THE IMPACT OF LIFTING GOVERNMENT PRICE CONTROLS ON GLOBAL PHARMACEUTICAL INNOVATION AND POPULATION HEALTH

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ABSTRACT

Objectives: To estimate the impact of lifting government price controls in non-US OECD countries on global biopharmaceutical innovation and population health. **Methods:** The Health Economics Medical Innovation Simulation (THEMIS), a Monte Carlo microsimulation, provided estimates of changes in new molecules released and quality-adjusted life expectancy after lifting government price controls in non-US OECD countries. THEMIS tracks the evolution of future health and innovation for populations aged 50 and older under different technological, policy, and/or health trends. In this analysis, 20% and 30% increases in non-US OECD prices were modeled to approximate a move to market-based pricing, based on prior research on the impact of regulation on biopharmaceutical industry revenues, yielding an 8-12% increase in OECD market size based on the comparison of US and other OECD pharmaceutical spending. A 3.5% elasticity of innovation was estimated, meaning that a 1% increase in revenues leads to a 3.5% increase in new drug releases. The value of a statistical life year was estimated to be $200,000. **Results:** If government price controls in other OECD countries were lifted, the number of new treatments available would increase by 9%-12% by 2030 (equivalent to 8-13 new drugs in that year). For an individual aged 15-years-old today, lifting government price controls would increase life expectancy by approximately 0.8 to 1.6 years, and the lifetime welfare gains in health and quality of life — net of drug and medical spending and appropriately monetized—would amount to $884 billion-$3.15 trillion in 2060 across all OECD countries including the US. **Conclusions:** Lifting government price control policies would result in an increase in revenues and R&D, and in turn, population health.

OBJECTIVE

To estimate the impact of lifting government price controls in non-US OECD countries on global biopharmaceutical innovation and population health. Specifically, the impact was quantified in terms of the three outcomes:

- The introduction of new drugs
- Life expectancy
- Welfare gains

METHODS

- The study modeled the impact of lifting government price controls in non-US OECD countries on global pharmaceutical innovation and population health.
- Outcome variables included:
  - The number of additional new molecules introduced annually
  - Life expectancy (years)
  - The net present value (NPV) of lifetime welfare changes (quality-adjusted life expectancy)
- To estimate the impact of such policy changes, we relied on past research that found that individual price control policies in nineteen OECD countries would decrease pharmaceutical revenues on average by 20% if implemented in the United States.[1]
- Furthermore, combining various policies also increased the overall effects. Combined they estimated that these policies could lead to an additional 10% decrease on top of the 20% initial impact.[1]
- The Health Economics Medical Innovation Simulation (THEMIS) was used to estimate the contribution of these policies on global pharmaceutical innovation.[2-12]
- THEMIS is a microsimulation that tracks individuals 50 and older over their remaining lives to project their disease and comorbidity burdens, life expectancy and functional status, health care costs, employment status, and personal taxes and transfer payments (including disability insurance receipt). A number of publications have used THEMIS to project the long-term consequences of disability trends for US society.[3,5,9,11,12]
- THEMIS tracks the evolution of future health and innovation for US populations aged 50 and older under different technological, policy, and/or health trends.
- People age in the model under a Monte Carlo simulation in which next year's health states depend on today's health states, and on a set of random health shocks that vary with individuals' own risk-factors — e.g., their age, health behaviors, and current disease conditions.
- In a given year, say 2024, sample individuals may have diseases and functional status limitations that put them at risk of contracting new diseases and disabilities, or even dying, in 2025. Moreover, new drugs may be introduced in 2024 that reduce some of these risks.
- THEMIS estimates a health transition model to simulate how population health will look in the next time step (2026), given the number of new drug introductions and existing health conditions. Finally, mortality will have shrunk the population in 2026, but the sample is "refreshed" by introducing those who were 49 in 2024, and who now age into our target population. This forms the set of sample individuals for 2025. The same process is repeated to obtain the population in 2026 and subsequent years.
- Cost and benefits can be measured using a variety of different metrics, including: medical expenditures, non-medical public spending, tax revenues, disease-free life-years, disability-free life-years, quality-adjusted life-years, and life expectancy. Expenditures are modeled based on data from the Medical Expenditure Panel Study and the Medicare Current Beneficiary Survey (for those 65 and older).
- A novel feature of THEMIS particularly relevant to this project is its ability to project the long-term effects of changes in pharmaceutical industry revenues on a range of outcomes, including: population life expectancy, quality-adjusted life expectancy, and the number of new molecules introduced to the market. Therefore, THEMIS permits a comprehensive approach to quantifying the social value of lifting price controls in OECD countries, and decomposing this value into its component parts.
- The impact of these government price control policies on innovation and population health was modeled using three scenarios:
  1. Baseline pricing – the status quo pricing schemes in all countries
  2. A 20% increase in OECD price and revenues
  3. A 30% increase in OECD price and revenues
- According to a recent report,[13] pharmaceutical spending in other OECD countries is roughly 40% of all OECD countries, including US drug spending.
- Thus we simulated an 8% increase in US and OECD market size for scenario 1 (0.20*0.40=8%) and a 12% increase in market size for scenario 2 (0.30*0.40=12%).
- Previous work with this model calculated an innovation elasticity of 3% for small molecules and 4.66% for biologics, yielding a market-share-weighted elasticity of 3.46%. This means that there is a 3.46% change in the number of new drugs on the market for every direct 1% change in revenues.[14]

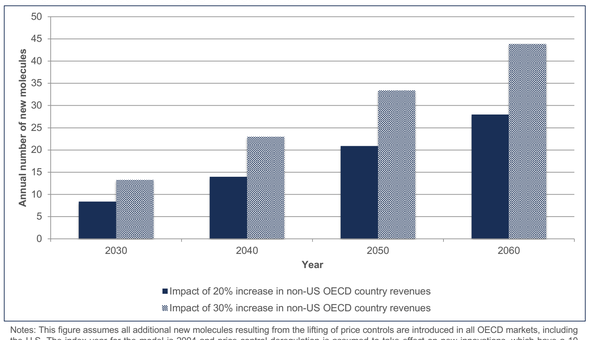
CONCLUSION

- **Lifting government price control policies in non-US OECD countries would result in an increase in revenues and R&D, and in turn, population health.**

RESULTS

- In Figure 1, we show how lifting price controls will impact global innovation in terms of new molecules to market. In scenario 2, with the conservative estimate of an 8% increase in market size, we find that lifting government price control policies in non-US OECD countries would be directly responsible for a 9% increase in the world's innovation leading to 8 new drugs per year by 2030. Similarly, assuming the larger more realistic 12% increase in global revenues in scenario 3, we see a 12% increase in the world's innovation, resulting in 13 new drugs per year. These impacts grow to 28 and 44 new molecules per year by 2060 respectively.

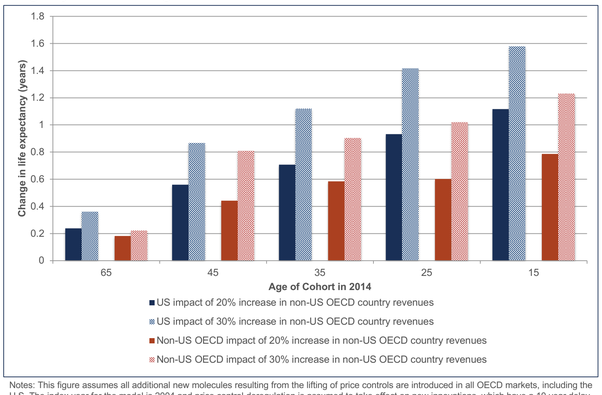
Figure 1. Estimated number of additional new molecules introduced annually if price controls were lifted in ex-US OECD countries



Notes: This figure assumes all additional new molecules resulting from the lifting of price controls are introduced in all OECD markets, including the U.S. The index year for the model is 2004 and price control deregulation is assumed to take effect on new innovations, which have a 10 year delay, so the first year of effect is 2015.
The model assumes that drug innovations will rise in lock-step with market size. The numbers above imply a 7% annual growth rate for the number of new drug introductions to triple from 2010 to 2030 (from 28 drugs per year to 107 drugs per year), which would be driven by a 2.3% growth in market size per year.

- In Figure 2, we show the impact of lifting government price controls on longevity. In scenario 2, we estimate that the average life expectancy of 45-year-olds in the US in 2014 would increase by 0.56 years when OECD prices increase by 20%. These benefits are magnified for younger individuals, such that the average life expectancy of 15-year-olds in 2014 would increase by 1.1 year.
- Similarly, in scenario 3 we find that average life expectancy increases by 0.86 year and 1.6 years for 45-year-olds and 15-year-olds respectively. Figure 2 also reports life expectancy gains for the OECD population. For example, average life expectancy for 45-year-olds in OECD countries will increase by 0.44 years and 0.81 years in scenarios 2 and 3, respectively (Figure 2).

Figure 2. Effect of lifting government price controls in ex-US OECD countries on longevity for selected age cohorts



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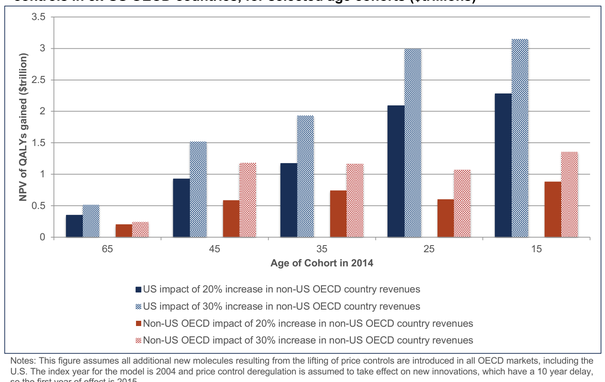
- Finally, in Figures 3 and 4 we estimate the total value of lifetime welfare gains realized by various age cohorts. For example, under scenario 2, with the 20% increase in prices, all individuals age 45 in the US in 2014 would gain $924 billion in social value. Similarly, under scenario 3, these same individuals would gain $1.52 trillion.
- As seen with life expectancy, younger individuals in 2014 will see more benefit across their lifetimes. We estimate that 15-year-olds in the US in 2014 would gain $2.28 trillion in social value under scenario 2 and $3.15 trillion in social value under scenario 3.

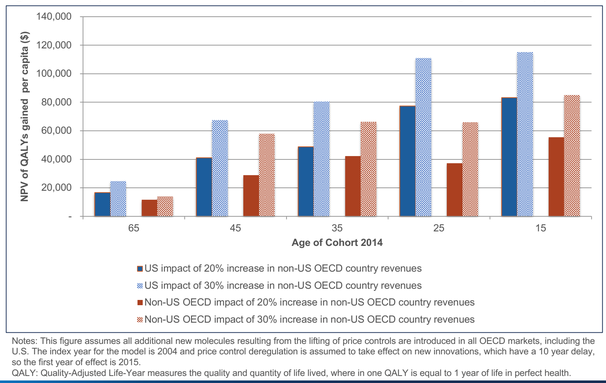
Figure 3. Net present value (NPV) of lifetime welfare gains from lifting government price controls in ex-US OECD countries, for selected age cohorts ($trillions)



Notes: This figure assumes all additional new molecules resulting from the lifting of price controls are introduced in all OECD markets, including the U.S. The index year for the model is 2004 and price control deregulation is assumed to take effect on new innovations, which have a 10 year delay, so the first year of effect is 2015.
QALY: Quality-Adjusted Life-Year measures the quality and quantity of life lived, where in one QALY is equal to 1 year of life in perfect health.

- Figure 4 shows these results on a per capita basis. For instance, a 20% and a 30% increase, respectively, in OECD revenues and prices would result in a $41,000-$83,000 and $67,000-$115,000 per capita valuation of lifetime welfare gains in the US.

Figure 4. Per capita net present value (NPV) of lifetime welfare gains from lifting government price controls in ex-US OECD countries, for selected age cohorts ($)



Notes: This figure assumes all additional new molecules resulting from the lifting of price controls are introduced in all OECD markets, including the U.S. The index year for the model is 2004 and price control deregulation is assumed to take effect on new innovations, which have a 10 year delay, so the first year of effect is 2015.
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