



# ExecutiveAction Series

## How Much Does Your Company Really Invest in Innovation?

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While the revolution in technology has created opportunities for new products and markets it has also created new challenges, including relentless pressure for innovation. As a result companies must shift attention to another dimension of the innovation process—the importance of the efficient organization and management and other intangible sources of creativity. But do businesses really know how much they are investing in the intangibles that are so critical to innovation?

### Targeting Investments in Intangibles to Meet Priorities

In the not too distant past, discussions of innovation and economic growth focused primarily on high-technology industries. These were the industries that pioneered the new technologies of the information, communications, and genomics revolutions and major advances in other science-based areas such as materials and chemistry. While these high-tech firms only account for about 10 percent of U.S. non-farm business private employment, according to data from the U.S. Bureau of Labor Statistics, their impact on the growth of the economy has been vastly greater.

Today, almost all industries can be said to have a “high-tech” component. While such industries are not necessarily the ones that discover and develop new science, their use of technology puts them at the cutting edge of innovation. In the past, industries such as agriculture, retail trade, metal working, and trucking were hardly the poster children of advanced technology, but the advent of innovations like e-commerce, GPS, wifi, inventory and human resource management systems, robotics, and computerized production have changed that.

The revolution in technology has created great opportunities for new products and markets, but has also brought almost continuous pressure for innovation, thus underscoring the importance of efficient organization and management.

Note: This report is a redacted and extended version of the paper, “Stimulating Economic Growth through Knowledge-Based Investment,” *OECD Publishing*, OECD Science, Technology, and Industry Working Paper No. 2013/02 (<http://dx.doi.org/10.1787/5k46dbzqhj9v-en>). Thanks are due to the many people who read and commented on the OECD paper and helped with the preparation of this article, with special thanks to Carol Corrado, Janet Hao, Charles Mitchell, and Bart van Ark.



Business innovation is more than just good ideas, it is also about good organizations that are able to execute and translate these ideas into new products and processes and new markets. These abilities depend on management flexibility, creativity, and skilled execution—all of which are connected to the strengths of a company’s human capital, technology, brand recognition, reputation, and customer loyalty.

These are also the terms business leaders point to in recent editions of *The Conference Board CEO Challenge*<sup>®</sup> survey to describe the dynamics of the changing economic environment.<sup>1</sup> The CEO Challenge survey rates the most pressing challenges CEOs are currently facing and describes the strategies they use to address them. While the list of challenges is diverse and strategies vary by geography, in the past two years CEOs have identified concerns in the areas of human capital, operational excellence, innovation, regulation, customer relationships, and brand identity (see Table 1, page 3). But the very diversity of this list presents another problem: how can a company benchmark its success in meeting these challenges? Is there a reliable metric that can be used to score progress in a way that can, in principle, be compared with past results and those of competitors?

Alternatively called “intangible capital” and “knowledge-based capital,” knowledge capital expands the concept of innovation beyond R&D to include the full range of activities needed to implement or commercialize new ideas.

The top and bottom lines of a company’s performance are, obviously, important metrics of success but they are the collective result of many interacting factors and the effect of any one single innovation is hard to isolate. Performance indicators like customer attrition and retention and length of product development cycles can be valuable, but they are often hard to connect to the dollar metrics that matter and are hard to aggregate into a summary metric of broad concepts like innovation and organizational excellence. Moreover, they measure outcomes, not the scale of effort and commitment of resources involved in the innovation process. It is the latter that is under the control of the company as a decision variable.

These considerations suggest that a cost-based metric of innovation is a valuable supplement to information needed to address the challenges identified in recent CEO Challenge surveys. Some cost metrics are available for this purpose, such as expenditure on R&D, but recent developments in the study of macroeconomic growth suggest that R&D spending alone is not sufficient. This report suggests that a broader concept of innovation and organizational investment is needed to characterize the process of innovation. Alternatively called “intangible capital” and “knowledge-based capital” (KBC), knowledge capital expands the concept of innovation beyond R&D to include the full range of activities needed to implement or commercialize new ideas.<sup>2</sup> It recognizes, for example, that a new product may be technologically innovative but has no economic value unless people know about it and want to buy it.

Investment in knowledge capital, broadly conceived, has grown to the point that it now exceeds investment in tangible fixed capital among U.S. non-farm businesses (Table 1 and Chart 1 on page 3). This type of capital is an important source of economic growth in the United States and in many of the world’s advanced economies—much more so than R&D alone—and is positively correlated with real GDP per capita in a cross-section of these economies (see Chart 3, page 5). It is also an important determinant of a corporation’s market capitalization.

The growth and importance of knowledge capital in the business sector as a whole are equally its growth and importance in the average company in the sector. This invites a further question for CEOs participating in The Conference Board survey: Do you know how much your business is really investing in innovation? How much you are truly spending to meet the various challenges you identify as top priorities? How large a role does knowledge capital play in the evolution of your business?

## How Much Does U.S. Business as a Whole Invest in Innovation?

United States businesses invested more than \$1.3 trillion in 2012 in nonresidential structures and equipment, according to estimates by the U.S. Bureau of Economic Analysis. This fixed capital is essential for productive capacity in the business sector and is also an important source of their financial value. Plants and equipment are not, however, the only source of value. Financial capital matters as well as the value of the firm as an organization. The latter includes the value of the firm’s intellectual property, its brand equity and customer base, and its human capital and management systems.

Table 1

### Components of the U.S. intangible investment rate in the nonresidential business sector, 2010

Rates as percent of expanded sector output

Computerized information	1.73%
Innovative property	5.44
a) conventional R&D	2.49
b) other R&D	2.13
c) mineral exploration	0.83
Economic competencies	6.65
a) Brand equity	1.80
b) Firm-specific human capital	1.66
c) Organizational structure	3.18
<b>Total intangible investment</b>	<b>13.81%</b>
"Core" investment excluding software and design	11.20
<b>Tangible rate of investment</b>	<b>7.82%</b>

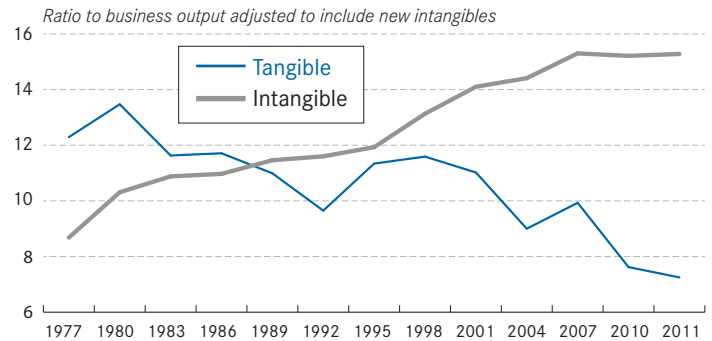
Sources: Carol Corrado and Charles Hulten, "How Do You Measure a Technological Revolution?" *American Economic Review*, May 2010, pp. 99-104; and Carol Corrado and Charles Hulten, "Innovation Accounting," Paper prepared for the NBER-CRIW Conference "Measuring Economic Progress and Economic Sustainability," in Cambridge, Massachusetts, August 6-8, 2012.

These sources of value are intangible but they are also an important component of a successful firm's stock market value, which explains why the market capitalization of successful corporations consistently exceeds the net worth of companies reported on their financial statements, even after the book value of assets is corrected for historical price accounting. In a study of the balance sheets of R&D-oriented S&P 500 corporations in 2006, the combined value of conventional balance sheet equity plus the cost-based value of these organizational intangibles accounts for 86 percent of the market capitalization of the firms, while conventional equity alone accounts for only 42 percent.<sup>3</sup>

American firms invest more heavily in innovation and organizational capability than in their plants and equipment. Estimates from the study presented in Chart 1 display the rate of intangible investment, expressed as a percent of GDP. The rate rose more or less steadily during the period 1977-2011, starting from just under 8 percent and reaching just under 14 percent by the end of the period, with a more rapid acceleration coming with the ITC investment boom of the early 1990s. The tangible investment rate, on the other hand, trended downward during this period and ended up at less than 8 percent of GDP. As the transition to a knowledge-based economy has unfolded, traditional investment has declined in relative importance.

Chart 1

### Trends in intangible and tangible investment in U.S. business capital formation, 1977-2011



Sources: Carol Corrado and Charles Hulten, "How Do You Measure a Technological Revolution?" *American Economic Review*, May 2010, pp. 99-104; and Carol Corrado and Charles Hulten, "Innovation Accounting," Paper prepared for the NBER-CRIW Conference "Measuring Economic Progress and Economic Sustainability," in Cambridge, Massachusetts, August 6-8, 2012.

Exactly what are these intangibles recorded in Chart 1? They are expenditures made within companies for the development of their capabilities and intellectual property. There are many dimensions to this internal development, and different metrics have been proposed. A macroeconomic classification system developed by researchers has been applied to a number of advanced economies and is the system that underlies Chart 1.<sup>4</sup> While it is essentially macroeconomic in conception, the list is similar to that in the IRS guide for reporting the value of financial assets following a corporate merger or acquisition, though one major difference is that it pertains mainly to own-account intangibles rather than to those appearing as a result of acquisitions.<sup>5</sup> The estimates shown in this chart are drawn from various macroeconomic sources and surveys.<sup>6</sup>

The main elements of the classification system are shown in Table 1. Intangible capital is divided into three general categories:

- 1 computerized information,
- 2 innovative property, and
- 3 economic competencies.

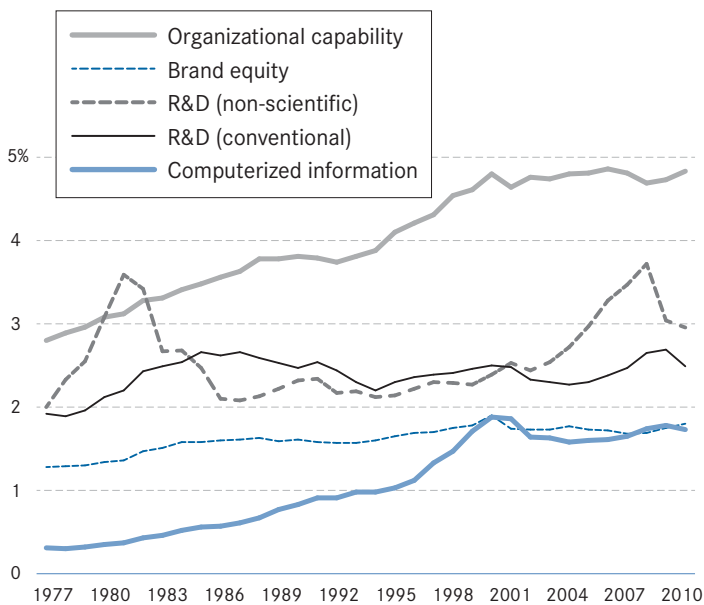
These categories span functions ranging from information management and product and process innovation to the enhancement of a firm's organizational capabilities. There is considerable diversity within the three categories: innovative property is more than the conventional National Science Foundation (NSF)-type of R&D, and includes artistic originals (e.g., books, movies, and music); development of new financial products; and architectural and engineering designs.

Economic competencies is divided into brand equity (i.e., advertising, marketing, customer support); firm-specific human capital (e.g., worker training); and organizational structure, a rather amorphous grouping that includes investments in management and human resource systems, strategic planning, and management consulting.

Table 1 shows rates of investment for each intangible category for the year 2010. Non-farm businesses in the United States as a whole invested an amount equal to 13.8 percent of GDP in 2010, a rate that was considerably more than the 7.8 percent they spent on tangible fixed assets. “Economic competencies” was the largest single category of intangibles, accounting for half of the investment total. On the other hand, conventional R&D contributed only a small fraction of the total, 2.1 percent. Indeed, it was not even as large as R&D spending for non-scientific purposes (note, in this regard, that innovative companies like Amazon, Nike, Wal-Mart, and J.P. Morgan-Chase do not report any R&D spending on their 2012 income statements). In fact, a look at Chart 2, which traces the evolution of components of the intangible investment rate over time, shows that this type of R&D has been relatively flat since the 1980s, and that almost all of the growth in the intangible investment rate seen in Chart 1 comes from other types of knowledge investment.

Chart 2

**Trends in the composition of knowledge-based capital investment in U.S. businesses, 1977-2010**



Source: Carol Corrado and Charles Hulten, “How Do You Measure a Technological Revolution?” *American Economic Review*, May 2010, pp. 99-104; and Carol Corrado and Charles Hulten, “Innovation Accounting.” Paper prepared for the NBER-CRIW Conference “Measuring Economic Progress and Economic Sustainability,” in Cambridge, Massachusetts, August 6-8, 2012.

This is significant because the rate of investment in formal R&D is a traditional metric of innovation, indeed one criterion used in defining “high technology.” The European Union has, for example, set a 3 percent goal for R&D investment in an effort to stimulate innovation and improve competitiveness. Whether setting targets for whole economies or individual companies, the results of Table 1 and Chart 1 suggest that R&D alone is insufficient for this purpose.

So are the knowledge investments outlined in Table 1 truly relevant to business? Evidence from the CEO Challenge surveys is rather instructive on this point. The Top 10 CEO challenges for the last four surveys are reported in Table 2, and it is evident that many of the items on this list can be linked to the investment categories of Table 1.

Table 2

**The Conference Board CEO Challenge Survey results, 2010-2013**

Finding reliable metrics to measure progress against the top challenges identified by CEOs is not easy.

Global rank	2013	2012	2011	2010
1	Human capital	Innovation	Business growth	Excellence in execution
2	Operational excellence	Human capital	Talent	Consistent execution of strategy
3	Innovation	Global political/economic risk	Cost optimization	Sustained and steady top-line growth
4	Customer relationships	Government regulation	Innovation	Customer loyalty/retention
5	Global political/economic risk	Global expansion	Government regulation	Speed, flexibility, adaptability to change
6	Government regulation	Cost optimization	Corporate brand and reputation	Corporate reputation for quality
7	Global expansion	Customer relationships	Customer relationships	Stimulating innovation/creativity
8	Corporate brand and reputation	Sustainability	Sustainability	Profit growth
9	Sustainability	Corporate brand and reputation	International expansion	Improving productivity
10	Trust in business	Investor relations	Investor relations	Government regulation

Source: The Conference Board

The challenges involving operational excellence and execution, and flexibility in adapting to change in Table 2 all relate to the “organizational structure” category of Table 1; while the human capital and talent challenges relate to the “firm-specific human capital” category. The customer relations and brand reputation challenges can be linked to the “brand equity” category and innovation to “innovative property.” Most of the other items in Table 2 involve general challenges to the sustainability and growth of revenues and profits. The exceptions are the macroeconomic challenges posed by global macroeconomic uncertainty and government regulation.

How new goods, techniques, and markets are developed is a complex process that involves a number of stages, ranging from the so-called “fuzzy front end” of innovation to the implementation or commercialization stage. Each stage requires its own commitment of resources, and again many are linked to the investment categories of Table 1. Judging from the priorities set forth by CEOs in the CEO Challenge surveys, businesses appear to be directing investment in the right directions that support their goals, at least for now.

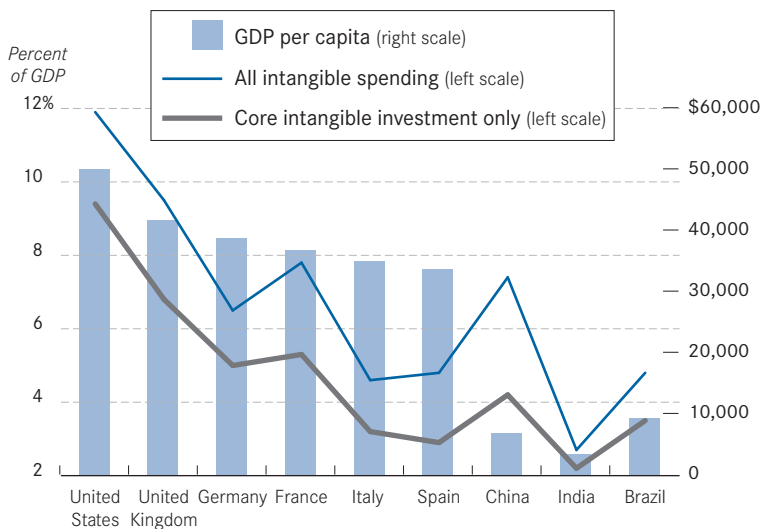
## How Important Is Intangible Capital as a Company-Level Innovation Metric?

Two pieces of macroeconomic evidence support a broader conception of innovation. First, the framework of Table 1 was applied to other countries to develop estimates of the rate of intangible investment that are consistent with those for the United States. Chart 3 shows there is a reasonable presumption that investment in intangible capital is a positive factor in promoting economic growth.<sup>7</sup>

A second piece of macroeconomic evidence from the United States comes from the “sources of growth” analysis used by the Bureau of Labor Statistics for their official multifactor productivity estimates. Chart 4 shows that the contribution of intangible capital was by far the largest systematic source of growth (R&D alone does not have much of a contribution), and it was exceeded only by multifactor productivity—the effectiveness with which a given amount of capital and labor are transformed into output.

Chart 3

### GDP per capita positively associated with core KBC investment

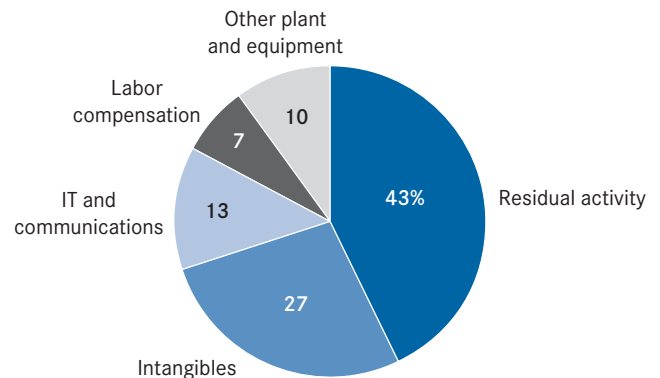


Note: All currency-based estimates for non-U.S. countries are in U.S. dollars, corrected for purchasing power parity (PPP). “Core” refers to intangible investment excluding software and design.

Source: Charles R. Hulten and Janet Hao, “The Role Of Intangible Capital in the Transformation and Growth of the Chinese Economy,” *National Bureau of Economic Research*, Working paper 18405, September 2012.

Chart 4

### Sources of the 2.76 percent growth in output per worker in the U.S. business sector, 1995–2007



Source: Carol Corrado and Charles Hulten, “How Do You Measure a Technological Revolution?” *American Economic Review*, May 2010, pp. 99-104.

What does the macro evidence mean for individual companies?

The Chart 4 breakdown of the factors behind the growth of the U.S. business sector as a whole applies equally to the representative firms in that sector. By implication, the very same intangible capital that is linked to the challenges perceived by CEOs is also responsible for more than a quarter of the growth in output per hour in the average company. This fact alone establishes the rate of intangible investment as a credible metric of growth and innovation.

The “average company,” however, is a theoretical construct and not a good guide to managing the challenges facing any one particular firm. Yet it is a framework whose insights suggest that managers should at least think about the role of internally developed knowledge capital in the context of their own company and look for ways to measure it. One step in this direction is to construct the equivalent of Table 1 specifically for the company. Unfortunately, this is easier said than done.

The difficulty is that this own-account intangible capital goes largely unmeasured in company financial statements because of conventional accounting practices. Data may exist in some form within the company, associated with specific projects or products, and may be used by managers in their decision processes. There may also be a large body of unorganized tacit knowledge within an organization, but either way the absence of such data from financial reports makes it hard for outsiders (and perhaps insiders as well) to understand the aggregate scope of investment in innovation and operational capabilities. However, if such data do exist in some form within the company, the evidence behind Table 1 suggests that it is well worth pulling them together into the general format of Table 1.

## Conclusion

Innovation and organizational excellence do not fall like “manna from heaven.” They are generally the result of decisions made within companies about their business model. Nor are they costless or effortless. The measurement of these costs presents many challenges, but it is the logical next step in addressing the problems identified in The Conference Board CEO Challenge surveys.

Accurate measurement is all the more difficult because much of the relevant knowledge capital is produced within the firm with no associated cash flows to use as a yardstick. Developing precise metrics is therefore difficult, particularly if innovation takes pace in “silos” within the company or in individual projects that are not connected across stages of innovation. The question “How much does my company invest in innovation?” can be answered, if only imprecisely, as a recent study of Microsoft’s intangible capital demonstrates.<sup>8</sup> Precision is usually preferable to impression, but not always: being imprecisely right is better than being precisely wrong, in this case by ignoring investment in intangible capital. Moreover, simply asking the question has a payoff in terms of its implicit invitation to take a holistic approach to innovation, the approach broadly suggested by the challenges identified in the CEO Challenge surveys.

## Endnotes

- 1 See for example Charles Mitchell, Rebecca L. Ray, and Bart van Ark, *The Conference Board CEO Challenge 2012: Risky Business: Focusing on Innovation and Talent in a Volatile World*, The Conference Board, Research Report 1491, March 2012.
- 2 “Intangible capital” is a familiar item of company balance sheets, arising from the attempt to allocate the difference between the acquisition cost and book value following mergers and acquisitions. In the context of this report, however, the term is used to refer to the organizational capital and intellectual property built up within the firm by own-account investment. Internally funded R&D is an example of the latter. This own-account intangible capital generally does not appear on a company’s balance sheets, although it might subsequently appear after a merger or acquisition.
- 3 Charles Hulten and Janet Hao, “What Is a Company Really Worth? Intangible Capital and the ‘Market to Book Value’ Puzzle,” *National Bureau of Economic Research*, NBER Working Paper 14548, December 2008.
- 4 Carol Corrado, Charles Hulten, and Daniel Sichel, “Measuring Capital and Technology: An Expanded Framework” (2005) in *Measuring Capital in the New Economy*, Carol Corrado, John Haltiwanger, and Daniel Sichel (eds.), *Studies in Income and Wealth* 65 (Chicago: The University of Chicago Press) 2008, pp. 11-41; and Carol Corrado, Charles Hulten, and Daniel Sichel, “Intangible Capital and Economic Growth,” *The Review of Income and Wealth* 55, no. 3 (2009), pp. 661-685.
- 5 As noted by Carol Corrado and Charles Hulten in “Innovation Accounting,” a paper prepared for the NBER-CRIW conference “Measuring Economic Progress and Economic Sustainability” that took place in Cambridge, Massachusetts from August 6-8, 2012: “The U.S. tax code specifies 12 intangible assets to be valued and listed as financial assets following a merger or acquisition, including the value of the business information base, the workforce in place, know-how (listed along with patents and designs), and customer and supplier bases. (See U.S. IRS Publication 535, *Business Expenses*, pp. 28-31).
- 6 Chart 1 has been updated using methods originally set out in Carol Corrado, Charles R. Hulten, and Daniel Sichel, “Measuring Capital and Technology: An Expanded Framework” (2005), in *Measuring Capital in the New Economy*, chapter in Carol Corrado, John Haltiwanger, and Daniel Sichel (eds.), *Studies in Income and Wealth* 65 (Chicago: The University of Chicago Press) 2008, pp. 11-41. Those methods were modified to include the U.S. Bureau of Economic Analysis estimates of performer R&D in Carol A. Robbins and Carol E. Moylan, “Research and Development Satellite Account Update: Estimates for 1959-2004 and New Estimates for Industry, Regional, and International Accounts,” *Survey of Current Business* 87, October 2007, pp. 49-92; Soloviechek’s estimates of entertainment and artistic originals in Rachel Soloveichik, “Artistic Originals as a Capital Asset,” *American Economic Review* 100, No. 5 (May 2010), pp. 110-114; and the new method for estimating investment in new financial products in Carol Corrado, Jonathan Haskel, Cecilia Jona-Lasinio, and Massimiliano Iommi, “Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results,” Working paper, June 2012, available at ([http://www.coinvest.org.uk/pub/IntanInvest/WebHome/Methods\\_and\\_Comparative\\_Data\\_-\\_June\\_2012-7.pdf](http://www.coinvest.org.uk/pub/IntanInvest/WebHome/Methods_and_Comparative_Data_-_June_2012-7.pdf)).
- 7 Chart 3 has evolved from earlier versions that have appeared in the following sources: Carol Corrado, Jonathan Haskel, Cecilia Jona-Lasinio, and Massimiliano Iommi, “Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results,” Working paper, June 2012, available at ([http://www.coinvest.org.uk/pub/IntanInvest/WebHome/Methods\\_and\\_Comparative\\_Data\\_-\\_June\\_2012-7.pdf](http://www.coinvest.org.uk/pub/IntanInvest/WebHome/Methods_and_Comparative_Data_-_June_2012-7.pdf)); Bart van Ark, Janet Hao, Carol Corrado, and Charles Hulten, “Measuring Intangible Capital and Its Contribution to Economic Growth in Europe,” *European Investment Bank*, EIB Papers 14, No. 1 (December 2009) pp. 62-93; China data from Charles R. Hulten and Janet Hao, “The Role Of Intangible Capital in the Transformation and Growth of the Chinese Economy,” *National Bureau of Economic Research*, Working paper 18405, September 2012; India estimate from Charles R. Hulten, Janet Hao, and Kirsten Jäger, “The Measurement of India’s Intangible Capital,” paper prepared for the World Input-Output Data project, *The Conference Board*, 2012; Brazil estimate from Mark Dutz, Sergio Kannebley Jr., Maira Scarpelli, and Siddharth Sharma, “Measuring Intangible Assets in an Emerging Market Economy: An Application to Brazil,” *Poverty Reduction and Economic Management Network, Economic Policy and Debt Department*, Policy Research Working Paper 6142, The World Bank, Washington, D.C.
- 8 Charles Hulten, “Decoding Microsoft: Intangible Capital as a Source of Company Growth,” *National Bureau of Economic Research*, NBER Working Paper 15799, March 2010.



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