



# Economic Letter

## Investment Enhances Emerging Economies' Living Standards

by Enrique Martínez-García

**ABSTRACT:** Investment helps countries at all levels of economic development reap productivity gains from new technologies and improve living standards. Investing to support innovation and a skilled workforce is as crucial for China as it is for the U.S.

Over the past two decades, the world has experienced a remarkable period of economic expansion that has led to improved living standards in countless countries. Between 1990 and 2013, output in a typical economy as measured by gross domestic product (GDP) per worker grew 45 percent. However, gains have been unevenly distributed among countries.

The median emerging economy, in particular, experienced a small decline in GDP per worker during the 1990s that was followed by a rapid increase of 46 percent between 2001 and 2013. Though uneven across countries, these gains have helped lift the material well-being of millions of people.

The experiences of the major emerging economies and the U.S. point to the fundamental reasons behind the improving living standards. Growth theory, the field of economics that studies these issues, emphasizes technological progress as the key determinant of *sustained* increases in living standards.<sup>1</sup>

However, data show that for most countries, the main source of increased output per worker is the accumulation of capital for production through investment. It plays a major role even for leading advanced countries such as the U.S. Rising capital per worker is essential for coun-

tries to reap the benefits of technological advancement and improve their standards of living.

China, for example, sought to catch up with the advanced economies by climbing the technology ladder over the past two decades. That process was supported by large increases in capital per worker. Brazil and South Africa increased labor productivity mainly through capital accumulation involving the adoption of new information and communication technologies.

These experiences suggest that investment can support economic expansion through technological advancement and the transfer and adoption of new technologies. In other words, investment is necessary for countries to attain increased efficiencies over time and to continue improving their standards of living.

While the data suggest that capital accumulation has been a major driver of labor productivity gains for most countries that adapted to structural changes in the global economy and the emergence of new technologies, the deeper lesson from the past two decades is that living standards cannot continue rising unless investment embodies technological advances. Investment also needs to promote technological catch-up for material gains to spread to developing countries that have yet to reach the technological frontier.

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## Uneven Productivity Gains

GDP per worker indicates a country's ability to provide for the material needs of its citizens. Gains in labor productivity are aligned with improvements in standards of living. Table 1 summarizes the growth in labor productivity and employment for the median world economy, the U.S. and five major emerging economies—Brazil, Russia, India, China and South Africa (BRICS). The analysis covers three periods, 1990–2000, 2001–07 and 2008–13.

A country's output growth is the sum of labor productivity and employment growth. While output growth is one standard measure of economic activity, labor productivity growth is a better gauge of whether a country's living standards are improving. For the median world economy—representing the typical pattern—employment growth tends to be as important as labor productivity growth (among advanced economies, labor productivity growth is more important).

The five emerging economies are among the largest and most dynamic, though no broad-based catch-up in standards of living has occurred. Countries with stagnant or even declining living standards still managed to attain some measure of output growth by adding workers to the labor force. For Brazil and South Africa, output growth was largely driven by an

expanding workforce in the 1990s, and for Brazil, it remained that way into the 2000s.

Labor productivity growth paced the stronger economic gains for most countries in the 2000s, though it declined among advanced economies. After the 2008 global recession, labor productivity growth declined globally toward its 1990s rate among most major emerging and advanced economies.

## Labor Productivity Growth Sources

Differences in labor productivity growth—the pace of improvement in the standard of living—among countries stem from two main sources.<sup>2</sup> One is the contribution of *capital deepening*—the rate of capital accumulation per worker. The other is the varying rate of technological change. Theory suggests that only technological progress can affect labor productivity growth in the long term.<sup>3</sup>

Emerging economies experienced a surge in labor productivity growth after 2001, with China achieving this breakthrough based on significant contributions from both capital deepening and measured technological progress, similar to the U.S. experience (*Chart 1*). India performed similarly.

The fall of the Berlin Wall and the collapse of the Soviet Union triggered a severe correction in Russia during the early 1990s.

**Table 1** Labor Productivity Gains Among Major Emerging Economies Lift World Living Standards

		Percent change 1990–2000	Percent change 2001–07	Percent change 2008–13
Median world economy	Labor productivity growth	1.25	2.24	1.19
	Employment growth	1.51	2.22	1.39
U.S.	Labor productivity growth	1.92	1.50	1.19
	Employment growth	1.32	0.91	–0.22
Brazil	Labor productivity growth	0.69	0.74	1.01
	Employment growth	1.16	2.60	1.74
Russia	Labor productivity growth	–3.34	5.38	1.67
	Employment growth	–0.60	1.16	0.07
India	Labor productivity growth	3.01	4.33	5.41
	Employment growth	2.50	2.91	1.03
China	Labor productivity growth	5.57	10.99	8.22
	Employment growth	1.20	0.65	0.36
South Africa	Labor productivity growth	–0.42	2.86	1.94
	Employment growth	1.98	1.38	0.35

NOTES: Table shows the mean for each period with all available information. World numbers correspond to the performance of the median country to measure the typical growth rates in the database.

SOURCES: Conference Board's Total Economy Database 2014 release; author's calculations.

Painful adjustments followed, and new business practices and technology were imported to replace the old ways of the centrally planned economy. In the 2000s, Russian labor productivity growth accelerated, primarily through the contribution of technological progress, with modest contributions from capital deepening. Brazil and South Africa experienced meager gains or even declines in labor productivity during the 1990s. They rebounded in the 2000s, primarily due to the contributions of capital deepening.

Economies that have more quickly improved their standards of living have tended to experience a contribution of technological change similar to that of the U.S. China attained strong efficiency gains and improved its standard of living by opening its economy and removing barriers that had prevented the reallocation of capital to more-productive activities. By comparison, Brazil was unable to achieve significant efficiency gains but partly offset this with investment.

## Interpreting the Numbers

The work of Nobel laureate Robert M. Solow and economist Trevor Swan suggests that the contribution of rising capital per worker should fade away over time due to diminishing returns on capital.<sup>4</sup> The contribution of capital deepening is expected to be more substantial in developing countries—economies with lower capital-per-worker ratios—as they catch up to the advanced countries’ standard of living.

Emerging economies with high employment growth rates—Brazil and South Africa, for example—tend to be poorer and grow their labor productivity more slowly. A greater proportion of their investment must be used to maintain a level of capital per worker (*capital widening*) before investment contributes to an actual increase. Differences in the contribution of capital deepening can also arise from low savings and low technological returns from innovation.<sup>5</sup>

## Investment Matters

Technological change may require new capital—expenditures for new hardware, communications devices and airplanes—to take advantage of the technology gains. Technological change may also occur

when a new technology produces more output with existing capital and workers—through new software, management methods and ways of organizing production. The information and communication revolution of the 1990s facilitated the latter form of technological change.

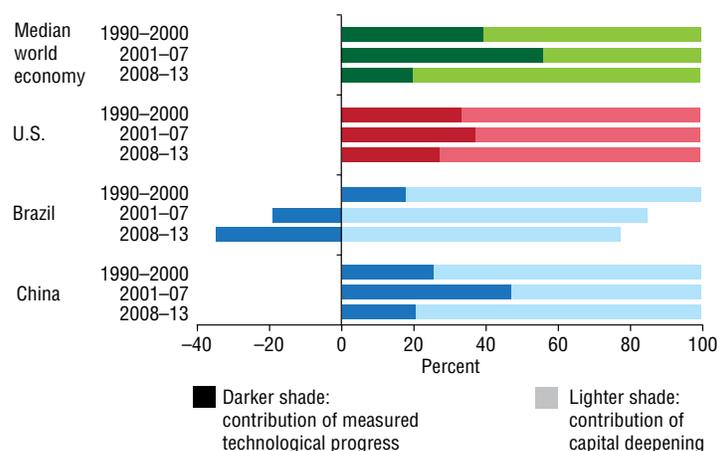
The data distinguish the contributions of capital deepening by sector. Sectors not directly connected with information technologies are nonresidential construction, transport equipment and machinery. Sectors that are directly

related include information technology hardware, telecommunication equipment and software.

Based on sector data, about 30 percent of capital deepening’s contribution for the median world economy has been related to information and communications technology during the past two decades (*Chart 2*). The shares are higher for advanced economies—ranging from 45 to 60 percent for the U.S.

Advanced economies were better prepared to capitalize on changes in

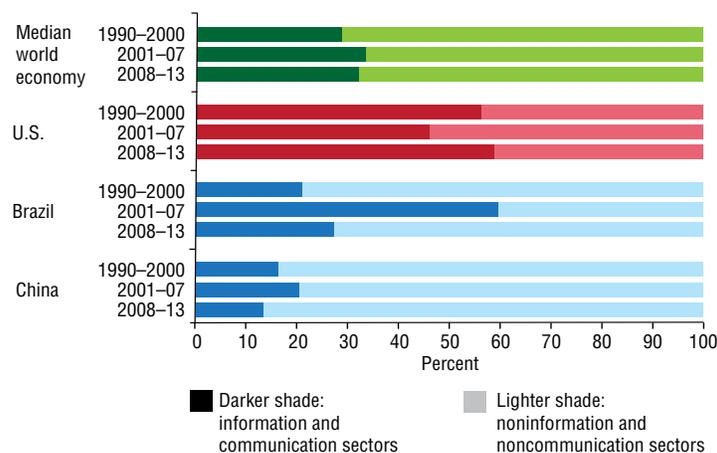
**Chart 1** Countries Differ in Contribution of Capital Deepening to Labor Productivity Growth



NOTES: Chart plots the shares of labor productivity growth accounted for by capital deepening and measured technological progress. The world numbers correspond to the median country, a measure of the typical contributions to labor productivity growth in the data.

SOURCES: Conference Board’s Total Economy Database 2014 release; author’s calculations.

**Chart 2** Capital Moves Into Information and Communication Technologies Sectors as Countries Become More Developed



NOTES: Chart depicts the share of capital deepening’s contribution to labor productivity growth accounted for by sectors both related and unrelated to information and communication technologies. The sector definitions follow the Conference Board’s Total Economy Database. The world numbers correspond to the median country to provide a measure of the typical fraction in the data.

SOURCES: Conference Board’s Total Economy Database 2014 release; author’s calculations.

production and increases in market competition and to reap the benefits of the new information and communication technologies. Capital deepening associated with the information and communication revolution may have contributed to some labor productivity growth among emerging economies during the 2000s, though the evidence is inconclusive.

Successful emerging economies such as China did not immediately leap toward the technological frontier. They exploited their comparative advantage in unskilled labor in the 1990s and expanded their output in less-capital-intensive, innovation-driven manufacturing activities such as textiles. In the 2000s, they moved to more capital-intensive activities in a process of rapid industrialization. This required further capital deepening to reap strong efficiency gains.

Countries with low investment per worker often pursued technological change differently, investing in new information and communication technologies. In Brazil, investment was tilted that way during the 2000s, prior to the global recession. Brazil demonstrates the limits of what can be accomplished—the country did not achieve strong efficiency gains and, accordingly, its standard-of-living advances lagged.

A shortage of suitably skilled workers slowed diffusion of the new information and communication technologies and limited their impact in emerging economies.<sup>6</sup> It also heightened disparities among emerging economies' abilities to improve standards of living.

## Some Lessons Learned

The global economy has experienced major shifts in the past two decades involving tax reform, exchange-rate pegs, currency unions and reductions in trade barriers. However, sustained increases in living standards over the long term have remained elusive. Capital deepening is no guarantee of improving material well-being unless it is accompanied by efficiency gains in production through technological advancement.

A surge in labor productivity in major emerging economies since the mid-1990s appears driven by a faster accumulation of capital per worker. Countries that were most successful at closing their standard-of-living gap with advanced economies were those that more effectively allocated their investments to reap the benefits of technological advancement and climb the technology ladder.

From the perspective of the U.S., the key to improving living standards is to continue expanding the technological frontier. This requires further investment in developing new technologies. Attaining the full benefits of technological progress requires innovation, promoting the exchange of ideas and technologies, and a skilled labor force.

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## Notes

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<sup>1</sup> See "Technological Progress is Key to Improving World Living Standards," by Enrique Martínez-García, Federal Reserve Bank of Dallas *Economic Letter*, vol. 8, no. 4, 2013.

<sup>2</sup> This growth decomposition is based on a model of how aggregate output is related to capital and labor and to the general efficiency with which they are used in production, according to "Technical Change and the Aggregate Production Function," by Robert M. Solow, *Review of Economics and Statistics*, vol. 39, no. 3, 1957, pp. 312–20.

<sup>3</sup> Capital deepening's contribution equals capital-per-worker growth times the share of capital in production.

<sup>4</sup> See "A Contribution to the Theory of Economic Growth," by Robert Solow, *Quarterly Journal of Economics*, vol. 70, no. 1, 1956, pp. 65–94; "Economic Growth and Capital Accumulation," by Trevor Swan, *Economic Record*, vol. 32, no. 2, 1956, pp. 334–61; and the technical appendix of Martínez-García (2013) (see note 1).

<sup>5</sup> A more-skilled labor force—"brains" and not just "brawn"—can have a similar impact, according to "A Contribution to the Empirics of Economic Growth," by N. Gregory Mankiw, David Romer and David Weil, *Quarterly Journal of Economics*, vol. 107, no. 2, 1992, pp. 407–37.

<sup>6</sup> Not all diffusion was slow. Cell phones have been widely adopted in many emerging economies where the penetration of landline phones was limited due to the high fixed cost of infrastructure.

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