between consumers' willingness to pay and what consumers actually pay; the standard economic measure of social welfare). Our estimates based on various percentage improvements in marginal manufacturing costs are reported below in Table 1 (which presents the benefits after 1 year and for all future years; the later is in present value dollars).

Table 1: Gains in Consumer Surplus from Improved Pharmaceutical Manufacturing Efficiency

Percentage Reduction in Manufacturing Costs	One-year Gain in Consumer Surplus	Gain in Consumer Surplus (All Years)
0%	\$0	\$0
10%	\$23.2 Billion	\$330.8 Billion
20%	\$47.4 Billion	\$676.7 Billion
30%	\$72.8 Billion	\$1.0 Trillion
40%	\$99.8 Billion	\$1.4 Trillion
50%	\$128.6 Billion	\$1.8 Trillion

Our second modeling approach considers the possibility that the gains in manufacturing efficiency will not be passed on to consumers in the form of lower prices, but rather will result in higher pharmaceutical profits and no change, *ceteris paribus*, in prices. While economic theory does not predict this outcome, it seems reasonable to consider this possibility nonetheless because it allows us to address all possible outcomes from improved manufacturing efficiency.

Based on published empirical economic research on the links between pharmaceutical prices, profits, R&D investment, and public health we project how various increases in pharmaceutical profitability, which result from improved manufacturing efficiency, will impact research and development (R&D) expenditures, the development of new drugs, and future health benefits in the U.S. These benefits are estimated to be much greater than those associated with the consumer surplus gains resulting from lower drug prices. This finding is consistent with recent research that suggests the U.S. is currently under-investing in medical and pharmaceutical research. We report these estimates below in Table 2.

Table 1: Dollar Gains to the U.S. Economy from Improved Pharmaceutical Manufacturing Efficiency

Percentage Reduction in Manufacturing Costs	Present Value Life Years Gained	Dollar Value of Present Value Life Years Gained
0%	\$0	\$0
10%	41.0 Million	\$4.1 Trillion
20%	82.1 Million	\$8.2 Trillion
30%	123.1 Million	\$12.3 Trillion
40%	164.1 Million	\$16.4 Trillion
50%	205.2 Million	\$20.5 Trillion

In sum, our research suggests that existing opportunities to exploit gains in pharmaceutical manufacturing efficiency will be of tremendous value to Americans if realized. While our estimates are strictly first approximations based on several simplifying assumptions, the magnitudes of our projections are striking. A greater public policy awareness of how improved pharmaceutical manufacturing efficiency can benefit consumers is warranted