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ARTICLE

The New Progressivism and its implications for institutional theories of development

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Abstract

Context: A growing body of literature argues that the world is better off now than it ever has been and that things will only get better. This trend, long identified in advanced economies, has more recently manifest in low- and middle-income countries and is attributed to the rapid diffusion of technological innovation through global trade, investment, communications, research and educational networks.

Purpose: We label this literature "New Progressivism", mapping its main claims and examining its limitations. New Progressivists pay insufficient attention to the interaction between technological innovation and institutional capacity. More specifically, we show that the New Progressivists fail to explain existing patterns of stagnation and regression, and suggest a modified approach.

Approach and Methods: Accounting for the significance of institutional pre- and co-requisites in facilitating the uptake of innovation, we analyze the different interactions between technological innovations and institutional capacities. We then provide illustrative examples of these relationships drawn from the areas of health, education, and financial development.

Findings: Technological innovation has vastly improved human well-being in many countries in recent decades, but understanding why innovation had been adopted in some jurisdictions but not others and why it has not always proven beneficial if adopted requires an account of jurisdiction-specific institutional landscapes.

Policy Implications: In many contexts technological innovations will not achieve their full potential without attention being paid to their institutional pre- or co-requisites. Technological innovation, by itself, provides no easy escape from the often admittedly daunting challenge of reforming dysfunctional institutions in low- and middle-income countries.

1 | INTRODUCTION

The daily media are replete with stories of disasters in various parts of the world—hurricanes, tsunamis, earthquakes, droughts, floods, civil wars, mass shootings, terrorist attacks. Opinion surveys offer pessimistic or even fatalistic assessments of the state of the world. There is also no shortage of gloomy prognostication from policy and academic circles—climate change catastrophe, nuclear Armageddon in the Middle East or on the Korean peninsula, military conflict between China and the

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US in the South China Sea, international trade wars, floods of refugees or destitute migrants, threats to liberal democracy from the rise of populist, nationalist, or autocratic political regimes. And now we face the added threat of the contemporary COVID-19 pandemic and the risk of the outbreak of other pandemics and their implications for future social and economic well-being.

Despite the prevalence of this doom and despair, there is a growing literature arguing that rather than the end of days, we are currently living in the best of times (notwithstanding any temporary setbacks). Indeed, it is hard to overstate the optimism of some of this literature. According to Jonah Norberg, for example, "we are witnessing the greatest improvement in global living standards ever to take place" (2016, p. 3). Similarly, Steven Radelet contends that, "Never before have so many people, in so many developing countries, made so much progress in so short a time" (2015, p. 3). This optimism is perhaps most clearly expressed in the title of Byron Reese's (2013) book *Infinite progress: How the internet and technology will end ignorance, disease, poverty, hunger, and war*.[1]

In contrast to pessimistic forecasts, this literature—which we call "New Progressivism"—is optimistic that the post-Enlightenment arc of progress will continue, with creative technological solutions (for example, vaccines for novel viruses) emerging to respond to new challenges to human well-being. New Progressivists point to rapid and substantial improvements in measures of global health, such as infant mortality and life expectancy, skyrocketing (female) primary school enrolment rates, and dramatic increases in the gross domestic product (GDP) per capita in many countries. The key driver of these gains, they argue, is technological development and the increasing and rapid global dissemination of ideas and innovations. Gloomy assessments of the future, they contend, underestimate the power of human ingenuity.

We suggest that, while identifying significant (and desirable) upward trends in many measures of human well-being and offering important insights into the possibilities of human development, this literature does not adequately account for the critical role that institutions often play in this process. Using a series of illustrative examples, we demonstrate that an accurate account of technological progress requires an account of the institutional dimensions of development.[2] Moreover, we argue that a failure to consider existing institutional capacity and orientation when introducing new technologies may well impair or even negate their salutary effects. While many technological innovations can be, and have been, implemented with minimal institutional supports, others cannot be. Accounting for this institutional dimension helps explain how, when, and where technology has promoted positive change; acknowledging the importance of institutions suggests a more cautious basis for optimism.

The remainder of the article is structured as follows. In Section 2, we briefly outline empirical evidence of global improvements that form the basis of the New Progressivist case, noting the continuing high level of variation, and the literature's limited explanations of these patterns. In Section 3, we discuss the relationship between technological innovation and institutions as well as impediments to their uptake on both the supply side and demand side, which are likely to vary across countries. Based on this analysis, we identify varying combinations of technological investment and institutional capacity required to effectively operationalize a given innovation. In Section 4, we present a series of illustrative examples of these combinations in the areas of education, health and financial development. Concluding comments are offered in Section 5.

[1] Other notable works in this area include: Easterbrook, 2018; Kenny, 2011; Legatum Institute, 2019; Pinker, 2018; Ridley, 2010; 2020; Rosling et al., 2018.

[2] What constitutes an institution has been the subject of much debate. For the purposes of this article, however, we understand institutions as, "those organizations (formal and informal) that are charged or entrusted by a society with making, administering, enforcing or adjudicating its laws or policies" (Prado & Trebilcock, 2009, pp. 27–28).

TABLE 1 Education and Health Indicators, 1990–2015

	Least Developed Countries			Globally		
	1990	**2015**	**Change**	**1990**	**2015**	**Change**
Literacy Rate, Ages 15–24 (%)	56.3	76.1	19.8 pp	83.2	91.2	8.0 pp[+]
Adjusted Net Enrolment Rate (%)						
Primary, Total	52.7	81.5	28.8 pp	82.4	91.1	8.7 pp
Primary, Female	46.9	79.7	32.8 pp	77.8	90.2	12.4 pp
Life Expectancy at Birth	51.7	64.1	12.4 yr	65.4	71.9	6.4 yr
Mortality (per 1,000 live births)						
Infant	108.6	49.9	−58.6	64.7	31.2	−33.5
Maternal	9.0	4.4	−4.7	3.9	2.2	−1.7
Child (Under 5)	175.3	71.4	−103.9	93.2	41.9	−51.3
GDP per capita						
Exchange, 2010 USD	525	905	72%	7,171	10,329	44%
PPP,[^] 2011 International $	1,376	2,479	80%	8,966	14,835	65%
Population at ≤ USD 1.90/day (2011 PPP)	..	..	..	35.9	10.0	−25.9pp

[+] Percentage points.

[^] Purchasing power parity.

2 | THE NEW PROGRESSIVISTS

2.1 | The (Uneven) arc of progress

The New Progressivist literature rightly celebrates the fact that hundreds of millions of people in dozens of countries are likely to live longer, healthier, and more comfortable lives than their forebears. Between 1980 and 2016, the average income of the bottom 50% of earners nearly doubled and the number of those living on less than USD 1.90 a day (the World Bank's threshold for extreme poverty) has dropped by more that half since 1990, from nearly 2 billion to around 700 million (Banerjee & Duflo, 2019). With respect to education, there have been remarkable improvements in school enrolment, particularly at the primary level, in the past three decades. As Table 1 shows, between 1990 and 2015 primary school enrolment in the world's Least Developed Countries (LDCs)[3] increased by nearly 30 percentage points. Female primary school enrolment experienced an even more pronounced improvement. Globally, youth literacy rates passed 90%, as did primary school enrolment for both girls and boys.

Recent gains in measures of health are also significant: globally, average life expectancy at birth increased by nearly six and a half years between 1990 and 2015 and the infant mortality rate fell from 65 per 1,000 live births in 1990 to 31 in 2015 (see Table 1). Progress in this area is even more striking when only LDCs are considered: infant, child, and maternal mortality rates fell by more than half and average life expectancy increased by more than 12 years. There has also been significant economic growth. The average country's GDP per capita increased by either 43.3% (USD) or 65% (PPP) between 1990 and 2015, depending on the measure of comparison. In addition, the number of people

[3] LDC is a UN-defined country designation based on income level, measures of health and education, and population vulnerability to personal and natural crises and to disasters caused by natural hazards (UNDESA, 2018, pp. 6–9).

living on USD 1.90 (2011 PPP) or less per day declined by more than 25 percentage points during the same period (World Bank, 2019).[4]

Remarkable as these gains are, substantial cross- and intra-national variation remains. Although most countries did experience some economic growth between 1990 and 2015, for some countries GDP per capita was largely stagnant, and for a small group—including Brunei Darussalam, Burundi, the Central African Republic, Gabon, Guinea-Bissau, Haiti, Ukraine, and Zimbabwe—it declined (UNDESA, 2018; see also, Collier, 2007). Moreover, GDP per capita only tells part of the story. Despite notable improvements in several of the most historically unequal countries such as Argentina, Brazil, and Mexico (UNU-WIDER, 2020), there has been an increase in within-country inequality in high-income countries as well as many low- and middle-income countries (LMICs) (Alderson & Pandian, 2018; Niño-Zarazúa et al., 2014; Sauer et al., 2020). This is particularly notable in China, where the Gini coefficient doubled—from 23.0 to 46.2—between 1990 and 2015 (UNU-WIDER, 2020). This pattern should be viewed with particular concern in light of recent challenges to the empirical validity of the Kuznets hypothesis—the belief that industrialization and trade liberalization would bring about an initial increase in inequality followed by a subsequent decline as the benefits of growth were gradually realized by the population as a whole (Milanović, 2016; Piketty, 2014).

Despite a global decrease in undernourishment between 2005 and 2015, Northern, Southern, and Western Africa along with Oceania experienced net increases. Moreover, global undernourishment increased in both 2016 and 2017 (FAO, 2018, pp. 3–4). In terms of gains made, despite an aggregate increase of 6.4 years globally and 12.4 in LDCs, life expectancy at birth in Lesotho declined by 5.5 years between 1990 and 2015 and 20 other countries experienced increases of less than three years. With respect to infant mortality, Dominica's infant mortality rate increased by 14.6 per 1,000 live births while Liberia's decreased by 114.4 and, although the global average improvement was 54%, 20 countries improved by 20% or less. There is also evidence of significant variation between countries with similar levels of socio-demographic development as well as sub-nationally (Kyu & Murray, 2018, pp. 1870ff., 1906; Lozano & Murray, 2018, pp. 2111–2114).

Substantial inequalities also remain in education, despite the marked improvement in enrolment levels in recent decades: of the estimated 61 million primary-age children worldwide not currently in school, more than half live in countries across sub-Saharan Africa (UNESCO, 2017). Moreover, enrolment levels are unevenly distributed within countries. In South Africa, for example, enrolment in sixth grade is 91.5% for children from households in the wealthiest quintile compared to 56.1% for those from the poorest (Spaull, 2013b, p. 22). More importantly, although enrolment in primary education is a positive step it is far from the end goal of education. Neither is it a reliable indicator of the quality of education those pupils receive and the resulting learning outcomes (Carson et al., 2015; Pritchett, 2013; World Bank, 2018). Great strides have been made, but why in some places and in some measures and not others?

2.2 | Explaining progress, explaining variation

The New Progressivist literature attributes the remarkable rate of improvement in the material conditions of people's lives to technological development. Proponents argue that these improvements

[4] The growth of formal democracy during early part of this period was also substantial. However, a consistent downward trend in country-level "freedom" over the past decade and more, as well as concerns regarding the quality of democracy and the prospects for long-term political stability in democratizing nations, raise questions about the causal significance of this trend (*Freedom in the world 2019: Democracy in retreat*, 2019, p. 4; Carothers, 2002; Diamond, 2019).

reflect an increasingly broad and rapid diffusion of innovations in recent decades through the expansion of global trade, investment, education, research, and communication networks (Rosling et al., 2018). In these narratives there is a strong emphasis on human ingenuity applied in an effort to improve one's own lot along with that of one's family and community (Norberg, 2016), in response to crises or necessity (Easterbrook, 2018), or as the result of a general creative spirit (Deaton, 2013). The New Progressivist understanding of the sources of variation, stagnation, and regression is less clear.

Indeed, within the literature there are at least three identifiable lines of argument that, to greater or lesser degrees, address the high level of cross- and intra-national variation in improvements. Those working in the first strand are largely concerned with macro-level trends and tend to seek out causes of and barriers to progress at a very general level. Byron Reese's work may represent the most developed version. For Reese (2013), ongoing improvements in global communications technologies such as the internet and technological innovation are the driving force behind the largely inevitable progress of humanity. Under this model of progress, variation is attributed to exogenous events such as undue interference by governments, terrorism, disasters caused by natural hazards, or global health crises. Such impediments, to the extent they are dealt with beyond simply acknowledging the reality of uneven growth, are understood to be temporary setbacks—effectively random noise—that delay rather than deny progress. Moreover, as progress continues, potential sources of problems—for example, war—are thought to become increasingly unlikely as the result of decreasing ignorance and intolerance as well as increasing global interconnectedness, economic and otherwise.

A second line of argument sees free markets as the key to unleashing progress by promoting technological development and rewarding ingenuity. The work of Norberg (2016) and Ridley (2010; 2020), for example, represents this libertarian-oriented line of New Progressivist scholarship, largely concerned with the necessity of restricting state actors to their core "night watchman" functions such as protecting property rights, enforcing contracts, and national defence. According to Norberg, we are currently witnessing the greatest improvement in global living standards that has ever occurred, a trend that has resulted from increased individual freedom, more open economies, and technological progress. This trend, he argues, is not the result of institutional capacity or leadership, but rather, "slow, steady, spontaneous, development of millions of people who were given the freedom to improve their lives, and in doing so improved the world" (2016, p. 6).

For New Progressivists working in this libertarian vein, global progress is somewhat less certain than it is for those in the "rising tide" camp. Nevertheless, there is a relatively clear path to progress or, more precisely, for establishing the conditions under which progress will occur: individual freedom must be fostered, trade must be liberalized, property rights and contracts must be credibly enforced, and state intervention in economic activities must be minimized.

The third line of argument within the New Progressivist scholarship tends to emphasize the importance of the decline of autocracy and the rise of democracy in recent decades as facilitating increased freedom, innovation, and economic openness. This scholarship tends to move beyond a "march of progress" or one-size-fits-all understanding of the necessary institutional conditions for growth found in the first two strands. Radelet, for example, points to the growth of democracy and the concomitant strengthening of civil society, the increasing inclusivity of political structures, and stronger economic management as essential components of the "Ascent of the Developing World" (2015, pp. 16–19). Similarly, Kenny identifies declining rates of inter- and intra-national, as well as gender-based, violence as supporting growth. He also acknowledges that the remarkable growth present in much of the world does not mean that "there isn't considerable, unconscionable underdevelopment" in other parts (2011, p. 150). Work in this vein also tends to envisage a stronger role for the state in softening short-term hardships brought about by development-oriented changes in law, policy, and practice. According to Easterbrook (2018), human ingenuity can and will overcome any obstacle in its path.

This, however, does not mean that we will always find the results of the solutions morally acceptable. To square morality with the future, he argues, steps should and perhaps must be taken to mitigate distributional inequalities.

Institutions do play a role in this strand of analysis, but a relatively minor one. According to Kenny, for example, "country-specific factors" like healthcare financing, education policy, economic growth and policy choices more generally account for a little less than 15% of recent global improvements in health. The rest, he argues, is attributable to global patterns of improvement, principally through the diffusion of technological innovations (2011, p. 115; Easterly, 1999). Elsewhere, he argues that "technology and demand rather than income and institutions play the major role in determining health outcomes" (Casabonne & Kenny, 2012, p. 21). Kenny does recognize the importance of demand-side factors in promoting growth, specifically the lack of knowledge or incentives to use existing, relatively inexpensive technologies such as sugar–salt solutions or bed-nets to improve health (and acknowledges the potential for government programmes and policies to address demand-side issues (2011, pp. 128ff., 153–157, 160–165). From a practical perspective, however, Kenny appears to have a limited view of the transformative capacity of institutions in a development context, as a result of their "stickiness" and the difficulty of transplanting them. Instead, he argues that the most workable solution is to focus on product-based (as opposed to procees-based) technologies, which tend to disseminate more effectively and expediently (2011, p. 197).

Much of the work in this third strand of literature presents a credible perspective on the importance of technological development and the spread of ideas. At the same time, we suggest that it has three key weaknesses. First, while the role of institutions like schools, democratic government, and stable financial systems are acknowledged as important determinants of rates of innovation and diffusion, there is little discussion about the difficulty of their establishment or reform. Second, little or no attention is given to the reality that institutions are often co-requisites for achieving citizen or consumer buy-in, as well as the provision of infrastructure, staff, and supply-chain logistics necessary for an innovation or idea to be put into effect at a national, or even local, level. Third, with the notable exception of Kenny, there is little or no consideration of how "sticky" existing institutions—corrupt or otherwise—can be and their capacity to both promote and thwart change.

That there has been a remarkable improvement in recent decades in the well-being of hundreds of millions of people across the so-called "developing world" is undeniable. So, too, is that fact that these benefits have not been distributed uniformly between or within countries. The New Progressivist literature, some strands more than others, offers a credible explanation of the former but not the latter.

3 | THE RELATIONSHIP OF TECHNOLOGY AND INSTITUTIONS

For most New Progressivists, technology is the solution to all or nearly all development problems, while institutions have little if anything to contribute (Morozov, 2013). We reject this position. Institutions, particularly local institutions, are often a necessary condition for realizing the benefits of technological innovations. Therefore, understanding the role of technological innovation in the promotion of progress in LMICs requires accounting for the institutional aspects of implementing new technologies. We argue that this interaction may help predict the likelihood that a particular technology may be adopted in a given jurisdiction and, to the extent that it is, whether or not it generates the intended benefits.

It is important to underscore that our argument does not fully explain the high level of existing variation in progress and trends over time. These variations are likely to be the result of a multitude

of factors outlined in at least three bodies of literature: endogenous theories of growth, sociology of technology diffusion, and institutional theories of development. We provide a brief overview of these contributions to help contextualize our claim.

With some notable exceptions, New Progressivists tend to assume the relatively rapid and barrier-free dissemination of technological innovations. This assumption is in sharp contrast with both theory and empirical evidence (Comin & Hobijn, 2004, 2010; Dewan et al., 2010; Feder et al., 1985; James, 2013; World Bank, 2008). On the supply side, adopting a technological innovation has associated costs, regardless of whether it is developed domestically or imported. For instance, endogenous growth models have devoted significant attention to the barriers to diffusion of technological innovations as a possible explanation of the divergent rates of economic growth across countries (Aghion & Howitt, 2008; Barro & Sala-i-Martin, 1997; Parente & Prescott, 1994, 2002; Romer, 1990).

On the demand side, user acceptance cannot be assumed to be either rapid or assured simply because a particular innovation "solves" a problem or is more "efficient" than an existing approach. Sociologists have shown that technological diffusion varies from innovation to innovation, and there are significant differences in the rate of adoption of the same innovation in different social systems, due to differences in local belief and value systems. In many, perhaps even most, cases, simply making a technology available to a community will not result in immediate uptake (Rogers, 2003; Rogers & Shoemaker, 1971).

New Progressivists also largely ignore claims that institutional arrangements are an explanatory factor of the high level of variation in contemporary development trajectories (Acemoglu & Robinson, 2012; Levy, 2014; North et al., 2009; World Bank, 2018). In their examination of technology adoption in 23 industrialized economies, for example, Comin and Hobijn (2004) found that the lack of a credible property rights regime—as manifest in an unaccountable political structure—was negatively correlated with technology adoption. Similarly, the presence of a strong legislature was also negatively associated with technology adoption, consistent with the theory that vested interests would lobby for the creation of barriers to new technologies. In a subsequent study, Comin and Hobijn (2010) found that the lags in the adoption of new technology have tended to decline over time. However, their data also indicate substantial variation in the speed at which particular countries have adopted technology relative to this trend. Key instances of this phenomenon include a marked slowing in the speed of adoption in Latin America and significant increases in the so-called East Asian Tigers. Such changes, we argue, point strongly to the significance of domestic institutions that shape the nature of political and economic power as well as the capacity of the actors operating within them.

Path dependence has also proven to be a significant impediment to convergence, both developmental and institutional (Milhaupt & Pistor, 2008; North, 1990; Prado & Trebilcock, 2009). Indeed, there is a strong correlation between the prosperity of countries (and their predecessors) today and 500 years ago (Comin et al., 2010). Moreover, institutional innovations, interventions, and policies that have been effective in one country will not necessarily be effective if replicated elsewhere (Hall & Gingerich, 2009; Hall & Soskice, 2001). Indeed, much of the recent literature on institutional reform espouses a much more targeted or problem-driven approach to what is both desirable and feasible (Andrews, 2013; Andrews et al., 2017; Banerjee & Duflo, 2012, 2019; Levy, 2014; Trebilcock & Daniels, 2009). For better or worse, societies tend to have relatively stable institutional arrangements (Kenny, 2011). The nature of those institutional arrangements will, in turn, shape whether an innovation or idea can be adopted or adapted in a beneficial way, as we discuss next.

The insights of these three bodies of literature do not necessarily point towards convergence in human welfare. Instead, they offer explanations for inequalities in access to technology or the

TABLE 2 Technological and Institutional Requirements, Selected Innovations

Technological Investment	Institutional Capacity	Innovation
Low	Low	Handwashing
	Medium	Antenatal Care
	High	Tablets/laptops in primary education
Medium	Low	Deworming
	Medium	Immunization
	High	Massive Online Open Courses (MOOCs)
High	Low	Mobile Money Transfers
	Medium	mHealth Initiatives
	High	Smart Contracts

variations in institutional quality. Building on these findings, this article focuses on one particular dimension of the problem: the complex interaction between technology and institutions on the ground. Not all innovations require substantial local institutional capacity, nor is the level or type of institutional support constant across innovations or contexts. Nevertheless, the benefits derived from many technologies depend on existing institutions and institutional capacity.

Realizing the benefits of mass transit, for example, is dependent on the existence of appropriate infrastructure, the institutional capacity to effectively deliver services and manage associated labour and maintenance issues, and in some cases a regulatory agency capable of enforcing legislation regarding safety and consumer protection. On the other hand, supplying hydration therapy for diarrhoea requires little institutional support. Institutions may, however, play a key role in whether parents or caregivers adopt the method—the demand side of the equation. Exhortations to alter one's behaviour are unlikely to be heeded unless they come from a trusted or respected source. A general distrust of state institutions, for example, would probably prove a serious impediment to reaping the benefits of relatively simple innovations.

An account of the benefits generated by technological innovations and, by extension, the rate of progress in LMICs, should consider two key dimensions: the investment required to develop or access the relevant innovation (technological investment) and the institutional resources required to implement or adopt it in an effective way (institutional resources). Table 2 presents a typology of interactions of technological innovations and institutional resources.

As one moves from technological innovations that entail modest institutional pre- and/or co-requisites to those that require much more demanding institutional ones, a country's ability to take advantage of such innovations will vary greatly depending on how close or distant it is from some idealized social order: countries that are afflicted with kleptocratic and repressive political regimes, rampant corruption, ethnic conflict and perhaps civil war ("failed states" on many definitions) will have little or no capacity to take advantage of technological innovations that demand high institutional capacity. Even the benefits of innovations that are much more modest in their institutional demands may be overwhelmed by broader sources of social, political and economic dysfunction. Indeed, this may well explain a significant portion of the more extreme variations in rates of human progress noted above. However, setting aside these "failed state" extremes that lack even rudimentary functioning institutions, we argue that a more granular mapping of the interaction of technological and institutional pre or co-requisites of human progress is likely to illuminate the bounds of both the desirable and the feasible, as we illustrate in the following section.

4 | THREE ILLUSTRATIVE EXAMPLES

In this section we present examples drawn from three areas of development—education, health, and financial development—that illustrate the variable relationship between technological investment and institutional capacity.

4.1 | Education

Some educational indicators have been improved with modest technological solutions requiring relatively little institutional support. For example, although primary enrolment rates have risen remarkably in recent decades (see Table 1), student absenteeism has remained a significant problem in many jurisdictions. Single-dose therapies that reduce hookworm, ringworm, and schistosomiasis infections have proven particularly effective technological means of reducing absenteeism and require moderate technological investment and low institutional capacity: tracking and follow-up for boosters is not required and the oral administration eliminates the need for things like cold-chains and medical staff to deal with injections (Miguel & Kremer, 2004).[5] A number of studies, however, have found no statistically significant impact of improved attendance on subsequent test scores, cognition, or school performance (Snilstveit et al., 2016, p. 18; Taylor-Robinson et al., 2015). While it is reasonable to assume that enrolment and attendance are necessary conditions for the receipt of primary education, they do not appear to be sufficient.

Another, more complex technology-centred approach to improving education has been the direct provision of laptops, tablets, and similar devices to schools and/or pupils.[6] Research on the efficacy of such programmes is mixed (Cristia et al., 2017; Mora et al., 2018), but, broadly speaking, successful interventions supplemented rather than replaced existing lessons (the latter being associated with negative effects), offered new content that was aligned with existing pedagogy, and provided teachers with training (Snilstveit et al., 2016, p. 32; Zheng et al., 2016). It is also of note that logistical problems such as delays in delivering or repairing equipment, lack of electricity, and the inability to access the internet appear to have had a negative effect on a number of these interventions.

Children may well need to be in school to learn and providing them with modern technology may well assist them in doing so, but these are insufficient in and of themselves. Nor is it simply a matter of insufficient expenditures. For example, despite government expenditure levels well above average for LMICs and comparable to that of wealthy countries, i.e. members the Organisation for Economic Co-operation and Development (OECD) in terms of proportion of GDP (World Bank, 2019), South Africa consistently performs worse than all or most MICs and many LICs in cross-national assessments of educational quality (Spaull, 2013b). A legacy from the apartheid era, formerly non-white schools are consistently inferior to former whites-only schools in terms of performance, grade repetition, dropout rates, and teacher absenteeism (Spaull, 2013a). Research on South Africa's basic education system identifies several factors that contribute to these poor outcomes, including poor infrastructure, a lack of learning material, poorly trained and unmotivated teaching staff, and ineffective administrators (Mncube & Madikizela-Madiya, 2013; Modisaotsile, 2012; Mouton et al., 2012; Spaull, 2013b). Although there have been improvements since the end of apartheid, the legacy of the division between schools for whites and non-whites remains insofar as roughly 20–25% of South African schools, the

[5] For a discussion of the requirements of an effective immunization programme, see 4.2.

[6] The best-known of these is the One Laptop per Child programme (http://one.laptop.org/).

majority of which are former white-only schools, perform relatively well while the performance of the other 75–80% is often described as abysmal (Mestry & Ndhlovu, 2014; Mncube & Madikizela-Madiya, 2013, pp. 166–167; Mncwabe, 1993, p. 3; Thomas, 1996).

Administratively, the quality of primary education in many LMICs is negatively affected by incompetence and malfeasance in the hiring of teachers as well as serious limitations in the ability of the state to perform basic functions such as delivering textbooks in a timely fashion (Legotlo, 2014). Such concerns raise serious questions about the institutional capacity of countries' education systems. These issues are particularly pressing in South Africa (Mouton et al., 2012) and a similar sets of problems have also been identified in other large countries such as Brazil and India (Carson et al., 2015). Correcting these issues, embedded as they are in institutional context, has proven problematic—teachers cannot be trained overnight, nor can organizational culture turn on a dime.

As one moves beyond the level of primary education, the potential for technology to operate with little or no institutional support appears to increase. For example, recent work in the area of education and development is cautiously optimistic about the potential for Massive Online Open Courses (MOOCs) and Open Education Resources (OER) to address problems of both quality and capacity in secondary and tertiary education in LMICs (King et al., 2018; Wildavsky, 2015)—a potential being massively tested during the current COVID-19 pandemic. The caution expressed, however, is often related to matters either directly or indirectly related to institutional capacity.

Intermittent electricity and internet access, as well as bandwidth concerns (in terms of both speed and cost), are frequently identified as barriers to access (King et al., 2018; van de Oudeweetering & Agirdag, 2018). Technological developments such as solar panels and distributed generation may well address some of these issues. However, to the extent that power production moves beyond the level of the household, technological development is unlikely to address core problems associated with a given country's ability to provide public utilities and communications infrastructure. Rather, these are matters that rely on credible and reasonably effective institutions that can create, maintain, and regulate these services.

Another set of concerns relates to course content. At present most content is produced in English and in high-income countries (HICs).[7] This in turn can present problems to learners who may have difficulty in understanding English (or particular accents), grasping the significance of examples or discussion due to the lack of a shared cultural background, or with the teaching style itself. There are also ethical considerations relating to the perception and reality of such courses as representing a neocolonial force that marginalizes local or regional pedagogies, hampering the development of or undermining existing local academic capacity (King et al., 2018, pp. 6–8). In both cases, these concerns are likely to be more prevalent in the humanities and social sciences than in the natural sciences. Resolving these concerns necessarily relies on the inclusion of local actors in content development and, quite probably, institutional partnerships and engagement with funders and developers and/or a shift toward domestic content development.

Another consideration is the level or prior knowledge and/or skill necessary to benefit from exposure to MOOCs and OER. One concern is computer literacy, something that is far from standard in many countries. Subject-specific knowledge may also be necessary (King et al., 2018; van de Oudeweetering & Agirdag, 2018). In both cases, these are skills one might expect to be provided by a well-functioning basic education system. Thus, MOOCs may be able to reduce the need for and reliance on domestic institutional capacity for their operation, but exposure to an effective system of primary education is likely to be a pre-requisite for users to be able to benefit from participation.

[7] A study of 4,905 MOOCs offered by 37 providers between 2013 and 2016 found that 75% of the time the language of instruction was English (Stratton & Grace, 2016, p. 4).

The contemporary form of the university is far from being supplanted by the emergence of institutions of higher education that emphasize teaching rather than research, dispense with timelines, allow students to pursue skills and interests as they see fit, rather than those deemed necessary for particular degrees, and are structured to support continuous learning (Carey, 2015; Selingo, 2013). Nevertheless, technological development does appear to have the potential to act as a substitute for bricks and mortar institutions in at least some areas of secondary and tertiary education. Its capacity to do so, however, continues to rely on the existence of an institutionally sound primary (and secondary) education system, as a well as domestic capacity to provide reliable public utility services, attract investment in and regulate telecommunications, and produce locally relevant, accessible content.

4.2 | Health

Recent increases in life expectancy at birth are both remarkable and concentrated in LMICs. Moreover, innovations requiring little technological investment or institutional capacity have contributed significantly to these gains. The broad acceptance of the necessity of hand-washing, the normalization of boiling or treating drinking water, the adoption of pit latrines, and insecticide-treated bed-nets have all resulted in high-magnitude, low-cost improvements in the measures of health throughout LMICs (Kenny, 2011, pp. 117–119).

Other improvements have come with relatively little technological investment but have required moderate institutional capacity. Particularly notable in this respect is the expansion of antenatal care. Recent years have seen some increase in access to antenatal care, and the use of mobile phones (mHealth) appears a promising means of further increasing its availability (Sondaal et al., 2016). Increased access and increased uptake are not the same thing, however. Finalyson and Downe (2013) identify several trends in the design of antenatal care programmes that may well act as demand-side barriers. Key among them are the failure to incorporate local or culturally specific beliefs, attitudes, and theories regarding pregnancy—in addition to the availability of staff and clinics, there is also a need to effectively develop local capacity to tailor programme design to local needs and perspectives.

Moving slightly up the scale in terms of technological investment, vaccines have been remarkably effective in addressing a host of ills worldwide. At the same time, a number of agencies and scholars have expressed concerns about stagnating improvements in recent years (Gavi, 2017; UNICEF, 2016). New or improved vaccines have the potential to diffuse rapidly across borders, but to be effective vaccines must be delivered in usable form and administered to willing recipients, something that is not always the case (Lancet, 2014; Shann & Steinhoff, 1999)—again, a massive challenge that will have to be confronted as vaccines are developed for COVID-19. The maintenance of "cold chains" in LMICs that are frequently unable to effectively and consistently store vaccines at appropriate temperatures result in reduced potency, significant waste, and lower rates of coverage (Ashok et al., 2017). The most frequently cited problems, however, are not technological, but political—the need for greater funding, increased education and familiarity with best practices, and monitoring of service delivery, each of which requires institutional capacity (in addition to political support).

The willingness of intended recipients is also a concern. In April 2019, for example, residents in Pakistan violently attacked health officials, killing several, who were attempting to vaccinate children against polio (Janjua, 2019). Estimates suggest that, in total, almost 100 people involved in the country's anti-polio campaign have been killed since 2012 (Larson & Bhutta, 2013; Masood, 2019). Part of the reason behind these attacks and the reticence of many parents to allow their children to be vaccinated stems from a fear that the programme is a cover for espionage or the like (Gostin, 2014;

McNeil Jr, 2012). While this may be an extreme case, it does highlight the fact that in the absence of trusted state (or other) institutions, creating demand may prove a difficult challenge.

Recent improvements in life expectancy at birth will also have a significant impact on the nature and scale of demands placed on domestic health systems (Kyu & Murray, 2018, pp. 1863–1870). Another key challenge for LMICs in relation to health is the prevalence of death and disability attributable to non-communicable diseases (NCDs). At present, NCDs such as cancer, cardiovascular diseases, chronic respiratory diseases, and diabetes are responsible for an estimated 70% of deaths worldwide, three-quarters of which occur in LMICs (Riley et al., 2017, p. 7). In addition to their human cost, the economic loss resulting from NCDs is estimated to be 4% of GDP in an average LMIC (Magnusson & Patterson, 2014, p. 44). Moreover, ageing populations are more likely to require—and demand—cancer treatments, joint replacements, and a host of other curative measures requiring substantial technological investment and institutional capacity (Deaton, 2013, pp. 151–153). This, in turn, will present serious challenges to domestic institutions regarding the allocation of resources between preventative and curative treatment and may well exacerbate existing inequalities as wealthier and better-connected citizens of LMICs gain access to world-class treatment that absorbs the bulk of domestic healthcare capacity.

The causes of leading NCDs are well established—for example, tobacco, alcohol abuse, obesity, and poor diet—and largely require behaviour modification to correct—smoking cessation, treatment for substance abuse, and improved nutrition. Many of the most efficient ways to address their economic and human impact, as identified by the World Economic Forum (WEF) and World Health Organization (WHO), emphasize either increased state regulation—health warnings, age and usage restrictions, mandated reductions in the level of specific ingredients such as salt—or the imposition of taxes (Riley et al., 2017, p. 7; WEF & WHO, 2011, p. 7). In this regard, technology has the potential to complement institutionally driven policies by improving the dissemination of exhortation and information-based policies. On its own, however, technological development is unlikely to effect substantial change: it cannot regulate inputs or require health warnings in the tobacco or food industries, nor can it effectively lobby policy-makers to counter industry associations or other actors with vested interests in maintaining the status quo. Successfully implementing and maintaining such policies requires well-functioning political and regulatory institutions and civil-society and/or professional organizations prepared to act in the public interest.

In contrast to policy implementation, one area in which technology may contribute significantly to addressing the burden of NCDs is the use of mobile phones for the rapid and frequent collection of high-quality data (for example, Ellis, 2017; Gibson et al., 2017; Jardine et al., 2015; Lamanna et al., 2019; Raza et al., 2017). Nevertheless, even such technology-driven advances rely on some level of institutional capacity. As has been made readily apparent by the experiences of advanced economies' attempts to develop centralized electronic health-record systems, concerns relating to data security, privacy, informed consent, and the potential for theft or misuse, both actual and perceived, are non-trivial (Malin et al., 2018; Rezaeibagha et al., 2015). More recently, the possibility of mobile phone-driven (mHealth) initiatives aimed at remote diagnosis and treatment have also been discussed and, to a limited extent, piloted (Wood et al., 2019). Subject to the concerns noted above regarding privacy, data use, and public acceptance, such initiatives have significant potential to increase access to healthcare services to those living in remote areas.

With respect to programmes and interventions intended to address emerging healthcare issues in LMICs, scholars have consistently raised concerns about the idea of "blueprint" or one-size-fits-all approaches. Rather than focusing on the expansion or replication of specific interventions which have proven effective in a few jurisdictions, there is a growing body of research suggesting that it is necessary to consider the contexts—institutional, social, political, economic—in which interventions or

policies are to be implemented, and their relationship to one another, in order to facilitate long-term development. The failure to consider the domestic resources—organizational or political—necessary to scale up such services, let alone how to build them (Andrews et al., 2017; Subramanian et al., 2011), is likely to have deleterious results on the health system as a whole by creating distortions in market incentives, unrealistic expectations, or inequitable allocation of resources (Peters et al., 2012). Moreover, in the absence of core domestic institutional capacity, it may prove difficult to continue or expand beneficial programmes aimed at the least advantaged because of their limited political influence.

4.3 | Financial development

The connections between technological interventions and poverty reductions or increases in per capita GDP are not as easy to measure as interventions in health and education. This is especially true when one considers that economists have no widely agreed, generalizable theory of long-term sustainable economic growth (Banerjee & Duflo, 2019, Chapter 5; Kenny, 2011; Rodrik, 2008). Yet New Progressivists tend to treat the significant reduction in poverty levels around the world in recent decades as causally related to technological innovation driven by global trade, investment, research and communication networks.

For example, the global proliferation of wireless networks and the internet (known as Information and Communication Technology (ICT)) has dramatically reduced information and co-ordination costs and facilitated ever more complex global supply chains into which an increasing number of LMICs have successfully integrated (Baldwin, 2016). However, the investments required to build these networks are large and depend on a credible institutional infrastructure. Many LMICs have benefited from such developments, but have also faced challenges due to chronically poor infrastructure, including roads, ports, railways, electricity, and communication systems. Enhancing infrastructure presents formidable institutional challenges which are likely to vary from country to country.

Notwithstanding these challenges, many of the New Progressivists argue that the ICT revolution has already had a major and expanding economic impact in domestic economies, including increasingly the economies of many LMICs. According to Radelet, "Mobile phones and internet connections are creating jobs, reducing business costs, facilitating research, extending financial networks, strengthening health systems, improving information flows, and increasing transparency and accountability" (2015, p. 175). The *Economist* (2019, May 2) recently argued that "A smartphone revolution in finance offers one of the best ways to boost the economy and spread the benefits". The widespread access to mobile phones around the world has vastly reduced communication costs, allowing for more efficient allocation of resources, higher rates of competitiveness, enhanced productivity, and welfare gains for producers and consumers (Aker & Mbiti, 2010; De Angoitia & Ramirez, 2009; Jensen, 2007; Klonner & Nolen, 2010).

Mobile banking is an important feature of the global diffusion of mobile telephony. It offers money transfers among individuals, and in some cases allows consumers to pay bills and buy airtime for their mobile phone (*Economist*, 2019, May 4). It is has diffused widely in Africa, Asia and Latin America (Asongu & Odhiambo, 2019). The most famous service is M-Pesa, a mobile banking service in Kenya, which has grown exponentially both in urban and rural areas—recent estimates suggest it is used by two-thirds of adult Kenyans—and now also offers a payment system (Buku & Meredith, 2013; Jacob, 2016). While touted as facilitating the banking of the unbanked by leap-frogging bricks-and-mortar bank branches, there is evidence that the diffusion has followed existing patterns of unequal distribution. Aker and Mbiti, for example, found that users of M-Pesa tended to be wealthier and better

educated than non-users as well as being disproportionately urban and "already banked" (2010, p. 221). It is, in other words, not clear whether mobile banking can contribute substantially to economic growth or poverty reduction (Donovan, 2012). One of the limitations of the service is that enabling electronic deposit and payment systems may entail minimal institutional oversight (low institutional capacity); but, when the service moves beyond that to providing loans and insurance, demands on institutional capacity will increase as a necessary means of ensuring the liquidity and solvency of such financial innovations. This is not to say that there are no benefits to mobile banking,[8] but these seem limited and highly context-dependent (Kim et al., 2018).

Blockchain technology is an innovation that is touted as an effective way of promoting contract enforcement and property rights protection (De Filippi & Wright, 2018). The technology is being widely used for cryptocurrencies, such as Bitcoin, and has recently expanded to smart contracts (Grinhaus, 2019). Smart contracts resort to blockchain technology to allow for self-execution: once the service is rendered or the good is delivered, payment is automatically processed. This supposedly removes the need for contracting parties to either trust each other or to have reliable institutions to enforce the agreement, especially in the case of non-simultaneous contracts (Eenmaa-Dimitrieva & Schmidt-Kessen, 2019). As an almost immutable ledger that records transactions, blockchain could also serve as a replacement for land registries, acting as an instrument to secure property rights in countries where the bureaucratic apparatus is unable to perform these functions, or cannot be trusted to do so (Oprunenco & Akmeemana, 2018).

While the emergence of digital technologies may indeed replace some of the functions initially performed by institutions, they also create a new set of institutional demands. In the case of blockchain technology, good governance is a condition for the realization of the anticipated benefits (Ølnes et al., 2017). For instance, governance rules need to be set up to decide the code that will govern the system and possible modifications of these original rules. In the case of smart contracts, the self-executing mechanism may resolve the problem of execution and non-performance, but it does not resolve more complex contractual problems, such as disputes over the meaning of contractual terms or unaddressed contingencies. Although the volume of disputes may well be reduced, the need for an impartial adjudicator ensconced in a reasonably independent judicial system—itself requiring a good many institutional prerequisites—will probably remain a necessary background institution (Pistor, 2019, Chapter 9).

Similarly, the ability of large multinational companies to locate nominal corporate head offices in tax havens or low-tax jurisdictions, while still managing complex global supply chains from their effective centres of control, is greatly facilitated by new information technology while intensifying demands on domestic institutional capacity and international co-ordination to apply effective and equitable corporate tax policies (Baldwin, 2016; Piketty, 2014; Zucman, 2015).

In an age where financial transactions can be made across the globe at the click of a button, contagion effects from a financial crisis in one market that spreads to others (as in the case of the 2008 Global Financial Crisis), along with the rapid growth of "shadow" banking sectors, require a level of both domestic and international institutional capacity beyond the conventional oversight function of governments and central banks in maintaining the solvency and liquidity of the commercial banking sector (Anand et al., 2016). With the exception of the 2008 Crisis, financial crises in various forms—banking, sovereign debt, currency, and inflation—have disproportionately afflicted LMICs in recent decades (Kindleberger & Aliber, 2011; Reinhart & Rogoff, 2009). Technologically enhanced fluidity of financial flows may intensify the challenges entailed in ensuring the stability of financial systems

[8] One advantage is the increase in money transfers, reducing prices in competing services (Mbiti & Weil, 2015). Although not designed for the purpose, it is also often used as a means of saving (Morawczynski, 2011).

while at the same time increasing the challenges for government in tracing the proceeds of money laundering, corruption and drug trafficking (Bullough, 2018).

Thus, institutions will continue to function as pre or co-requisites of many of these technological innovations, although these innovations are likely to reconfigure institutional demands in often novel and more demanding ways.

5 | CONCLUSION

Technology and human ingenuity may well provide the answers to many of the problems facing low- and middle-income countries and, in a few circumstances, they may be all that is necessary to address a problem. In most circumstances, however, the process of integrating technological developments into existing institutional and legal arrangements to protect privacy, prevent or mitigate deleterious unintended consequences, monitor effectiveness, and ascertain ongoing need requires local, regional, national, and international institutions. If these lack capacity or political support, it is unlikely that any given technological innovation will achieve anything like its full potential.

The benefits of some, perhaps even most, innovations are likely to be universally desired. Products and ideas that quickly, inexpensively and easily decrease infant mortality—for example, pre-natal care, hand-washing, vaccination schemes, and access to basic medicine—certainly fall into this category. In contrast, certain kinds of innovations require greater institutional and/or financial support to implement. For example, in the context of the current cornonavirus pandemic, even if one assumes (unrealistically) that Personal Protective Equipment, tests, ventilators, and eventually vaccines and antivirals are readily available in LMICs, the effective use of these technologies is hugely dependent on institutional capacity (as many wealthy countries have belatedly come to realize). Indeed, as the final round of editorial revisions was underway (in early November of 2020), excitement about Pfizer's announcement of a positive test results for a COVID-19 vaccine has been tempered by concerns about its accessibility in LMICs because it will almost certainly require well-developed and reliable cold chains (Reuters, 2020).[9]

We do not contest the fact that technological innovations have profoundly shaped the nature, organization, and prosperity of humanity. However, we also argue that as they become established and evolve, institutions influence the distribution of resources and authority, creating vested interests and expectations that in turn shape preferences and must be dealt with if change or development is to occur (Trebilcock, 2014). Moreover, while technological innovations may sometimes have the potential to transcend or bypass institutional constraints, in other contexts institutional innovations (such as institutional bypasses) may hold out more promise of relieving these constraints (Prado & Trebilcock, 2018).

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[9] See 4.2 for further discussion of the significance of cold chains to vaccination.

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