World Development 103 (2018) 88–99

Contents lists available at ScienceDirect

World Development

journal homepage: www.elsevier.com/locate/worlddev

Vaccination and GDP Growth Rates: Exploring the Links in a Conditional Convergence Framework

Neal A. Masia [a,f], Jonathan Smerling [d,g], Tendayi Kapfidze [e], Richard Manning [b], Mark Showalter [c]

[a] Vice President, Patient & Health Impact, Pfizer Inc, New York, USA
[b] Partner, Bates White LLC, Washington D.C., USA
[c] Professor of Economics, Brigham Young University, Provo, USA
[d] Medical Student, SUNY Downstate Medical Center, New York, USA
[e] Former Director, Global Economics, Pfizer Inc, New York, USA
[f] Adjunct Associate Professor of Economics and Management, Columbia University, New York, USA
[g] Former Economics intern, Pfizer Inc, New York, USA

ARTICLE INFO

Article history:
Accepted 8 October 2017

Key words:
vaccination
GDP growth
conditional convergence

SUMMARY

Vaccination rates vary significantly across countries, and the intensity of vaccination programs is a matter of public choice, infrastructure limitations, budget constraints, and many other factors. The link between better health and better economic performance is by now well established, and many vaccines have been shown to generate significant ROI in a classical cost-benefit framework. To our knowledge, the longer term macroeconomic benefits of improved vaccination programs have not been estimated. We modify the standard conditional convergence model to account for changes in vaccination rates across time and countries, and use the modified model to estimate the macroeconomic gains from improved vaccination rates, using the DTP vaccine as a proxy for vaccination programs generally. We find evidence to suggest economically and statistically significant and sustained increases in the GDP growth rate associated with lagged increases in vaccination rates; furthermore, we find these effects increasing over time. We find that investments of the sort made by the Global Alliance for Vaccination and Immunization (Gavi) are linked to measurably higher DTP rates, and we estimate the returns to such investments as at least 12:1. For countries on the threshold of graduating from Gavi, these results suggest that much is at stake: reducing investment in vaccination could reverse both the public health improvements and tangible economic benefits associated with ongoing improvements in vaccination rates.

© 2017 Elsevier Ltd. All rights reserved.

1. Overview

What does it cost when a country's immunization program falls short? No single leader in any government can provide a comprehensive answer. Health Ministers certainly understand the implications for population health, but quantifying the lost long-term economic benefits is harder. Finance Ministers recognize that healthier populations are more productive, but government budgets are often constrained, and Finance Ministers also need to focus on near term budgetary obligations; long-term productivity benefits tend to materialize fully over subsequent years or decades. To a Health Minister, budget constraints force painful tradeoffs between vaccines and many other types of healthcare spending. For a Finance Minister, a healthy workforce is critically important, but allocating funds toward healthcare must be weighed against other government tax and spending priorities. There is little research to facilitate a conversation about these difficult tradeoffs.

As a starting point, consider that economic policy decisions that accelerate economic growth are likely to have long-term beneficial effects on health that are well beyond the planning horizon of most governments. Health improvements are viewed mostly as a *benefit and consequence* of economic growth rather than as a *rationale* for it. Conversely, health policy decisions could certainly have an impact on long-term economic growth, but such considerations are usually not an explicit part of the analysis and would also likely fall outside of the typical policymaker's planning horizon. For example, when significant segments of the US healthcare system were dramatically transformed under the 2009 Affordable Care Act, the Congressional Budget Office (CBO, 2009) did not directly consider the longer term impact the proposed changes would have on economic growth. The lack of coordination between health and finance objectives, and lack of data to support such coordination, is a conundrum for those seeking to enhance investments in vaccination programs or any other investments in long-term population health.

https://doi.org/10.1016/j.worlddev.2017.10.013
0305-750X/© 2017 Elsevier Ltd. All rights reserved.

The World Health Organization (WHO) recently reported that the Global Vaccine Action Plan (GVAP) has made "insufficient progress" during the current "Decade of Vaccines," and will not meet its projected goals by 2020 (WHO, 2015). Independent review of the GVAP by the Strategic Advisory Group of Experts on Immunization (SAGE) concludes that the average immunization coverage level across the world has risen by only 1% from 2010 to 2015 (WHO, 2016). The SAGE additionally notes that during 2010–15, coverage levels of the DTP3 vaccine (often used as a proxy for overall coverage) did not significantly change for 26 countries and actually decreased for 25 countries, while only 16 countries observed measurable improvement. There can be no doubt that budget constraints play a significant role in the disappointing rate of improvement. Our research objective is to help policymakers quantify the tangible economic growth benefits of improved vaccine adoption. Many health economists have followed a traditional approach of comparing the costs of vaccine expansion to the savings from reduced health spending or the estimated value of living longer or healthier lives. Our approach has potential to be complementary to that line of research.

We use macroeconomic modeling to consider the broadest, measurable economic case for vaccines. We use a new extension of the well-known conditional convergence framework first developed and tested by Barro and Sala-i-Martin (1992, and many followers) to test whether improved vaccination take-up rates have a measurable effect on economic growth holding other key factors constant. The fundamental insight of the conditional convergence literature is that poor countries tend to catch up to rich countries, conditional on certain other measurable factors. We are interested in measuring whether and how changes in the vaccination rate impact economic performance within the conditional convergence framework. Section 2 provides a rationale for the potential GDP growth implications of improvements to vaccination rates and posits an appropriate proxy variable for broad progress on vaccination rates by year and by country. Section 3 illustrates how improvements in vaccination rates come about and discusses how such investments might affect growth. Section 4 replicates Barro's (2012) conditional convergence model using our data and then adds in our vaccination rate proxy variable (and its lags) to estimate the impact of higher vaccination rates on economic growth over a 15-year period. We estimate that higher vaccination rates are linked to statistically significant and enduring increases in GDP growth. Achievable improvements to the vaccination rate are associated with increases in the GDP growth rate in the 0.05–0.08% range and appear to persist and grow with time. Section 5 presents some illustrative and exploratory applications of these results with a particular focus on the economic impact of Gavi (the Vaccine Alliance). Section 6 discusses some limitations and possible extensions of the research, and Section 7 concludes.

2. Why, and how, might more vaccination lead to improved GDP growth?

(a) Background and context

Rich people and rich countries are, on average, much healthier than poor people and poor countries (Deaton, 2003). Economists, demographers, public health researchers, and others have explored the connection between health and wealth for decades using a wide array of approaches and have put forward plausible explanations for causality in both directions. Rich people and rich countries have more resources to devote to improving health; healthy people tend to be more productive and to live longer, generating more wealth over time. These explanations are intuitively obvious and have been well tested and quantified (e.g., Newhouse, 1977; Bloom, Canning, and Fink, 2014), but they do not offer much concrete advice to policymakers.

Economists have a well-developed toolkit that can help our understanding of the drivers of long-term economic growth rates and the value of individual health interventions or new technologies to society. Some researchers have used a top-down macroeconomic approach to examine the link between GDP and broad measures of health such as life expectancy or mortality. Results have been mixed; Acemoglu and Johnson (2007) find that the improvement of life expectancy had no statistically significant effect on economic growth, while Aghion, Howitt, and Murtin (2011) and separately Bloom, Canning, and Fink (2014) find a relationship once they account for initial life expectancy. Becker, Philipson, and Soares (2005) developed a robust framework to explore the dollar value of increases in life expectancy beyond what can be immediately measured in direct dollar terms. Deaton (2003) explains that while income inequality may have no impact on health, poverty in general likely does cause adverse health. Such models rarely delve into particular health interventions or improvements; for finance ministers, the best that might be taken from this literature is that investments in healthcare should, in the long run, feed back into more economic growth. Clearly different health interventions will have wildly different impacts on growth in terms of timing and magnitude.

Health economists tend to take a bottoms-up approach, basing their analyses on cost-benefit calculations that attempt to add up all of the economic benefits that are attributable to specific improvements in health and compare the value to the cost of achieving such gains. For example a cost-benefit analysis of a particular vaccine might be calculated by subtracting the cost of immunization from the total dollar value of the estimated benefits such as treatments avoided, higher productivity, or longer life expectancy. These benefits can be estimated in a present value framework and in theory those results can be extrapolated in the context of the broader economy. For example, Ozawa et al. (2016) calculated the cost of immunization and the costs saved over a patient's lifetime to determine the return on investment for 10 different vaccines. They show that on average, immunizations yield a net return of about 16 times their costs during 2010–20. Kotsopoulos and Connolly (2015) estimate that an adult immunization program for seven vaccine preventable diseases would provide Netherlands taxpayers over €500 million over the lifetime of a 50-year-old cohort, for a 4× return on investment, and Bloom, Canning, and Weston (2005) estimate that the value of future returns to Gavi investments is roughly 18% per year. Bloom et al. (2005) and Becker et al. (2005) argue that these types of estimates undervalue the true impact of immunization because they do not account for the intangible and unmeasurable benefits such as behavioral changes from improved health or higher productivity at work. While these estimates are compelling, the challenge for policymakers is that any individual intervention might make economic sense, but the timing and size of the long-run benefits are uncertain and the dynamic impact on the economy is rarely included in a well-specified macroeconomic framework.

One of the strongest determinants of long run GDP growth is long-term capital investment (Mankiw, Romer, & Weil, 1992). Improving vaccination rates requires investments in both physical and human capital, providing a plausible reason why rising vaccination rates might have important follow-on impacts on GDP growth once the required investments begin to pay dividends. Consider how such improvements might take place: to increase in Diphtheria, Tetanus, and Pertussis (DTP) and other vaccination rates, a country makes investments today in health infrastructure and training; the marginal immunized child is healthy rather than infectious (including to working and elderly adults) or dead, enabling parents to remain productive today and eventually enabling the child to become a productive adult. Guitierrez (2016) has examined the case of Peru's economic crisis in the

Download English Version:

https://daneshyari.com/en/article/7392220

Download Persian Version:

https://daneshyari.com/article/7392220

Daneshyari.com