How the Patent and Trademark Office Helps Can Help to Create Jobs

Statement of Robert J. Shapiro

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Before the Committee on the Judiciary
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I am pleased and honored to testify today on the role of the Patent and Trademark Office (PTO) in helping to create employment. I approach this matter as an economist who has served in the government as Under Secretary of Commerce for Economic Affairs in the Clinton administration and in the private sector as chairman of Sonecon, an economic consultancy advising many companies whose value rests largely on the intellectual property protected by the patents and copyrights issued by the PTO.

It is commonly said that ours is an idea-based economy, and recent developments have made that a concrete reality. Over the last half-century, economists have documented the role played in the economic growth of the United States, the world's most successful advanced economy, by intellectual property and the innovations which embody it. Since the 1950s, researchers starting with Robert Solow established that the development and adoption of economic innovations have been the single most powerful factors determining America's underlying rate of growth and productivity in the 20th century. Solow, who was awarded the Nobel Prize for this work, and others have estimated that 30 percent to 40 percent of the gains in productivity and growth achieved by the United States from 1900 to the 1980s can be traced to economic innovation in its various forms. These innovations encompass the development not only of new technologies, but also new materials and processes, new ways of financing, marketing and distributing goods and services, and new ways of managing a workplace and organizing a business.

The dominant role of new ideas in our economic life also is documented in a recent study from the Federal Reserve System. The authors analyzed the various ways that companies use ideas by examining business spending on so-called "intangibles," including software programs and databases; scientific and non-scientific R&D, new-product development by service firms; new business models and corporate cultures; and more. By classifying these outlays as capital investments intended to increase future earnings, the researchers found that U.S. businesses invest as much in these idea-related intangibles as they do in all plant, equipment and other traditional, tangible forms of investment.

The Federal Reserve study shows that since the 1990s, U.S. business spending on long-lasting, knowledge capital grew faster than any other type of business or personal spending. Finally, they traced more than four-fifths of recent gains in U.S. productivity to the development and application of new ideas, especially those involving new information technologies: Over the years 1995-2001, the development of new information technologies accounted for 28 percent of those productivity gains, capital investment in those technologies accounted for another 34 percent, research and development accounted for 10 percent, and changes in the organization of firms and worker training in response to these innovations accounted for another 10 percent. By applying this approach to data for more recent years, other researchers estimate that nearly 90

percent of U.S. economic growth from 2001 to 2003 can be attributed to increases in the stock of intangible assets.

Finally, research by the McKinsey Global Institute has documented the role of innovation in the value of large corporations. They found that in 1984, the book value of the 150 largest U.S. public companies – what their physical assets could be sold for on the open market – was equal to 75 percent of their market caps: Three-quarters of the value of large American companies was derived from its physical assets. By 2005, the book value of the 150 largest American companies was equal to just 36 percent of their market caps: Nearly two-thirds of their value is now based on their intangible assets, principally the value of the ideas protected by patent and copyrights.

The reason that United States is the world's dominant producer of economically-powerful innovations – and consequently, why the United States had the strongest growth and productivity gains of any advanced economy from 1990 to 2005 – is that innovation thrives in places where commitments to research and development are strong, the political and economic environments are stable, barriers to starting new businesses are relatively low, and, perhaps most important, intellectual property rights are sound, respected and enforced. The process of creating these innovations requires taking investment capital away from uses known to produce substantial returns, and using it instead in much riskier ways that promise unknown returns at some unknown time. The necessary incentive to do so comes from the monopoly privilege granted by patents and copyrights, the only monopoly rights legally provided in our market-based system. And the integrity of those patents and copyrights depends on the quality and due speed with which the PTO adjudicates the claims by innovators that their new ideas meet the criteria for the monopoly rights attached to patents and copyrights.

Innovations and the intellectual property embodied in them help create jobs, because they play a critical role in economic competition between domestic companies within the economy and between American firms and their foreign rivals in both domestic and third-country markets. The pace of the development, adoption and application of innovations across our economy also greatly influences how much our GDP, productivity and incomes increase, compared to other nations. In fact, the capacities to develop new intellectual property and apply the consequent innovations have become the primary grounds of the economic competition between American firms and those in other advanced economies, within their own markets and across the global economy.

While intellectual property protections promote the development of innovations, their impact on the nation's economy and competitiveness depends on the extent to which businesses and households adopt them and how effectively they use them. Broad adoption of many innovations takes many years. Jet engine travel, for example, spread slowly, because travel on early jetliners was expensive and offered travelers only modest benefits compared to prop airplane travel. The adoption of an innovation also involves significant costs, which may include new training and organizational changes as well as the price of a new technology. Decades after the development of supersonic jet travel, for example, the high price of the technology continues to block its general adoption for commercial use.

However, broad adoption can occur fairly rapidly, especially in the area of digital technologies. The reason is that these technologies often produce what economists call "network

effects" that encourage their diffusion, because the usefulness of the new technology or business method based on it increases as more people or businesses adopt it. The value of a computer operating system such as Windows, for example, increases as more people adopt it and use it to share or exchange information. Such network effects, in turn, tend to take hold as the utility of an innovation increases – for example, as more applications are written for the Windows system – and as its cost declines.

Some innovations also produce a type of cascading dynamic, in which their introduction and adoption are followed by subsequent innovations which build or depend on the initial technology, and which may have greater impact on a nation's productivity and competitiveness than the initial innovation. The most prominent example in recent years is the personal computer and Internet, although electrification and early 20th-century mass production also exhibit these features. The spread of the Internet depended first on the previous broad adoption of personal computers, and later on the innovative development of "killer applications" starting with e-mail. The Internet also has produced cascading tiers of additional innovation, especially in the development of Internet-based businesses and the unique services which they can provide.

A more common type of cascading effect involves incremental improvements or enhancements of an existing innovation, which extend its usefulness to more industries or activities. This process may occur through changes in the product or improvements in the production process which reduce the price and thereby promote its adoption for more purposes and industries. Both processes are apparent in innovations such as cellular telephony and personal computing devices, which gained a broad range of new capacities in a brief time. In all of these cases, the cascade depends on the patent regime. We grant time-limited monopoly rights to innovations through patents; and in exchange, the inner workings of the innovation become public knowledge. In that way, subsequent innovators can build on an initial breakthrough, often using reverse engineering to develop an alternative that may be more useful or less expensive.

While many forces affect the broad adoption of many innovations in advanced countries like ours, the principal underlying factor is usually the strength of competition. Once an innovation proves to be profitable for its developer and initial adopters, by raising productivity or expanding the goods and services available to businesses and consumers, that success exerts competitive pressures on other businesses to follow suit. That process also increases the incentives to develop innovations by raising the returns to the original innovator. All of those dynamics, which ultimately lead to productivity and employment gains, depend on the integrity of the patent process and the enforcement of patent rights.

In a period of rapid technological advance, such as the current time, competition itself often centers on innovation. Cellular telephony is a current example of innovation-based competition, in which U.S. companies such as Apple (i-Phone) and Google (Android) have vastly expanded the U.S. share of the global market for a product which European and Japanese firms initially dominated, creating thousands of jobs at home. In such periods, economies like ours that foster the development and adoption of innovations can secure a significant competitive advantage even when factors such as the cost of labor and capital produce competitive disadvantages.

However, globalization allows companies in advanced economies to combine the advantages derived from the conditions that foster innovation with those based on low factor costs, limiting the employment benefits. American companies are particularly successful in this use of globalization, developing new products in the United States and then using foreign-direct investment in low-cost countries for much of their production and assembly operations. In 2005, 27 percent of the total stock of U.S. foreign direct investment was located in low-cost developing nations, compared to less than 10 percent for Germany, France and Britain. This economically powerful combination helps explain why the global market share of U.S.-based high-tech companies increased from 24 percent in 1990 to 41 percent in 2005, with much smaller gains for U.S. employment in that sector.

As an idea-based economy, the United States is increasingly dominated by intellectual-property-intensive industries. One recent study, for example, found that in 2003, IP-dependent industries accounted for 20 percent of private sector GDP, but 40 percent of the growth of private industry, attesting once again to the impact of innovations and the intellectual property embodied in them on U.S. productivity. These IP-dependent industries also accounted for 40 percent of all exportable high-value-added goods and services and nearly 60 percent of the growth of exportable high-value-added goods and services, demonstrating the disproportionate impact of innovation on our international competitiveness.

America's recent capacity to extract greater productivity gains from IT innovations, compared to Europe or Japan, also has spurred a number of studies comparing conditions across the various economies. One recent study examined the role of the "knowledge economy" in explaining why from 1995 to 2004, productivity gains accelerated here while slowing down in the EU-15. Over this period, the EU-15 grew an average of 2.2 percent per-year while the United States expanded an average of 3.7 percent annually, producing widening gaps across key economic measures. By 2004, Europe's GDP *per capita* was only 74 percent that of the United States, the hours worked *per capita* by Europeans were 82 percent that of Americans, and GDP and capital input, per-hour worked, across the EU-15 were both only 90 percent of the levels in the United States. The researchers found that the traditional factors of economic production – labor and capital investment – could not explain these differences. Rather, they traced these differences to three factors which together, they argue, comprise the "knowledge economy" – investments in information technologies, the increased use of highly-skilled workers, and multifactor productivity encompassing both organizational and technological innovations.

Advanced economies which nurture and promote the conditions for innovation and its broad adoption, and thus become more focused on innovation-based competition, have a competitive advantage over those more focused on price or efficiency-based competition, which is more the province of developing economies. Promoting those conditions, therefore, should be a central priority for national growth and employment policy. Inventive and commercial genius are qualities that know no national borders. But the United States is the home to a disproportionate share of companies capable of developing and adopting the powerful and often disruptive innovations which help drive economic progress and competitiveness share. That reflects, first, strong intellectual property protections for the new ideas that animate innovations. However, every advanced economy today has reasonably strict IP rights and protections – a major change from the 19th century. The sustained development and broad application of new intellectual property, then, also depends on other social, economic and political conditions. An

entrepreneurial economic culture and low barriers to the formation of new businesses play significant roles, because new and young businesses are major sources of innovations and more likely than established firms to quickly adopt innovations from others. The importance of a strong competitive environment also cannot be underestimated. In addition, strong government support for basic research and development is critical, since the incentives for private firms to undertake basic R&D are notoriously weak. Finally, sustained public investments in education and training are vital to ensure a sufficient supply of workers who can operate new technologies or operate effectively in workplaces dense with those technologies.

When these conditions are fulfilled, competition itself often centers on innovation or quality, rather than efficiency and price, especially in a time of rapid technological and organizational changes like today. These developments have transformed the United States into the world's first, genuine idea-based economy. With regard to employment, our focus here today, this transformation creates an imperative to expand and improve our public commitments to education and training, so that all Americans have real opportunities to thrive in this new economy.