Intangible Assets: Measuring and Enhancing Their Contribution to Corporate Value and Economic Growth: Summary of a Workshop

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Christopher Mackie, Rapporteur; National Research Council

INTANGIBLE ASSETS

Measuring and Enhancing Their Contribution to Corporate Value and Economic Growth

Board on Science, Technology, and Economic Policy
Policy and Global Affairs

Committee on National Statistics
Division of Behavioral and Social Sciences and Education

Christopher Mackie, *Rapporteur*

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Preface

In 2004, the U.S. Commerce Department's Bureau of Economic Analysis (BEA), the agency responsible for the National Income and Product Accounts (NIPAs), began an effort to convert the NIPA treatment of research and development (R&D) expenditures from an annual business expense to an investment. The latter allows future returns, which contribute substantially to economic growth, to be considered. The first step, supported by the National Science Foundation, was to develop a Research and Development Satellite Account that would, with further refinements, eventually be incorporated into the NIPAs. With the completion of the first R&D satellite account in 2006, the lead BEA economist on the project, Sumiye Okubo, approached the National Academies' Science, Technology, and Economic Policy (STEP) Board for assistance in organizing a workshop to evaluate the satellite account's progress, and the National Academies agreed.

At roughly the same time, an influential study by Federal Reserve Board staff economists Carol Corrado and Daniel Sichel and University of Maryland economist Charles Hulten (CSH)[1] estimated the nation's investment in all intangibles (not limited just to scientific R&D) to exceed total investment in tangible assets (plant and equipment) and to account for a large share of economic growth. The CSH analysis included other categories such as expenditures on software, brand identification, employee training, and "nonscientific" R&D. The study was later closely replicated by analysts studying Japan and the United Kingdom, with similar findings.

[1]Corrado, Hulten, and Sichel (2006a). Intangible Capital and Economic Growth. Working paper as part of the Finance and Economics Discussion Series, Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, Washington, DC, April.

Briefed on the CSH study, Senator Jeff Bingaman (D-NM), chairman of the Senate Energy Committee and a member of the Senate Finance Committee, encouraged BEA and STEP to broaden the meeting's agenda to address intangible investments beyond R&D. The STEP Board, in consultation with the National Academies' Committee on National Statistics (CNSTAT), readily agreed.

A steering committee was formed to plan the workshop, composed of Carol Corrado, now with the Conference Board; Martin Fleming, IBM; Kenan Jarboe, Athena Alliance; Richard Manning, Pfizer; F.M. (Mike) Scherer, Kennedy School of Government, Harvard University; Katherine Schipper, Fuqua School of Business, Duke University; and myself as chair. Stephen Merrill, STEP executive director, assumed the lead staff role, in consultation with Connie Citro, CNSTAT director.

In addition to adopting a broad conception of intangible investments, the steering committee and staff adjusted the scope of the meeting agenda to include topics beyond measurement and accounting issues, which would promote discussion in several other directions:

1. To compare the national studies of intangible assets to identify geographical differences in the composition and importance of intangible assets.
2. To probe corporate views of and practices with respect to intangibles, especially the development of human capital.
3. To examine and estimate the magnitude of the federal government's intangible investments and how they can be better exploited.
4. To draw on U.S. experience and multinational, national, regional initiatives elsewhere in the world to identify a range of public policy instruments that could promote private sector investment in, and better utilization of, intangible assets.

Once the workshop was scheduled, four of the steering committee members—Corrado, Flamm, Fleming, and Jarboe—assumed roles as speakers or moderators; three other members—Manning, Scherer, and Schipper—were unfortunately unable to attend. However, all were helpful in identifying participants, framing the questions, and attracting an international contingent of participants to the conference. We are grateful to them and to Stephen Merrill for assembling an outstanding program and an engaged audience. The cooperation of BEA staff and Jonathan Epstein of Senator Bingaman's staff was indispensable; and we are also indebted to Chris Mackie of the CNSTAT staff for preparing this summary of the proceedings.

This workshop summary was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Research Council (NRC). The purpose of this independent review is to provide candid and critical comments that assist the institution in making its report as sound as

possible, and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

The panel thanks the following individuals for their review of this report: Martin Fleming, Corporate Strategy, IBM Corporation; Bronwyn H. Hall, Department of Economics, University of California, Berkeley; and E.J. Reedy, Entrepreneurship Division, Ewing Marion Kauffman Foundation.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Mark B. Myers, Senior Vice President for Corporate Research and Technology, Xerox Corporation (retired). Appointed by the NRC, he was responsible for making certain that the independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of the report rests entirely with the author and the NRC.

Kenneth S. Flamm, *Chair*
Committee for a Conference on Intangible Investments

1

Overview

According to a 2006 Federal Reserve Board analysis, investment in intangible assets in the United States exceeds all investment in tangible property and, if properly accounted for, would raise measured productivity growth significantly (Corrado et al., 2006a, 2006b). These assets—which include computer software, research and development (R&D), intellectual property, workforce training, and spending to raise the efficiency and brand identification of firms—comprise a subset of services, which, in turn, accounts for three-quarters of all economic activity. Increasingly, intangibles are a principal driver of the competitiveness of U.S.-based firms, economic growth, and opportunities for U.S. workers. Some intangibles, like intellectual property, are being securitized, auctioned, and traded; not long ago, few would have contemplated the existence, let alone the proliferation, of "technology markets." Yet, despite these developments, many intangible assets are not reported by companies, and, in the national economic accounts, they are treated as expenses rather than investments. At the moment, there is also no coordinated national strategy for promoting intangible investments, apart perhaps from R&D.

Research on the role of R&D investments—specifically that supported by the Bureau of Economic Analysis (BEA) and the Division of Science Resources Statistics of the National Science Foundation (NSF)—indicates how important just this single type of intangible can be in terms of its impact on the nation's economy. Switching from the current measure of gross domestic product (GDP), which considers R&D as an intermediate expense (similar to salaries and material inputs), to one that reclassifies these expenditures as business investment (a category that includes such assets as buildings, structures, equipment with long-term service capacity, and tools) leads to an increase of 11 percent for 2002. If

correct, R&D investments have contributed more to growth in GDP than tangible capital investments over the past 50 years. And, according to the preliminary results, their relative contribution is on the rise: R&D accounted for 4.5 percent of growth in GDP between 1959 and 2002 and 6.7 percent for the period between 1995 and 2002 (Robbins and Moylan, 2007).

On June 23, 2008, the Board on Science, Technology, and Economic Policy, jointly with the Committee on National Statistics, held a workshop to examine measurement of intangibles and their role in the U.S. and global economies and to discuss a range of policy-relevant topics:

- What intangibles are and how they work.
- How intangible investments compare and contribute to growth in the United States and other countries.
- How intangibles are created and used by firms.
- The variety and scale of emerging markets in intangibles.
- What government statistical agencies are doing in the area.
- What the government's role should be in supporting markets and promoting investment in intangibles.

In the keynote address to the workshop,[1] Senator Jeff Bingaman (D-NM) presented his perspective on why policy makers and lawmakers should care about improving measurement of intangible asset investments and nurturing their development. Citing research by BEA and the Federal Reserve Board, he emphasized the point that R&D, and intangible assets more broadly, significantly affect worker productivity, GDP growth, and, in turn, the economic well-being of the nation's individuals and families. He challenged the workshop's participants to continue work to measure these economic factors as accurately as possible so that Congress and other leaders will be adequately informed to enact the right policy incentives—with regard to creating parity in tax incentives between tangible and intangible output and to appropriate funds for the right mix of basic and applied research—for today's knowledge-based economy. Accurate measurement of investment in intangible assets and implementation of policies to optimize their value, he observed, are great technical challenges, ones that are especially important as the nation works to remain globally competitive.

In the opening session, key terms were defined and their role in the modern economy identified. Irving Wladawsky-Berger (IBM and Massachusetts Institute of Technology) sketched out the salient factors in the U.S. economy's transition from an industrial to a knowledge economy. He described how the advent and proliferation of the Internet and other information technologies marked a key point in that transition. He argued that economic progress and growth now hinge on asset development that is intangible in nature. In particular, he focused on the

[1]Full text of the address is reproduced in Box 1-1.

leading role of talent and intellectual capital as the intangible assets most important to future economic development.

Charles Hulten (University of Maryland) outlined the difficult issues that need to be resolved in defining and measuring intangibles. His research, along with that of Carol Corrado and Dan Sichel, his colleagues at the Federal Reserve (referred to in this volume as CHS), has shown that investment in intangible assets is larger than fixed capital investment, and that its inclusion in micro and macro statistics is essential to the task of explaining corporate valuation, measures of economic growth, total factor productivity, and indeed GDP. He laid out viable methodologies for advancing these measurement objectives and reported results from this area of research.

1.1. MACROECONOMIC MEASUREMENT IMPLICATIONS

The second session of the day probed further into the macroeconomic implications of intangible assets. Carol Corrado (Conference Board and formerly the Federal Reserve), extending comments made by Hulten, discussed the CHS empirical results for the U.S. case. This research presents a clear and compelling case for treating tangible and intangible assets in a methodologically symmetric manner and for capitalizing the latter in the nation's economic accounts. In this way, the portrayal of business activity is brought up to date by recognizing the role of innovation in the dynamic nature of production and capital accumulation in the modern economy.

The workshop encompassed international perspectives as well. Jonathan Haskel (Queen Mary College, University of London) presented evidence about the role of intangible assets using the CHS methodology applied to the economy of the United Kingdom. In the process, he identified several questions of concern for policy makers, business executives, and academics in the United Kingdom. Like Corrado, he concluded that including intangibles as investments makes a significant difference in measured economic activity and growth, although the patterns of intangible investment and sources of productivity growth are somewhat different from those detected for the United States; in addition, he reported high levels of interest, in both the measurement and the policy communities, in constructing an innovation index for the United Kingdom.

Kyoji Fukao (Hitotsubashi University and Research Institute of Economy, Trade and Industry) provided estimates of intangible investments in Japan and of their contribution to economic growth. His team's research found the country's economic growth, from the mid-1990s on, to be characterized by slow growth in total factor productivity in sectors with intensive information and communication technology (ICT); ICT investment was also found to be relatively stagnant. Following the measurement approach of the CHS team (2005, 2006a, 2006b), Fukao showed that, in comparison to the United States, Japan invests somewhat less in intangible assets. The Japan case is also characterized by high levels of

BOX 1-1
Keynote Address: Importance of Intangible Investments to Congress

The workshop's keynote address was delivered by Senator Jeff Bingaman of New Mexico. Senator Bingaman, one of Congress's members with a longtime interest in innovation policy, was architect of the America Competes Act. He is chairman of the Senate Energy and Natural Resources Committee, placing him at the nexus of two of the most important elements of America's economic future, innovation and energy.

Let me thank Steve Landefeld of the Bureau of Economic Analysis and Steve Merrill of the National Academies for inviting me to give these remarks. This is an appropriate conference at a time when our nation is deeply concerned about its world economic standing.

In 1995, at the peak of the dot-com bubble, Alan Greenspan made the now famous quote that sums up the importance of investments in R&D that perhaps is the forebear to today's conference: "Had the innovations of recent decades, especially in information technologies, not come to fruition, productivity growth would have continued to languish at the rate of the preceding twenty years."

About 10 years later, the value of innovation to our economy was quantified by Carol Corrado, Dan Sichel, and Charles Hulten of the Federal Reserve by looking at the broader category of so-called intangible assets, which include research and development, intellectual property, information technologies, re-organization of companies and worker training. Though these intangibles cannot be physically seen or touched, they account for nearly 11 percent of our GDP, or roughly $3.1 trillion in 2003.

In 2007, the Bureau of Economic Analysis looked at a more narrow set of R&D data provided by the National Science Foundation and, instead of treating R&D as an expenditure, it is treated as an investment. The result is that the GDP would have been on average about 3 percent higher—that is a pretty big number. The BEA reported that, for my state, treating R&D as an investment would actually increase my state's average GDP by about 8 percent. That makes intuitive sense given the strong role that Los Alamos and Sandia National Laboratories have in science and technology.

So it is clear to me that R&D and perhaps a broader set of economic measures have an important effect on our economic well-being. The question for those of you assembled today is how we can accurately measure these economic factors so the Congress can be informed and enact the right incentives for today's knowledge-based economy. In the area of R&D, the BEA points out the strong linkage of R&D funding and GDP growth, but the question we ask is how much money should be appropriated and what is the right mix of basic and applied research?

The OECD annually reports R&D as a percentage of GDP. The United States is currently at 2.5 percent while Japan is 3.1 percent. Is there a strong correlation with GDP growth in these data? In terms of the federal funding of R&D, are there

strong correlations between basic and applied research funding and growth in GDP? Answering these funding questions is important to policy makers. So often we simply state we should double a certain agency's research budget, but in a constrained fiscal environment it will come at the expense of other programs, so it would be helpful to at least have some guideposts on what the proper levels of investment are by the federal government.

The work of Corrado and colleagues raises questions which I believe the Congress will have to eventually grapple with. For instance, it shows the importance of worker retraining and organizational re-engineering in a global economy. In our country, worker retraining is often is handled through the Trade Adjustment Act as an after-the-fact result of an industry closing down or re-engineering by shedding a business line. Would it make more sense to offer tax credits to industries to retrain and retain employees before they re-engineer and restructure for a global economy? Japan and Korea offer such tax credits.

In the Senate Finance Committee, on which I serve, "innovation" has long been a watchword, and we regularly consider and debate proposals to promote innovation through targeted tax incentives. But, too often, that word is construed only to look to R&D that produces tangible output. The production of intangible output is often not fully compensated—and carries significant positive externalities. This creates an especially compelling need to reconsider our R&D tax incentives, and to create parity in incentives for tangible and intangible output.

In the area of financial disclosure, would it make sense to require industries to account for and disclose intellectual property assets to give signals to markets and their investors? We in Congress are very concerned these days about the transparency of companies' balance sheets; is it time to look at intellectual property as part of their overall capitalization?

Finally let me note that we should not look at the concept of intangible assets from a perspective of companies shedding manufacturing jobs overseas and becoming totally service oriented. Simply stated, recognition of the role of intellectual property—whether it is patents, R&D, worker retraining or organization re-engineering—is essential in manufacturing (as well as other sectors) if U.S. companies are to stay competitive with other countries across the world. We should avoid the "either-or" perception that there is either a knowledge economy and no manufacturing or vice versa. Japan's Ministry of Economy, Trade and Industry or METI has programs to help their industries internalize the value of these assets so they realize their full value. It seems entirely reasonable to me that we should be doing the same through the Department of Commerce.

I encourage the Department of Commerce to continue these important efforts, especially with the Bureau of Economic Analysis. What may appear to many as an obscure area of economics is starting to be noticed by the Congress, and I believe will grow in importance.

Let me thank you all today for inviting me to offer my views. This particular area is one of great technical challenge but I believe important as we work to remain globally competitive.

investment in R&D; the contribution of intangible capital deepening to labor productivity growth is relatively large in manufacturing but small in the service sector. His presentation added evidence to the day's theme that proper accounting of intangible investment leads to a significant impact on measured economic performance and growth.

1.2. THE ROLE OF INTANGIBLES IN THE FIRM AND IN FINANCIAL MARKETS

During the afternoon session, presenters tackled questions that took on a more microeconomic perspective: How are intangibles created and used by firms? How do intangibles operate in financial markets? And what efforts are being made to capture intangibles in accounting and company valuation procedures? Baruch Lev (New York University) discussed the consequences and possible remedies to address the current deficiencies in information about spending and performance of intangible assets. He struck a theme repeated throughout the workshop: "What is not reported is not measured and is not managed." According to Lev, the key information that is needed at the firm level (as opposed to that needed for national accounting) is systematic measures of the factors that drive business—specifically structured input-output data on the performance of the major drivers of enterprise value, some of which are intangible assets. He suggested a collaborative effort undertaken by various government and business organizations to establish well-designed disclosure templates. Lev's view is that a reasonably high level of voluntary compliance could be achieved if usefully structured templates are available.

Comments by Laurie Bassi (McBassi & Company) emphasized a particular class of firms that markets seem to undervalue—those that invest heavily in human capital and skill development, specifically education and training. To begin correcting for this perceived undervaluation, she prescribed taking steps to account for these investments in company reporting requirements. This, she advised, would involve breaking out firm investments in human capital and reporting them separately, even if they are still accounted for as an expense. Such an approach alone would not be sufficient to correct for the undervaluation of intangibles in general, but it would be a useful first step.

Jim Malackowski (Ocean Tomo) spoke about intellectual property and capital assets, focusing on the emerging markets for patents. Assets related to proprietary innovation are, in some respects, the output of R&D spending and human capital development—the topics of previous presentations. He painted a picture of a future that will involve an active marketplace for an array of different kinds of intellectual property and innovations. Nir Kossovsky (Steel City Re) provided additional insights about intangible assets from a finance management perspective, specifically the intriguing notion of insuring the value of intangibles. He stated that policy goals should seek to advance the competitiveness of U.S. firms

by helping them create, manage, and protect intangible assets—particularly those that drive their ability to pursue ethical sourcing, environmental sustainability, quality, and integrity.

A major theme throughout the day was that concise, transparent, and understandable accounting standards are essential to the efficient functioning of the economy because optimal resource allocation decisions can be made only if accurate financial information is available. This premise underlies the mission of the Financial Accounting Standards Boards (FASB) to "establish and improve standards of financial accounting and reporting for the guidance and education of the public, including issuers, auditors, and users of financial information."

Ron Bossio (FASB) provided an overview and update of the organization's standards-development activities, especially as they relate to intangible assets. FASB's priorities include working toward international convergence with the International Accounting Standards Board (IASB), the completion of codification of the U.S. generally accepted accounting principles (GAAP), and ongoing research and support activities. He reported that a comprehensive project on improving accounting for intangible assets has been considered but is not currently a top priority for the organization; however, the board has been asked by its advisory council (and others) to develop a project on a disclosure framework, which could eventually generate more accurate aggregate numbers. This may be a way to achieve more transparency about firms' expenses and capitalized expenditures.

1.3. GOVERNMENT MEASUREMENT

A key purpose of the workshop was to sort through the priorities of the statistical agencies for collecting better data on private investments in intangibles, as well as the size and composition of public investments, and incorporating them into broader measures of economic performance. Steve Landefeld (BEA) described the role of BEA and its satellite work on measuring intangible assets. Brent Moulton (BEA) provided additional details on BEA's Research and Development Satellite Account. Currently, the top priority for BEA is to finish the work necessary to incorporate R&D satellite estimates in the national income and product accounts (NIPAs) and to treat investment in these assets in a way that is consistent with other business investment expenditures. BEA will also work incrementally to expand measures of intangibles and to produce a version of the satellite account that includes social science R&D, human capital, business models, and firm-specific R&D. Landefeld emphasized the importance of collaboration between businesses and national accountants. The goal, he said, must be to take advantage of coincidental interests, to rely on market data, to improve data accuracy and consistency, and to minimize respondent burden. Both government and businesses have interests in further development of consistent valuations of intangibles in order to promote a better understanding of firm and general economic growth.

John Jankowski (NSF) described NSF's R&D and related data collections, which feed into various measurement programs at the statistical agencies. His comments focused on current initiatives to redesign its industry and academic R&D surveys. BEA uses expenditure data from these annual surveys of government, academic, industry, and nonprofit entities to produce the satellite account (noted above), which supplements the traditional accounts to determine the impact of R&D spending on U.S. growth and productivity. This information has allowed BEA to more accurately account for the share of U.S. economic growth attributable to R&D (it estimated a 6.7 percent contribution for the period 1995 through 2002).

Cynthia Glassman (U.S. Department of Commerce) provided an overview of a major initiative—the Advisory Committee on Measuring Innovation in the 21st Century—set up to advise the secretary of commerce on new or improved metrics to advance understanding of how innovation occurs in different sectors of the economy, how it is diffused across the economy, and how it impacts economic growth and productivity. Three sets of recommendations emerged from this committee's work, directed toward steps that can be taken by government, the private sector, and researchers.[2]

1.4. GOVERNMENT POLICY

A final session addressed the role of governments, beyond improved measurement, in facilitating or encouraging the development and use of intangible assets. Presenters asked: What should the government do to encourage company creation of intangibles? What should be the government's role in creating or supporting more robust markets in intangibles? And what are other governments doing in these respects?

Ahmed Bounfour (Paris-Sud University) discussed the role of intangibles and intellectual capital at the community level from the European perspective. He raised the issue of how communities are affected by transformations in economic systems, such as those brought on by the increase in networking and outsourcing. From his perspective, there is a close link between the dynamic changes occurring in the knowledge economy and the way people live and the way communities function. He provided insights into questions about what motivates people to invest in the intellectual capital of a community, city, or nation, and about what makes communities different from companies. He described fascinating cases of communities or nations creating value from public-sector assets, including intangibles, such as the French government's branding and licensing of the Louvre Museum.

[2]The full text of the committee's recommendations can be found at http://www.innovationmetrics.gov/.

Douglas Lippoldt (Organisation for Economic Co-operation and Development, OECD), discussed the roll of intangibles in European economies and explained why the OECD is pursuing work in this area. Among the reasons is the growing recognition that intellectual assets are central to value creation, growth, and competitiveness of a modern economy. Also, as noted by nearly all the workshop presenters, he emphasized that continued shortfalls in measurement and understanding of these processes ultimately hamper decision making at many levels. He concluded by outlining OECD's interests in exploring the relationship between intellectual assets and innovation.

The importance of corporate reporting was stressed throughout the workshop. Following a common theme of the day, Lippoldt stated that the OECD would pursue government policies to promote identification and dissemination of best practices in voluntary reporting. His hope in voluntary measures rests on the idea that disclosure can enable investors to better assess future earnings and risks, improve transparency in financial markets, and foster the possibility of allocating resources efficiently. On the business operations side, openness in the management of assets and accountability can potentially reduce the cost of capital. Lev and others called for the development of templates and the generation of peer pressure to promote their use.

Kenan Jarboe (Athena Alliance) offered policy prescriptions, in the U.S. context, for reversing the fact that, right now, intangibles are largely invisible. In order to improve measurement and, in turn, management of these assets, he offered policy recommendations to (1) encourage understanding of intangibles—such as to create a safe harbor in financial statements for reporting of intangible assets; (2) to encourage financial investment intangibles—for example, by creating a central national registry of intellectual property security interests; and (3) to foster the use of intangibles—using such policies as a permanent knowledge tax credit to increase investments in intangibles.

2

Intangible Assets in a Knowledge Economy

In introducing the first session, which was charged with defining the role of intangible assets in the economy, workshop chair Kenneth Flamm (University of Texas, Austin) identified the questions he hoped would be answered: What are intangibles? What distinguishes tangibles and intangibles? How should these business inputs be defined and measured? And how do these vary across industries and firms? For example, is a dollar of investment on advertising and brand equity by Pepsodent the same as a dollar spent on advertising and brand equity by Intel? Is a dollar of research and development (R&D) spent on innovation at McDonald's the same as a dollar of R&D at Microsoft? These are difficult questions, but presenters throughout the session enlightened aspects of each.

2.1. TRANSITION FROM THE INDUSTRIAL TO THE KNOWLEDGE ECONOMY

Irving Wladawsky-Berger began with a description of the recent evolution in the economic landscape brought about by the digital technology revolution. The distinguishing feature of this revolution, he noted, is the ever-increasing speed and ever-decreasing cost of computer components. If steam power was the driver of the industrial revolution, there is very little question that information technologies are driving the evolution of the knowledge economy.

Wladawsky-Berger pointed to the advent and proliferation of the Internet as a key point in the transition from the industrial to the knowledge economy. Before the Internet, technology change mainly referred to components, such as microprocessors, and the products that were built with them, like computers. That has begun to change drastically in the past 10-15 years; as a result of

advances related to the Internet, technology is being applied in many different areas. Wladawsky-Berger predicts that, in the knowledge economy, the bulk of the innovation will increasingly be "up the stack," occurring in applications, services, business practices, and the workings of society generally, as opposed to the hardware, goods-producing side of the economy. The technology and product innovations are now "market-facing" systems that are complicated and have to be designed and managed in a way that reflects the essential differences between machines and products, on one hand, and people and services, on the other. Technology is being applied to help people performing services do them better, which involves complicated emergent applications and systems, rather than well-behaved deterministic machines that do what people tell them to do. Part of this transition involves a world in which, increasingly, much that is needed to make progress is intangible in nature.

Wladawsky-Berger posed the question, "How can we structure a conversation about something as cosmic as the industrial and the knowledge economies and the transition between them?" He proceeded to examine how the knowledge economy differs from the industrial economy on the basis of three concepts that were at the heart of 18th century economist Adam Smith's writings.

Division of Labor

Adam Smith observed that, when markets are big enough to warrant worrying about efficiencies and productivity, then companies and people can achieve greater productivity through specialization (instead of doing the same custom jobs, as was the practice in agriculture). This involves breaking down a problem into its components, which is all about specializing and improving processes.

The consequences of division of labor are fairly obvious when examining a big industrial project, such as designing and building a new airplane. But how does division of labor apply to the knowledge economy? *Does* it apply to the knowledge economy and to more intangible types of activities? The answer, according to Wladawsky-Berger, is that, more and more, people are able to apply technology, engineering disciplines, information analyses, and collaborative capabilities to the design, management, and operations of a business—and this is evident in sectors from banking to health care. In fact, he pointed out, in a lot of cases in which things are not working well—such as the health care system—it is because these things have not been done to the extent that is needed.

The same principles of division of labor, specialization of processes, technology, and automation collaboration are still critical elements of economic efficiency, but now they must be applied to very complex systems. Wladawsky-Berger described how IBM has started a major drive toward services sciences, management, and engineering, which examines this question of how to apply technology up the stack to improve production processes of services. In the case of IBM, services account for about 55 percent of revenues and, in the case of

the U.S. economy, about 75 percent of gross domestic product (GDP). Without improvements in productivity and quality that have already occurred in manufacturing, a company like IBM would have difficulty earning profits and a nation like the United States would have trouble raising its standard of living. Indeed, development of intangible assets and innovation generally facilitates division of labor between big and small companies and across borders in the global economy.

The Invisible Hand

Wladawsky-Berger turned next to a second Adam Smith principle—the notion of the invisible hand—wherein each participant in the economy must be concerned only about how to do his or her job well and earn money, and need not explicitly be concerned about the general economic interests of society. By working in one's own self-interest, chances are that society will benefit. How, asked Wladawsky-Berger, does the concept of the invisible hand translate into the world today? Does it apply in the same way to the globally integrated enterprises and industries that characterize today's economy, as it did to the baker or the factory owner in Smith's day? He argued that, if ever there was a need to rely on the invisible hand to help guide economic processes, it is in these times of incredibly complex systems that people are increasingly building and living with. He added that, with the world changing at an increasing rate, events that businesses encounter that used to occur with very low probabilities in a kinder, gentler world have begun to happen with more frequency and with more cataclysmic effects.

Of course, things can be done to help better manage the emerging, increasingly unpredictable, and complex world (one need only look at the current financial crisis). Technology and innovation at all levels once again offer the greatest hope for solutions, and, by Wladawsky-Berger's reckoning, businesses and markets need to do a far better job using information-based decision support, information-based management, predictive analysis, and predictive simulations to harness this promise. Work is ongoing to do just that, but these are the early stages of an extremely complicated knowledge economy, so there is still a long way to go.

Moral Sentiment

The third principle discussed by Wladawsky-Berger—one that perhaps is less known about Adam Smith, as it derives from his *Theory of Moral Sentiments* (not *The Wealth of Nations*)—is the idea that human beings have an innate sense of sympathy for other human beings. This trait helps bind the community together and is what puts a break on people's worst impulses. While the invisible hand says, "go do whatever you need to," moral sentiment counterbalances with, "but if you go too far, the community will ostracize you and, by the way, they may decide not to do business with you."

Along with the first two Smith concepts, how does moral sentiment apply in a global world? It is easier to see how moral sentiment was influential during the 17th century, when people dealt with each other face to face on a village or neighborhood scale, and even later at the town or city levels. But people on Wall Street managing mortgages can act in a "semi-psychotic" way with no sympathy whatsoever because they are detached from the people they are dealing with. They can sell products that they know are poor and make a lot of money, while not facing the kinds of brakes created by having to look somebody in the eye. So the question is, how does a system scale up sympathy—Adam Smith's moral sentiment?

Wladawsky-Berger then noted that some of the most exciting Internet-based activities going on today involve transforming the Internet into a far more social network and collaborative platform to bring people together from around the world and let them work with each other. Beyond the social networks is the work being done in open-source communities with Linux and other such areas. These developments depend and are motivated by the concept that sympathy can be scaled. It has to be managed carefully to deal with members of the community who may not care, but the concepts do scale, and there are things being done to make it happen on some level.

Talent-Based Intangible Assets

Wladawsky-Berger closed by reiterating that, while information technology plays a critical role in the transition from the industrial to the knowledge economy, it should be viewed only as an enabler for innovation in business society and people's personal lives. Some incredible things can be done to better leverage technology on these fronts, and they all involve talent. And if talent capital is the intangible asset that is most important in a knowledge economy, it must have a value in which one can invest and monetize. Wladawsky-Berger added that it is critical that these problems be framed properly, because the battle for talent is going to be the most important one in the economic world.

During open discussion, one participant noted that the potential to learn to improve performance, often thought of as something innate, is also important. Given this, the question was asked "Isn't the key characteristic the learning itself and the content of knowledge?" For example, R&D extends from basic physics to designing the door handles on an electric car. The R&D category is an accounting convention, but the content is hugely heterogeneous. And one can expand on that for other kinds of knowledge. Wladawsky-Berger responded that "talent" was not the only attribute contributing to capture this knowledge effect. For example, what appears to be most important to his IBM clients is to help them build global enterprises and cope with the changing market and improve their ability to design processes; to become more efficient and robust; to gather information, analyze it and take action on it; and to use social networks and collaborative mechanisms

to help their employees work more effectively with each other and with the outside. A whole set of things exist that are critical to leadership in the knowledge economy. He noted that the key ingredient that cuts across all of them (aside from technology) is the need for talented people. Cutting-edge companies rely on employees who are very well educated. It is conceivable that 20 years worth of talent from current and earlier periods will have been embodied in the right tools, the right software. Of course, this is already happening today, and the talent—that is, the people creating these things—is the most important input. A major way to monetize the value of these human capital components is to translate it into products and tools and the like.

According to one participant, "competence" is another way to characterize the essential intangible asset described in the presentation. Wladawsky-Berger responded that competence is part of the story, but that great collaborative leaders are not just born. A superior manager or organizational leader—a financial person concerned about the impact of his or her decisions on the world—may require the right personality, but many of the skills can be taught. One hopes, he added, that academia contributes to this learning process.

2.2. DEFINING INTANGIBLES FOR MEASUREMENT PURPOSES

The measurement of intangible assets as productive inputs involves developing an operational framework that embeds a number of complex methodological issues. Charles Hulten explained that, for macroeconomic analysis, the structural shift that has occurred in business and in the world economy presents a real challenge, in part because most conceptual thinking on growth theory and accounting has heretofore applied to an environment in which the production of goods was the critical process to understand. However, in a world in which fewer and fewer physical goods are being made, at least in this country, it is essential to understand what modern companies really do. Hulten cited Apple Computer, Inc., as an example of corporate success attributable to acumen in design, technical innovation, and marketing—aspects of a business that embody significant integration of intangible assets. The challenge ahead is to try to encapsulate this shift in the nature of production in a set of measures, as well as to develop a parallel theory that sheds light on the structure of the modern economy.

Traditional Views of Intangibles

There has been no lack of interest in the topic of intangibles over time, although the primary focus has often been limited to R&D. This area of research can be traced back to scholars in the 1960s, such as Zvi Griliches, and, in some respects (as discussed by Wladawsky-Berger), as far back as Adam Smith. Beyond R&D, intangibles involve marketing, worker training, and the entire set of coinvestments and surrounding processes of which R&D is only a part. Much

of the literature that exists has taken a part-by-part perspective in studying these components. Hulten stated that one of the challenges is to find a way to integrate these various parts. In order to progress in this direction, better approaches to taxonomy and classification are needed.

According to Hulten, in the view of traditional accounting and of formal economic growth theory, much of what is now discussed in terms of intangibles was not considered investment in a company's future. Marketing, innovation, and so forth were basically seen as current expenses. These kinds of inputs were treated in a similar manner to any type of material that was used up and that did not generate lasting effects.

The key point is that there was no output associated with the production of these intangibles. Thus, for example, when Apple busily prepared for its future by inventing the iPod and doing all the things necessary to make it a successful innovation, none of that counted toward (GDP) investment by the firm. As discussed below, the Bureau of Economic Analysis (BEA) is now moving to correct this by capitalizing R&D. Hulten pointed out that some intangibles do appear in part in firm accounts as a residual between the market value of the company and the reported book value.

Alternative Methods

Hulten presented some of the findings that have emerged from his research and that of his colleagues. Corrado, Hulten, and Sichel (2005, hereafter CHS) looked at the relationship between what firms report in terms of their capital base—the equity base—and the book value over time. It is a backward-looking metric of what firms invested and what the market says they are worth. The wedge between the two, the market-to-book gap, is a measure of something that has not been explained. It could be the volatility and irrationality of the markets, but, Hulten posited, the gap is probably a little too big to chalk up to that. Beginning with changes in financial accounting standards that took place in 2001, companies have been asked, when they acquire another company, to fill in as much of that gap as possible with specific line items. And, according to Hulten, this has not been an easy task. He spoke with one executive who had complained how difficult this is.

Part of the difficulty has to do with the lack of conventions in reporting and classification systems. Hulten discussed how classification systems could be modernized to make it possible to move from a more traditional view that ignores own-firm-produced intangibles toward one that accounts for them more explicitly. One alternative for structuring the taxonomy, outlined in Lev (2001), distinguishes three classes of intangibles by their structural characteristics: (1) innovation-related intangibles, such as research, products, and so forth; (2) human resources, such as developing and retaining talent; and (3) pure organizational intangibles, such as management schemes and capacities, use of information technology, and business models in general.

This ambitious taxonomy involves broader coverage than anything that could be implemented in a short period of time. Hulten also pointed out that intangibles that actually appear in a firm's annual report might involve blends of these conceptual categories. These, he said, are ingredients of the dish, not the dish itself. He then suggested that one way to think about what the dish might look like is to examine the functional characteristics by valuing the output of the tangibles. One prominent strand of research in the late 1990s used the stock market value of companies as a starting point. Hall (e.g., 2001) wrote several papers on this but rejected some of the ideas after the stock market crash following the dot-com bust.[1]

Another way of proceeding would be to model the classification structure along the lines recommended by the Financial Accounting Standards Board (FASB) for companies acquiring intangibles; this involves forecasting the income streams associated with various identifiable intangibles, such as copyrights, customer lists, and so forth. *Business Week* is doing something similar in its study on the valuation of brands (Kiley, 2007). The study estimates that the top 100 companies account for about $1 trillion in brand equity, about two-thirds of which is in U.S. companies. Hulten also noted the securitization option. Various organizations, such as Ocean Tomo, discussed later in this report, are attempting to create markets for identifiable intangible assets. This is an interesting and perhaps promising method that could be applied to certain types of intangibles, but perhaps not for all categories.

The final method presented by Hulten on how to proceed involves valuing intangibles according to their input cost. As he noted, this is largely what is done now on the tangible capital side. When a building or automobile is acquired, the value of that investment is recorded according to how much is paid in the transaction; there is no underlying assumption that it must be worth at least that much to the company. This same thinking could apply to intangibles as well and is the insight that led the CHS team in this research direction; Leonard Nakamura (e.g., Nakamura, 2008) has also done work in this area, as have researchers at BEA and the United Nations System of National Accounts. As a first cut at the problem, this is probably the way to go; later, other information may be used as a correlate to enrich the analysis. The problem, as Hulten put it, is one of trying to put a reasonable set of principles around a broad set of intangible asset types. He and his colleagues are encouraged by the results produced from treating intangibles analogously with tangible capital—that is, as resources that could be used in the production of current or future consumption and hence conceptually satisfy the definition of investment.

[1]McGrattan and Prescott (2000) also featured prominently in this literature. Microeconomic work on the stock market value of firms and their R&D by Griliches (e.g., 1981), Hall (2000), and others is also highly relevant to the issues raised.

Unique Measurement Difficulties for Intangible Assets

Significant conceptual differences between tangible and intangible assets exist that have measurement implications, not the least of which is the potentially very long gestation lags—up to 14 years, for example, for a pharmaceutical patent life. Another is that intangibles, like R&D, are not continuous inputs to production. If Apple doubles its R&D budget, it will not necessarily double its production of iPods. This involves a different concept of the transformation of inputs into outputs that deviates from a conventional production function; it is a more general transformation process in which these intangibles are not fixed costs, but continuous inputs in other dimensions.

Also, with tangible assets, one can observe on a plant floor or in a parking lot the various machines and figure out what vintage models they are and depreciate accordingly. One can inspect what has survived from the past. Intangibles, in contrast, are generally produced within the company, but there is no market transaction. This presents a measurement complication and may be the principal reason that accountants have been reluctant to try to capitalize them; there is too much latitude for discretion and all that it implies. But it also leaves the statistician and the growth accountant with the difficult task of trying to figure out what these assets are really worth.

An example of the difficulty of establishing a link between intangible asset value and age is illustrated in an article by Jonathan Rauch (*Atlantic Monthly*, July/August 2008) describing the Chevrolet Volt electric car program. According to the article, the enabling idea for the research came from a program that had been discarded because the electric charge for the car was inadequate to allow it to drive very far. General Motors had the idea to use the gasoline engine to recharge the battery—an old idea, but one that would not be seen "in the plant." It would have been difficult to observe this input.

Another important measurement difficulty discussed by Hulten concerns the strong nonrival characteristics often present in knowledge capital—patents are an exception. When intangibles are discussed as something symmetric with tangible investment, one is dealing only with the commercialized part of the investment, because a process of diffusion ultimately takes place for any major set of ideas that develops. Knowledge diffuses to other companies, to other industries, and to other countries, either directly copied or through spillovers; at this point, it benefits society, not as an investment, but as an idea that penetrates the business culture and is reflected in increased productivity and lower costs. Thus, a disconnect exists between the private return to intangibles and their general social value (their public return). Hulten suggested that the broader impact is more relevant from the point of view of public policy, and the private return is most relevant for establishing dollar metrics.

CHS Methodology and Results

Hulten summarized some of the conclusions of the CHS research to implement an input-based model, acknowledging along the way the limitations and question marks associated with the approach. In that research, the authors looked at software and innovative property, which amounts to a broader definition of intangibles than scientific R&D only. In constructing a list of items to be accounted for, he acknowledged an element of arbitrariness in drawing the boundary. For example, they included only about 40 percent of advertising and had to make assumptions about other categories as well. Hulten suspects that, if anything, the research underestimated the size of more categories than it overestimated. For example, CHS include only advertising and not marketing, which tends to be a much broader expenditure. At IBM, the advertising budget is only one-sixth of marketing; this is probably roughly true of the pharmaceutical industry as well.

Although sensitivity analysis has been left for the next generation of research on the topic, CHS were able to show that including intangibles makes a measurement difference. Hulten noted that scientific R&D (along the lines defined by the National Science Foundation, NSF, for its survey) is not particularly significant—and to think that R&D equals intangibles would be a mistake. By their estimates, in 2003, R&D accounted for just under $200 billion of the over $1 trillion spent on intangibles, which is greater than for business–fixed investment. The spending levels are also higher than they are for many of the inputs looked at as indicators of innovation activity—such as computer investment, software investment, and conventional R&D. So these, in and of themselves, do not provide a full picture of what is happening with business processes.

The CHS analysis also provides some evidence on the extent to which measured GDP gets a boost from including investment in intangibles. Hulten again emphasized the idea that research on the topic is needed not only to measure inputs into production more accurately, as an enabler of making things, but also to pick up the augmentation on GDP itself. These intangible resources are being used to build the future just as tangible assets are. It follow that they should be counted as GDP—and, in fact, such an approach makes a large difference in final estimates.

CHS estimated that the stock of intangibles amounted to about $3.6 trillion in 2003. Again, because of relatively high rates of depreciation assumed in the paper (compared with similar work in the literature), Hulten suggests that this may be an underestimate of their actual levels. The depreciation issue is an important question, though, and one that BEA is already working hard on.

Independent of the depreciation issue, ignoring intangibles leads to more than a level error in statistics. It is not that measured GDP will be wrong by 10 percent now and 8 points in the past. Business intangibles are growing as a fraction of business output. There are also huge private expenditures—on education, for example—that are another large source of investment for the economy. In this realm alone, the growing presence of these factors changes the dynamic path that researchers are analyzing.

Hulten then returned to the book-to-market-value gap issue. Taking the strategy developed in CHS and using Compustat data, he estimated the value of intangibles at cost. He analyzed individual companies at the level of their income statements and balance sheets to ask the question, "How much of the gap could we explain?" The answer turned out to be "a lot" for a sample of research-active firms. Although the picture is incomplete—it is hard to derive from Compustat data what other firms would look like, because so many data points are missing—the bottom line is that much of the gap can be filled. One can go from explaining one-quarter to one-third of the gap under the pure-equity view of the world (the prevailing view in accounting) to 80 or 90 percent. The conclusion that is warranted from the research is that good progress can be made to understand much of corporate valuation by including intangibles. Investors and corporate managers ought to be interested in this information as well, or some more accurate version of it, and it might be something that they themselves could be encouraged to produce.

Pointing toward the next presentations on the program, Hulten reiterated that intangibles are important for measuring total factor productivity. CHS showed this, and there is evidence dating back to the literature of the 1960s and even before, but it has a defeatist tone along the lines of "Yes, this stuff should be in there, but what can you do?" Investment in intangibles, however, is something that both researchers *and* policy makers should attend to, since it determines a lot of what transpires in the economy and, in particular, it shifts our sense of what drives growth. There is, Hulten concluded, lots of work ahead in order to develop a more complete understanding of both the private and social returns from intangible investment.

During open discussion, Flamm pointed out that advertising and brand equity expose the empirical difficulties of trying to measure intangibles. For example, when Macy's runs an ad in the newspaper, a part of the function of that ad is building the Macy's brand image, but the firm is also communicating information about prices or product characteristics, which has a very transitory value and which clearly is not a capital investment in any sense. In this case, there is a combination of investment in an intangible and a current expenditure in producing sales. He wondered how these components might be disentangled and whether the method for doing so would be the same for retail stores as for computer manufacturers or for advertising in some other industry.

This is where a lot of conceptual spadework needs to be done, Hulten responded. The default assumption seems to have been, at least in many areas, that advertising was primarily transitory. In areas where there is a lot of technical innovation, that may be a mistake, according to Hulten. Wladawsky-Berger added the point that maybe Macy's advertising in *The New York Times* and its sponsorship of the Fourth of July fireworks and the Thanksgiving parade could be reasonably separated, as those things are quite distinct; and maybe that is at the root of short-term versus brand-building activities and actions.

Hulten noted that a lot of new pharmaceutical drugs emerge as a result of intensive R&D over a long period of time by small biotech companies. However, in the later phases of the development, these companies tend to want to partner with a larger pharmaceutical firm, in part, to help with the approval process by the Food and Drug Administration and also to use the marketing muscle and sales expertise of these companies. Typically, when drugs become successful, they do not suddenly jump to a huge market share. Their success is more often the result of serious effort, and so these calculations get factored in at an earlier stage in the innovation. He cautioned against the too-easy assumption that all such expenditures should be considered transitory.

During open discussion, Senator Bingaman was asked his view about the pace and the outlook for improved financial accounting in terms of disclosure and transparency, given that it is from the business sector that the statistical agencies would ultimately look to for source data. He responded that the likelihood of any action depends on whether a strong justification can be produced for requiring changes in accounting in the area of intangibles. If, he said, there is a real purpose served by it, then support can be generated for making those kinds of changes. To the extent that it is solely an academic inquiry that does not have clear policy implications, either for the company or for investors or for public policy issues, then it is more difficult.

Another participant asked whether the senator, as a member of the finance committee, could assess the outlook for the creation of tax incentives for intangibles. He noted that various members of Congress had been dealing with the R&D tax credit for a long time, but that no one could seem to make progress on an investment or knowledge tax credit for worker training, although the idea has been around for at least a decade and a half. He was also asked whether there was any hope of making some of these things, like the R&D tax credit, permanent.

Bingaman replied that the only way to make the R&D tax credit permanent would be as part of a larger reform effort. Whether the new administration will ever have this as a top priority was unknown at the time of the workshop. He added that there is a tendency to think that it will happen, but the reality is that the current deficit situation is such that the nation has to find a way to generate more revenue; rather than just raising taxes, politicians typically like to do that as part of a tax reform package. He expressed the view that the chances of a substantial tax reform might be reasonably good in the next Congress, and maybe some of these things could be done as part of that.

He noted that the reason many tax credits are temporary in the first place is because of the Budget Act of 1974, which, by putting limits on the size of the deficit that can be run each year, causes Congress to pass short-term tax extensions instead of making them permanent. The Joint Tax Committee takes the position that the effect on cost projections of making them permanent is substantial, and no one wants to have to factor that in. The president does not want to factor it into the budget he sends to Congress, and Congress does not want to factor it into the budget it passes.

3

Macroeconomic Implications of Intangible Assets

How do intangibles contribute to gross domestic product (GDP) and productivity in the United States? How does this contribution compare with other industrialized countries in the global economy when efforts have been made to estimate it? And how significant are international flows of intangible assets? In this session, Carol Corrado, Jonathan Haskel, and Kyoji Fukao addressed these questions.[1]

3.1. EMPIRICAL IMPLICATIONS OF CAPITALIZING INTANGIBLES IN U.S. ECONOMIC ACCOUNTS

Carol Corrado presented a set of empirical results indicating that measured patterns of growth depend significantly on how spending by firms is categorized. When expenditures made by firms to develop intangible assets are treated as investment rather than expensed, a new picture of economic growth emerges. The key idea advanced by the research of Corrado and her colleagues (Corrado, Hulten, and Sichel, 2005, 2006a, 2006b; CHS) is that an expanded view of investment—one that considers the innovation-promoting activities by firms as part of the output and capital measures used in the calculation of multifactor productivity—is grounded in economic theory.

The work of CHS recognizes that innovation is not costless; that firms invest to bring new products to the marketplace, and that the pattern of output changes with these investments. This is a departure from analyses of innovation that take

[1]Brent Moulton from the Bureau of Economic Analysis at the Department of Commerce, who addressed these issues as they relate to the national income accounts, also presented during this session; most of his observations are discussed in Chapter 5.

output as given and then seek to uncover the determinants of existing measures of labor productivity or multifactor productivity. Corrado noted that, when she was working at the Federal Reserve during the late 1990s and early 2000s, it was common to associate information technology (IT) spending with underlying productivity change. This led her to wonder about the extent to which innovation was more than this, and to think about related effects from firms coinvesting in other inputs (including workers) along with IT.[2] The CHS work, as well as that by other researchers working in this area, sought to determine whether a broader set of innovation inputs could be captured and measured.

Implementing an expanded view of investment required CHS to develop a framework for measuring what is, in essence, the knowledge capital of the firm. This framework—which included three broad categories and then expanded to identify nine broad asset types (and many subcategories)—was grounded in an earlier literature that included important contributions by Leonard Nakamura and Baruch Lev.

Corrado presented results, updated through 2007, that emerged from the researchers' analytic process aimed at estimating a macroeconomic series for intangible investment. Figure 3-1 shows investment shares of output for business investment in both tangible and intangible assets. The trajectory of estimated business investments in intangible assets (the triangle plots) has a decidedly upward trend over the nearly 60-year period, whereas that for tangible investments (the diamond plots) includes extended flat and downward portions. U.S. intangible investment was more than $1 trillion in the late 1990s and, after falling off during the recession, returned to that level by 2005. In the first seven years of this decade—2001 to 2007—intangible business investment was 45 percent larger than tangible investment.

For estimating GDP, the Bureau of Economic Analysis (BEA) already capitalizes an important intangible, software, along with some other smaller items. However, nonfarm business output would have been 12 percent higher if the new intangible categories were included. And, despite the flattening of intangible investment relative to output in the early parts of this decade, if BEA were to capitalize the remaining CHS intangibles, saving rates and capital accumulation would have been higher; for example, the value of capital would have been more than $3 trillion higher in 2003; and the updated estimates show the value of intangible assets at more than $5 trillion in 2006, nearly $4 trillion higher than those currently capitalized in the national accounts.

In new work, Corrado and Hulten have built a system for producing macroeconomic estimates of output and productivity including intangibles from 1959 to 2007 (the CHS work covered the period from 1973 to 2003). Corrado referred to a forthcoming paper for technical explanations, stating that the idea was to design

[2]Corrado also pointed out the historical roots of these ideas dating back to "Schumpeterian entrepreneurs" and "Nelson-Phelps managers," among others.

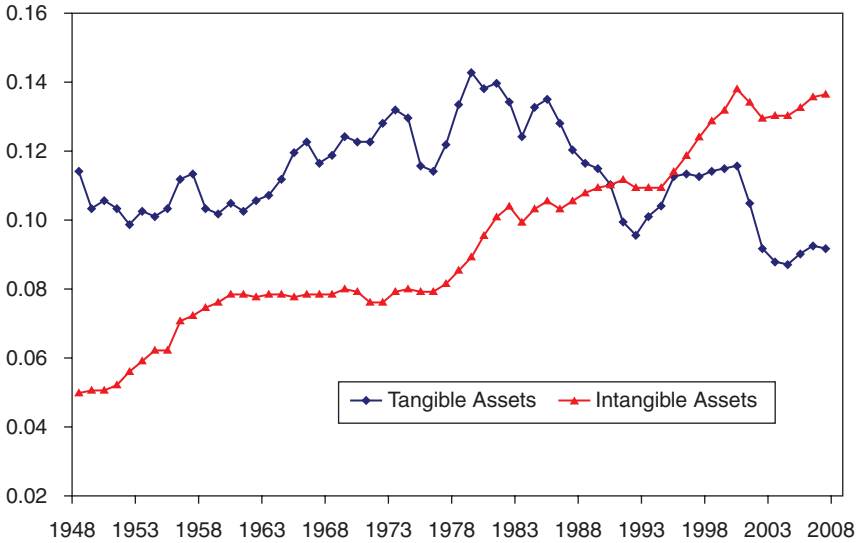

FIGURE 3-1 Investment shares: Tangible and intangible investment relative to nonfarm business sector output.
SOURCE: Workshop presentation by Carol Corrado. Reprinted with permission.

a system that allows exploration of the macroeconomic implications of alternative prices for intangible output and allowance for specific intangible risk. As in the original CHS work, the new framework enables the modeling of production and capital accumulation resulting from innovative investments and knowledge appropriation, and it expresses the effects of advances in knowledge through two mechanisms rather than one. Because knowledge capital, unlike most plant and equipment, is nonrival, its benefits can diffuse through the economy without necessarily diminishing the quantity available to the original producer or to the original innovator. The first of the two mechanisms through which an investment in knowledge may diffuse is the commercially recoverable value of the research or the original investment. The second is the diffusion of the innovation to other users, an effect that is reflected in the standard growth accounting framework in total factor productivity (TFP) residual.

Corrado then showed how, in this framework, the growth of output per hour can be decomposed into multifactor productivity, capital deepening, and "labor composition" components. She referred to the Bureau of Labor Statistics (BLS) website for details on the labor composition effect, noting that it is the standard way in which education is accounted for in empirical analyses of economic growth and is, in essence, what is challenged in the new view that also allows for knowledge creation by businesses to be measured.

Other results presented by Corrado involve breaking the contribution of intangible capital to economic growth into its different components. As in the original CHS work, the results indicate that nonscientific research and development (R&D) and firm-specific resources have been growing in prominence over the years. Though imprecisely estimated, these appear to be two major components driving the dynamism in their productivity results. Corrado noted that the updated results were produced using measures of own-account software adjusted for what BEA considers a double count with R&D. The results for scientific R&D are based on BEA data for performer spending deflated by the nonfarm business output price index.

The residual of the multifactor productivity calculation, which Abramovitz (1956) famously called "a measure of our ignorance about the causes of economic growth," is lower when intangibles are accounted for. This makes sense: To the extent that intangible investments represent previously unmeasured inputs to the innovation process, a broader macro-level indicator of the innovation process has been created. Business capital investment is a key macro data series, and an updated measure including intangibles would help researchers and analysts better understand sources of and trends in productivity and innovation growth.

The other result from the analysis that Corrado is still struggling to present in a satisfying theoretical framework relates to the share that labor contributes to total output. The labor share is trendless when intangibles are treated in the conventional manner, but it falls when intangible investments are capitalized. The logical interpretation of these data is that the returns to tangible capital are relatively constant over time. The action, then, is in the returns to talent (as discussed by Wladawsky-Berger), competency, knowledge capital, or education in the workplace. Someone whose view is rooted in the Becker-Mincer thesis that all education, including professional education and experience, belongs in the production function as an augmenter of the raw labor input would have a hard time with this idea. Corrado cited the work by Richard Nelson and Edmund Phelps (1966) as among the early scholarly research on economic growth that posited a broader role for education. They claimed that advanced education (mainly college education) was necessary for managers to evaluate innovations. In this view, education plays a direct role in the innovation process and in business growth in a way that goes beyond simply augmenting raw hourly labor input. And, whether people cite that work or not, this has become a view that is widely held to this day. The CHS research takes another step and recognizes that, if long-lasting knowledge—which is more than an augmenter to the labor term in the productivity analysis—is created and funded by the firm, then that knowledge is partially appropriated as the capital of the firm and, in turn, generates capital income or profits.

Having now done the original work and gone through this extensive updating of growth numbers back to 1959 and forward through 2007, and having done some sensitivity analysis, Corrado was able to summarize the implications of the CHS work for research on economic growth and capacity:

- The symmetric treatment of intangible and tangible assets results in a higher growth of labor productivity, an explicit role for knowledge appropriation in economic value creation, and a larger role for capital as a source of economic growth. Historically, an increasing fraction of total capital is knowledge capital.
- The results of the earlier CHS work seem to be bolstered by subsequent research. In terms of the sensitivity of the results to the many assumptions that were needed for the analysis, what has been learned is that the choice of price deflators used to estimate intangible investment in real terms make a big difference on measured growth of real output and capital input.
- Depreciation rates also are important, but the choices used play virtually no role in the major conclusions of the CHS research about patterns of growth and productivity.
- Some people have questioned some of the arbitrary assumptions used to estimate economic competencies; but, when those parameters are changed, the impact on estimates of real output growth and productivity is also relatively small.
- Estimates of the value of knowledge capital, however, are sensitive to assumptions about depreciation rates and the levels of investment.

Corrado concluded that there is a clear and compelling case for capitalizing intangibles in the nation's economic accounts. Not only does it modernize the portrayal of business activity, it also has important macroeconomic implications. Including intangibles allows for more accurate quantification of the sources of economic growth and of the dynamics of production and capital accumulation, and the aggregate empirical analysis of productivity and innovation is improved.

3.2. EVIDENCE FROM THE UNITED KINGDOM

Jonathan Haskel presented evidence about the role of intangible assets in the economy of the United Kingdom (UK). In the process, he identified several questions of concern to UK policy makers, business executives, and academics. In addressing the first of these questions—"In the United Kingdom, where is the new economy?"—Haskel pointed to a couple of facts. First, the investment to GDP ratio has been more or less flat since the 1950s. This has led analysts to ask, if a revolution with new information technologies is under way, where is all that investment? The second empirical observation is that the ratio of profits to GDP is more or less flat as well. So, similarly, where are the returns to this new industrial revolution? Also, in contrast to the U.S. concerns, labor productivity growth (LPG) and TFP growth both fell from the mid-1990s onward—and those numbers have been falling in most of Europe.

These statistics have created several notable policy concerns. In 2000, prime ministers of the European Union (EU) met in Lisbon and issued the statement proposing to make the European Union "the most competitive and dynamic knowledge-driven economy by 2010." Given the immediacy of that date, Haskel noted that this is becoming a concern. Another target set was to attain a ratio of R&D spending to GDP in Europe of 3 percent. In Britain, at the moment, the figure stands at about 1.9 percent, and in most other countries it is also well below 3 percent. Given these trends, it appears that EU countries are going to have difficulty meeting this target. Kenneth Rogoff, who was chief economist of the International Monetary Fund, remarked in 2003 during his twice-yearly assessment of global prospects that the only way most Europeans were going to see an economic recovery at that time was by watching it on American television. It was a stinging comment that heightened the issue and raised further concerns about innovation in the European Union.

Another development in the United Kingdom about which Haskel reported is that calls for creation of an innovation index have increased. The idea gained momentum in part due to the influence of the innovation metrics report (in Chapter 5). Indeed, the UK equivalent to the U.S. Commerce Department stated that it was a priority to have an innovation index in the near future.

The remainder of Haskel's presentation dealt with two topics: First, the extent to which adding intangibles to the UK data matters—Carrado argued persuasively that it matters a great deal for the U.S. case. Second, he addressed the extent to which it would be possible to develop better data on intangible investments—for example, whether European innovation-type surveys might provide some useful types of information for measuring intangibles.

Addressing the first of these topics, Haskel presented statistics indicating that, in the United Kingdom, both LPG and TFP growth (without intangibles) have been falling over the 1990-2004 period. Work to explain poor productivity performance has been carried out by a joint Federal Reserve and Bank of England project. Basu and colleagues (2003) and Oulton and Srinivasan (2005) looked at the productivity growth and total growth slowdown in the United Kingdom between 1995 and 2000 and compared the results industry by industry with the United States. In an attempt to explain the sources of the UK slowdown, the authors used industry-level data, and they reexamined the way work hours are calculated to see whether there was something unusual about UK measurement that might slow down observed rates. They also attempted to distinguish between capital services and stocks when, previously, only capital stocks had been examined. Finally, they capitalized software, a method that the official Statistics Bureau had not yet implemented.

Even with these adjustments, the authors still observed the slowdown in labor productivity growth and total factor productivity growth for 1995-2000. The question that arises, then, is whether intangibles can explain this. At the time, when Hulten briefed the UK treasury on the CHS research, people in the

department recognized that this was something that should be examined for the UK case as well.

In the research by Haskel and others, the treatment of intangibles in the United Kingdom mirrors that used by CHS for the United States (see Table 3-1). Software is treated as investment. Mineral exploration and some artistic originals are also treated as an investment—as they are in the UK national accounts (the UK Statistics Bureau has been working to capitalizing these elements). Following the U.S. lead, scientific R&D is not yet capitalized in the analysis, nor is brand equity.

In the broader economy, for the period 1970 to 2000, the United Kingdom experienced a strong increase in the percentage of market-sector gross value added, which consists roughly of nonfarm and business-sector output. The figures are similar to those found by CHS for the U.S. case; for example, in both countries, computerized information accounted for around 13 percent of GDP. For every British pound of tangible investment, the authors found, more or less, a British pound of intangible investment as well. The numbers for both nations, Haskel reported, look remarkably similar.

Next, Haskel and his colleagues recalculated GDP to include intangibles treated as investment. Adjustments were made to labor service quality along education, gender, and age dimensions. The results for the United Kingdom, with and without intangibles included, are shown in Figure 3-2. The left-hand side shows

TABLE 3-1 UK Treatment of Intangibles

Type of Investment	Includes the Following Intangibles	Current Treatment in UK National Accounts
Computerized information	(1) Computer software (2) Computer databases	Both treated as investment
Innovative property	(1) Scientific R&D (2) Mineral exploration (3) Artistic originals (4) New product development costs in the financial industry (5) New architectural and engineering designs (6) R&D in social science and humanities	Only (2) and (3) treated as investment
Economic competencies	(1) Brand equity (2) Firm-specific human capital (3) Organizational structure	None of these treated as investment

SOURCE: Workshop presentation by Jonathan Haskel. Reprinted with permission.

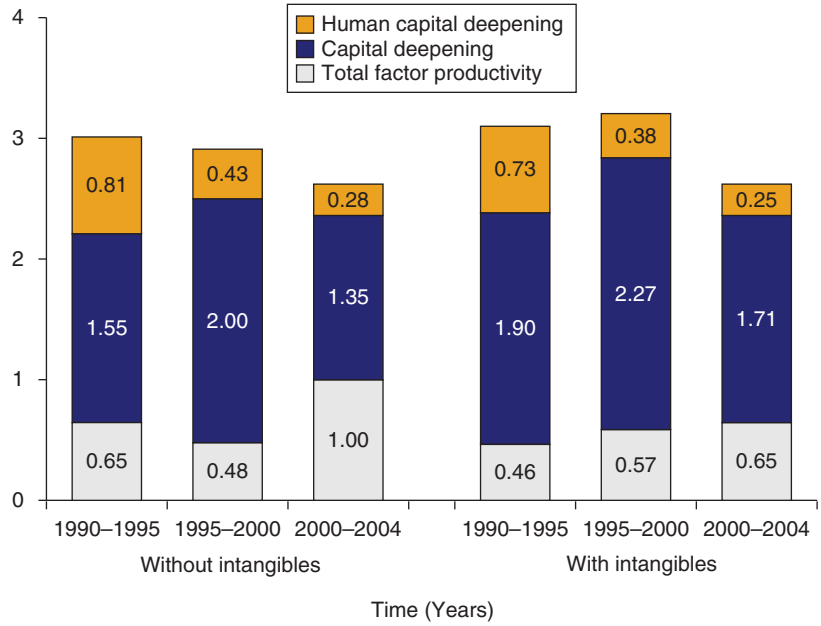

FIGURE 3-2 Labor productivity growth/total factor productivity growth, market sector, without and with intangibles**.**
SOURCE: Workshop presentation by Jonathan Haskel; see also Marrano et al. (2009: Table 3). Reprinted with permission.

the gradual fall in labor productivity over this period using the existing national accounts conventions (without intangibles). A good deal of capital deepening is occurring. The right-hand side figure applies the CHS methodology (with intangibles) and leads to several interesting results.

First, each bar is higher than for the corresponding measurement of the left, which means that, overall, measured labor productivity has increased. This makes sense because, again, additional items are counted as output, or, more accurately, as GDP. Second, between the early and the late 1990s, an increase in measured labor productivity is observed with intangibles included, as opposed to the decrease without intangibles. This is not surprising given that a considerable amount of investment occurred in the intangible categories during the late 1990s. However, a fall does occur for the 2000-2004 period, probably reflecting the dot-com bust.

Haskel also compared the UK and U.S. experiences for the period 1995-2003 using numbers from the (earlier) CHS paper. Ignoring intangibles, overall productivity growth over this longer period in the United States and the United Kingdom are quite similar. However, there is an important difference—more TFP growth is

detected in the U.S. data than in the UK data, whereas there is more capital deepening going on in the United Kingdom than there is in the United States. Since, in the United Kingdom, a large share of productivity growth is driven by capital deepening, there is much less of this "measure of our ignorance" to be explained. Intangibles are still important to measure accurately but, Haskel suggested, perhaps less so relative to the U.S. case. The research agenda, implied by the need to explain this large amount of TFP growth, may therefore be slightly different in the United Kingdom. Once intangibles are included in the data, more activity and more labor productivity growth is captured. Much more capital deepening is picked up in the United States (as reported by CHS) than in the United Kingdom. Total factor productivity becomes smaller, but not by as much as it shrinks in the United States, in part because there was less productivity growth accounted for by total factor productivity in the first place.

The overarching question is "Are patterns of intangible investment different in the United Kingdom than they are in the United States?" Table 3-2 breaks the amount of intangible capital deepening into the categories identified by CHS. In the United States, 32 percent of capital deepening over this period was accounted for by computerized information, 26 percent by innovative property, and 42 percent by economic competencies. The comparable numbers for the United Kingdom show similar levels of investment for many of the categories though, in the United States, there is a larger measured contribution from scientific R&D. And 10 percent of that capital deepening came from U.S. R&D and only 1 percent from UK R&D. Haskel reported that concern in the United Kingdom about the lack of spending on scientific R&D seems to be warranted by the numbers. On the nonscientific R&D side, the United Kingdom appears to spend a bit more—the data show high levels of spending on design and financial innovation. He expressed the view that design is reasonably well measured, but that financial innovation may not be.

TABLE 3-2 Contribution of Intangible Capital Deepening to the Annual Change in Labor Productivity, Nonfarm Business Sector (percentage points)

	United States 1995-2003	United Kingdom 1995-2003
Intangible capital deepening		
Computerized information	32	31
Innovative property	26	24
Scientific	10	1
Nonscientific	17	24
Economic competencies	42	45
Brand equity	10	6
Firm-specific resources	32	39

SOURCE: Workshop presentation by Jonathan Haskel; see also Marrano et al. (2009:Table 6). Reprinted with permission.

Next, Haskel discussed what he called the Community Innovation Survey, a European Union–wide survey that will be used to attempt to better measure innovation. The EU innovation survey asks the following:

1. Broad questions about innovation such as, "Did you innovate in the last three years or not?" This is followed by a question about fraction of sales—a metric that businesses themselves would use. For example, it might ask, "What fraction of sales was accounted for over the last three years by your new products?"
2. Questions about level of spending on R&D, design, marketing, training—categories that look very much like the CHS intangibles categories and, in that sense, the innovation survey.
3. About information sources. Again, these are typically yes/no questions of the form: "Did you have a joint venture?" or "Did you learn from your clients? Learn from your suppliers? From trade fairs? The Internet?"
4. Questions about the barriers to innovation: "What stopped you from innovating? Too many costs? Shortage of skilled labor?" And then there is a ragbag of other questions such as: "Did you do organizational change?" and "Did you get public support?"

Haskel reported that the innovation survey was yielding mixed results in terms of the value of the data. The British Community Innovation Survey, as follow-up to the "Did you innovate?" asked firms to specify what was their most significant innovation. It can be difficult to obtain that response because it may disclose valuable information to competitors for particular types of innovations. Many firms answered that question by identifying a recent purchase of capital equipment. So it typically provides information about capital deepening. For example, a firm that produced eyeglasses specified that they had a new machine for grinding eyeglasses, and it was a piece of new technology. This may not be what economists typically think about when trying to get at disembodied types of innovation. So, Haskel concluded, that is basically a capital-deepening question.

Information on spending on R&D, design, marketing, and training have been extensively used in academic work, but it is less clear, Haskel noted, whether one could get a lot of useful information from a national accounting kind of measurement process there. The barriers-to-innovation questions are not useful, as a serious identification problem is present; he advised strongly against using these. The companies that report the most barriers to innovation are also the most innovative companies. The IBMs and other companies that are doing extensive innovation report how difficult it is to innovate. And, indeed, those questions will be dropped from the survey.

The UK Community Innovations Survey consists of about 12 pages of questions. Because the statistics authorities rightly worry about questionnaires being

too long, and therefore overly burdensome, Haskel posed the question, "If the survey could only be a half page long, what should be asked?" The response suggested asking the spending questions—and maybe that might be useful for thinking about a U.S. survey. He concluded that in the United Kingdom (1) intangibles make a big difference; (2) it is therefore of tremendous interest to construct an innovation index; and (3) some of the questions from the UK survey have turned out to be useful.

3.3. MEASURING INTANGIBLE INVESTMENT IN JAPAN

Kyoji Fukao presented results from recent research on intangible investment in Japan, providing new estimates of their contribution to economic growth. His coauthors in this work were Tsutomu Miyagawa (Gakushuin University and RIETI), Kentaro Mukai (Cabinet Office, Government of Japan), Yukio Shinoda (Cabinet Office, Government of Japan), and Konomi Tonogi (Hitotsubashi University).

The motivation for the study was to explain why the convergence of labor productivity rates in Japan to the U.S. level came to a halt in the mid-1990s. Growth accounting shows that the cause of this phenomenon was a slowdown in capital deepening and TFP growth in Japan and an acceleration of TFP growth in the United States. This pattern can be seen in Figure 3-3. Further motivation was provided by the need to explain that, while Japan's TFP growth was high in the information and communication technology (ICT)–producing sector, TFP growth stagnated in ICT-using sectors, such as distribution services and non-ICT manufacturing, which have much larger output shares in the economy than the ICT-producing sector. The data seemed to indicate that Japan and continental EU countries did not experience an ICT revolution on the same scale as the United States, partly because of the stagnation in ICT investment (see Figure 3-4).

Fukao reported that empirical studies and interviews show that the productivity payoff from ICT investment depends on successful reorganization and training of workers (a form of intangible investment). For example, the ratio of custom software investment to packaged software investment is much larger in Japan than in the United States. When Japanese firms introduce ICT, such as an ICT system for customer services or the management of information flows within the firm, they prefer custom software in order to get around the reorganization and training of workers. This results in a smaller measured productivity improvement from ICT investment and suggests that it is important to compare intangible investment in Japan with that in other developed economies.

Like Haskel and colleagues, the authors measured intangible investment in Japan following the CHS approach. As shown in Figure 3-5, the principal finding was that the intangible investment/output ratio in Japan is smaller than that in United States. And, as shown in Figure 3-6, Japan invests at a high level in scientific R&D but, relative to the United States and the United Kingdom, only

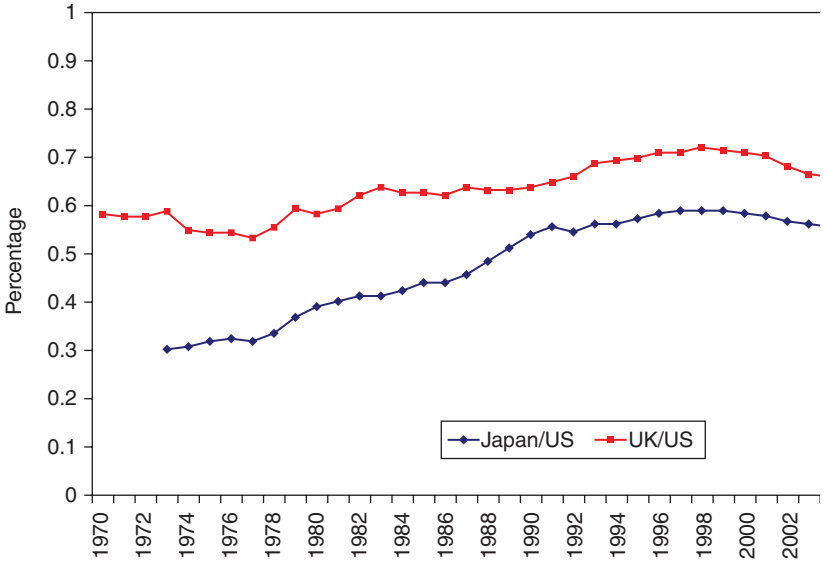

FIGURE 3-3 GDP per person-hour input in Japan and the United Kingdom in comparison with the United States: 1975-2005, based on gross output purchasing power parity of 1997.
SOURCE: Workshop presentation by Kyoji Fukao (Hitotsubashi University and RIETI), based on EU KLEMS, March 2008. Reprinted with permission.

a small portion is directed toward economic competencies. Fukao suggested that the pattern of intangible investment in Japan leads to less capital deepening and lower labor productivity growth than that in the United States. The authors also conducted growth accounting of intangibles by sector, in which they found that the contribution of intangible capital deepening to labor productivity growth is relatively large in manufacturing and relatively small in the service sectors.

In discussing these results, Fukao noted that the divergent patterns of measured intangible investment between Japan and the other countries reflects, in part, differences in data sources and the definition of intangible investment. Focusing his comments on the measurement of firm-specific human capital and organizational change (an area in which there is a large gap in expenditures between Japan and other countries), Fukao noted that on-the-job training is not included in the measure of investment in firm-specific resources employed (CHS, 2005). However, Japanese firms often use on-the-job training to accumulate firm-specific human capital. According to a survey by the Cabinet Office in 2007, Japanese workers spend about 9 percent (weighted average across all types of workers and all industries) of their time in on-the-job training.

Another related issue is double counting. CHS (2006a, 2006b) uses off-the-job training cost data from BEA. If workers gain nonfirm-specific skills from

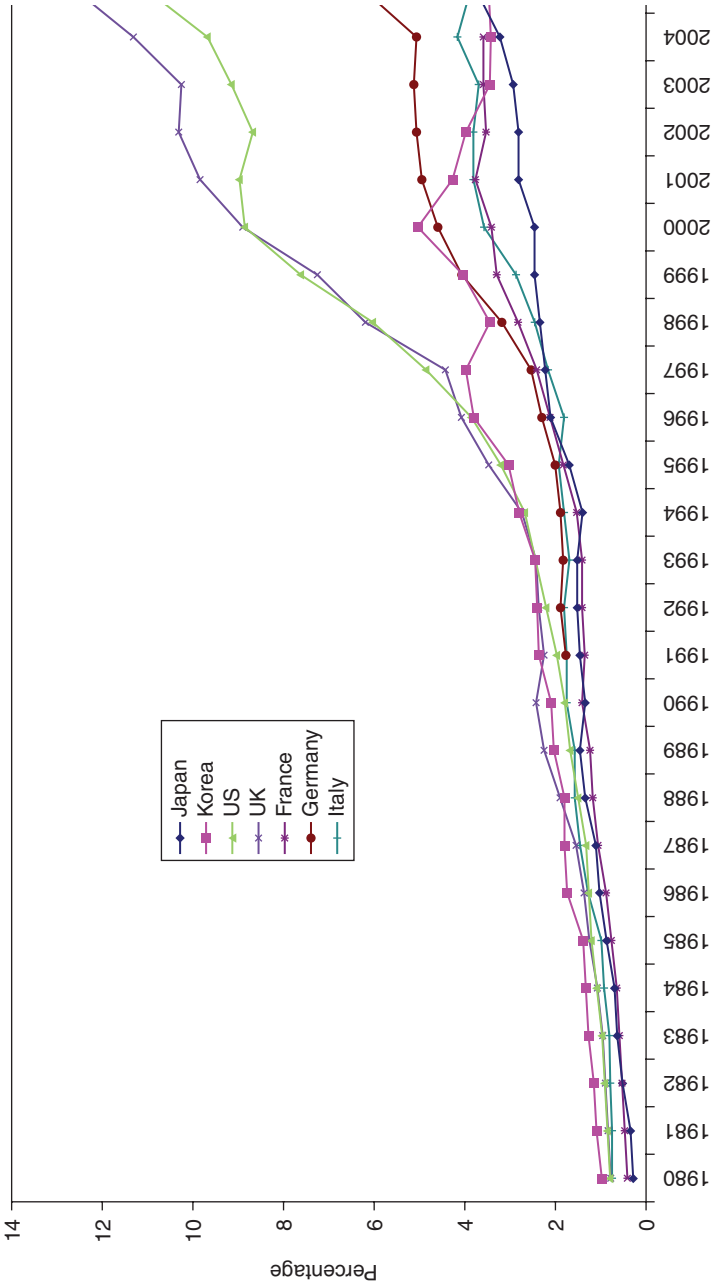

FIGURE 3-4 Information and communication technologies (ICT) investment as a percentage of GDP in the major developed countries.
SOURCE: Workshop presentation by Kyoji Fukao (Hitotsubashi University and RIETI), based on EU KLEMS database, March 2008; JIP database, 2008; KIP database. Reprinted with permission.

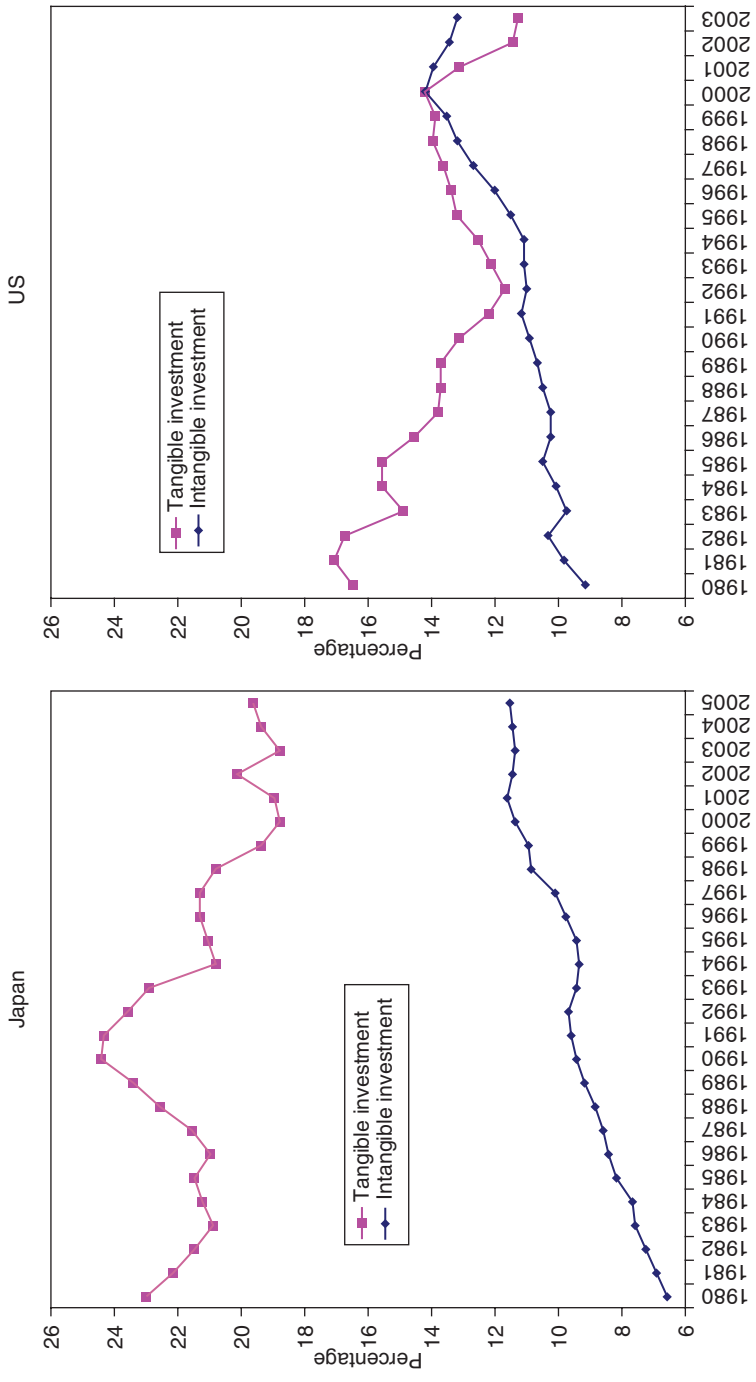

FIGURE 3-5 Investment as a percentage of output.
SOURCE: Workshop presentation by Kyoji Fukao (Hitotsubashi University and RIETI). Reprinted with permission.

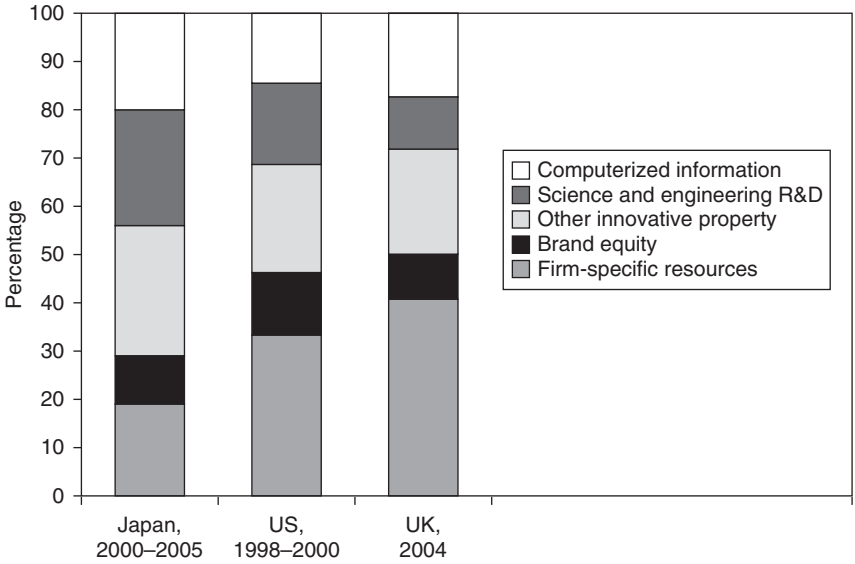

FIGURE 3-6 Intangible investment by category: Share in total intangible investment.
NOTE: Japan: authors' calculations; United States: Corrado, Hulten, and Sichel (2006a, 2006b), United Kingdom: Marrano and Haskel (2006).
SOURCE: Workshop presentation by Kyoji Fukau (Hitotsubashi University and RIETI). Reprinted with permission.

off-the-job training, such accumulation of human capital will theoretically be reflected in their wage rates. Since, in standard growth accounting, wage increases by age are already taken into account as improvements in labor quality, there is a risk of double counting. According to a survey conducted by Keio University, workers answered that 63 percent of total skills gained through off-the-job training supported by their employers will be useful even if they change their jobs.

Fukao turned next to the topic of organizational structure. Referring to Nakamura (2001), the CHS work (2006a, 2006b) assumes that executives spend 20 percent of their working time on managing organizational structure; they go on to calculate investment in organizational structure by multiplying the remuneration of executives (as captured in BLS data) by 0.2 (reflecting the portion of time spent managing organizational structure). The gap in expenditure on organizational structure between the United States and Japan may reflect the difference in the levels of remuneration of executives, which are much higher in the United States. According to Robinson and Shimizu (2006), Japanese executives spent only 9 percent of their working time on strategy development, developing new business, and reorganization. This survey shows that following the approach of CHS (2005, 2006a, 2006b) leads to an overestimate of investment in organizational structure.

According to interviews conducted by the authors, in many Japanese firms, divisions specialize in corporate strategy, create plans, and conduct organizational restructuring. But there are no data about expenditures for these tasks in such divisions. Fukao concluded that a new survey was needed to capture these factors.

The authors conducted sensitivity analysis to examine the robustness of their results across several different cases and under different assumptions about depreciation rates of firm-specific human capital. The analysis indicates that, if on-the-job training costs are taken into account, the ratio of intangible investment to GDP in Japan is actually higher than that in the United States or the United Kingdom. Figure 3-7 shows the investment levels under different measurement scenarios. In case 1, the depreciation rate of firm-specific human capital is assumed to be 20 percent rather than the 40 percent assumed by CHS (2006a, 2006b); in case 2, the figures include on-the-job training costs + 0.37 × off-the-job training costs + 0.09 × the remuneration of executives. The results on TFP growth remain unchanged because of the stagnation of estimated firm-specific human capital in Japan. Fukao offered a number of conclusions from his team's research:

- Like continental EU countries, Japan's economic growth from the mid-1990s is characterized by slow TFP growth in ICT-using sectors and relatively stagnant ICT investment.

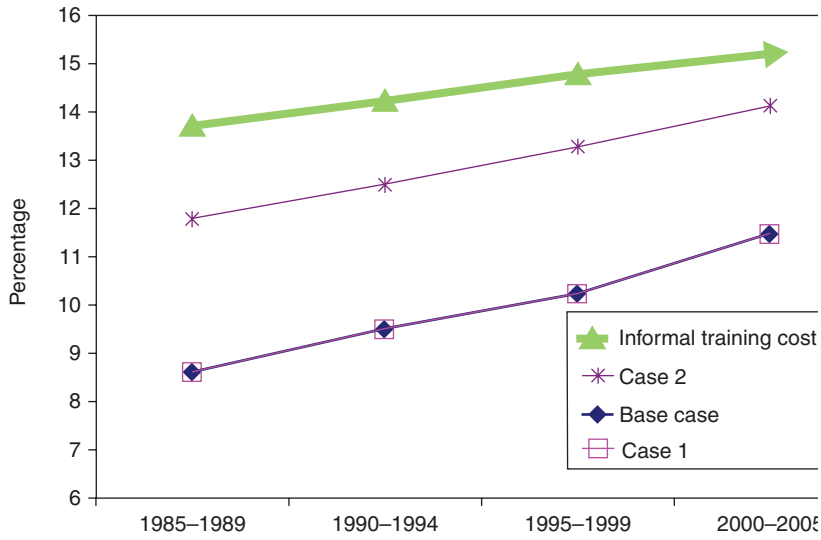

FIGURE 3-7 Share of intangible investment in Japan's gross domestic product (see text).
SOURCE: Workshop presentation by Kyoji Fukao (Hitotsubashi University and RIETI). Reprinted with permission.

- Following the measurement approach of CHS (2005, 2006a, 2006b), Japan invests a lot in tangible assets but less in intangible assets relative to the United States.
- Japan's intangible investment is characterized by high levels of investment in R&D but very little in economic competencies. And the contribution of intangible capital deepening to labor productivity growth is relatively large in manufacturing but small in the service sector.

Fukao's assessment of data quality was that estimates of intangible investment were relatively weak in the area of firm-specific human capital and organizational structure. Japan, he said, does not have good official statistics for on-the-job training costs. Furthermore, very little is known about expenditures on organizational restructuring by firm divisions specializing in such tasks. As for the estimation of investment in broad categories of intangible assets at the firm level, a new survey has begun in Japan. Based on data that emerges, the authors' results can be reexamined in the near future.

During open discussion, several points were raised. Moderator Kenneth Flamm observed that the data presented showed clear increases at the national level (United States and United Kingdom) in intangible investments relative to tangible ones. He wondered whether, at the company level, the data might be capturing an offshoring effect; that is, companies may still be engaging in significant amounts of tangible investment, but many of the activities may have been shifted to other countries. Corrado responded that the increase in intangible investment in the United States is most obviously correlated with the increase in the growth of the service sector relative to manufacturing. She offered the view that, while it is hard to get at the cause and effect, offshoring is part of what is going on. For this, it would be useful to have a worldwide calculation of tangible versus intangible investment. Fukao agreed that the effects associated with internationalization of companies are difficult to pick up. For example, he noted that Toyota now produces more cars abroad than it does in Japan. However, it still conducts the majority of its R&D domestically in Japan.

Flamm asked Corrado how she would interpret the observation that, in the United States, the unadjusted labor share was roughly constant, but that it declines when intangibles are included and an adjustment made for labor quality. Corrado responded that a large and growing component is being added to income—namely the rental income, or return to, knowledge capital. She speculated that a lot of what is going on is associated with growth in the demand for workers with higher skills that has nothing to do with the labor share.

Haskel interpreted this as evidence that, if the firm is going to pay for an investment in a worker, it has to see some returns. Therefore, a gain in knowledge capital may not show up in the workers' wages (at least not fully); otherwise, the worker would pay for it. So the numbers from which training estimates are

derived come from responses to questions about how much firms pay to train workers and about the opportunity cost of that time. Corrado noted that depreciation also has to be taken into account. If the process is modeled, one may observe very short lives for knowledge capital.

4

Intangibles in the Firm and in Financial Markets

Several sessions during the workshop focused on large national and global-level measurement issues. However, investment in intangibles and steps to innovate are most often taken at the firm level, so the microeconomics of the topic are essential. A series of presentations addressed questions such as: How are intangibles created and utilized by firms? How do intangibles operate in financial markets? And what efforts are being made to capture intangibles in accounting and company valuations?

Baruch Lev addressed the question raised by Senator Bingaman, "Why would private-sector firms be motivated to care about these measurement issues and participate in any sort of reporting or data collection?" Laurie Bassi focused on human capital, a topic raised a number of times during the earlier sessions. Jim Malackowski shared the work that his company, Ocean Tomo, has been doing on emerging markets for intellectual property that involve understanding and estimating the value and discovering the prices of these assets. Ron Bossio described the state of systems for reporting and recording all of this financial information from the perspective of the Financial Accounting Standards Board (FASB).

4.1. INFORMATION DEFICIENCIES REGARDING INTANGIBLES—CONSEQUENCES AND REMEDIES

Baruch Lev opened the session by relating an anecdote about a senator who, 10 years ago, asked him who is damaged—and how—by the lack of data and reporting of financial issues by companies. This question, Lev reported, had a profound effect on his work. He identified a number of serious adverse consequences to capital markets that can arise due to deficiencies of information

at the company level about intangible assets. He then discussed what kinds of information investors need and how it can be generated. The most basic theme of his remarks was that, in capital markets (unlike life in general), no news is bad news. Without information about an asset or an investment, it will be heavily discounted, or people will simply walk away from it.

Trends in Research and Development Investment

Lev noted that studies consistently show that stock shares of intangible-intensive companies are systematically undervalued. When shares are undervalued by investors, the cost of capital for these companies is excessive, and the consequence is a suboptimal level of investment in intangibles. This can lead to substandard growth, adverse effects on employment, and even to excessive insider trading gains at research and development (R&D)-intensive companies.

Lev next illustrated some of these points using examples from his research. One study (Lev, Nissim, and Thomas, 2007) used a methodology that is commonly used in finance and economic research and in capital markets themselves to identify undervaluation or overvaluation of securities. The methodology involves ranking securities by a piece of information that, a priori, is suspected to be either overappreciated or underappreciated by investors; subsequent risk-adjusted returns on the portfolios of these securities are then examined. If investors, on average, properly price securities based on known information, there is no way, months or years after that, to gain or lose from this information. This is a clear and very powerful test of whether securities are mispriced relative to specific information.

Figure 4-1 aggregrates into three categories a ranking of about 1,600 companies on the basis of R&D capital spending relative to total assets. The ranking is based on information published in the income statements of the companies. The risk-adjusted rates of return, subsequent to the ranking of 3 years of data, have been estimated for each company for the past 25 years. Stocks of companies with large R&D capital (depreciated) have systematic growth in rates of return, risk adjusted, of about 15 percent by about the 20-month mark. This is, by Lev's assessment, an abnormally high rate of return, which means that, at the time the companies were ranked when financial reports came out, investors systematically undervalued large R&D capital and overvalued low R&D capital. This, reported Lev, is consistent across practically every study with which he is familiar.

He then pointed out other studies that directly estimate the cost of capital for R&D-intensive companies. Almost all of them reveal substantially higher costs of debt for the R&D-intensive companies relative to other companies. As an aside, R&D is the only intangible investment that is reported by companies separately in financial reports, which makes it easier to do research on it. All other investments, things like software and branding, tend to be buried in larger cost items, which make it difficult to disentangle the data to do firm-level research. Lev also

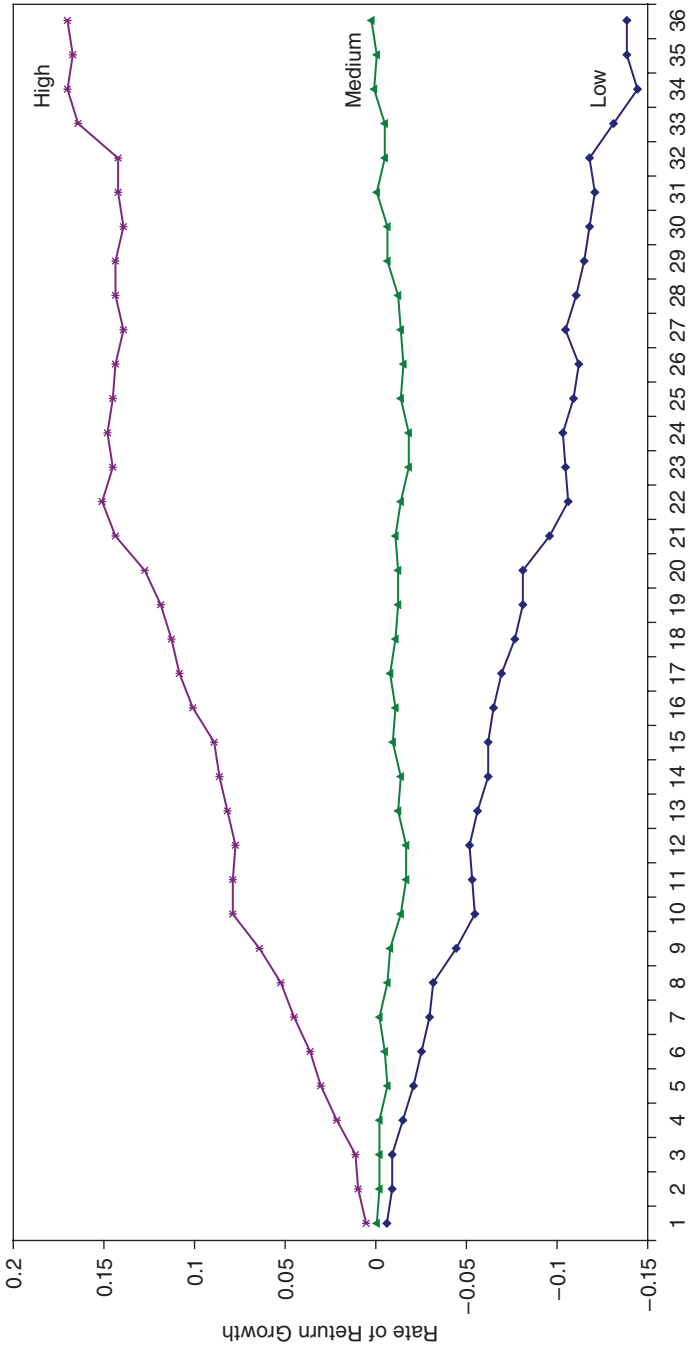

FIGURE 4-1 The performance of companies with high, medium, and low R&D capital.
SOURCE: Lev, Nissim, and Thomas (2007). Reprinted with permission.

cited a set of studies showing that managers of R&D-intensive companies, not surprisingly, are able to take advantage of investor ignorance about the company and gain financially, sometimes through insider trading; he noted that they trade in the shares of their own companies at a rate four times the average of managers working in non-R&D-intensive companies.

Next, Lev presented data on trends in R&D and advertising intensity of all companies covered by Compustat. Advertising, he noted, is a very rough proxy for investment in the enhancement of the brands. Figure 4-2 shows R&D-over-sales averages for the 1,600 companies in the study (there are roughly 2,400 total firms in the population). The level was below 3.5 percent in the mid-1980s and increased quite significantly to over 4.5 percent with the technology bubble in the 1990s; since then, it has declined significantly. The R&D intensity today of companies is not substantially different from what it was 20 years ago. Yet, during this period, whole industries were emerging with huge investments in R&D—software, biotechnology, Internet—which means that there was a substantial reduction in the R&D intensity of all other industries.

Firm Measurement of Intangibles

Once again, the key theme that Lev raised for the workshop is that what is not reported is not measured and is not managed. He pointed to a quote from Bamford and Ernst (2002):

> Most large companies now have at least 30 alliances, and many have more than 100. Yet despite the ubiquity of alliances—and the considerable assets and revenues they often involve—very few companies systematically track their performance. Doing so is not a straightforward task. . . . Our experience suggests that fewer than one in four has adequate performance metrics. . . . Few senior management teams know whether the alliance portfolio as a whole really supports corporate strategy.

As Bamford and Ernst point out, despite this ubiquity of alliances—among manufacturing, marketing, R&D, and other firms—and the considerable assets and revenue they often involve, very few companies systematically track their performance. Lev reported that the typical reaction of chief executive officers (CEOs) and chief financial officers (CFOs) is, "Yes that's all nice, but our financial analysts do not ask for this information." If they do not ask for this information, Lev asserted, it does not have to be provided; if it is not provided, it is not measured.

When presented with evidence of undervaluation of subsequent high returns, finance scholars perennially raise the question: Is what one observes a compensation for risk that will be natural in capital markets? If R&D is riskier than other investments, then clearly there will be higher returns on R&D. Or is it the result of information issues? The answer emerging from the literature, Lev argued, is that it is the latter.

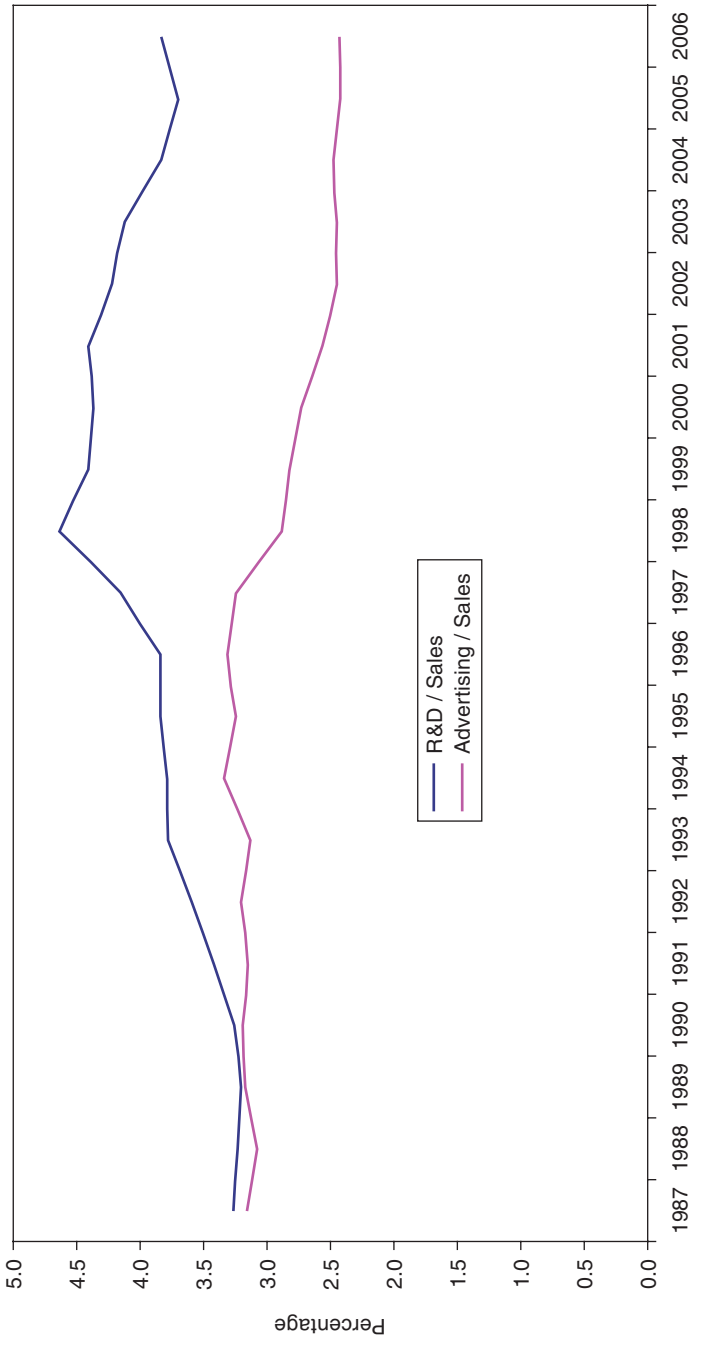

FIGURE 4-2 R&D and advertising intensities, 1987-2006.
NOTE: Data from Compustat.
SOURCE: Workshop presentation by Baruch Lev. Reprinted with permission.

Jonathan Haskel, reflecting on the evidence that information about intangible investments is valuable, wondered why there is little communication within firms about these assets. Bassi noted that people are not typically rewarded in their compensation packages for doing this kind of measurement work, so it does not get done. Lev agreed, citing as an example some consulting work he did with a major chemical company. He was asked to estimate the return on product and process R&D in which the firm had been engaged. The R&D was aimed at reducing production costs and investment in brand enhancement. When he asked them for examples of previous R&D measurement projects, the company, which has existed more than 130 years, said it had never done it before.

Though measures of intangibles should be considered essential information for resource allocation within companies, they are not. Even in the case Haskel cited, the reason the company asked for the study was not so much a routine desire to know how to allocate resources, but was largely political. Previously, a consulting company had stated that brand valuation was important and that R&D was largely a waste of the company's resources. The R&D group in the company needed counterbalancing expert analysis. Unless there are pressing issues on management, the regular need-to-know in order to inform decisions is not always there.

Lev continued, noting that many managers somehow believe that when it comes to intangibles—R&D, branding, or human resources—they more or less know what to do. CEOs have said, "We don't really have studies, but we think we know what is adequate in this area." He noted a study of his on a sample of biotech companies. Some of these companies disclose quite a bit of information in their initial public offering—about the drugs they are developing, the target markets, the tests they perform, at what stage the drugs first face clinical tests, second-phase clinical tests, patent coverage, etc. Other companies disclose much less.

Lev constructed a detailed index of the amount of information that is disclosed. The study showed that biotech prospectus disclosure reduces stock volatility and bid-ask spreads (which reflect uncertainty). Disclosing patent royalties increases R&D valuation. The reason for this is clear. If there are customers for a company's patents, this means that, like a *Good Housekeeping* seal, it has a good technology. It is this kind of information that drives what one sees in capital markets. In addition, managers' guidance mitigates share undervaluation. When managers regularly impart information about future prospects, a substantial amount of this undervaluation and the resulting cost of capital increase disappears.

So what, according to Lev, is the key information that is needed? First, collecting information about capitalizing R&D on the macro level, as in the national accounts, discussed earlier, is important. On the firm level, capitalizing R&D, while a step in the right direction, is not something that investors will get terribly excited about. What is needed is not haphazard, nonstandardized measures, such as employee or customer satisfaction grades, brand values, corporate reputation,

or the triple bottom line. Investors want to know about factors that drive the business. What is needed is structured input-output information on performance of the major drivers of enterprise value—these are things that accounting is not yet designed to provide. Lev provided two examples of this type of information, one prevalent in the pharmaceutical and biotech industries, the other in Internet and telecommunications firms.

Input-output linkages for these industries involve high levels of R&D. Companies may provide information about the product pipeline and the outcomes from these programs—how many products they are working on and where are they on the scale of development. These pieces of information are major value drivers of biotech companies. If a company has a few products in an advanced development stage, like Phase II clinical tests, a high value will be generated. If they are all in the preliminary stage, a very low value will emerge.

Good disclosure, by Lev's definition, is something that relates the R&D to its consequences. Innovation revenue, a percentage of total revenue that comes from recently introduced products, is an extremely powerful measure of innovation, in that it can be indicative of two things. The first is the ability to come up with new products and services and bring them quickly to the market. Most companies provide information about the target market expected launch date and how much they intend to capture from the market. This information can be directly factored into an evaluation model. The second is something that is somewhat less prevalent. Most Internet and telecommunications companies provide a spectrum of information that explains the market value of the company, starting with the cost of acquiring customers, then the consequences. Subscribers increase in some cases and decrease in others. These variables, along with the churn rate and revenues from new customers—which are analogous to innovation revenue—allow computation of customer lifetime value.

Lev has recently examined companies with large differences between market value and book value—companies that, in some cases, show balance sheet book values on the order of one-fourth of the market value. When he computed customer's lifetime value, which is the piece of the franchise missing from the balance sheet, it can account for 60-70 percent of the entire difference—just this one intangible. This is useful information—not haphazard indicators that are not connected to anything, but something that guides the investigator from the inputs to the outputs and, by implication, to the future.

Accounting practices are, by Lev's estimation, a long way from including this level of detail because they are not designed to directly trace inputs to outputs. He believes that the only way to get companies to track and report this information would be through a concerted effort by an interested government agency working with the Securities and Exchange Commission (SEC) and the FASB, the accounting standards setting body, and at least some representation of accounting firms and managers, to establish well-designed disclosure templates. The idea would be not to force companies to comply—they already have a lot

to do to conform to generally accepted accounting principles—but to essentially codify successful voluntary practices.

Lev's view is that a reasonably high level of voluntary compliance could be achieved if good disclosure templates are provided, which might vary across industries. When an influential body, particularly an organization or combination of bodies, comes out with good templates, some companies will adopt them. Others will follow suit because, in the capital market, no news is bad news. If some companies report something and others do not, investors will suspect that those that do not report have something to hide. This idea was recommended by a commission in which Lev participated, set up by Richard Marshall while he was chair of the SEC. It can be done. This is, he concluded, the way to solve this cycle of poor information—both at the capital markets level and at the firm level—which leads to undervaluation, the high cost of capital, and low investment.

4.2. HUMAN CAPITAL AND SKILL INVESTMENT

A unique feature about human capital as a productive input and an intangible asset is that it is not owned by firms; it is owned by individuals and it is portable. Laurie Bassi's presentation focused on this intangible asset, noting that the uncertainty created by this characteristic adds a unique element of risk for firms. It also explains why human capital depreciates more rapidly, and, in some sense, firms may be prone to underinvest in it relative to other forms of intangibles. From the perspective of employees, they are able to capture a portion of the investment that firms make in their education and training in the form of future wage premiums; it may also decrease their likelihood of unemployment.

Investments in human capital, education, and training in the workplace are of extraordinary importance both to individuals over their life cycle and to the evolution of economies and societies. Labor economists have estimated that much of the growth in productivity over the years is attributable to human capital gains. Once people leave the education system, the workplace becomes the primary source of economically consequential learning.

The tendency to underinvest in human capital intangibles carries with it some clear negatives for the workforce viewed in the aggregate. Bassi pointed out that, while data are scant on the issue, some evidence suggests that investments in workforce education and training by employers in the United States are smaller than elsewhere in the developed world. One could hypothesize that this is an indication of a highly educated, highly productive workforce and that therefore less investment is needed. Alternatively, the evidence could suggest that the United States should be concerned about falling behind countries that are making larger investments.

From the perspective of the firm, employee mobility undermines incentives to invest in developing human capital in the workplace. For a variety of reasons, the pressure to underinvest in human capital is likely to be even more severe

than it is in other forms of intangible assets. Since firms do not own human capital, investments in it are accounted for as a cost; they are hidden in general and administrative costs. Bassi asked participants to imagine two firms: Firm A invests heavily in workplace education and training, while Firm B does not make similar investments. All that the analysts can see is that Firm A is a high-cost firm with lower current earnings.

Since data on human capital are not reported, it is difficult to produce evidence to support the theoretical argument that there is underinvestment. However, Bassi and a group of colleagues have been collecting data on investments in education and training for well over a decade, and the picture is becoming less murky. From an economic point of view, evidence of underinvestment has to indicate that a supernormal risk-adjusted rate of return is attributable to the asset. The easiest way to do this is to analyze publicly traded firms for which data exist. The research by Bassi's team has provided this evidence of underinvestment by revealing (1) very high wage premiums accruing to employees from even modest investments by their employer and (2) outperformance of publicly traded firms that (appear to) make the largest investment in human capital (education and training). Of course, past performance is no guarantee of future performance. With that caveat, Bassi presented data on a backward-tested portfolio and an actual portfolio of firms that make large investments in workplace education and training relative to the Standard and Poor's (S&P) 500. (Bassi's company actually runs investment funds around this idea of picking firms that make large investments in education and training relative to the S&P 500.) The top line in Figure 4-3 shows the significantly better performance for a set of high human capital investment firms.

As in Lev's example, Bassi pointed out a situation in which markets seemed to undervalue firms at the time investments are made—in this case, firms that are making large investments in education and training. An obvious measure to begin correcting this underinvestment would be to account for and report on these investments differently. Bassi's prescription would be to break out investments in human capital and report them separately, as is done for R&D, even if they continue to be accounted for as an expense. Lev showed that this is not sufficient to correct the underinvestment in intangibles in general, but it would be a useful first step.

Bassi concluded with three summary points. The first is that the unique nature of human capital—it is not owned by the firm—makes it more subject to underinvestment than other forms of intangibles. From a public policy perspective, human capital development is also very important to the quality of life and standard of living of employees. Second, the implications of this underinvestment are particularly problematic because of its impact on employees (as well as shareholders). Third, an important first step toward correcting this underinvestment is to modify reporting requirements to fully account for firms' investments in people.

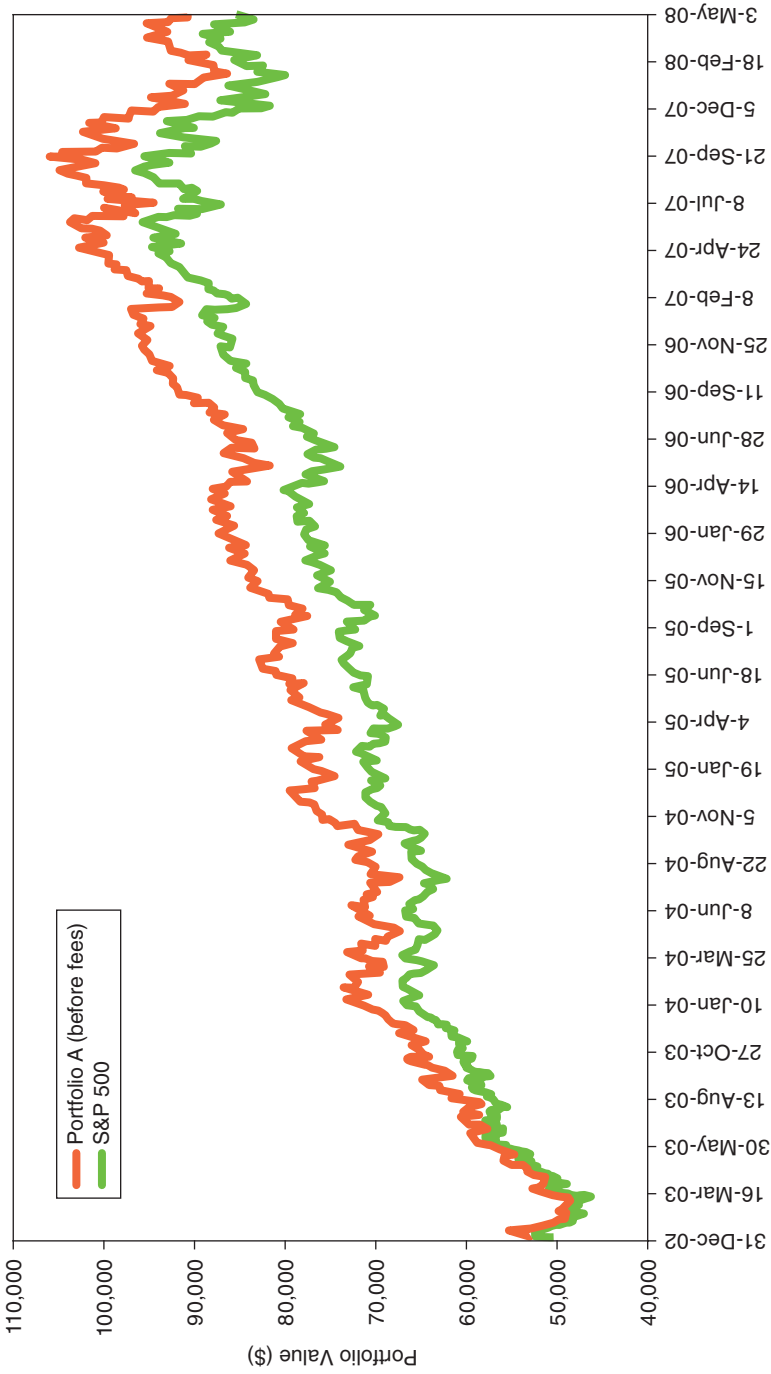

FIGURE 4-3 Growth of $50,000 invested on December 31, 2002, through May 3, 2008. Bassi Portfolio A vs. S&P 500 (before deduction of fees).
SOURCE: Workshop presentation by Laurie Bassi. Reprinted with permission.

4.3. INTELLECTUAL PROPERTY AND CAPITAL

Jim Malackowski spoke about intellectual property and intellectual capital assets, focusing on the emerging markets for patents. He made the point that assets related to proprietary innovation are, in some respects, the output of R&D spending and human capital development—the topics of the previous two presentations. Malackowski discussed four markets: the historical market of patent maintenance, the episodic price discovery of public auctions, global micro markets, and macro markets (intellectual property traded exchange). He pointed out that there is an active marketplace today for intellectual property and innovation, and that a form of it has existed for more than 100 years in the U.S. Patent and Trademark Office (PTO).

Patent Value

Patents are assets that are often not maintained for maturity—in fact, as Figure 4-4 shows, less than half are. Malackowski's partner at Ocean Tomo, Jonathan Barney, a practicing patent lawyer, has sorted through every decision that was made in the U.S. PTO from 1982 forward. He divided each of the millions of observations into two groups—one in which corporations and individuals maintained their intellectual property, and one in which they cast it aside and it became public information. As expected, the data showed that the more valuable the patent, the longer it was kept by the owner.

To substantiate this, Barney and his team used a large multivariate regression model to assign each patent an "IPQ" score, which objectively rates patent assets based on a set of metrics. The IPQ scoring system has a median of 100. As shown in Figures 4-5 and 4-6, patent assets with higher IPQ scores are statistically more likely to generate economic returns. IPQ scores are unique to each particular patent examined and are updated monthly. Typical metrics include such factors as number, length, and type of patent claim; amount and type of prior art cited; number of forward citations or references made by later-issued patents; presence or absence of limiting claim language; and patent prosecution history. Barney also asked a Fortune 100 company to select 200 patents at random and rank them from the most valuable in the market to the least valuable. He compared these results with the statistical output of the regressions and found similar results.

According to Malackowski, higher quality correlates with a higher probability of being licensed and commercialized—this relationship is shown in Figure 4-5. He pointed to three factors that give patents value and are reflected in a gross margin metric. Patents can allow a price premium to be charged if they lead to a unique product feature. They can also lead to cost reduction if they involve a proprietary machine or some other facet of the production process. Or, they can create a unique product altogether, thereby producing a market share apart from those of other companies. As shown in Figure 4-6, this contributes to an observed positive correlation between patent quality and gross profit margins.

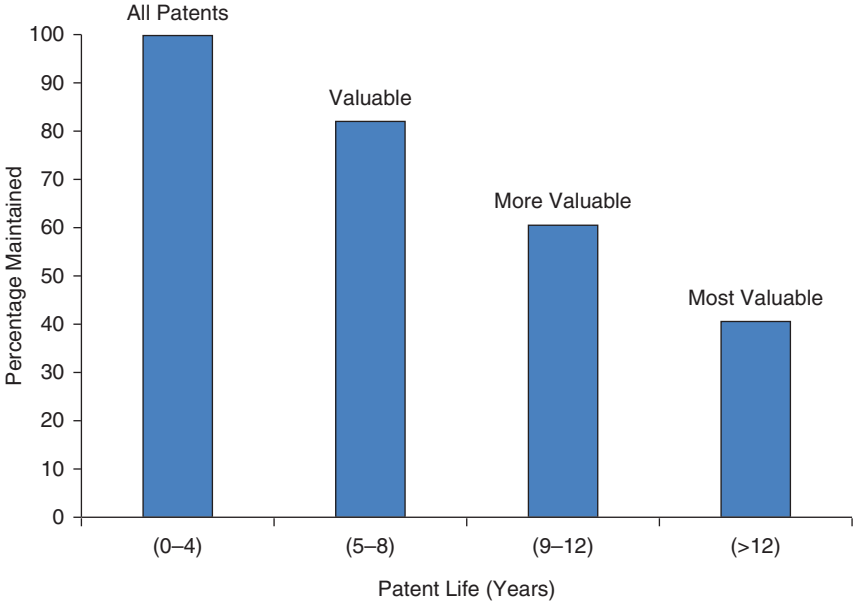

FIGURE 4-4 Average patent life.
SOURCE: Workshop presentation by Jim Malackowski. Reprinted with permission.

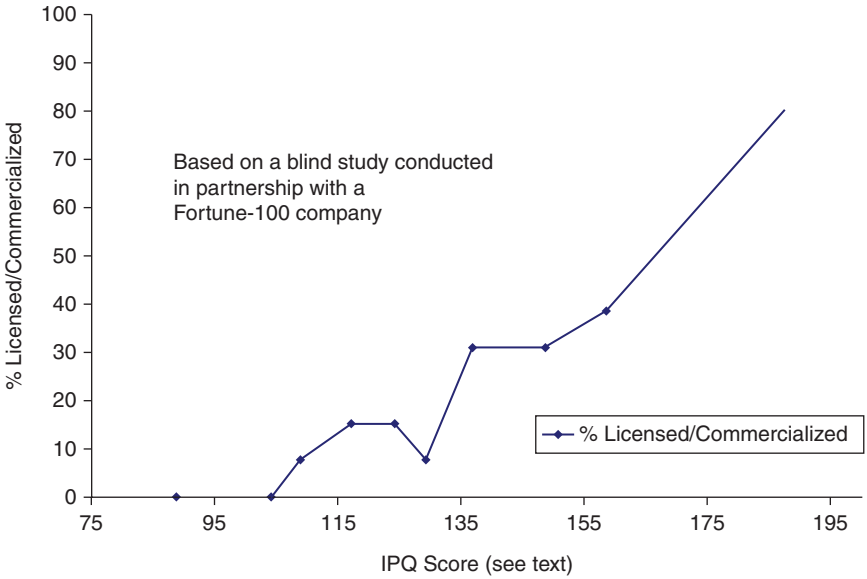

FIGURE 4-5 Patent quality and licensing and commercialization rates.
SOURCE: Workshop presentation by Jim Malackowski. Reprinted with permission.
NOTE: IPQ = Intellectual property quotient.

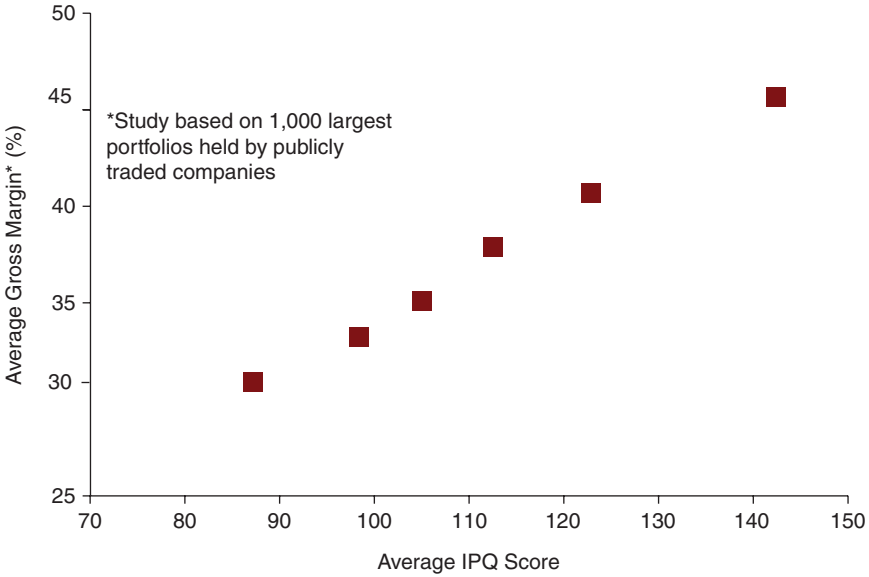

FIGURE 4-6 Patent quality and gross profit margins.
SOURCE: Workshop presentation by Jim Malackowski. Reprinted with permission.

Empirical observations like these led Ocean Tomo to engage in public auctions to sell intellectual property—patents, brands, and copyrights. The idea was to establish a price reflecting the value of intellectual property in the marketplace, just like a Sotheby's auction does for paintings, or Barrett-Jackson's auctions do for automobiles. After two years, the company has sold approximately $80 million worth of property at an average price of between $300,000 and $600,000 per patent. In Malackowski's view, this marketplace—though still episodic, happening three times a year—is clearly having some influence on people's understanding of the price for intellectual property (IP). Ocean Tomo sees a global market developing that applies not to just 80 lots or 100 lots of intellectual property in a given day, three times a year, but to the millions of patents and applications in the 81 issuing jurisdictions around the world. One way to scale the selling of intellectual property is through micro markets and a voice brokerage platform.

The fourth emerging marketplace Malackowski discussed was what he called a focused macro market. The company used its historical data to identify which patents ought to be auctioned and to learn where people want to transact; it then created these markets across the world using voice brokers and a web transparency. The website patentbidask.com allows people to look up any patent—and to see if there is a bid or an ask price on the patent—without registration or fee. It also allows users to see completed transactions.

Still, according to Malackowski, these direct transfers of IP rights are not where the real potential lies. This, he posited, is a traded exchange for intellectual property rights. There are four products that the Intellectual Property Exchange International (IPXI) is in the process of building and rolling out a January 2010 market launch. The first of the products is qualified equities. These are categories of stock that, as discussed above, can be shown to be IP-intensive and IP-rich by meeting certain standards. Those stocks will trade on the IP exchange.

Then there are the equity indexes. In 2006, Ocean Tomo began a series of public equity indexes based on the quality of a firm's patent portfolio. Malackowski presented data indicating that Ocean Tomo funds—which focus on companies that generate significant licensing revenue or earnings, that have high intellectual property value to total book value ratios, and that have intellectual property valued by an independent third-party appraiser in excess of $1 billion—have outperformed their traditional counterparts (e.g., S&P, NASDAQ, and Dow Jones).

Malackowski turned next to a product on the IP exchange called tradable technology baskets, which are based on the creation of financial futures contracts related to intellectual property. An illustration of these tradable technology baskets is shown in Figure 4-7. The middle line represents the statistical patent score of an actual company's portfolio of patents. It is relatively stable over time, increasing slightly. Like other financial futures contracts, the IP exchange will write a financial contract that predicts where that line will be in 12 months (the middle dot) or 36 months (the middle square). Based on this and other information, some traders will invest long because they think the index will outperform the square and the circle. Others will invest short if they think that the company will not meet the expectation. In this way, people can begin to trade in the intellectual property of a company, its patent portfolio, apart from its equity. The bottom line in the figure represents a patent portfolio related to a specific product belonging to the company. If it is a relatively recent product, one would expect to see the line rapidly growing. Here again, contracts can be created, but on a specific product portfolio. The top line represents the industry patent portfolio for the class of products for which, again, a market can be created.

Such a market would create for investors the opportunity to choose between owning traditional stock in a company or in its patent portfolio. For example, perhaps an investor in communications technology a couple of years ago knew that HD DVD would fail and Blu-ray would win and so would choose to go long on Toshiba but short on the HD DVD technology. In essence, what the tool allows is to begin to disaggregate IP value from the cloud of overall intangible value.

The last product identified by Malackowski to be offered on the IP exchange involves the emerging market for the issuance of license rights. As an example, Ford Motor Company has a patent related to engine valves; it is a technology for replacing old valves with new ones that allow either ethanol or standard fuel to be burned. If Ford wants to license its patent today, they must visit potential suitor companies around the world, spend months debating the patent's merits,

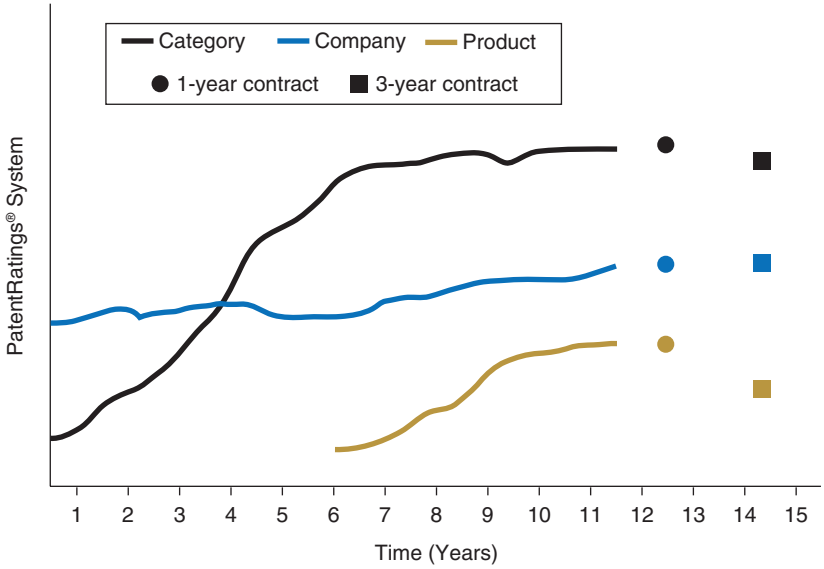

FIGURE 4-7 Tradable technology baskets (see text).
SOURCE: Workshop presentation by Jim Malackowski. Reprinted with permission.

and, if it is valid, whether or not they are infringing on other patents, etc. It is very inefficient commerce.

In the IP exchange of the future, Malackowski envisions that Ford will issue an initial public offering for a license transaction. It will go to the market with unit license rights to the product at various prices. If Honda wants to use this patent, it simply calls its broker and bids on a certain number of units at the corresponding listed price. If it has that contract fulfilled, it has the right to make x vehicles using the patent. If it does not use them all, it can put back what it does not use. Speculators can go long or short based on the quality of the technology. In this way, a process can be established to begin to monetize what is now a huge notional morass of cross-licensing. Malackowski concluded by reemphasizing that he sees real progress being made—real price discovery, a real global initiative, and ultimately an efficient way to transact these assets.

4.4. INSURING THE VALUE OF INTANGIBLES

Nir Kossovsky provided insights about valuing intangible assets from a finance management perspective. His presentation reiterated themes developed throughout the workshop. First, Kossovsky asserted that policies toward intangible asset management can make or break U.S. competitiveness and, in turn, the

economy. Second, from the perspective of his company, Steel City Re, intangible assets are the principal source of value and risk in global economies that are knowledge based. Kossovsky's presentation emphasized how risk informs his company in its practices of valuing intangible assets. He also raised a few policy ideas for consideration.

Kossovsky began by noting that financial statements, while they can be rich in information, do not fully convey the underlying value of a company; they do not always inform investors about the drivers of value and the sources and nature of risks. Echoing the message of Lev and others: One cannot manage what cannot be seen, and this affects the competiveness of U.S. industry and the efficiency of capital markets.

Intangibles—ranging from business processes, patents, trademarks; reputations for ethics and integrity; and quality, safety, sustainability, security, and resilience—are interconnected, and each piece builds enterprise value. This, Kossovsky noted, makes it difficult to put them in well-defined boxes as would typically be done in the accounting world; that is why they are called intangibles. Again, the iPod example illustrates this point. It is the design, the distribution system, the nature of the way music can be collected, and the reputation of the company to deliver innovative products that enabled that product to be so successful. If any single element had been missing, it might not have worked.

Kossovsky reported that, when Steel City Re queries a company (and its customers) about what intangible factors contribute to its value, reputation is prominently noted. Does the company have a reputation for managing its intellectual property and being innovative? Does it have a reputation for integrity, environmental sustainability, ethical sourcing, security, and resilience? When a company is building value, it creates business processes to drive these reputations. Kossovsky cited the Walmart example. Walmart is known for its supply processes. Pallets of products move from factories around the world, to shipping containers, to distribution systems, in a process that never stops. Its processes are typically faster and more efficient and effective than the competition, which translates into greater profits—their revenues are now around $367 billion, and the cost of goods sold is about $264 billion. That's a lot of goods bought and sold, and all they do is move things across the warehouse floor.

Kossovsky reiterated that, if a company manages its intangibles well, the markets will reward them. Looking at some 2,800 companies over 28 months, Steel City Re researchers found that the companies that are superior managers of their corporate intangible assets—their ethical reputation, their environmental sustainability, their quality, their integrity, perceived innovative and inventive, etc.—tend to outperform the market substantially. Companies ranking in the top 10 percent in the intangible asset management (reputation) index returned 19 percent to shareholders in the 28-month period ending February 2008. Those in the bottom 25 percent lost 29 percent. The median return for the broad market excluding dividends was –4 percent.

Companies with superior intangible asset management have higher gross margins because people want to buy their products; they will pay a little bit more for that cool product. Employees will work longer, they will not be as likely to quit, and they may work for less. Apple pays less than many of its competitors, indicating that people like working for the company for nonpecuniary reasons. The capital markets reward them because they have this forward-looking reputation; this is an example of a company with price earnings multiples that are higher because of superior management of intangibles. Their shareholders have a better understanding of what the company is doing, and, because of better information, their stock price volatility is lower.

Of course, there are counterexamples to Apple as well. If a company errs, the value associated with intangibles can be destroyed. One such example is ConAgra, a large industrial company that produces food items. A principal intangible that customers expect from food producers is safety (they expect that the food will not poison them—that is a requirement). In 2007, salmonella was found in the company's peanut butter, and it took a reputational hit. Class action lawsuits followed, $30 million was spent to pull products off the market, and there were no sales for half a year or so, which amounted to another $80 million of lost revenue. The company had to retrench and rebuild an entire product line because its intangible value, as a function of safety, was compromised.

Because safety is an intangible asset with tremendous value to companies like ConAgra, the firm remodeled its peanut butter manufacturing plant to much more rigorous standards. The effort appears to have paid off, as no ConAgra products were named in the more recent peanut butter safety crisis. For these kinds of firms, much of their book value is based on intangibles. Kossovsky estimated that 96 percent of ConAgra's trading value is based on process. That is a lot of faith in the company's behavior. When the market is disappointed in that behavior, faith is lost.

Kossovsky cited the RC2 Corporation as another example of lost intangible asset value. This company produces the Thomas & Friends brand wooden railway toys. In 2007, 1.5 million of the Tank Engine products had to be recalled due to lead in the surface paint. The market punished RC2: The recall cost the company some $28 million, and lost sales another $30 million. Sales for the first quarter of 2008 were down by 20 percent, with legal costs still pending. Overall, this company started out managing its intangibles very well. The markets were rewarding it with a high price-earnings ratio, and it had a very stable stock price. A premium was placed on its product. Then something in operations began to slip and, as a consequence, it was penalized. Mattel experienced a similar crisis. Millions of its Barbie doll toys—which account for around 80 percent of the company's bottom line—had to be recalled over several phases due to lead paint concerns. First-quarter 2008 sales of Barbie fell 12 percent, and the company recorded a net loss of $7 million versus a $10 million gain the previous quarter (Bloomberg). This was the first time in many years that the product produced a loss for the company.

Kossovsky closed by stating that policy goals should seek to advance the competitiveness of the U.S. industry by helping them create, manage, and protect intangible assets—particularly those that drive their ability to pursue ethical sourcing and environmental sustainability, quality, and integrity. The competitiveness of capital markets depends on transparency, controls, and forecasting, and tools are needed that help the markets understand where the value is coming from. Policies that increase information flow reduce volatility, reduce the frequency and severity of intangible asset impairment events, and lead to overall improved financial resilience and increased enterprise value.

4.5. REPORTING INTANGIBLE ASSETS TO ENHANCE THEIR CONTRIBUTION TO CORPORATE VALUE AND ECONOMIC GROWTH

The Financial Accounting Standards Board is the major standard setter for corporate reporting, not only for business enterprises but also for many universities. Its mission is to "establish and improve standards of financial accounting and reporting for the guidance and education of the public, including issuers, auditors, and users of financial information." Furthermore, the organization seeks to "improve the usefulness of financial reporting by focusing on the primary characteristics of relevance and reliability and on the qualities of comparability and consistency." FASB also develops broad accounting concepts as well as standards for financial reporting and provides guidance on the implementation of standards.

Ron Bossio described the organization's work on external financial reporting, its current projects and priorities, and made suggestions for ways to improve reporting of intangible assets. Much of FASB's work is directed toward providing decision-useful information through general-purpose financial statements, including notes to statements and other reporting mechanisms. The organization strives for standards that are neutral so that similar kinds of transactions are accounted for consistently and so that they apply to IBM, DOW Chemical, and New York University equally. FASB also seeks to improve the relevance of information for making investment, credit, and similar resource allocation decisions and to ensure that the information not only faithfully represents an entity's underlying economic resources, obligations, and changes in them, but also is comparable and understandable. The key users of external financial reporting information are investors and creditors, donors, and grantors of nonprofit entities.

Bossio noted that FASB is not the only player in this area. The SEC has a major role, particularly in areas beyond financial statements, such as management analysis and even note disclosure. They also serve the important function of signaling where harm can be created and bringing that to public attention. Another important player is the International Accounting Standards Board (IASB), based in London. A major initiative on FASB's agenda is to work with IASB to promote convergence of international accounting standards across countries.

In discussing external financial reporting requirements, Bossio distinguished between financial statements and financial reporting. There are clear limits on what FASB is currently capable of including in financial statements, given that measures must be verifiable and information credible; meeting these criteria can be especially problematic for "soft" items, such as internally developed intangible assets. Management discussion and analysis affords opportunities for reporting softer information outside financial statements and SEC requirements.

Bossio added that one of the problems with financial reporting is that so much emphasis is put on earnings and earnings-per-share metrics. Intangibles involve a payout now that depresses current earnings for a payback later. People inside firms, and investors outside them, do not necessarily have longer term visions; they may have quarterly pressure to deliver earnings now, not three years from now. The most problematic intangibles are those that are difficult to value as an asset. R&D at pharmaceutical companies may realize only 1 product in 10 as something that will be a hit in the market, and maybe another 1 or 2 that become moderate hits. Some of this gets lost in the aggregate measures, and the earnings-per-share metric is not necessarily the best way to anticipate future financial performance. Bossio noted that FASB has been wrestling with how to address calls for more detailed and more accurate disclosure about expenses, whether they are put on the balance sheet or not. Much of this, he said, comes down to whether something is classified as an asset or as an expense and whether there is liability or not.

Bossio cautioned that FASB will not be able to solve all of the problems of measurement and definition. The organization's current priorities are to work toward international convergence and joint projects with the IASB, the completion of codification of U.S. generally accepted accounting principles, and ongoing research and support activities under way in response to recommendations by the SEC advisory committee and its own valuation resource group. In December 2007, FASB and IASB considered whether to add a comprehensive project on accounting for intangible assets, including those that are internally developed. It was decided that this would not be pursued due to resource constraints. Although there will always be ongoing work to improve financial statement presentation—to better capture liabilities and equity, accounting for leases, earnings per share, income taxes, the conceptual framework, etc.—Bossio warned participants to not expect major improvements on accounting of intangibles to happen quickly in light of these recent priority decisions. In pointing a way forward, Bossio did deliver some good news. Investors, and others that FASB hears from, such as their user advisory counsel, are asking the board to develop a project on a disclosure framework. The disclosure framework may be a way to generate better information so that more accurate aggregate numbers can be produced; it may be a way to achieve more transparency about expenses or capitalized expenditures.

Bossio agreed with other participants that market players would benefit from improved financial statements. He acknowledged that the goals of the earlier

presenters—to develop better measures of spending on things like human capital and intellectual capital—are worthy. He pointed out, however, that there are still definitional issues to be resolved: What assets reside in the firm? What are the firms? What should be included as workforce or human capital? What are the assets of the firm? The conceptual framework is still developing in terms of these questions.

Another constructive move forward, though not a panacea, Bossio suggested, is the adoption of International Accounting Standard 38 (IAS 38). The objective of IAS 38 is to prescribe the accounting treatment for intangible assets that are not dealt with specifically in other international accounting standards. The standard requires an enterprise to recognize an intangible asset if, and only if, certain criteria are met. The standard also specifies how to measure the amount of intangible assets carried forward and requires certain disclosures about them.

Bossio also identified the issue of voluntary initiatives, which was raised earlier in the program by Lev. It might be possible, he suggested, to initiate progress on this front through an enhanced business consortium of financial executives, both domestic and international, that focuses on internal management reporting of key performance indicators, intellectual capital, management discussion and analysis (SEC and IASB), and inputs through the SEC advisory committee, the Financial Accounting Standards Advisory Council, and others. Managers and investors need to know what they are spending and what the payback is from that spending, and this kind of reporting has a place in a principles-based disclosure framework (such as that advocated by the Investors Technical Advisory Committee). If there is one direction that might be fruitful to push the board in, Bossio suggested, it might be to join the investor community in this area of voluntary reporting. There is potentially an opportunity to improve disclosures about the types of expenditures incurred—including, for example, costs for research, development, training, and branding—whether or not they are capitalized.

During open discussion, Lev noted that, historically, the development of financial reporting follows quite closely with what is reported in companies. However, in his view, if there is to be systematic improvement in information on intangibles for investors and for use within companies, the push must originate from outside. Although there are exceptions, the behavior inside companies has evolved as a by-product of financial accounting and reporting systems. Bossio noted that some companies are taking the initiative voluntarily to get better information on key performance indicators. Whether those will be haphazard or linked in a way that is structured has yet to be seen. And if businesses do not find their self-interest to be in managing, in developing their own strategy, in systematizing some kind of structured way to see whether they are performing against their own internal key drivers, then it is difficult to imagine that performance indicators will be successfully imposed on them by outsiders. Martin Fleming added that firms have to be able to see that the financial benefits to be gained by measuring and treating expenses associated with building intangible assets differently from

ordinary operating expenses outweigh any costs associated with disclosure of strategic information to competitors and regulators.

These points largely supported Lev's point that the leadership to improve the value of financial disclosure has to come from government agencies or those related to government. The key role of external forces has been evident historically. In the New York Stock Exchange of the late 19th century, there were no SEC regulations. The exchange pleaded with the CEOs of major companies to disclose their annual sales, but the response was the same as that heard today from managers with respect to other types of information: The disclosure will benefit competitors, it is costly, and it is not needed. And this is with respect to sales—nothing of importance was ever disclosed without having been required.

One participant pointed out that spending by companies on intangibles is hidden in income statements. If the information is disclosed in a separate statement of detail, as is done with other kinds of management information, it would go far in promoting an understanding of investment at the firm level. It would be powerful for companies to be able to see what they are spending on, say, training, relative to their peers in the industry. It would be in the firm's interest and also in the interest of analysts. Lev agreed with this assessment but noted that there are two aspects of disclosure: One is getting managers to disclose new information, and the other is standardizing the information—that is, making it comparable, which is as important as the first one. With respect to most intangibles, including R&D, there is little standardization.

Bossio followed up this point by noting that the chairman of the SEC has been pushing for the use of extensible business reporting language (XBRL) in an effort to get people to standardize data reporting electronically. A common taxonomy is needed; it is of little use if one firm calls a category one thing, and another firm calls the same category something else. XBRL will be helpful in getting data at a disaggregated level to conform to common definitions. Even if information is aggregate—such as cost-to-sales figures or on-the-job training within cost-to-sales—if it is tagged with a common definition, it may be possible to get useful data on expenditures, such as whether an asset is capitalized or expensed.

5

Intangibles and Government Measurement

An overarching theme to the workshop was that better information about intangibles is needed for firms to manage these assets efficiently and for policy makers to value them appropriately. It is also clear that the conceptual approach used in the accounting of intangible assets is likely to have a significant impact on measures of economic performance and growth. Many of the workshop's participants suggested that improvements in the accounting of and information about intangible assets could be effectively initiated and orchestrated only by government.

With this as the backdrop, a session was organized to sort through the priorities of the statistical agencies for collecting higher quality data on private investments in intangibles, as well as the size and composition of public investments, and incorporating them into broader measures of economic performance. Beyond the measurement issues, narrowly defined, presenters asked: What should the government do to encourage company creation of intangibles? What should be the government's role in creating or supporting more robust markets in intangibles? And, what are other governments doing in these respects?

Jonathan Haskel, who moderated the session, noted that inherent in this group of presentations were a lot of issues—about the redesign of research and development (R&D) and innovation surveys and better measurement of intangibles—that extend to European and other international contexts. The two speakers for the first government session were Steven Landefeld and John Jankowski, who spoke about developments at the Bureau of Economic Analysis (BEA) and the National Science Foundation (NSF), respectively. Earlier in the day, Brent Moulton provided details about BEA's R&D satellite account.

5.1. THE ROLE OF GOVERNMENT STATISTICS

Presenters throughout the day characterized the role and value of intangible assets, both to firms and industries and in terms of their macroeconomic implications. Similarly, the way that intangible assets are measured, or not, potentially has a significant impact on the statistics calculated and used for monitoring the performance of the economy. Rigorous measurement of intangibles can lead to improved accuracy of estimates of gross domestic product (GDP) and the ability to identify sources of economic growth.

Brent Moulton, in explaining the rationale for classifying expenditures on intangibles as capital formation, noted that economic theory strongly suggests that investment in such assets is similar to tangible investment in terms of its effect on reducing current consumption and increasing future output. Consistency in national accounting requires that assets with these shared qualities be treated analogously. As noted above, certain types of intangibles, such as computer software, are already capitalized in the national accounts. Although rents and royalties and the services output associated with knowledge assets are included in the economic accounts, the production of all knowledge assets is not.

The major thrust of Steven Landefeld's presentation dealt with the measurement challenges facing BEA and the priorities for confronting them to improve data on intangibles. In order to provide a sense of the magnitude of the issue, Landefeld first summarized preliminary results that have emerged from the NSF/BEA R&D satellite account (discussed in greater detail in the next section). Of particular note is the observation that the impact on the broader economy of R&D appears to be expanding: Between 1959 and 2004, R&D accounted for 5 percent of growth in real GDP, whereas, for the period 1995-2004, its contribution rose to 7 percent. If spillovers (the residual unexplained portion of growth) from R&D are, as research suggests, at least as large as the direct returns, this means that R&D may account for one-sixth of total factor productivity growth.[1] Landefeld cautioned that, while substantial progress in measurement has been made and preliminary results indicate an influential role for R&D in the economy, a number of questions are unanswered about these statistics and much remains unmeasured.

Next, Landefeld reviewed some of the data (see Table 5-1) from the research by Corrado, Hulten, and Sichel (CHS) that has specific implications for BEA's immediate programs. A portion of the capital spending itemized in the table is already captured in the national accounts (e.g., the above-mentioned software), and methods for handling additional components are being advanced in the satellite R&D accounts. Landefeld stated that the pieces that BEA is particularly interested in pushing further are nonscientific R&D (2b) and firm-specific investment (parts of 3b), in particular, human capital. For practical reasons, BEA does not plan to put significant effort into measurement of the brand equity arising from

[1]This figure is based on estimates from Jorgenson et al. (2005:38-39).

TABLE 5-1 A Broader Measure of Business Intangibles, 1998-2000 (billions of dollars, annual average)

Type	Total Spending	Comments on Evidence as Capital Spending	Capital Spending (included in NIPAs)
(1) Computerized information	154	Firms capitalize only a fraction of purchased software in financial accounts. Relatively little is known about the service life of software assets.	154 (151)
(2) Innovative property			
(a) Scientific R&D	201	Research suggests that scientific R&D yields relatively long lasting returns and is capital spending.	201 (16)
(b) Nonscientific R&D	233	Little is known about nonscientific research R&D, but a portion of new product development expenditures in the entertainment industry apparently have relatively short-lived effects.	233 (40)
(3) Economic competencies			
(a) Brand equity	235	Research shows that the effects of some advertising dissipate within one year, but that more than half has effects that last more than one year.	140 (0)
(b) Firm-specific resources	407	Research suggests that firm-specific training is investment. Spending for organizational change also likely has long-lived effects, but a portion of management fees probably is not capital spending.	365 (0)
Total	1,220		1,085 (205)
Percent of Existing GDP			11.7
Ratio to Tangible Capital Spending			1.2

SOURCE: Corrado, Hulten, and Sichel (2006b).

advertising (3a). BEA will leave it to researchers to figure out how this should be measured, and perhaps, at some point down the road, it can be addressed in the statistical agency context.

It would be controversial for BEA, as a statistical agency, to simply add an extra 2 to 3 percent to GDP based on these findings. That is a significant magnitude, and Landefeld said that the source data and methodologies for making such an adjustment will have to be examined under a microscope before BEA could even think about adding them to official statistics. One of the biggest jobs for BEA analysts and leadership is to arrive at a consensus methodology on which the experts and users (including policy makers such as the Federal Reserve) agree.

International Dimensions to the Measurement of Intangibles

Intangibles sold and transferred by multinational corporations to their overseas units are particularly difficult to track. Yet, as Landefeld noted, these assets are a key part of the scenario—R&D by multinationals accounts for over 80 percent of U.S. R&D—so it is essential that BEA work toward solutions to the measurement challenge. Multinationals are, by nature, oriented toward maximizing their global profits net of taxes, and their stock price will reflect those profits whether they are generated in the United States or elsewhere. Because companies are not typically required to repatriate profits, they may attempt to minimize their operation's taxable income and assets in high-tax countries; one way to accomplish this is to transfer intangible assets to operations in lower tax locales, such as Ireland or Switzerland. The incentive is to transfer the right to collect revenues from assets yielding royalties overseas. According to press reports, multinationals such as Microsoft have been able to dramatically lower their effective corporate tax rate worldwide in this way.

As Table 5-2 indicates, these transfers of intangible assets have been growing in importance over time. The percentage of receipts recorded by U.S. parent multinational corporations in the "tax haven" countries has risen from 13 to 38 percent during the 1977-2005 period. Similarly, U.S. direct investment in the same set of countries has gone from 19 percent in 1977 to 34 percent of the total in 2005. When one examines the rates of return to U.S. companies' investments overseas versus what foreign companies earn on their direct investments domestically, there is a considerable divergence, with the former earning much more overseas than what the latter earn in the United States. Landefeld offered the view that the rates of return on investments, risk adjusted, made by U.S. companies do not look too far out of line relative to what U.S. companies earn domestically. The more notable effect is what is happening to foreign earnings in the United States, which seem very low. Many researchers have suggested that a significant transfer pricing issue is probably at work.

This example raises the issue of how these assets should be treated given that they can often be used both overseas and in the United States where, in many

TABLE 5-2 U.S. Parent Companies' Receipts for Royalties and License Fees from Foreign Affiliates in Lower Tax Countries (millions of dollars)

	1977	1982	1989	2005
Belgium	104	149	326	580
Ireland	10	39	255	4,285
Luxembourg	2	1	5	91
Netherlands	107	166	633	1,589
Switzerland	45	83	255	4,160
Bermuda	2	10	4	(D)
UK Islands, Caribbean	0	0	0	(D)
Hong Kong	3	14	94	393
Singapore	10	24	151	2,278
Tax haven subtotal	283	486	1,723	13,995
Worldwide total	2,173	3,585	10,082	37,771
Tax haven share (percent)	13.0	13.6	17.1	37.1

NOTE: The table values are net of withholding taxes. (D) = suppressed to avoid disclosure of data of individual companies.
SOURCE: The list of low-tax-haven destinations for foreign direct investment is from Sullivan (2004); receipts data are from BEA.

cases, they were originally produced. This is as yet an unresolved measurement problem for BEA. The agency is working on getting the research and the empirical results right, but a reasonable consensus also needs to be reached among users with respect to the BEA methodology and to what needs to be measured. Given the complexity of some of these tasks, Landefeld cautioned against integrating results into formal statistics too quickly. People have suggested to BEA that, since it has produced R&D estimates, why not simply integrate them into the accounts and move on to the next set of intangible assets. There is still much work to be done—not just on the international aspect, but also on regional ones. When dealing with the idea of adding figures of this magnitude to GDP, BEA must be extremely careful that everything is correct and the methodology is correct, defensible to users, and can be consistently reproduced.

BEA Plans

Next steps for advancing BEA's agenda, both in the area of intangibles and elsewhere, will involve continued source data development and conceptual work. BEA will continue to move toward integrating the new version of the International Accounting Standards which, in accordance with the 2008 Revision of the System of National Accounts (SNA), the United States and all other countries are recommended to follow. The SNA revision also recommends that R&D be capitalized, an important first step if international comparability of macro data and

common accounting standards are to be achieved. Also in adherence with SNA recommendations, work will continue on integrating the productivity accounts produced by the Bureau of Labor Statistics (BLS) to create a crosswalk across data sets to identify sources of economic growth. Noting that this has always been something of a cottage industry, with outsiders doing much of the work, Landefeld expressed the view that it was time that the federal government begin to develop fully integrated sets of accounts.

Another major set of items on BEA's agenda is to begin implementing recommendations from the *Report on the Advisory Committee on Measuring Innovation in the 21st Century*, which was summarized by Cynthia Glassman at the workshop (see section 5.4.). That committee offered practical guidance on expanding data sharing, or data synchronization, between the statistical agencies (mainly BLS, the Census Bureau, and BEA).[2]

In order to promote further understanding of technological change and innovation, discrepancies that exist within the U.S. statistical system need to be reconciled. For example, the growth rates in productivity for computers over time appear very different depending on whether the analyst is looking at Census Bureau data or BLS data. This is true for many of the most rapidly growing industries, many in the service sectors, which are major users of technology. BEA, which must integrate data from both BLS and the Census Bureau, is, at times, essentially dividing apples into oranges. The output series is produced by the Census Bureau, and the input series is produced by BLS. Some of the discrepancies have to do with classification issues because aggregate output data often look virtually the same.

In a related initiative, also tied to recommendations by the innovation committee, BEA hopes to soon finish developing an integrated macro model of GDP and productivity; this will involve the joint publication by BEA and BLS of real GDP and multifactor productivity data. There have been ongoing efforts over the years with BLS to reduce the differences between various data series. Some of the problems are attributable to methodological differences across programs, which Landefeld is confident can be eliminated.

Landefeld expressed optimism that the relevant data sets could be synchronized and improved in other ways, since the key discrepancies exist for only about a half dozen industries. Fixler and Landefeld identified these in a paper prepared for an earlier workshop on data sharing (see National Research Council, 2006). Taking a hard look at the classifications systems reveals much of the problem. For example, because of their global approach to manufacturing, major U.S. computer manufacturers are sometimes classified as wholesalers rather than as manufacturers. This inconsistent classification of the activities of the computer

[2]See also National Research Council (2006), a summary report from a workshop held by the Committee on National Statistics on data sharing, for a detailed discussion of the goals of the statistical agencies on the topic.

industry creates problems for estimating this very important contributor to economic growth and productivity.

Another top priority for BEA, identified by the innovation committee, is to continue improving definitions and measures of output in the service sectors. Landefeld congratulated BLS on the superb job that agency has done to expand its coverage of the service industries. Only a decade ago, the producer price index covered only about 5 percent of services; it now covers them up in the 70 percent range. This is a huge improvement, but there is still a significant amount of work to be done. It will also be important to continue to improve annual measures of overall services activity in the United States. Currently, such an aggregate is produced only once every five years in conjunction with the quinquennial census. The Census Bureau is making good progress through their expansion of the quarterly and annual surveys of services and, with a little funding, the agencies may be able to take the final step to provide full coverage of the service sector in an ongoing fashion.

Another recommendation by the innovation committee is to link data from the existing NSF R&D survey to BEA and Census data on R&D conducted by U.S. and foreign multinational firms. The progress attained thus far has been made possible by NSF funding; Landefeld reported that there is a memorandum of understanding for an expanded project to combine data sources on R&D that will take advantage of each agency's relative specialization (BEA for large firms and data on R&D, and the Census Bureau on overall coverage of small- and medium-sized firms) to create a more complete and consistent set of estimates.

Landefeld also reflected on various ideas for expanding the measurement of intangibles, identifying candidates for an innovation account. For spending on scientific and engineering R&D, these involve further study of product and process innovation, developing more timely data and more frequent indicators, and collecting data on royalty and licensing fee receipts (as well as expenditures) and on associated capital investment expenditures. Landefeld also expressed the hope that someday better data and methodology would be available for the valuation of intellectual property. He agreed with Baruch Lev that developing an NSF survey geared toward such a measure would be a very interesting project. If standards can be developed that can be shared by industry and governments, it would go a long way toward getting the process started.

Continuing the discussion of potential expansions in the measures of intangibles, Landefeld identified expenditures on social science R&D related to new products and processes. For example, explicit subcategories could be created for product and process design and development for both industrial and artistic and entertainment areas. Additional areas for expansion, identified in earlier presentations as well, include employer spending on employee training and development, computer software, and investment in business models, such as inventory and distribution control systems.

During the discussion of business processes, the example of Walmart was raised, with Landefeld noting that he was not sure of the extent to which things like inventory control systems were being captured in the current data. Later during the workshop, a participant pointed out that there had been much discussion about human capital and knowledge capital, but less about organizational capital, yet the latter appears to be one of the more influential types of intangible assets. This involves not only the business processes of Walmart, but also the organization of work, talent, and training. Organizational capital theory suggests that much more is at work than simply information technology (IT)—such as how work and workforces are structured—in determining which industries and which companies succeed. Ideally, these factors would be measured at either the firm level or nationally or both. Kossovsky commented that some intangible process and systems factors are captured in net income measures because a company's cost of delivering its services is ultimately reflected therein. If a company is organized efficiently, if the workers are well trained and are working well together, if the IT systems link them efficiently together and the employees are pleased with their environment, and if there is less turnover, the cost of delivering the product will be lower and so the net income will be higher.

Landefeld concluded by reiterating the importance of collaboration between businesses and the national accountants. If the data being collected are not those that businesses have in their records, the project is, in his view, largely doomed to failure. BEA can make indirect estimates and undertake modeling to cover some of the transactions that are internal to the firm, but ultimately the goal has to be to take advantage of coincidental interests and reliance on business records for accuracy and consistency and minimization of respondent burden. Both government and businesses have an interest in consistent valuation of intangibles in terms of understanding growth for the firm as well as for the U.S. economy. Landefeld expressed optimism that all of the talking would ultimately lead to valuable data products, but he cautioned that it will be a long road.

5.2. THE U.S. RESEARCH AND DEVELOPMENT SATELLITE ACCOUNT

Brent Moulton presented an overview and results from BEA's work on an R&D satellite account, an effort that has been under way for about four years, with sponsorship from NSF. He began by identifying several conceptual challenges to improving measurement of R&D—challenges that are substantial but probably still simpler than those that will arise for some other categories of intangibles. Among these challenges are defining the unit of economic output, estimating R&D output price indexes, measuring depreciation and obsolescence, and dealing with the issue of the public good aspects of some R&D.

Price Indexes

Most R&D is done within a firm for its own use, which means that observable market prices for R&D output are not frequently available. This is, of course, problematic for price index construction. Even for cases in which R&D specialist firms sell custom products to other firms, a problem still exists because rarely is it possible to monitor the same unit across periods. Unlike a gallon of milk, which remains unchanged, R&D projects typically are unique, and so a standardized unit of measurement is not available. Even when prices can be observed, it is still difficult to construct a price index using traditional methods.

Moulton reported that BEA has considered several approaches to price indexing associated with intangibles. One option that is often used for nonmarket output is to simply look at the prices of inputs. This has the well-known problem that, when the value of the output is equated with the value of the input used to produce it, productivity change is defined away. If one of the main purposes of the R&D account is to generate insights into productivity, this is not a very useful approach.

BEA has pursued other approaches. In some cases, the price of the output is largely driven by the innovation that it embodies. For example, the value of a semiconductor chip originates from the engineering that has gone into it and very little from the physical inputs. This has led BEA to examine output price indexes for the goods that are being produced through the innovative activity. Another approach is to try to establish a measure of productivity for the relevant industry and then to augment the price of inputs based on a broad-based productivity factor. A fair amount of work has been done on the depreciation issue—by BEA and others—and, in Moulton's view, the results, while not perfect, have produced a good range of estimates.

During his presentation, Landefeld provided an indication of how price indexing results from the input- and output-based methodologies diverge, using the R&D example. Figure 5-1 shows two price indexes. The dashed line reflects input costs, which is probably not the right one to use; as noted earlier, it presumes zero productivity growth. The solid line shows an aggregate output price index constructed for 13 R&D-intensive industries and reflects falling prices of key inputs to R&D, most notably computers. This is what was used to deflate the figures in the 2007 satellite account update. BEA's theoretical research suggests that this was appropriate, although more empirical work is needed to examine the relationship between R&D's input costs and output prices.

Landefeld cited the example of the semiconductor industry (which has been studied by Ana Aizcorbe at BEA) to illustrate the complexities that the agency confronts in this research. The declining costs per unit of speed and, in turn, the declining price index for semiconductors are well understood. Complications arise when looking at the output price for semiconductors themselves because it is difficult to place the timing of when the R&D that led to improvements occurred. Relevant activities include not only those related to research to develop semi-

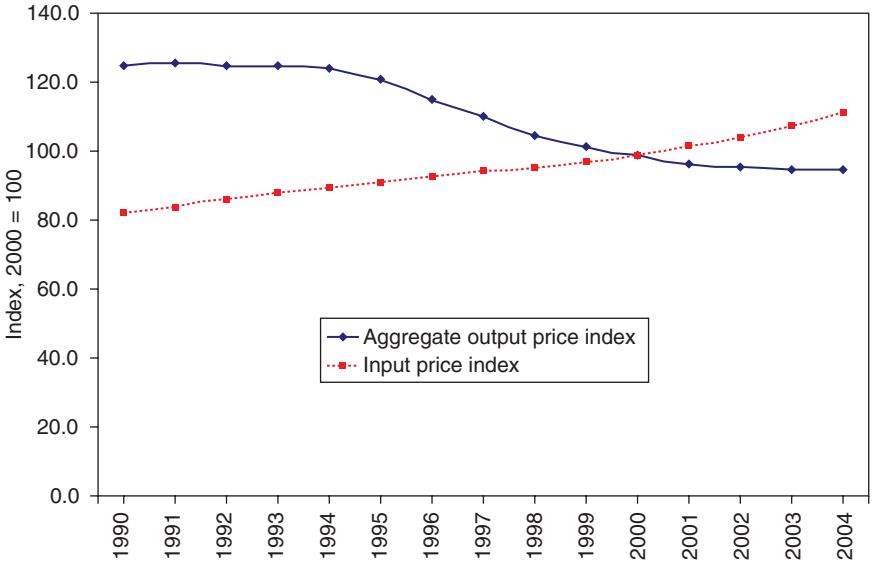

FIGURE 5-1 R&D price indexes.
SOURCE: Workshop presentation by Brent Moulton. Reprinted with permission.

conductors, but also the R&D of semiconductor manufacturing, which involves another set of people working to improve the equipment for that stage of the process. Over time, there has been a miniaturization of the equipment that makes the semiconductors, and development of faster and cheaper semiconductors is very much a product of R&D in both areas. Several feasible assumptions could be made about how these processes interact. Perhaps there is little market power on the part of, say, Intel, and, as a result, the market price that is being charged by the manufacturers of semiconductor equipment is fully captured. This is uncertain, however, and Landefeld articulated the need for more research in order to avoid potentially large misallocations of R&D across industries.

The public goods issue is particularly a problem for BEA as it looks at multinational corporations and also domestically for the regional accounts—GDP by state and so forth. As discussed above, a large multinational company that conducts R&D in the United States may transfer ownership of that R&D asset or that knowledge asset to a low-tax country. Microsoft, for example, has a large affiliate in Ireland, a low-tax country, that collects royalties from most of Europe. In this case, should the ownership be recorded where it was produced or in the country where it is legally owned? Or, since these are large multinational companies with subsidiaries throughout the world, should ownership be allocated among all of the countries where the asset is used? Similar issues arise in allocating R&D output

in industries that have establishments in many states. Each option—other than the legal ownership—is likely to involve some imputations.

Another option might be to allocate all of the ownership to one country and then to impute rentals. Some countries do charge their subsidiaries for R&D, but BEA researchers have found that, in most cases, those charges are not for use of existing R&D knowledge assets, but rather for ongoing R&D work—an overhead expense charge—which is less relevant. So internal company charges, which are not uniformly applied by companies at any rate, still probably are not conceptually what would be most appropriate to use when the goal is to measure a royalty for use of R&D within a company. These are a few of the issues that need to be resolved for this public good aspect of R&D assets, even within a single company.

Progress to Date on the R&D Account

Moulton provided some details of what progress BEA has made in the development of its satellite account. The starting point in the evolution of this work has been the NSF surveys, a valuable resource that provides over 50 years of consistent industry-level time series data on R&D expenditures. The focus of the data, which include such items as costs for employees, materials, and depreciation, is on physical and life sciences and engineering—scientific R&D.

Construction of the R&D accounts entailed the following steps: current dollar investment is estimated as the sum of input costs, which is the best dollar value available for now. Current dollar investment figures are then deflated (using an output price index constructed for 13 R&D intensive industries, described above) to produce measures of real investment. Using a perpetual inventory model, capital stock measures are created, calculated as cumulative R&D investment less R&D depreciation.[3] For government and nonprofit institutions, R&D includes a net return measure. On that basis, the experimental measure of GDP gets recalculated.

Moulton next presented summary results from the 2007 R&D account. As described above, scientific R&D has historically accounted for around 5 percent of growth in real GDP, although that figure has increased during the 10-year period of coverage beginning in 1995. In comparison, business gross fixed capital formation in commercial and all other types of buildings accounted for just over 2 percent of real GDP growth. The magnitude of the R&D numbers, as a portion of total real GDP growth, is comparable to those associated with major categories of tangible investment. In the satellite account, the contribution of R&D to GDP growth is almost as large as the measured contribution of computers. Figure 5-2 shows (in billions of current dollars) the addition to GDP attributable to changing

[3]Depreciation rates are based on average estimates from the literature ranging from 11 percent for chemical manufacturing to 18 percent for transportation equipment and manufacturing.

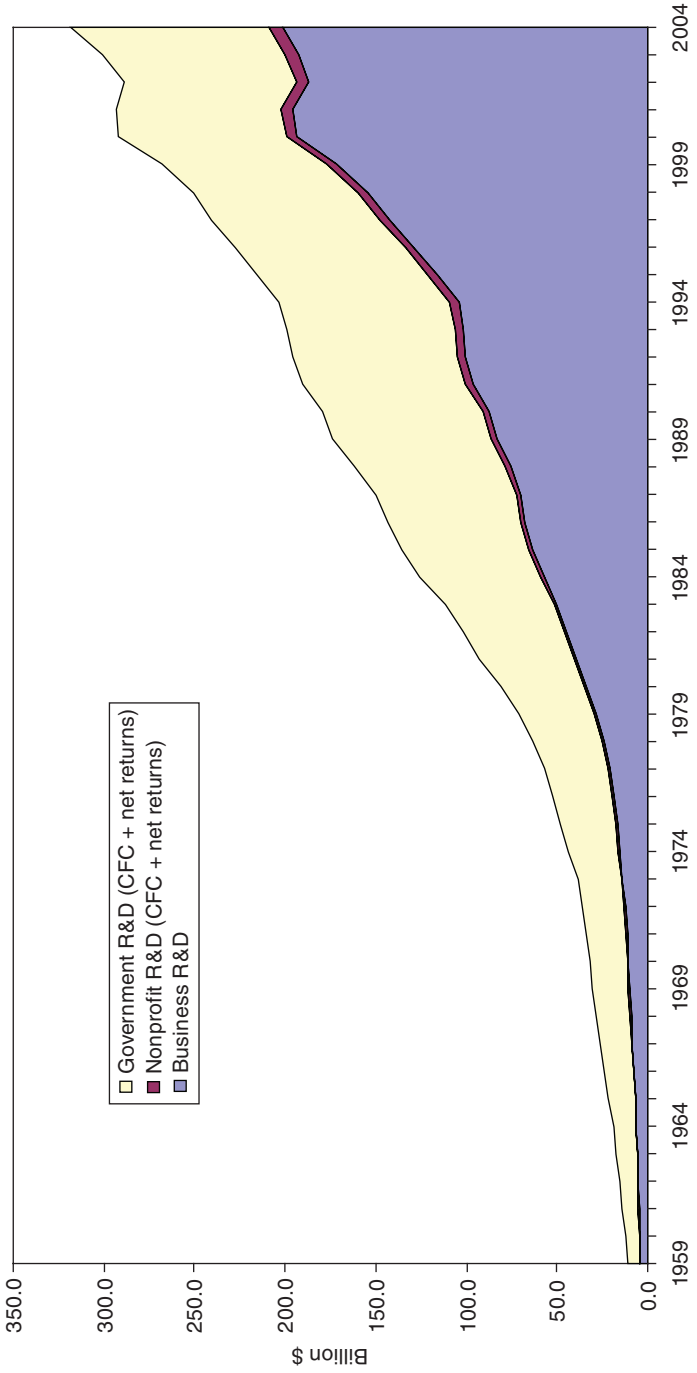

FIGURE 5-2 Addition to GDP from incorporating R&D as investment.
SOURCE: Workshop presentation by Brent Moulton. Reprinted with permission.
NOTE: CFC = controlled foreign corporation.

the treatment of R&D in the accounts to investment. Although, in the new treatment, business investment in R&D directly adds to GDP, the impact of government and nonprofit R&D is indirect as these expenditures are already included in GDP. The indirect effects derive from the creation of a stock of R&D capital for these sectors, which affects associated estimates for consumption of fixed capital and net returns. The medium-shaded area in the figure represents business R&D; the light shaded area is government R&D investment; and the thin dark-shaded area between the two is nonprofit R&D.

Over time, shifts have occurred in terms of where R&D activity is taking place. In 1987, pharmaceuticals accounted for 8 percent of business R&D spending; by 2004, they had grown to 20 percent. Aerospace was one of the four largest categories in 1987, but, by 2004, it had dropped out of the top five and been replaced by software publishing. R&D spending in the semiconductor and motor vehicle industries was large in both periods.

Table 5-3 shows how changes in the patterns of R&D spending influenced the output of particular industries. For some, such as pharmaceuticals, comput-

TABLE 5-3 Industry Impacts of R&D Spending: Average Percent Change in the Level of Value Added, 1987-2004

Pharmaceutical and medicine mfg.	38.4	Motor vehicles, bodies, trailers, and parts mfg.	45.5
Chemicals minus pharmaceutical and medicine mfg.	7.9	Aerospace product and parts mfg.	14.3
Computer and peripheral equipment mfg.	29.8	Other transportation equipment mfg.	4.1
Communications equipment mfg.	22.1	Software publishers	14.2
Semiconductor and other electronic component mfg.	25.7	Computer systems design and related services	2.4
Navigational, measuring, electro-medical, and control instruments mfg.	12.2	Scientific R&D services	12.7
Other computer and electronic products mfg.	9.1	All other industries	0.7

SOURCE: Workshop presentation by Brent Moulton. Reprinted with permission.

ers, and communication and semiconductors, changes in spending had a dramatic effect on the levels and growth of output. The data are extremely important for putting together a picture of how the economy is evolving.

Next Steps for the R&D Account

Moulton concluded by listing some next steps for the BEA satellite R&D accounting program. Both he and Landefeld noted that the top priority is to finish the work necessary to incorporate R&D in the national income and product accounts (GDP). If this is to be done and if the data are to be used by the Federal Reserve Board and others for policy making, then BEA will need consistent benchmark estimates of R&D, reasonable extrapolators for quarterly estimates, and capital stock estimates of R&D. BEA will also focus on further incorporation of R&D to the international, industry, and regional accounts. Moulton cited the need to build R&D into an input-output framework and to deal with problems in regional and international aspects of R&D as investment. More timely indicators need to be developed, so that they can be used for quarterly GDP estimates.

In terms of long-term expanded measures of intangibles, BEA will be working to produce a framework for a satellite account that includes social science R&D, human capital, business models, and firm-specific R&D. Landefeld stated that, by the end of 2009, the agency will have produced a blueprint for this broader intangibles project (Aizcorbe et al., 2009).

In expanding the measures of intangibles for an innovation account, several candidates exist. For R&D, BEA will examine product and process innovation, receipts (royalties and license fees), as well as expenditures, associated capital investment expenditures, and, someday, valuation of intellectual property. Moving beyond scientific R&D, next steps include expanding the sample frame and adding explicit subcategories for (1) industrial product and process design and development and (2) artistic and entertainment product and process design and development. During the discussion, Corrado encouraged Moulton and BEA to include the financial services sector as an area for future investigation, along with industrial design and entertainment. BEA could also expand human capital measures to capture employer spending on employee training and development. These areas, according to Moulton, represent some of the more feasible and productive next steps for the agency's work on innovation.

5.3. R&D AND RELATED DATA COLLECTIONS OF THE NATIONAL SCIENCE FOUNDATION

John Jankowski spoke about the work of the NSF Research and Development Statistics Program on improving measurement of R&D activities in the economy. The Division of Science Resources Statistics (SRS) fulfills the legislative mandate of the National Science Foundation Act to "provide a central clearinghouse

for the collection, interpretation, and analysis of data on scientific and engineering resources, and to provide a source of information for policy formulation by other agencies of the Federal Government."

With such a broad mandate, SRS is involved in a range of activities to enhance the comparability, scope, and availability of R&D and related data. Among these are

- redesigning the industry R&D survey;
- redesigning the academic R&D survey;
- improving two surveys of federal government funding of R&D (a panel of the Committee on National Statistics was convened to explore issues and new approaches for survey improvement);
- continuing a new state government agency R&D survey, for which data collections were conducted for 2006 and 2007 and will be conducted periodically in the future;
- expanding the research facilities survey of academic and biomedical facilities to include, among other things, expanded data collection on cyberinfrastructure;
- developing a nonprofit R&D survey, which is in the very early planning stage;
- exploring innovation data collection possibilities from very small firms (1-4 employees);
- continuing work on the R&D satellite account—the joint work with BEA discussed by Landefeld;
- linking NSF's business R&D data with BEA data on foreign direct investment; this will include U.S. firms' international R&D activities and foreign firms' R&D activity in the United States by state and industry; and
- planning to add R&D and innovation-related questions to other surveys, such as the Kauffman Firm Survey (third follow-up) and the Census Company Organization Survey.

Jankowski focused his comments on initiatives that the agency has taken in terms of collecting information on R&D, particularly the redesign of its industry and academic R&D surveys. The rationale for why the surveys need to be redesigned can be established by observing the changes that have taken place in the business R&D context over time. During the 1950s, government was the largest source of R&D expenditures, and it was domestically focused; business is now the largest spender, and the context is global. A half-century ago, business was the largest performer of basic research; now the largest performer is academia. And, as emphasized throughout the day, the past 50 years have seen the transformation from a manufacturing economy populated with large companies dominating R&D to an economy driven by a service sector in which large companies are not as dominant in the R&D picture.

Although perhaps not quite as pronounced as these trends, a number of changes have taken place among the academic enterprises conducting R&D. The federal government has always provided the bulk of funding to universities for R&D, although the relative share has declined, and the amount of cost sharing that the universities provide has grown substantially. Collaboration has grown with universities along with the extent of multidisciplinary and interdisciplinary research. In addition, interest has grown in the commercialization of academic R&D,[4] at times controversially, as when pharmaceutical companies farm out drug development to academic researchers who also have a financial stake in the outcome.

The Survey Redesign Process

Jankowski stepped through what NSF does when it embarks on a survey redesign. Perhaps most importantly, the agency seeks extensive input from the data user community that establishes a prioritization of activities. Expert panels—which typically include such people as vice presidents or heads of research for major universities or corporations—are convened and data user workshops are held. The process may involve surveys of record-keeping activities, cognitive interviews, and a number of other activities to understand what the available data mean and what gaps need to be filled. SRS also collaborates with other government agencies, such as BEA, to identify what can be done to provide data that will be helpful in the execution of their missions. Once data needs have been identified, SRS then focuses intense efforts on identifying data sources and establishing data availability. If data are not available, work then begins to establish what might be reasonable proxies for some of the variables of interest.

The first survey described by Jankowski is the industry R&D survey, an annual collection of industrial (manufacturing and services) R&D expenditure data that has been conducted since 1953. Data collection and tabulation have been carried out by the Census Bureau since 1957. The survey, conducted with a pledge of confidentiality, includes all for-profit R&D-performing companies with five or more employees, which are surveyed at the company level (as opposed to the establishment level). The annual sample includes approximately 32,000 firms. The overall unit response rate (in 2006) was 77.5 percent; the top 500 R&D performers responded at an 89.2 percent rate. Two different forms are used—a standard length typically used for the known R&D performers and a short version for smaller companies with unknown R&D status. The survey includes five

[4]Legislative actions have encouraged some of this. The Bayh-Dole Act of 1980, for example, enabled universities and small businesses to patent discoveries created by research sponsored by government funding (mainly the National Institutes of Health) and then to grant exclusive licenses to drug companies. Prior to this legislation, although individual agencies still had a variety of agreements with universities, taxpayer-financed discoveries were in the public domain and therefore available to anyone who wanted to use them.

mandatory response fields: total and federal R&D, sales, employment, and R&D by state. All items are mandatory in economic census years.

Data are collected through extensive company contacts who provide information about what data companies have and how they get the data. Record-keeping and environmental scanning interviews are conducted to find out what information companies track in their records. NSF has conducted 5 rounds of cognitive interviews with more than 100 individual companies. Interviews are done with accountants for financial sections of the questionnaire, human resources representatives for the employment section, R&D managers for technical aspects of the activities, and legal experts for intellectual property and technology transfer information.

Jankowski cited several lessons that have been learned from interacting with companies during the R&D surveys. Perhaps most obviously, not all of the data that policy makers and researchers may want are knowable. And, for what does exist, different types of data are stored in different parts of the company, and no single person typically has direct access to all of the data. This means that getting the survey to the correct, most informed respondents in the company for specific topics is crucial to the task of obtaining the right data. In addition, questionnaire development requires contact with a variety of companies and the input from a variety of subject matter experts.

The structure of the business R&D survey reflects this learning process. Because the survey content covers a range of topical areas and requires data from multiple parts of the company, NSF/SRS has structured it into the following separate sections:

- financial measures of R&D activities (R&D expense in accounting terms),
- financial measures of R&D funded by others (not classified as R&D in accounting definitions but is R&D performance),
- nature and technical aspects of R&D,
- R&D employment data, and
- intellectual property and technology transfer.

Content of the New Business R&D Survey

Jankowski stepped through a description of the content of the new version of the business R&D survey, which will be sent out to about 40,000 businesses. A new set of initial check-off questions will be included that are geared toward gaining a sense of the role of innovative activities at the firm. These will ask about any introduction of new or significantly improved products (good and services) or of new or significantly improved processes over the past couple of years and about any patent and intellectual property licensing activity. Firms not engaged in R&D or funding R&D will be able to set aside the rest of the questionnaire;

this in itself will generate some useful information about the patterns and extent of innovative activities. The heart of the questionnaire will collect information on the financial measures of the R&D activities. Many of the components of the upcoming survey, which are listed in Box 5-1, are new or expanded.

One question that arose several times during the workshop is the extent to which the statistical system and the R&D survey specifically would pick up expenditures on design innovation, such as Apple's investment in the iPod. Jankowski reported that NSF's expert panel was asked about this. Although there are some exceptions—perhaps financial services—the consensus was that design expenditures largely should be in the R&D totals reported on the survey. That said, he emphasized that the question needs detailed investigation and that, for a specific example such as the iPod, there would need to be much more granularity about what exactly is being included in various categories. He also noted that some firms may report R&D and design activities separately in their filings to the Federal Communications Commission, but that is not necessarily the way it will be reported on their R&D survey. In some cases, there seems to be considerable expansion of what is being counted as R&D in the annual reports beyond the more narrow definitions of R&D as defined by the Financial Accounting Standards Board (FASB) and definitions used in the NSF/Census Bureau survey.

Participants commented about categories of innovation that could be candidates for further investigation. The point was made that most R&D is in fact design and development. If one were to ask engineers and the people in corporations who manage them what they do, they would be likely to respond that they conceptualize and design first at very general levels and then at increasingly detailed levels. The real question about something like the iPod is where does design become product styling, as it used to be called. Whatever the industrial design or the styling is, it will typically only account for a fraction of the expenditure involved in bringing a product to market. One participant pointed out that, for the iPod example, another element of innovation is the business model itself. The entire retail distribution industry of music—and now, more broadly, video and other types of entertainment—has changed. In some cases, it is not just a product innovation that may be important to track and measure, but also a much broader series of innovations that change the flow of economic revenues through the course of a number of different industries.

Jankowski and Landefeld agreed that, because these are significant components of innovation, it is important that NSF continue to enlist expert panels from industry to move forward with the collection of data. In fielding these questions, Jankowski reminded participants that R&D funding is not the same thing as innovation funding and that business model innovation is, by design, not part of the current survey. This is not to say, he continued, that it would not be valuable at some point, but it is not part of the current effort. Similarly, the SRS team has not talked to companies about looking at marketing or advertising. In fact, in order to be consistent with what FASB includes, Jankowski reported that they would be

BOX 5-1
Business R&D Survey Content

Financial Measures of R&D Activity
- Detail on domestic U.S. R&D and on worldwide R&D activity (NEW)
- Company R&D expense
- Includes social science R&D (NEW)
- "Business segment" (i.e., below the company level) (NEW)
- U.S. state location and country location (NEW)
- Type of expense (wages, materials, etc.) (EXPANDED)
- Outsourced R&D by sector (universities, other companies, etc.)
- Detail on domestic U.S. and worldwide sales and revenue (NEW)
- Capital expenditures for R&D (buildings, software, equipment) (NEW)
- Projected R&D expense

Measures of Company R&D Activity Funded by Others
- Funds for global R&D activity as well as domestic U.S. activity (NEW)
- R&D funded by others
- "Business segment" (i.e., below the company level) (NEW)
- U.S. state location (NEW)
- Type of expense (wages, materials, etc.) (EXPANDED)
- Associated with single largest R&D project (NEW)
- R&D performed for others under grants, contracts, or other agreements (NEW)
- Type of organization (other companies, federal government, state and local governments, others)
- Foreign vs. domestic organization
- Cinical trials and the production and testing of prototypes

careful to encourage companies to ensure that they specifically exclude money spent on market research.

Business R&D Survey Timeline

At the time of the workshop, NSF/SRS had fully developed the survey questionnaire using the interactive process described above and submitted the package to the Office of Management and Budget (OMB) for approval. Final cognitive testing took place in summer 2008. The plan was to launch the full-scale pilot of the redesigned survey in January 2009 and to send it to 40,000 companies, to collect data for 2008. Following the guidance of their industry panel and that of OMB, respondents receive a guarantee of confidentiality, and the survey is mandatory. During calendar year 2009, NSF/SRS will evaluate survey operations and analyze the pilot data that are returned so that, by January 2010, the questionnaire

Measures Related to R&D Management and Strategy

- Share of R&D
  - Devoted to new business areas for the company (NEW)
  - Involving science or technology new to the company (NEW)
  - Science or technology that is new to the market (NEW)
  - Spent on research versus development
  - Devoted to specific application areas (health, defense, energy, etc.) (NEW)
  - Devoted to specific technology areas (EXPANDED)
- Counts of R&D projects (NEW)
- Number active and number started
- Number moved from R&D into production or marketing
- R&D partnerships (EXPANDED)
- Sector (universities, companies, government)
- Type of organization (customer, vendor, competitor)

Measures Related to R&D Employment

- U.S. R&D headcount and worldwide R&D headcount (NEW)
- Occupation (scientists, engineers, technicians, support) (NEW)
- Gender and level of education (NEW)
- U.S. R&D employees working under a visa (H-1B, L-1, etc.) (NEW)
- R&D full-time-equivalent counts

Measures Related to Intellectual Property and Technology Transfer (NEW)

- Patent data (counts, external sources, foreign filings) (NEW)
- Licensing to outside parties (NEW)
- Importance of types of intellectual property protection (NEW)
- Participation in specific technology transfer activities (NEW)
- Importance of types of intellectual property protection (NEW)

can be revised in advance of the official survey to collect 2009 data. By December 2010, the Census Bureau plans to deliver the 2009 survey data to NSF, in time for production of the *Science and Engineering Indicators: 2012*.

Jankowski reported that future plans call for possibly adding new/rotating modules to the survey—for example, for other innovation categories and for key industries and industry segments, such as financial services and pharmaceuticals. In addition, they may develop a pilot survey of firms with 1-4 employees to identify innovative activities. And the survey content, methodology, and processing will be continuously reviewed and updated.

NSF Academic R&D Survey

Jankowski provided a brief overview of the agency's academic survey. The survey is a census of all universities and colleges in the United States that con-

duct at least $150,000 of R&D annually; since this is a small threshold level, it includes essentially all R&D-performing universities (about 680 institutions). The survey has been conducted annually since 1972; the web-based version is now used by 99 percent of respondents. It is a voluntary survey, but response rates are regularly in the 95-98 percent range. The survey requests information on expenditures for all separately budgeted R&D performed at the institution during the previous fiscal year. Data are published at the micro (institution) level, which allows for peer comparisons (something that cannot now be done with the industry survey). R&D expenditures are recorded in the following categories:

- source of funds (federal, state/local, industry, institution, other);
- character of work (what percentage is basic research?);
- field of science and engineering (S&E);
- federal agency sponsor and S&E field;
- amount expended on research equipment, by S&E field;
- amount passed through to subrecipients or received as a subrecipient; and
- non-S&E field.

Recently, NSF brought together data users for a survey redesign workshop. Expert panels were convened to discuss what should be collected and what is possible to collect. The top data needs identified were to expand coverage to academic technology transfer activities, academic and industry collaboration, and interdisciplinary or multidisciplinary research. The panels recommended the following:

- including non-S&E R&D in the totals for institution rankings,
- collecting data separately for medical schools,
- capturing all sources of funding by field, and
- collecting data on interdisciplinary R&D and emerging fields.

Furthermore, the panels recommended collecting (if feasible) data on foreign sources of funding, R&D collaboration, proposals and awards, technology transfer activities, and R&D personnel.

As with the business survey, NSF has efforts under way to improve the academic survey by way of redesign. Based on findings from 15 institutional visits, SRS has found a demand to expand the number of funding categories in the questionnaire; for example, nonprofits as a source would be added. Clinical trials in R&D, which are currently excluded, will be added. And information on all sources of funding (including foreign)—not just total and federal—will be requested for all fields. A major objective is to be able to determine how much industry funding is for specific fields, such as engineering or biomedical research.

Jankowski also noted that fields of coverage need to be updated and a question on interdisciplinary research added. He was not overly optimistic about that happening soon. The survey also requests some minimal information about R&D faculty and other personnel, as well as R&D proposal submissions. Findings from the institutional visits also revealed a demand to add a small module on technology transfer activities, and information on total R&D expenditures by cost categories (salaries, indirect costs, equipment, supplies, etc.) to address some BEA data needs. At the time of the workshop, NSF was in the fairly early stages of putting the new questionnaire together. The goal is to go through the stages of development, similar to those for the business survey, to pilot the survey with 40 institutions in the fall of fiscal year 2009, and to be able to launch the redesigned survey by fall 2010 to collect fiscal year 2010 data.

5.4. ADVISORY COMMITTEE ON MEASURING INNOVATION IN THE 21ST CENTURY

Cynthia Glassman spoke about a focused government effort directly relevant to the workshop topic: a major initiative to develop a comprehensive set of measures of innovation in the economy by the secretary of commerce's Advisory Committee on Measuring Innovation in the 21st Century.[5]

The advisory committee was established in September 2006 in response to Secretary Carlos Gutierrez's concern that measures of innovation for the economy were inadequate. Consisting of 10 chief executive officers (CEOs) and business representatives and 5 academics, "it was meant to be practical rather than theoretical." Carl Schramm from the Kauffman Foundation served as chair.[6] The advisory committee's charter stated that it would advise the secretary on new or improved metrics to improve understanding of how innovation occurs in different sectors of the economy, how it is diffused across the economy, and how it impacts economic growth and productivity. Glassman noted that the initiative was never intended to establish a magic number—for example, that "innovation was X this year, and Y the next year." It would be great if that were possible, she added, and maybe some day it will be, "but we are not there yet."

First, Glassman described the committee process, which influenced the manner in which its recommendations were developed: Prior to the first meeting, Glassman and her staff met with committee members individually to

[5]The final report of that committee can be read at http://www.innovationmetrics.gov/.

[6]Business members were Steve Ballmer, Microsoft Corporation; David L. Bernd, Sentara Healthcare; James Blanchard, Synovus Financial Corp.; George Buckley, 3M; Art Collins, Medtronic; Michael Eskew, UPS; Luther Hodges, Jr., Phoenix Associates, Inc.; John Menzer, Walmart; and Samuel J. Palmisano, IBM Corporation. Academic members were Ashish Arora, Carnegie Mellon University; Rajesh Chandy, University of Minnesota; Kathleen B. Cooper, Tower Center for Political Studies, Southern Methodist University; Dale W. Jorgenson, Harvard University; and Donald Siegel, University of California at Riverside.

understand how, in their view, innovation occurs and their ideas for measuring it. CEOs reported that the culture within organizations and their willingness to accept failure and to take risk were very important to how innovation happens in their companies. Drivers of innovation, as well as regulatory impediments to it, were discussed. Glassman noted that the interviews did not produce much information about how the companies measure innovation. There was no consistent measurement methodology across firms, although some consistent themes emerged.

One theme was that companies tended to assess their innovation, at least to some extent, based on some concept of market share. If they were growing, and if the industry whose market they were in was growing, that was viewed as an indicator that efforts to innovate had been successful; again, there was no specific measurement of that, only a basic concept. Another theme that was voiced sounded something like a "vitality index." It was called different things by different respondents but, basically, it is the percentage of growth, revenues, sales, or whatever was relevant to the firm, attributable to new innovative activities over the past three to five years. The committee's definition of innovation referred not only to products, but also to services, organizational structure, marketing, and processes—whatever it was that companies did that was new and different and that resulted in an increase in performance, however defined. The fact that no concrete or systematic measure of innovation was uncovered made the committee's task all the more challenging.

Glassman reported that the committee's first meeting, held in February 2007, involved discussions of data gaps and potential recommendations, building on what had been gleaned from the pre-meeting conversations. The committee then requested public comments on its charge and more generally on ideas germane to the measurement of innovation, which resulted in submissions by 34 individuals and organizations (see the above cited website). The first meeting was followed by another round of phone calls with individual committee members to discuss what had been learned during the meeting and from the public comments and to identify potential key issues that the recommendations might ultimately address. A second public meeting was held in September 2007. The final report was drafted and circulated and then made public on January 18, 2008.

In laying out key themes and guiding principles for measuring innovation, the committee recommended that measures be practical and relevant and that input required for their construction should impose a minimal burden on institutions and businesses. It also became evident that not all the measures could be quantitative and that there were some qualitative issues that justified some attention and were relevant.

Three sets of recommendations emerged—one for government, one for the private sector, and one for researchers. The recommendations for the government occupied the largest portion of the report. The first was to create a formal framework for identifying and measuring innovation in the national economy. This

included developing annual industry-level measures of total factor productivity by restructuring the national income and product accounts.

In addition, it was recommended that a supplemental innovation account be created for the national income and product accounts to expand the categories of innovation-related inputs. The purpose here was to broaden some of what BEA was already doing—specifically, the agency's satellite R&D account—to include other aspects of innovation. Other recommendations specified the need to improve service-sector data, increase survey coverage, and improve measurement of intangibles, particularly intellectual property, by building on the work that has been led by NSF. Other recommendations for the government were to better leverage existing data and linkages, including synchronization among the statistical agencies. Glassman noted that most data synchronization efforts will require legislation beyond that specified in the Confidential Information Protection and Statistical Efficiency Act of 2002.[7]

The committee also recommended increasing access to data to facilitate more robust cutting-edge research, including fostering the work of data tagging. Data tagging, something that the Securities and Exchange Commission (SEC) has been promoting, involves the use of extensible business reporting language (XBRL), a standards-based system that allows software vendors, programmers, and others developers to enhance the creation, exchange, and comparison of business reporting information. XBRL improves the ability of the SEC and others to use data that companies file in a way that enables better analysis and research across companies and over time than can be done with the current flat files that the reports now come in. The SEC is pushing this idea, and some companies, including Microsoft, are already reporting in XBRL (as recommended in National Research Council, 2007).

The committee also suggested that work continue toward development of a national innovation index, although the group thought that it was premature to do this now. The committee also supported funding to implement its recommendations. Responding to a question during discussion, Glassman noted that the committee examined existing innovation indicators, such as those that have been used by the Organisation for Economic Co-operation and Development, Eurostat, and Canada, in trying to work toward international comparability. In fact, the committee explicitly recommended that work continue to develop consistent, if not identical, measures as other countries.

Moving beyond government, the committee issued guidance on how businesses could help with innovation measurement. The guidance involved essentially two recommendations: one is to create firm and industry-level measures of innovation and develop best practices for innovation management and accounting. An important contribution of the committee was to raise the consciousness of the

[7]See National Research Council (2006, 2007) for detailed discussions of the Confidential Information Protection and Statistical Efficiency Act of 2002, and of ways in which it could be expanded to improve business statistics through data sharing and greater agency program coordination.

community of stakeholders about the importance of measuring innovation. Much work has been done on a variety of aspects of measuring intellectual property, valuing patents, rethinking the financial reports, and a whole range of issues, to which the committee called attention, raising awareness of the importance of innovation itself and the need to measure it. The other recommendation for businesses is that they participate in research activities themselves and make innovation information available to outside researchers.

On the research front, the committee recommended further work aimed at identifying and assessing innovation outcome measures. Thus far, measures of innovation have emphasized R&D, patents, intellectual property, and other inputs—all very important—but the committee recommended going further to focus on innovation output and how that affects the economy. The committee also recommended that researchers work to identify gaps in innovation data and how they might be filled, analyzing relationships between innovation activities and collaboration, innovation performance, and firm performance.

One of the concepts that was raised by both the academic and business members of the committee, as well as in the public comments, is the importance of collaboration—within the firm, between innovators and the producers, among firms, and between companies and the government and companies and researchers globally. Collaboration, though very difficult to measure, seems to be important, in the view of many.

Glassman reported that, upon publication of the final report, the secretary of commerce asked BEA to work with BLS to provide a comprehensive accounting of the effect of high-tech goods and services on growth and productivity. BEA plans to unveil a design for a supplemental innovation account this year and is working with NSF to expand and collect R&D information on innovation-related inputs.

6

Intangibles and Government Policy

In the workshop's final session presenters were asked to shift the focus from the measurement topic to government policy issues. Among the questions considered were as follows: What are the size and composition of the public investment in intangibles? How can government encourage company creation of intangibles? And what should be the government's role in creating or supporting more robust markets in intangibles? To these, moderator Michael Mandel (*Business Week*) added one more question that relates to the previous session: If people knew more about intangibles, if they were measured differently, would policy makers be making different decisions? We now turn to these questions, beginning with an overview of several international developments.

6.1. INTANGIBLES AND INTELLECTUAL CAPITAL FROM A COMMUNITY PERSPECTIVE

Ahmed Bounfour provided information that is the basis of an ongoing World Bank Conference on Intellectual Capital for Communities. His coauthor for the presentation was Jean-Eric Aubert of the World Bank. Bounfour's presentation highlighted several points or developments:

- Why the conference, held annually since 2005, embodies an important concept.
- The nature of intellectual capital management activities occurring elsewhere in the world—in Europe, Asia, South America, the Middle East, and North Africa.

- The idea behind the network created in 2006, which is called the New Club of Paris, to deal with the debt of emerging countries.
- How a network of people who are interested in knowledge and intellectual capital on a global scale can be created.
- To outline some common issues across the international landscape.

In addressing the question, "Why communities and intangibles now?" Bounfour discussed how communities are affected by the transformation of economic systems, particularly by the increase in networking and outsourcing. From his perspective, there is a close link between the dynamic changes occurring in the knowledge economy and the way people live. Large vertical corporations are less relevant, as many people are now working outside large enterprises, where they attempt to find a space for recognition. The conference on intellectual capital for communities deals with various natural communities—nations, regions, resident cities—and new forms of organizing in the knowledge economy. Aspects of intangibles and intellectual capital provide levers for reviving communities' policies and strategies. Bounfour provided responses to the question: What makes people really want to invest in the intellectual capital of a nation or a city, and what makes a community different from companies?

The European Perspective

Bounfour first summarized reports from the European countries participating in the World Conference on Intellectual Capital for Communities. The Nordic countries, particularly Denmark, have done extensive work on intangibles, especially from what they call the "narrative perspective," which is oriented less toward the financial aspect of the market and more toward the qualitative. This approach involves at least 200 companies reporting internally, in a narrative fashion, on knowledge as an asset.

Bounfour also cited Austria as an interesting case. It was the first country to enact guidelines—the 2001 Law on Universities and Research Centres—asking entities to report on intangibles. The law provides guidelines for reporting on inputs, processes, outputs, and outcomes associated with activities related to intellectual capital and intangibles. Companies may be asked, "How much money do you receive from the government, how is it spent, what publications have been produced, etc.?" In this way, it is similar to what Baruch Lev was asking for with the template idea. There is also a Supreme Court of Audit that produces a report on intangibles. It involves a project called Knowledge Politics, which takes account of knowledge in cities by asking: What does intellectual capital mean for citizens? What does intellectual capital mean to policy makers? It is an issue not only for statisticians, but also for people, communities, and cities. Germany is similarly focused, not on the big corporations, but what it views as the core of the socioeconomic system in Germany—medium-sized

enterprises. In its transformation of the economy, Germany would like to focus on small and medium-sized enterprises and to revive its intellectual capital and to focus on regional aspects.

In France, a report for the Organisation for Economic Co-operation and Development (OECD) was one of the first to publicly report measures of intangible investment (Kaplan, 1987). More recently, the Levy-Jouyet report was issued in December 2006. Morris Levy is the chief executive officer (CEO) of one of the largest public relations firms in France, and Jean-Pierre Jouyet is the secretary of foreign affairs for France. The report, which was well publicized in the media, concludes that, if growth in intangibles is emphasized, then there will be an additional 1 percent measured growth of gross domestic product (GDP). Bounfour noted that, although the report does not carefully document this projection, the idea has had a big impact orienting research and development (R&D) expenditures toward small- and medium-sized enterprises (SMEs). Another outcome of the report was a call for the creation of an agency called APIE, the Agency for Public Intangibles of France. This agency, which began its work last year, is now charged with creating value from public-sector assets. In France, the public sector is central to the life of citizens, and the aim is to change the mind set of people about it and also to generate revenues.

One concrete outcome from the Levy-Jouyet report is the Louvre Abu Dhabi Agreement. The Louvre Museum is one of the landmark cultural institutions in the world, with more than 8 million visitors annually, a large percentage of whom are foreigners. The question posed was "How should the country brand the Louvre? Should the brand be licensed? And, if yes, what is the price?" A very large national debate ensued. It was not only a technical debate, but also one about culture. At the beginning, nobody knew how much money they should ask from Abu Dhabi for the licensing agreement; the outcome was a 30-year partnership with the United Arab Emirates valued at €1 billion to be paid to the Louvre and to other museums in France. This included a brand licensing contract of €400 million (the new museum will be called the Louvre Abu Dhabi); art loans with other French museums, €195 million; exhibitions, €190 million; sponsorship, €25 million; and specialized services and management advice to help building the new museum, €160 million (Anfruns, 2008).

The underlying notion of something like the Louvre Abu Dhabi Agreement is that the public sector owns intangible assets that should be valued. There are few precedents for reporting on and measuring these assets, or for protecting them if needed. To deal with these issues, France's leading business association (which includes CEOs of companies in France) has created working groups to advance reporting on intangibles in service activities. Subgroups have been created to deal with R&D, information technology (IT) and organizational processes, tax issues, business models, and marketing and branding. The group will provide recommendations to policy makers on the question of intangibles, performance, and value creation.

European institutions are also investing in intangible assets. The European Investment Bank has historically invested mainly in tangibles—providing hard facilities has been its core business. Now, it is moving toward intangibles as a line of business, but it does not know exactly how to tackle it. Nonetheless, it is investing €1 billion in these assets, with another €1 billion coming from the European Investment Bank 2010 7th Framework Program. Bounfour noted that research projects are underway throughout Eurpoe that aim to promote a better understanding of the impact of intangibles on economic growth at national, regional, and corporate levels; or that are designed to introduce standards for the management of intellectual capital as a means of achieving business success.

The Japanese Experience

Turning to activities in Asia, Bounfour expressed the view that Japan has the most structured program for dealing with intangibles—particularly intellectual asset–based management—with actions at the corporate, regional, and city levels. One aim of the program, which is led by the Ministry of Economy Trade and Industry, is to provide guidelines for intellectual property rights reporting, then for intangible reporting at all corporate levels. The ministry now has roughly 30 companies reporting according to these guidelines. They are also creating incentives for companies to recognize and use local intangibles (intellectual assets), especially in agriculture, manufacturing, and tourism (the regional policy is articulated in the Agglomeration Act of May 2007).

In addition, JASDAC, which is the equivalent of NASDAQ in the United States, is developing software for SMEs to report on intangibles. It has created a branch of the New Club of Paris in Tokyo, with 100 professionals meeting every year to discuss how to report intangibles and their performance. Japan has also created a process of benchmarking with Germany to take advantage of the idea that they have similar industrial structures, moving toward an economy based on information intellectual capital and intangibles.

Perspectives from Other Regions

Bounfour reported that a number of initiatives are under way in the Middle East and North Africa. He stressed that one thing that characterizes many of these countries is that they have very young populations, and one question is how best to use their energy. Intellectual capital seems to be one way of leveraging this energy and, in the region, there is lots of investment in creating new universities, which should produce economic returns. Saudi Arabia has recently made huge investments in higher education designed to accelerate the process of moving toward a knowledge economy. Israel has produced a national report on intellectual capital for several years now.

In Latin America, Brazil's BNDES Program, designed to achieve national goals with regard to the intensity of knowledge investment, has reoriented financial resources toward it. BNDES is one of a number of large national banks in the world interested in developing an agenda for intellectual assets and management. The idea is to strategically change the way people invest in Brazil from manufacturing to intangibles and to creatively use people inside as well as outside Brazil. BNDES is cooperating with the Federal University of Rio de Janeiro, and one idea for its portfolio is to develop some metrics regarding intangibles that can be used for investment decisions. The program looks at the question not purely from a financial investment perspective, but from one focused on national interests. Bounfour noted that one sector of particular interest for Brazil is biotechnology. Mexico has also developed a specific program oriented toward knowledge city building, mostly organized at the local level (e.g., the Monterrey international knowledge city program).

Bounfour also raised the issue of brain drain or diaspora as a way of circulating intellectual assets among nations. The Chinese and Indian diasporas are examples. Bounfour suggested that the Indian government has a very structured program for leveraging this hidden intellectual asset, which operates for them in different parts of the world. Tracking diaspora is interesting from a statistical point of view as well. Very little evidence exists about the level of intangible assets being created by diasporas in the world, or even of the flow of knowledge between specific countries, such as the United States and China or India. Bounfour suggested that this kind of measurement could be an important point on the agenda for the Conference on Intellectual Capital for Communities.

Bounfour next turned to the research and policy agenda for various nations participating in the New Club of Paris. The central question posed at the first meeting, which took place in the Parliament of Finland in November 2006, was: What can Finland do in the future to leverage its intellectual capital? Finland has one of the most innovative economic systems; what can be done to advance a society that already works very well and has a large population of highly qualified people? Also, what can the rest of the world learn about intellectual capital management and structure from Finland? The final report (Ståhle, 2007), published by Tekes, a scientific organization in Finland, shows that, for all the strengths of its systems, weaknesses are still present. For example, Finland has difficulty attracting talented foreigners. They have problem with brand recognition in the country, in part because they mainly produce intermediate goods. So they have to work along several levels, especially regarding the environment and the water supply, to project the image of Finland to the rest of the world.

Bounfour's group observes similar trends in such places as Morocco, a country with a lot of creativity and history that can be used as the root for the production of content. Although it is a different context, people understand intangibles and intellectual property rights clearly, as well as marketing and branding. The real problem is how to leverage the energy of countries and how to make

this emotion creative. Figuring out how to use this energy to mobilize intangible assets and advance economies at various levels, stated Bounfour, is the key challenge for his group.

To conclude, Bounfour drew some common policy issues from the diverse settings with which the Conference on Intellectual Capital for Communities deals. First are some demographic issues. Aging populations characterize some parts of the world, like Europe, a fact that leads to emphasis of specific topics on innovation and intangibles and demography and intangibles. An aging population does not necessarily have the same energy or the same view of the world as other countries; therefore, an older population may innovate in one manner, whereas innovation and job creation in a comparatively young population may follow a different path. Other issues on the agenda include improving measurement of intangibles and developing simple standards for disclosing information; the intellectual property rights issue; the interaction between global knowledge and local knowledge (e.g., when a pharmaceutical company goes to an African country and develops a brand or patent using some local knowledge); the qualitative dimension—how nations, regions, and cities position themselves in space and time; tax issues; and ad hoc sectoral issues—documenting global perspectives on issues ranging from knowledge on water, to knowledge on agriculture, to knowledge on smart energy.

6.2. INTELLECTUAL ASSETS AND VALUE CREATION

Douglas Lippoldt explained why developed countries are addressing intellectual assets through the work of the OECD secretariat.[1] There are a number of reasons: first, there is growing recognition that intellectual assets are central to value creation, economic growth, competitiveness, and a modern economy. Also, as was noted by nearly all of the workshop's presenters, there are continued shortfalls in measurement and understanding of these processes, which ultimately hamper decision making. There is also an interest at OECD in exploring the relationship between intellectual assets and innovation, on both the input and the output sides. Software, for example, is an innovative sector in its own right, but it also interacts critically to create innovation in other sectors. Another reason for the keen interest in intellectual assets in the OECD is that the organization is preparing to launch a multiyear initiative called the innovation strategy. The idea of the initiative is to go beyond the traditional OECD sector by sector consideration of the economy and to look at it from a perspective that recognizes connectivity between sectors. A working group will investigate cross-cutting pillars, such as the interaction between globalization and innovation, and will look at new issues

[1]He provided the disclaimer that his views expressed do not necessarily reflect those of the OECD, a point worth underscoring because his work, which involves policy conclusions, is still in process. For a summary of the recent OECD work on intellectual assets and value creation, go to http://www.oecd.org/sti/ipr/iavc.

for the OECD, such as entrepreneurship and innovation from the perspective of businesses cultures. Questions about what drives innovation and what are the possibilities to leverage intangible assets for acceleration of development in leading businesses will also be addressed.

At this point, the OECD group is taking stock of what is known and assessing measurement gaps. A particular strength of OECD is international comparisons. OECD will continue to look at aggregate data (as in Figure 6-1) on intangibles, but it will also be getting more into measurement of the underlying components. Lippoldt stated that this will be an area of continued interest to be developed more fully.

Much of Lippoldt's presentation focused on a recent interim OECD synthesis report, *Intellectual Assets and Value Creation* (Bismuth, 2006), which takes stock of current work by the organization on macroeconomic, regional, and firm-level issues. At the macro level, the report reflects the concern in member countries about the importance of having a system of national accounts that corresponds to the real economy. It recognizes that, although there has been progress in including certain types of software and R&D investment, estimation and tracking of

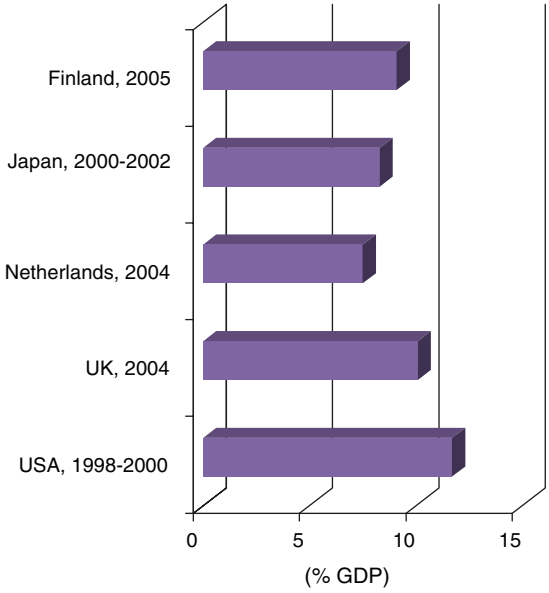

FIGURE 6-1 Total investment in intangibles.
NOTE: Data derived from Corrado et al. (2005, 2006), Marrano and Haskel (2006), Fukao et al. (2007), van Rooijen-Horsten et al. (2008), and Jalva et al. (2007).
SOURCE: Workshop presentation by Douglas Lippoldt. Reprinted with permission.

intangible assets are incomplete. Lippoldt noted that, in light of the conceptual challenges, it is understood that an incremental approach to system revisions will be required. The 1993 revisions are just recently being implemented; nevertheless, Lippoldt predicted that OECD will remain engaged in following up on improvements to this dimension of macroeconomic measurement.

Lippoldt reported that his directorate has been actively engaged in studying the regional dimensions of innovation involving firm location and linkages. Dominique Guellec has been building a regionalized patent database, which reveals some interesting patterns. A preliminary assessment shows that highly innovative or inventive regions tend to cluster together, and that this tendency has increased over time. This may support the well-known idea that agglomeration leads to decreased transport and communication costs, or perhaps provides opportunities for spillovers for tacit knowledge, which often depends on interpersonal interaction. Another conclusion is that the most inventive regions tend to have more multinational enterprises among their inventive firms. Firms boost linkages across regions, as evidenced by the fairly high frequency of cross-regional co-invention within firms. Data for the names and addresses of inventors and the patent documentation reveal that there is a lot of knowledge sharing and collaboration across regions but within firms. This is in line with what one might expect from multinational enterprises, given their ability to select, foster, and coordinate research and development.

The regional variation in geographic patterns of patenting and inventiveness underscores the importance of national innovation systems and framework conditions, such as the competitive environment that might propel and motivate R&D. It also points to such factors as the availability of skilled labor and public investment in research, infrastructure, and regional governance. Hot spots or clusters of innovative activities include the West Coast and Northeast of the United States, southern Germany, and Finland (Usai et al., 2008). Where an inventive region exists, there is a comparatively high probability of seeing another next door.

Policy plays a role in shaping the factors that spur innovation, so developing a better understanding of these processes will be important to improving the efficacy of policy. Although these associations do not imply causality, Lippoldt noted that some of the environmental factors at work imply that a policy dimension should be considered. Lippoldt cited a quote from the OECD growth project that took place a few years ago, which reads "something new is taking place in the structure of OECD economies . . . and this transformation might account for the high growth. . . . Policies that engage ICT, human capital, innovation and entrepreneurship in the growth process, alongside fundamental policies to control inflation and instill competition while controlling public finances are likely to bear the most fruit over the longer term" (February 2007 OECD Policy Brief, "Creating Value from Intellectual Assets," p. 7).

OECD researchers have developed a particular interest in intellectual assets with respect to small- and medium-sized enterprises. These firms pose a unique

challenge for government policy because they often use informal means to protect their intellectual property, making it more difficult for them to enter technology markets and to monetize intellectual property.[2] This is a potential area for policy intervention in the form of extension services or administrative easing, which might make it possible for these firms to engage more deeply. In France, for example, there was discussion at the World Bank IC4 Conference of the possibility of restructuring the patent fee schedule by taking into account the size of business, with just this objective in mind.

Lippoldt turned next to the topic of corporate reporting and inadequate disclosure of intellectual assets. Examination by the OECD fiscal affairs department has led to the conclusion that current practices are often backward-looking and provide inadequate information about capacity to generate future revenue from intellectual assets. However, some initiatives are afoot aimed to enhance narrative reporting and promote disclosure by companies of material, qualitative, and forward-looking information about value drivers, trends, risks, and uncertainties. OECD has been informally engaged in the World Intellectual Capital Initiative, which is working toward standardizing at least a high level taxonomy of terms in an effort to move toward international comparability. Echoing a common theme of the workshop, Lippoldt noted that OECD is quite firm about pursuing voluntary approaches here, hoping to inspire business by demonstrating that this can be in their self-interest if properly structured.

The importance of corporate reporting was stressed throughout the workshop. Lippoldt, too, noted that disclosure can enable investors to better assess future earnings and risks. This information can help improve transparency in financial markets, which is associated with the possibility to allocate resources efficiently. It also promotes management of assets and accountability; this openness can potentially reduce the cost of capital. Here, as noted above, government policy can promote identification and dissemination of best practices in voluntary reporting. Baruch Lev and others called for templates and the idea of using peer pressure to promote the usage of such templates. In Japan, 30 firms are engaged in such a program.

Lippoldt concluded by identifying next steps to be undertaken at OECD and providing general recommendations for governments. Member countries are pushing OECD to consider closely for further work particularly promising areas:

- **Intellectual assets and new business models,** including examination of the influence of intellectual assets on the emergence of new business models.
- **Value creation and globalization,** including exploration of the relationship between intellectual assets and organizational change and how firms

[2]One method of monetizing intellectual property is to sell the entire firm, which is easier for smaller companies than it is for larger ones.

create value through boosting equity, but also decreasing cost or increasing the value of output.
- **Support for improved measurement approaches,** for example, for definition of asset boundaries and determination of appropriate depreciation rates and deflators.

Lippoldt reiterated the point made by other presenters that government policy can be used to support better measurement. It can influence some of the drivers of intellectual assets and value creation. Participants pointed out the importance of human capital and public research investment and of a balanced intellectual property rights system. In Lippoldt's view, the government can promote improved transparency, in terms of disclosure of intellectual assets "using a soft approach." The objective of government engagement is improved management of resources in the economy and improved accountability to create the potential to evaluate not only the business sector but also government policies. Lippoldt's final remark was that care is required and that government should be aggressively monitoring the risk of failing to address barriers that are created by policy or of imposing undue burdens on the economy.

6.3. U.S. POLICIES FOR FOSTERING INTANGIBLES

Kenan Jarboe outlined possible directions for U.S. policy, the end goal of which should be, in his view, not only to measure intangible assets, but also to improve management and utilization of them. Appropriate policy dealing with intangibles must consider both the micro and macro economic implications. Beyond initiatives to create, use, and invest in these assets, Jarboe pointed out that intangibles are also integral to broader social policies. Intangibles are embedded in health care issues and in many other social policies. Finally, there is the need to better manage public assets, some of which are intangibles (along the lines of the Louvre Abu Dhabi example).

By Jarboe's admittedly rough estimation, in fiscal year 2006, the federal government spent about $200 billion (outlays, not budgetary authority) investing in intangibles—about 8 percent of the $2.5 trillion budget for the year, or about 20 percent of discretionary spending. As shown in Table 6-1, most of this spending was in public R&D funding and in training and education. It is difficult to estimate the education and training and federal R&D numbers as reported by the Office of Management and Budget (OMB), because they get distorted by the fact that they include both the civilian and military spending. Although the vast majority of the total goes to education and R&D, there is a series of other valuable entities, such as the statistical agencies and the weather service, that may have a large social impact even though they do not involve large dollar-volume outlays.

Some of the data, such as those covering R&D and the funding for statistical agencies, are quite reliable, as they are generated by OMB. The $61 billion

TABLE 6-1 Federal Investment in Intangibles, FY 2006 Outlays (rough estimates) in Billions of Dollars

Information and Intellectual Property	
R&D funding (does not include facilities and equipment)	$122.4
Arts and humanities/museum funding (including Smithsonian)	1.0
Government information creation	
Statistical agencies	2.2
Weather service	0.7
Library of Congress, CBO, GAO	1.0
PTO	1.6
Individual Human Capital (Know-How)	
Education and training	61.0
Training of government personnel (military)	9.0
Social Capital (Alliances and Networks)	
Organizational building and technical assistance	
Community (HUD, EDA, HHS, USDA extension service)	0.5
Company (MEP, SBA)	0.5
Brands and Marketing (Reputation)	
Export promotion	1.5
Product safety, food safety, drug safety (investments in product reputation)	3.0
TOTAL	204.4

NOTES: Does not include tax expenditures or value of landing slots, grazing rights, water rights, mining rights, spectrum and broadcast licenses, etc.
CBO = Congressional Budget Office, EDA = Economic and Development Administration, GAO = U.S. Government Accountability Office, HHS = U.S. Department of Health and Human Services, HUD = U.S. Department of Housing and Urban Development, MEP = Manufacturing Extension Partnership, PTO = Patent and Trademark Office, SBA = Small Business Administration, USDA = U.S. Department of Agriculture.
SOURCE: Workshop presentation by Kenan Jarboe. Reprinted with permission.

figure for education and training is also a fairly hard number. The $9 billion figure for government training includes the military only and would be higher if the civilian agencies were included. The $3 billion spent for food and product safety—discussed by Kossovsky—is about protecting citizens. Historically, part of the reason these measures came about was to protect the brand reputation of companies. All in all, investment in intangibles is a huge management issue that the federal government must take on.

Jarboe sorted the policy areas into three overlapping categories: (1) those to encourage understanding of intangibles, (2) those to encourage financial investment in intangibles, and (3) those to foster use of intangibles. Much of the first category, in the context of increasing corporate disclosure of intangibles, was

covered throughout the day. Bossio discussed the prospects for reinstating the joint Financial Accounting Standards Boards (FASB) and International Accounting Standards Board (IASB) research project on expanded disclosure guidelines for intangibles. Lev discussed the importance of clearly designating nonfinancial measures for evaluating intangibles in the management discussion and analysis portion of financial statements—his templates concept.

Another policy option is to create a safe harbor in financial statements for the reporting of intangible assets. This, Jarboe argued, is something that the Securities and Exchange Commission (SEC) could do very quickly. In fact, the American Institute of Certified Public Accountants recently produced a report recommending that this should be done. The safe harbor idea allows respondents to feel that they are not violating SEC regulations by disclosing this information. Jarboe observed that the idea of a safe harbor has been around for at least 20 years for intangibles.

Next, Jarboe raised the idea of modifying the Sarbanes-Oxley Act—also known as the Public Company Accounting Reform and Investor Protection Act of 2002, passed in response to a number of major corporate accounting scandals—so that a clear directive is created for assessing material intangible assets. One of the issues that Malackowski raised is what happens the first time there is a lawsuit involving a corporate CEO facing criminal penalty for not disclosing the company's intangible assets because they were deemed material. An overnight change in mind set would be likely. The problem right now with Sarbanes-Oxley is that it is not that clear on intangible assets, as is the case with most security regulations.

Another policy lever for encouraging understanding of intangibles involves better use of the stock exchange as an initial testing ground by requiring listed members to make additional disclosures that capture metrics for intangibles. The tension here is that companies have historically resisted giving sales and revenue information; these data were considered proprietary, and they were not made available until the SEC required it. However, almost every industry has some sort of benchmarking activity, because they understand its value. Somehow, Jarboe asserted, a balance must be found between voluntary benchmarking and use of industry associations and the mandatory SEC requirements. He quoted a line from a February 2007 report by PricewaterhouseCoopers, which surveyed a large sample of investment professionals and concluded: "There is clear evidence that respondents are more interested in the nature of and expenditure on intangible assets than in the treatments of intangible assets in the primary statements" (*Measuring Assets and Liabilities: Investment Professionals' Views*, http://www.pwc.co.uk/pdf/measuring_assets_liabilities.pdf). In other words, investors care less about whether the information is booked and more about what the company is doing with it. Again, disclosure is what is most important for policy.

Another idea is to include innovation and intangibles in the Malcolm Baldrige National Quality Award, given by the National Institute of Standards and Tech-

nology to recognize quality service in the business, health care, education, and nonprofit sectors; it was inspired by the concept of total quality management. Looking at the criteria for the award, there are actually more references to innovation than to quality. Jarboe suggests turning the award into an intellectual asset management one that encourages efforts like improvements in business models. Back to the iPod example, it is innovation that made it a great product—and not just the quality of the player. Jarboe expressed the view that the big innovation was the iTunes part of the model, which allowed parents to give their teenager a way to download music in a way that is not illegal.

Jarboe would also like to see a cross-cutting analysis of the federal budget along the lines of the one done for capital accounts (which is where education and the R&D measures are found). It would be possible for OMB, the Government Accountability Office, or the Congressional Budget Office to apply a similar treatment to intangibles. Jarboe also endorsed the idea of including intangibles in the GDP account, as discussed by Landefeld and Moulton. However, he cautioned, the idea will not gain traction unless policy makers rally behind it.

Next, Jarboe moved on to his list of policy measures to encourage financial investment in intangibles. For starters, he suggested creating a central national registry of intellectual property security interests. If a person would like to borrow a patent, or to find out if there is a lien on a particular patent, there is currently no easy way to do it. It is hard to create a secondary market for these assets when investors "don't know what they don't know." Proposals exist to create a centralized registry of intellectual property security interests.

Another helpful action would be to convene a special FASB/SEC task force on valuation methodologies and to support increased research on valuation standards. Intangibles are not always reflected in a company's book value, and it would be useful to develop some rigor to valuation so that, for example, banks have an idea what various assets are actually worth. Jarboe noted that companies do consult evaluation experts, asking, "What part of the company's value is intangibles? What is their patent portfolio worth?" It can be done now, but the problem is that it can be done within a range of plus or minus 20 percent. For companies considering a large merger or acquisition, this is not accurate enough. The good news according to Jarboe is that both FASB and the SEC are beginning to set up processes to value things that people have been saying for years cannot be valued.

Other ideas raised by Jarboe for encouraging investment in intangibles include exploring the creation of an Intangibles Mortgage Corporation (Ida Mae) to regularize the intangibles-backed securities market; undertaking a review of the Basel II Accords to better understand their implications for intangible-backed lending; and coordinating ongoing efforts at market reform, such as the President's Working Group on Financial Markets, to ensure that intangible-backed assets are properly included.

Jarboe concluded with a discussion of policies that could be implemented

to foster the use of intangibles. The first would be to expand or reorient the Manufacturing Extension Partnership (MEP) Program to include intangible asset management. Given that the economy has moved from a manufacturing or industrial age to an information age, it is time to reformulate MEP so that, rather than simply helping small machine tool shops understand how many turns they can get off a lathe, they can actually understand what their intangible assets are. In addition, federal and state insurance laws and regulations need to be reviewed and restructured to promote the development of financially sound insurance coverage of intangibles (as discussed by Kossovsky). If people know that these assets are worth something, greater attention will be given to their management.

Also, a permanent knowledge tax credit could be created that would increase investments in intangibles—not only R&D, but also things like worker training. In the past, stimulus packages have included investment in machines; such initiatives should include investment tax credits for people. Jarboe argued that "if we really believe that people are our most important asset, why in the world is our basic public policy still built around a machine, and not people?" Lippoldt responded to the suggestion for this kind of investment in human capital and the mobility of people, noting that firms need extra incentives to invest in training given that there is leakage of the returns due to worker turnover and other factors leading to rapid depreciation. The idea of this tax credit is intriguing in that it could internalize some of the external social benefit created by worker training. The tax credit would be used because training is, in part, a public investment that will provide returns to society. And, theoretically, if the investment in human capital has a stimulus effect on the economy, there could be a neutralizing effect on the cost to the budget over time. Jarboe noted that the problem to date, politically, has simply been up-front cost. He referred to Senator Bingaman's comment that Congress has been fighting since 1981 with the temporary R&D tax credit. It is a lot cheaper in the short run to increase the depreciation on machinery for a year, than it is to do something on a human capital investment credit.

Another policy lever for increasing the use of intangible assets is to explore lowering the tax rate on royalties derived from them; this should be done in conjunction with stricter regulations on international transfer pricing mechanisms and cost-sharing arrangements and on passive investment companies that can be used as tax havens. Landefeld raised this issue, in the measurement context, of how location of intangibles can be attributed to tax havens. This is a major political issue for two reasons. One is to improve the extent to which companies play it straight in their valuations for tax purposes; the second is that misattribution distorts international trade figures. It is possible that royalties are being paid to people in low-tax countries for inventions developed elsewhere, simply because they were transferred. Ultimately, Jarboe suggested, it is worth looking to see whether the taxes on royalties can be reduced in exchange for closing the loophole on intangible asset transfer prices.

He also suggested that more could be done to foster use of intangibles in the

area of patent reform legislation. This might include a review of patent litigation and patent liability insurance and a review of federal and state technology policies to encourage promotion of patent pools. Also, a review of how the federal technology transfer system, including the Bayh-Dole Act, does or does not facilitate the creation of intangible assets may be in order. Finally, there is a whole series of federal government business loan programs to review, especially in the small business arena, to ensure that intangible assets can be used as collateral. This would include requiring the Small Business Administration to work with its commercial lenders to develop standards for the use of intangible assets as collateral, similar to its existing underwriting standards.

Jarboe concluded with the point that measuring, encouraging development, and using intangibles is all about changing people's mind set—changing the fact that, right now, intangibles are largely invisible. Echoing a major theme of the day, he stated that what is not measured does not get managed, and there are "a thousand places in the public policy area where we can begin to get a handle on that."

References

Abramovitz, M. (1956). Resource and output trends in the United States since 1870. *American Economic Review, 46,* 5-23.

Aizcorbe, A.M., Moylan, C.E., and Robbins, C.A. (2009). Toward better measurement of innovation and intangibles, *Survey of Current Business,* Jan., 10-23. Available: http://www.bea.gov/scb/pdf/2009/01%20January/0109_innovation.pdf [accessed Sept. 2009].

Anfruns, J. (2008). *New Development Opportunities for Museums: The Case of the Louvre Museum.* Presentation at the World Conference on Intellectual Capital for Communities (4th Edition), Paris, May. Available: http://info.worldbank.org/etools/docs/library/244616/IC4Session5_Anfruns%20IC4.pdf [accessed Sept. 2009].

Bamford, J., and Ernst, D. (2002). Managing an alliance portfolio. *McKinsey Quarterly, 28*(3), 29-39.

Basu, S., Fernald, J., Oulton, N., and Srinivasan, S. (2003). *The Case of the Missing Productivity Growth: Or, Does Information Technology Explain Why Productivity Accelerated in the United States but not the United Kingdom?* (Working Paper Series No. WP-03-08.) Chicago: Federal Reserve Bank of Chicago.

Bismuth, A. (2006). *Intellectual Assets and Value Creation, Implications for Corporate Reporting.* Paris: Organisation for Co-operation and Development.

Corrado, C., Hulten, C., and Sichel, D. (2005). Measuring capital and technology: An expanded framework. In C. Corrado, J. Haltiwanger, and D. Sichel (Eds.), *Measuring Capital in the New Economy, Studies in Income and Wealth*. Chicago: The University of Chicago Press. Available: http://www.nber.org/books/corr05-1 [accessed Sept. 2009].

Corrado, C., Hulten, C., and Sichel, D. (2006a). *Intangible Capital and Economic Growth.* Working paper as part of the Finance and Economics Discussion Series, Divisions of Research and Statistics and Monetary Affairs, Federal Reserve Board, April, Washington, DC.

Corrado, C., Hulten, C., and Sichel, D. (2006b). *Intangible Capital and Economic Growth.* (NBER Working Paper No. W11948.) Cambridge, MA: National Bureau of Economic Research. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=877453# [accessed Sept. 2009].

Fukao, K., Lee, K., Inui, T., Liu, D., Ito, K., Kwon, H., Yuan, T., Kim, Y., Jung, M., Kabe, S., and Takeuchi, F. (2007). *Database of the TFP of the Firm of Japan, China and Korea. Research Report.* Tokyo: Japan Center for Economic Research. Available: http://www.seriworld.org/sq/wldQArticle.html?psq=20080202&atseq=33&ssq=&mcd=0006 [accessed Oct. 2009].

Griliches, Z. (1981). Market value, R&D, and patents. *Economics Letters, 7*(2), 183-187.

Hall, B.H. (2000). Innovation and market value. In R. Barrell, G. Mason, and M. O'Mahoney (Eds.), *Productivity, Innovation and Economic Performance*, Cambridge: Cambridge University Press.

Hall, R.E. (2001). The stock market and capital accumulation. *American Economic Review, 91*(5), 1185-1202.

Jalava, J., Aulin-Ahmavaara, P., and Alanen, A. (2007). *Intangible Capital in the Finnish Business Sector 1975-2005.* (Discussion Paper No. 1103.) Helsinki: The Research Institute of the Finnish Economy.

Jorgenson, D.W., Mun, S.H., and Stiroh, K.J. (2005). *Information Technology and the American Growth Resurgence.* Cambridge, MA: MIT Press.

Kaplan, M.C. (1987). *Intangible Investment: An Essay at International Comparison*. Presented to the Organisation for Economic Co-operation and Development Industry Committee, Paris.

Kiley, D. (2007). Best global brands. How five names in this year's rankings staged their turnarounds. *Business Week,* Aug. 6. Available: http://www.businessweek.com/magazine/content/07_32/b4045401.htm [accessed Sept. 2009].

Lev, B. (2001). *Intangibles: Management, Measurement, and Reporting.* Washington, DC: Brookings Institution Press.

Lev, B., Nissim, D., and Thomas, J. (2007). On the informational usefulness of R&D capitalization and amortization. In S. Zambon and G. Marzo (Eds.), *Visualising Intangibles: Measuring and Reporting in the Knowledge Economy* (pp. 97-128). Surrey, England: Ashgate.

Levy, M., and Jouyet, J-P. (2006). *Economy of the Immaterial One: Growth of Tomorrow.* Paris, France: Ministère de L'Economie, des Finances et de L'Industrie.

Marrano, M.G., and Haskel, J. (2006). *How Much Does the UK Invest in Intangible Assets?* (Department of Economics Working Paper No. 578.) London: Queen Mary, University of London.

Marrano, M.G., Haskel, J., and Wallis, G. (2009). What happened to the knowledge economy? ICT, intangible investment, and Britain's productivity record revisited. *Review of Income and Wealth, 55*(3), 1-31.

McGrattan, E.R., and Prescott, E.C. (2000). Is the stock market overvalued? *Federal Reserve Bank of Minneapolis Quarterly Review, 24*(4), 20-40.

Nakamura, L.I. (2001). Investing in intangibles: Is a trillion dollars missing from GDP? *Business Review, Q4*, 27-37. Available: http://www.phil.frb.org/research-and-data/publications/business-review/2001/ [accessed Sept. 2009].

Nakamura, L.I. (2008). *Intangible Assets and National Income Accounting.* (Working Paper No. 08-23.) Philadelphia: Federal Reserve Board of Philadelphia. Available: http://ssrn.com/abstract=1285048 [accessed Sept. 2009].

National Research Council. (2006). *Improving Business Statistics Through Interagency Data Sharing: Summary of a Workshop.* C. Kuebler and C. Mackie, Rapporteurs. Steering Committee for the Workshop on the Benefits of Interagency Business Data Sharing. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

National Research Council. (2007). *Understanding Business Dynamics: An Integrated Data System for America's Future*. Panel on Measuring Business Formation, Dynamics, and Performance. J. Haltiwanger, L.M. Lynch, and C. Mackie (Eds.). Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Nelson, R., and Phelps, E.S. (1966). Investments in humans, technological diffusion, and economic growth. *American Economic Review: Papers and Proceedings, 56,* 69-75.

Oulton, N., and Srinivasan, S. (2005). *Productivity Growth in UK Industries, 1970–2000: Structural Change and the Role of ICT.* (Working Paper No. 259.) London: Bank of England.

Rauch, J. (2008). Electro-shock therapy: GM and the Chevy Volt. *Atlantic Monthly,* July/August. Available: http://www.theatlantic.com/doc/200807/general-motors [accessed Sept. 2009].

Robbins, C.A., and Moylan, C.E. (2007). Research and development satellite account update estimates for 1959–2004: New estimates for industry, regional, and international accounts. *Survey of Current Business,* Oct., 49-64. Available: http://www.bea.gov/scb/pdf/2007/10%20October/1007_rd_text.pdf [accessed Sept. 2009].

Robinson, P., and Shimizu, N. (2006). Japanese corporate restructuring: CEO priorities as a window on environmental and organizational change. *Academy of Management Perspectives, 20*(3), 44-75.

Schramm, C.J., Arora, A., Chandy, R.K., Cooper, K., Jorgenson, D.W., Siegel, D., Bernd, D.L., Ballmer, S., Blanchard, J., Buckley, G., Collins, A., Eskew, M.L., Hodges, L., Palmisano, S.J., and Menzer, J. (2008). *Innovation Measurement: Tracking the State of Innovation in the American Economy.* A Report to the Secretary of Commerce by the Advisory Committee on Measuring Innovation in the 21st Century. Available: http://www.innovationmetrics.gov [accessed Sept. 2009].

Ståhle, P. (2007). (Ed.). *Five Steps for Finland's Future*. A high-level Round Table initiated by the New Club of Paris held in Helsinki, November 11, 2006. Helsinki: Tekes.

Sullivan, M.A. (2004). U.S. multinationals move profits to tax havens. *Tax Notes International, 33*(7), 589-592.

Usai, S., Paci, R., Schivardi, F., Bellinzas, M., Caruso, G., and Dettori, B. (2008). *The Geography of Inventive Activities in OECD Regions.* (STI Working Paper No. 2008/3, Statistical Analysis of Science, Technology and Industry.) Paris: Organisation for Economic Co-operation and Development. Available: http://www.oecd.org/dataoecd/41/52/41771231.pdf [accessed Sept. 2009].

van Rooijen-Horsten, M., van den Bergen, D., de Haan, M., Klinkers, A., and Tanriseven, M. (2008). *Intangible Capital in the Netherlands: Measurement and Contribution to Economic Growth.* (Discussion Paper No. 08016.) The Hague: Statistics Netherlands.

Appendix

Workshop Agenda

Board on Science, Technology, and Economic Policy,
in cooperation with the
Committee on National Statistics

Intangible Assets:
Measuring and Enhancing Their Contribution to Corporate Value and Economic Growth
Lecture Room, National Academy of Sciences Building
Washington, DC

Monday, June 23, 2008

8:30 a.m.	**Welcome** **Stephen Merrill,** STEP
8:35	**Keynote** **Honorable Jeff Bingaman,** U.S. Senate (D-NM)
8:50	**Introduction** **Honorable Cynthia Glassman,** Under Secretary for Economic Affairs, U.S. Department of Commerce *Innovation Measurement—2008 Report of the Secretary's Advisory Committee*

9:20 **Panel I Introduction to Intangible Assets**

What are they? How do they work? What is the production paradigm (in contrast to industrial age economies of scope and scale)? Is it important to reconcile the many different taxonomies of intangible assets?

Moderator: **Kenneth Flamm,** University of Texas-Austin

Presenters:
Irving Wladawsky-Berger, IBM and MIT
Charles Hulten, University of Maryland

10:15 **Break**

10:30 **Panel II Macroeconomic Implications of Intangibles**

How do intangibles contribute to GDP and productivity in the United States compared to other industrial countries in which efforts have been made to estimate them? How significant are international flows of intangible assets?

Moderator: **Kenneth Flamm,** University of Texas-Austin

Presenters:
Carol Corrado, The Conference Board
Jonathan Haskel, Queen Mary College, University of London
Kyoji Fukao, Hitotsubashi University and RIETI
Brent Moulton, Bureau of Economic Analysis, Department of Commerce

12:15 p.m. **Lunch**

1:00 **Panel III Intangibles in the Firm and Financial Markets**

How are intangibles created and utilized by firms? How do intangibles operate in financial markets? What efforts are being made to capture intangibles in accounting and company valuation?

Moderator: **Martin Fleming,** Vice President, IBM

Presenters:
Baruch Lev, New York University Stern School
Laurie Bassi, McBassi & Company
James Malackowski, Ocean Tomo
Ron Bossio, Financial Accounting Standards Board

2:45 **Break**

3:00 **Panel IV Intangibles and the Government: Part One**

What are the priorities of the statistical agencies for collecting better data on intangibles and incorporating them in broader measures of economic performance?

Moderator: **Jonathan Haskel**

Presenters:
Steven Landefeld, Bureau of Economic Analysis, Department of Commerce
John Jankowski, Science Resources Statistics Division, National Science Foundation

4:00 **Panel V Intangibles and the Government: Part Two**

What are the size and composition of public investments in intangibles? What should the government do to encourage company creation of intangibles? What should be the government's role in creating or supporting more robust markets in intangibles? What are other governments doing in these respects?

Moderator**: Michael Mandel,** *Business Week*

Presenters:
Ahmed Bounfour, Paris-Sud University
Douglas Lippoldt, Organisation for Economic Co-operation and Development (OECD)
Nir Kossovsky, Steel City Re
Kenan Jarboe, Athena Alliance

5:45 **Adjourn**

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The Committee on National Statistics (CNSTAT) was established in 1972 at the National Academies to improve the statistical methods and information on which public policy decisions are based. The committee carries out studies, workshops, and other activities to foster better measures and fuller understanding of the economy, the environment, public health, crime, education, immigration, poverty, welfare, and other public policy issues. It also evaluates ongoing statistical programs and tracks the statistical policy and coordinating activities of the federal government, serving a unique role at the intersection of statistics and public policy. The committee's work is supported by a consortium of federal agencies through a National Science Foundation grant. CNSTAT membership, activities, and reports are described at http://www7.nationalacademies.org/cnstat/.

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