

The George J. Stigler Center for the Study of the Economy and the State

George Stigler founded the Center for the Study of the Economy and the State at the University of Chicago in 1977. It has from the beginning been a joint enterprise of economists and legal scholars at the Graduate School of Business, Department of Economics and Law School of the University of Chicago. The Center was renamed in George Stigler's memory after his death in 1991.

The Stigler Center is dedicated to the study of the effects of political life on economic life and the reciprocal effects of economic life on political life. That is not a very restrictive program, since there are few areas of our lives where neither economics nor the state intrudes. To carry out its mission, the Stigler Center supports research of faculty at the University of Chicago and of visitors from other academic institutions. The Center publishes a Working Paper series, and it promotes the dissemination of this research to a wider audience via conferences and lectures.

The Stigler Center contributes importantly to the continuity and growth of 'Chicago Economics,' which is known worldwide for two attributes:

- A tough-minded professional style that views economic theory not as an end but as a tool to assist in understanding the real world
- A lively appreciation for the working of private markets

George J. Stigler

George Stigler joined the faculty of the Graduate School of Business and the Department of Economics at the University of Chicago in 1958. This event and the arrival two years later of Merton Miller is widely recognized as establishing the Business School as a world leader in academic research and making it a full partner in an extraordinarily fruitful cooperative research enterprise with the University's Department of Economics and Law School.

Stigler was one of the great economists of the 20th century. He made seminal contributions to the economic theory of information and oligopoly and to the economic analysis of government regulation and the public sector. Stigler received the profession's highest honors including the presidency of the American Economic Association and the Nobel Memorial Prize in Economic Science. His 1982 Nobel Prize was the first awarded to an economist whose primary appointment was in a Business School.

More information may be found at the Stigler Center's website:
<http://www.stiglercenter.org>

THE GEORGE J. STIGLER CENTER

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Introductory Note from the Director

This *Annual Report* summarizes the work of the Stigler Center's research community during the 2004/05 academic year. The Stigler Center's mission is to support economic research about the interaction between the private economy and the state. The great breadth of topics covered in this report is testimony both to the pervasiveness of public policy concerns in our lives and to the ingenuity of Chicago economists in applying economics to them.

The essence of the research conducted at the Stigler Center is the application of Chicago-style economic analysis to issues confronting economic policy makers at all levels of government. The Chicago-style of analysis has several hallmarks: an interest in *applying* economic theory to better understand real-world developments, a deep appreciation of the ability of private markets to allocate scarce resources efficiently, an understanding of the contractual and regulatory infrastructure necessary to support those markets, and an effort to verify theoretical predictions of behavior through a careful analysis of data and evidence.

Recent Developments among our Scholars

This coming year marks a time of transition for the Stigler Center, with Sam Peltzman stepping down as Director after more than 13 years of service. It is impossible to overstate Sam's contributions to the Center. Without his dedication and tireless efforts, the Stigler Center would not have been able to continue to support the Chicago-style research that makes a real difference in the formulation of public policy. Sam preserved and extended the legacy of George Stigler, and following him will be no easy task. Fortunately, as Professor Emeritus, Sam will be available to offer support and guidance as I assume the responsibilities of Director.

Beyond academic research, the Stigler Center's research community continues to contribute its talents directly to public policy. Raghuram Rajan remains in the position of Economic Counselor and Director of Research at the International Monetary Fund. Tomas Philipson returned to the Stigler Center at mid-year after serving as Senior Economic Advisor at the Centers for Medicare & Medicaid Services.

In order to enhance our outreach efforts, we have created the position of Research Director at the Stigler Center. For the coming year, William Melick will fill this position while on sabbatical from Kenyon College. In addition to his research on globalization as a Visiting Scholar at the Center, Will's key responsibilities will include assisting in our efforts to broaden the Center's support base and making the products of our researchers accessible to as wide an audience as possible.

Highlights of our Scholars' Current Research

Stigler Center research on the interaction between the economy and the state most often examines the behavior of an individual agent, be it a firm deciding how best to respond to

a new tax, a household deciding how much to spend on educating its children, or a drug user deciding how much of a drug to buy at a higher price. This focus on individual behavior certainly does not limit the range of analysis undertaken at the Stigler Center. Researchers at the center examine how a market mechanism would increase organ transplants, the inefficiencies in the Japanese banking system, whether the Food and Drug Administration (FDA) should further streamline the drug approval process, and the effect of suicide bombings on the willingness of individuals to ride mass transit.

Stigler Center researchers are especially adept at applying the insights of economic analysis in novel ways to important areas of concern to policy makers. Topics that our researchers have investigated this year include corporate governance, banking regulation, politics of regulatory change and the role of the media, health, the war on drugs, development, inequality, and race.

The Stigler Center research continues its long-standing interest in analyzing firm structure and corporate governance. Building upon a Chicago line of research on the nature of firms that began with Nobel prize-winner Ronald Coase, **Steven Kaplan** is addressing the fundamental question of why and how firms evolve from an early business plan to a public corporation. **Randall Kroszner** is undertaking a detailed examination of the wave of recently enacted corporate governance reforms.

Closely related to firm governance is the financing of firm activities and the role of the banking system. **Anil Kashyap** explores the damage caused when political interests intervene in bank lending decisions. He studies the Japanese experience over the past 15 years to better understand the size of the damage resulting from misdirected lending. Work by **Randall Kroszner** suggests somewhat paradoxically that firms that rely on external finance in well-developed financial systems are harder hit by financial crises than are similar firms in more primitive financial systems. Visiting Scholar **Emilia Bonaccorsi di Patti** is researching the ways in which credit markets function when dealing with opaque firms or firms that may engage in tax evasion and other illegal activities.

Firms are often confronted with government regulations concerning the products they produce and Stigler Center researchers, following the lead of Center founder George Stigler, are interested in whether or not these regulations accomplish their intended goals and how different interest groups shape the regulatory outcomes. **Marianne Bertrand** examines the licensing of drivers in India as a particular example of the ways in which government bureaucrats may try to profit from their regulatory power rather than promote social well being. **Luigi Zingales** examines the quality of a single sector's output, focusing on the ways that the media can influence public policy through encouraging the adoption of consumer legislation. This research clarifies when the media can serve as an effective check on the political influence of vested interests and when it cannot.

Casey Mulligan uses the 1986 tax reform in the United States as a laboratory to better understand the process by which tax reform can subsequently lead to special tax privileges for vested interests. His research suggests that tax reform, when considered in

light of these subsequent privileges, ultimately does little to increase economic efficiency. Visiting Scholar **Alan Auerbach** investigates the optimal budget planning horizon for governments - focusing on the tension that a long horizon gives a more accurate picture of future expenditures but also allows the government to push needed reforms too far into the future.

Work on health and social issues at the Stigler Center continues to be varied and vibrant. As has been the case since the Center was founded almost 30 years ago, research on health issues remains at the forefront of Stigler Center output. Nobel prize winner **Gary Becker** finds that the current system for encouraging organ transplants falls well short of what could be accomplished under a market system that would compensate organ donors. To date, the “war on drugs” has been fought through criminal penalties, but **Becker** and **Kevin Murphy** find that drug use could be reduced to a greater extent, and at a lower cost, by legalizing and taxing drugs that are currently illegal. A new method proposed by **Tomas Philipson** indicates that reforms to the FDA’s drug approval process provided U.S. health care customers with large net benefits. This method can also be used to evaluate other potential changes in FDA policies.

Although much attention has been paid to the rising cost of health care, relatively little attention has been paid to the benefits that this health care confers on individuals. **Murphy** and **Robert Topel** fill this gap by calculating the value of improvements in health care. They find that the value of these improvements has been enormous, much greater than the increased cost to deliver the improvements. Their findings temper any calls for a fundamental reform of the health care system. Of course, individuals will change their behavior in response to health care improvements. As a disease becomes treatable, individuals will spend less time and effort trying to avoid the disease, a finding emphasized by **Sam Peltzman** in his study of gains in the provision of antibiotics and the treatment of heart disease.

Behavior will respond not only to perceptions of risk, as in the risk of heart disease, but the fear engendered by the risk. This distinction is crucial for understanding how suicide bombings affect decision making, a point made by **Becker** in research on the responses in Israel and the United States to acts of terrorism. Objective calculations of risk would suggest a much smaller response to attacks than has been the case, although, for example, in Israel there is a large difference between casual bus and café customers and frequent users after a suicide bombing. It seems that frequent users find it worthwhile to overcome their fears while casual users do not. This research has policy implications beyond terrorism, for example in situations like mad cow disease where risks are small but fears can be powerful.

Poverty and racial disparities are important social issues that continue to receive attention at the Stigler Center. **Becker** and **Philipson** consider the conventional wisdom that rich countries are getting richer while poor countries are getting poorer. Taking a broader measure of well being that includes life expectancy as well as income, they find that the poor countries are catching up to the rich countries. This finding gives pause to adopting policies that are meant to close a gap that may not exist.

Derek Neal examines the skills of black and white workers over time. He finds that up until the 1990s, the gap between black and white skills was narrowing. However, over the past 15 years this narrowing has stopped. Neal finds that black skills remain relatively low not because black workers see no reason to acquire skills due to labor market discrimination but rather because black families raising children have fewer resources. He argues that this is the case since the skills gap emerges very early in life. Addressing the gap will require a policy response that targets black families with young children.

Outreach Activities

The Stigler Center also promotes discussion of the issues on our research agenda in both general public forum as well as before both academic audiences. The Center organized a number of important events during the year:

- The Center sponsored two panel discussions assessing the pros and cons of the economic policies of the presidential candidates Bush and Kerry prior to the 2004 election. Panelists included **Austan Goolsbee**, an advisor to the Kerry campaign, and **Randall Kroszner** a member of President Bush's Council of Economic Advisers from 2001-2003. Panels were held at both the Hyde Park and Gleacher Center campuses of the Graduate School of Business (GSB). In total, more than 500 students, faculty, alumni and journalists attended.
- The Stigler Center sponsored two debates on Social Security reform. One debate was held at the Hyde Park campus, featured **Austan Goolsbee** and **Randall Kroszner**, and was moderated by **Anil Kashyap**. The second debate was held at the Gleacher Center and added **Kevin Murphy** to the panel. This event was co-sponsored by the GSB Dean's Forum and was moderated by Dean Richard Leftwich. Overall, roughly 500 students, faculty, alumni and journalists attended.
- The Center co-sponsored with the Ronald Coase Institute a conference at the Gleacher Center to discuss barriers to business creation in emerging markets. Nobel-prize-winner Douglass North, **Sam Peltzman**, and other leading scholars presented their perspectives concerning transaction costs. The conference brought together academics, students, entrepreneurs, and regulators to confront the important topic of promoting entrepreneurship in emerging markets.

Our accomplishments could not have occurred without the generosity of our supporters. All of the Stigler Center's research community is grateful for that support.

Finally, thanks are due to Vicki Ryberg-Drozdz for excellent administration of the Center's operations and its website and to Benjamin Fleischer for his administrative support.

Sincerely,

Randall S. Kroszner
Director

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Life Expectancy and Global Inequality

Tomas Philipson, Ricardo Soares and I completed a paper on the impact of increased longevity on world inequality. Usually GDP per capita is used to measure the quality of life of individuals living in different countries. The lack of convergence in this measure for the world as a whole has led to concerns about the impact of globalization of markets on world inequality. However, well-being is also affected by quantity of life, as represented by longevity. Our analysis incorporates longevity into an overall assessment of the evolution of cross-country inequality.

The absence of income convergence noted in the growth literature stands in stark contrast to the reduction in inequality after incorporating recent gains in longevity. We compute a 'full' income measure to value the life expectancy gains experienced by 49 countries between 1965 and 1995. Countries starting with lower income tended to grow more in terms of 'full' income than countries starting with higher income. The average growth rate of 'full' income is about 140 percent for developed countries, compared to 192 percent for developing countries.

Additionally, we decompose changes in life expectancy into changes attributable to thirteen broad groups of causes of death. We find that for poor countries, the greatest mortality improvement occurred in infectious and respiratory diseases. In mortality from cardiovascular disease, however, the poor countries fell further behind the rich. We also discuss the recent setback in some poor countries due to the spread of HIV/AIDS. This paper was published in the March 2005 issue of the *American Economic Review*.

The Economic Theory of Illegal Goods: The Case of Drugs

Kevin Murphy, Michael Grossman, and I have continued work on the market for illegal drugs. The current system of supply interdiction plus penalties for possession has numerous costs – the explicit costs of enforcement and incarceration and the resources

devoted by buyers and sellers to evading detection and securing 'turf.' We are comparing those costs to alternative methods of restraining the consumption of these drugs. For example, one alternative that has been discussed is decriminalization plus a tax on consumption. This would replace the implicit non-monetary tax of the current system with an explicit tax. There would however be an important difference in social cost, because the current implicit tax requires an expenditure of resources by criminals and the government. Much of that expenditure would be converted to government revenue with an explicit tax.

Our analysis suggests that a well-designed monetary tax on drugs could reduce consumption of drugs more than optimal enforcement of an outright prohibition. We show that a major reason why the war on drugs has been so costly is that the elasticity of demand for drugs is relatively low. We compare the effects of the present war with a change in regime to legalization, but with a possibly stiff tax on drug use. We show that the latter system would be much more efficient, and could, if desired, lead to lower drug use. Thus it may be more effective to fight a war on drugs by legalizing and taxing consumption rather than pursuing the current policy of criminalizing the production and sale of drugs. The optimal policy depends in part on the price elasticity of demand for drugs. We are currently working on estimating this elasticity for cocaine and heroin from data we have obtained on actual use of these drugs, as compared to previous estimates that rely on the memory of drug users. This paper has been accepted for publication in the *Journal of Political Economy*.

Markets for Organ Transplants

Julio Elias and I have continued to analyze the potential of using the price system to overcome the shortage of organs in transplant surgery. We are especially considering payment for live transplants. Almost half of all kidney transplants use live donors and so also a growing number of liver transplants. These transplants often come from relatives of the donee, who are both more interested and more likely to provide a medically appropriate match.

However, the potential for live transplants seems underdeveloped. Under the present system, the queues for organ transplants have continued to grow, and many persons die while waiting for organs to become available. These queues could be eliminated by allowing organs to be bought at a market clearing price. In our analysis, we integrate the markets for live and cadaver organs, and we show that the marginal donors for kidneys and livers are very likely to be live donors if the price of organs clears the market. Our preliminary calculations indicate that it would not be expensive - relative to the cost of the surgery - to clear the markets for kidneys and livers with live donors.

Fear and the Response to Terrorism

In the aftermath of September 11, terror is no longer a phenomenon limited to particular areas of conflict. It is common knowledge that the likelihood to be harmed by terror is very low. Thus, the fact that terrorist attacks lead to substantial disruptions in daily life is often attributed to peoples' "ignorance", either of the objective probabilities of an attack or the underlying process that generates the attack. Contrary to these explanations, we put forward an alternative theory of the response to a terrorist attack based on the framework of a rational choice model.

We point to the role of fear. We argue that an exogenous shock to the underlying probabilities of being harmed affects peoples' choices in two different channels: (i) the risk channel: by changing the weights of the "good" and the "bad" states, as in the standard expected utility models; (ii) the fear channel: unlike the standard models, the probability to be harmed affects persons' utility in each state of nature. Fear can be managed. Persons can handle their fears. They do so by accumulating the necessary skills. Like other investments in human capital, it is not a free-lunch and the investment does not offer the same pay back to everyone. Those who are more likely to benefit from the risky activity will invest and overcome their fears, while others will substitute away from the risky activity by other consumption or production plans.

Using data from the US (before and after September 11th) and from Israel (during the last wave of violence starting in the year 2000) we identify the role of fear on economic

behavior by comparing the effect of terror on people who face a similar objective (and subjective) probability to be harmed, but face a different incentive for overcoming fear. We find that those who are more likely to be paying the fixed costs of overcoming the terror fear effects are less likely to be affected by terror. For instance we show that while terror does generate large effects on consumers, especially in low frequency usage like air passengers or bus passengers, it has little effect on the compensation (wages) of those employed in the affected industries. Suicide bomber attacks decreases the likelihood of drivers to serve as bus drivers, however it has no effect on the likelihood of bus drivers to quit their jobs.

Using micro data on the use of public bus routes and taxis we find that suicide bomber attacks on buses have a substantial negative effect on bus rides and positive effect on the use of taxis. Decomposing the treatment effect by the likelihood to use a bus, we find, consistent with our theory, that suicide bomber attacks affect those who are at the margin of using public buses and have no effect on others.

Terror takes advantage of people being human and rational. By generating fear, terror, even in the form of a low probability event, may generate substantial effects. Hence, terror generates large scale effect by damaging the quality of our life rather than the "quantity" of life.

Fear is not limited to terror. Large scale effects can be generated by low probability events that are part of our daily life. Our model offers new insights on this phenomenon as well. Evidence from the "Mad Cow" crisis shows, in accordance with our theory, that those who consumed high levels of beef did not change their consumption at all, while those who consumed little beef reduced their consumption substantially. A summary of this paper appeared in the July 23, 2005 issue of the *Economist*.

An Experimental Approach to Corruption: Driving Licenses in India

This paper reports on an experimental study aimed at better understanding the efficiency implications of corruption, as well as the relationship between red tape and corruption. About 800 individuals were followed through the process of getting a driving license in New Delhi, India. Detailed surveys were conducted to measure all the steps of the bureaucratic process (number of lines, paperwork, number of bureaucrats, number of exams) and payments. All subjects were also asked to take an independent driving test upon completion of the surveys. In addition, a randomized design was overlaid on top of these surveys to generate exogenous variation among the participants in their willingness to pay for a license and their ability to drive.

Our findings indicate that, as predicted by a “grease-the-wheels” view of corruption, discretionary bureaucrats appear responsive to the *private* benefits of obtaining a license: individuals with a higher willingness to pay are more likely to obtain a license and experience less red tape. However, in contrast with the efficiency view, the bureaucrats appear to place much less weight on social costs and benefits: among those that obtained a license, individuals with higher private valuation were more likely to automatically fail the independent driving test than a control group; also, individuals that were better drivers were at most only slightly more likely to get their license than a control group. Interestingly, consistent with previous research, we find suggestive evidence that the bureaucrats are endogeneously creating additional red tape in order to extract higher payments. Finally, we find that corruption in this context does not take place through direct bribing but instead through the hiring of “agents.” We describe in detail the role agents play in this process.

What are Firms? Evolution from Birth to Public Companies

Since Ronald Coase's classic contribution to the theory of the firm in the 1930s, economists have attempted to understand why firms exist and what constitutes firms. Despite the long history of theory and empirical work, there is little systematic evidence concerning what constitutes a firm at birth and how a firm evolves from birth to mature company. In this paper, Berk Sensoy, Per Stromberg and I provide such evidence by studying 49 venture capital-financed firms from early business plan to initial public offering (IPO) to public company (three years after the IPO). The average time elapsed is almost 6 years. We describe the financial performance, business idea, point(s) of differentiation, non-human capital assets, growth strategy, customers, competitors, alliances, top management, ownership structure, and the board of directors. Our analysis focuses on the nature and stability of those firm attributes. Firm business lines remain remarkably stable from business plan through public company. Within those business lines, non-human capital aspects of the businesses appear more stable than the human capital aspects.

Private Equity Performance: Returns, Persistence and Capital Flows

The performance of publicly traded firms has been intensively studied. However, much less is known about venture capital and private equity funds, which have become an important source of capital, especially for new small firms that cannot easily access the public markets.

In this project Antoinette Schoar and I investigate the performance of venture capital and private equity partnerships using a data set of individual fund returns collected by Venture Economics. Over the sample period, average fund returns net of fees approximately equal the broad stock market, as measured by the S&P 500 Index. However, there is a large degree of heterogeneity among fund returns. Returns persist strongly across funds raised by individual private equity partnerships. The returns also improve with partnership experience. Better performing funds are more likely to raise

follow-on funds and raise larger funds than funds that perform poorly. This relationship is concave so that top performing funds do not grow proportionally as much as the average fund in the market.

We find that entry into the private equity industry is cyclical. Funds (and partnerships) started in boom times are less likely to raise follow-on funds, suggesting that these funds subsequently perform worse. Aggregate industry returns are lower following a boom, but most of this effect is driven by the poor performance of new entrants, while the returns of established funds are much less affected by these industry cycles. Several of these results differ markedly from those for mutual funds. This paper will appear in the *Journal of Finance* in August 2005.

How Do Legal Differences and Learning Affect Financial Contracts?

Until recent years, Venture Capital (VC) firms seemed to be mainly a U.S. phenomenon. However, they have become an important source of capital for new firms in many countries. In this paper, Fredric Martel, Per Strömberg and I study the role of differences in legal systems on the development of VC financing. One reason the United States may have been the pioneer in VC financing is the generally greater legal protection for investors in U.S. law than in other countries. Such protection would make enforcement of VC contracts easier and lessen the need for contractual complexity to overcome weak investor protection.

We analyze venture capital VC investments in twenty-three non-U.S. countries and compare them to U.S. VC investments. We describe how the contracts allocate cash flow, board, liquidation, and other control rights. We find that the contracts do differ across legal regimes. However, the more experienced VCs implement U.S.-style contracts regardless of the legal regime within which they operate. In addition, the VCs who use U.S.-style contracts fail significantly less often than those who do not. The results suggest that U.S.-style contracts are efficient across a wide range of legal regimes.

The Economic Crisis in Japan

In work with Ricardo Caballero and Takeo Hoshi, I am continuing to explore the mechanisms by which the misguided bank lending to under-performing firms has distorted competition in Japan. We make two major contributions in this paper. First, we develop an algorithm for identifying firms that receive subsidized credit. Our approach begins by constructing a lower bound for the rate at which a highly credit-worthy firm can borrow. We then identify those firms who are paying less than that rate. We find that almost 15 percent of Japanese loans were made at subsidized rates since the late 1990s.

We then construct a model to explore the implications of having so many companies receiving subsidized credit. The model suggests that subsidies will allow inefficient firms that we dub “zombies” to stay in business instead of exiting as normally would happen absent the subsidy. By continuing to operate, the zombies reduce the profit opportunities for other firms that could expand. Equivalently, the congestion created by the zombies raises the costs of operating for the healthy firms and forces them to become more productive to successfully compete. Over time, the congestion also dulls the healthy firms’ incentive to invest, meaning that the economy becomes less productive because workers are not being redeployed from the zombies to the more efficient firms.

We find three important patterns in the data. First, we confirm the prediction that for the sectors where subsidized lending is more prevalent, sector-wide productivity is lower. Second, we find that the productivity gap between the zombies and the non-zombies is largest in the sectors where the zombies are most prevalent (and hence creating the most congestion). Finally, we show that the non-zombie firms’ investment and employment growth becomes increasingly depressed as the prevalence of zombies rises. On the whole, the evidence suggests that zombies are depressing the restructuring that would normally have taken place and reducing growth in Japan.

Banking Reform in China

I am beginning a new project with Wendy Dobson on China's banking reform. China's centrally planned agrarian economy of the 1970s is being transformed into a modern market-driven industrial economy with dramatic results. Millions of people are moving into the cities from the countryside to take higher paying jobs in manufacturing, construction and services. Millions more have been redeployed from state-owned to self-employment and non-state-owned enterprises.

Suffusing this transformation is a less noticeable but basic contradiction between the state's goal of a market economy and its determination that the transformation should be gradual and always under its control. State owned enterprises (SOEs) used to provide all the jobs as well as goods and services. Their financial needs were met by a bank dominated financial system. Until 1984, the Peoples Bank of China (PBOC), the central bank, also owned the banking system, collecting deposits from thousands of branches across the country and allocating capital to uses directed by policy makers. After 1984, deposit and lending functions were turned over to four state-owned policy banks. These banks also practiced directed lending, which kept the SOEs supplied with loans that were more like working capital.

Today, the four state-owned banks are expected to operate like commercial banks and herein lies the contradiction: they are still entirely owned by the state and enmeshed in a legacy of directed lending. When the drive to rationalize the SOEs and commercialize the big banks began in earnest in the mid-1990s, the latter disclosed large stocks of non-performing loans – mainly to SOEs – that have accounted for more than 20 percent of GDP since 2000. Governments have moved to deal with these debts by rationalizing the SOEs, but employment and worker concerns have trumped the banks right to have their loans repaid. Thus, the four major state-owned banks remain significantly undercapitalized if the hidden losses in their portfolios are acknowledged.

The sustainability of this approach is challenged by China's commitment in 2001 to remove the remaining restrictions on foreign bank entry at the end of December 2006.

Since making that commitment, the central government has deepened bank reforms to make the state-owned banks operate as conventional commercial banks, rather than as part of the fiscal arm of the state. Indeed, the policy framework established by bank regulators in many ways meets international best practice. The big uncertainty lies in implementation, given the internal policy contradiction.

Our project seeks to identify alternative policy options that not only could achieve the government's goals but also are consistent with international evidence on how to successfully reform a capital-impaired banking system.

Assessing Corporate Governance Reform

Building on my previous research and my policy experience, I continue my work on corporate governance. In order to undertake a more comprehensive assessment of the various corporate governance reforms, Philip Strahan and I are gathering detailed data on the corporate governance characteristics and board structures of publicly-traded firms to understand how they have evolved since 2000. We are looking at variables ranging from the size and composition of the board and its committees to the compensation schemes (including stock options) for executives to see how they have changed and how the market reacts to changes in such variables. We also plan to contrast the characteristics of the major firms hit by scandals with other firms, and compare the characteristics of firms that are more or less easy for the markets to monitor. That is, we want to see what determines the “opaqueness” of firms. We are still in the data-collection stage but the results should help us to evaluate the impact of legislative, regulatory, and private sector responses.

My paper giving an overview and preliminary assessment of the Sarbanes-Oxley Act, “The Economics of Corporate Governance Reforms,” was published in the Journal of Applied Corporate Finance.” I also have an entry on “Corporate Governance” forthcoming in The Concise Encyclopedia of Economics. In addition, I discussed the policy implications of this work in an Securities and Exchange Commission (SEC) Roundtable before Commissioners of both the SEC and the Public Company Accounting Oversight Board.

Financial Crises and Sectoral Growth

Another line of research, conducted with Daniela Klingebiel and Luc Laeven, investigates the linkage between financial crises and industry growth. In “Financial Crises, Financial Dependence, and Industry Growth,” we analyze data from 19 developed and developing countries that have experienced financial crises during the last 30 years to investigate how financial crises affect sectors dependent on external sources of finance.

Specifically, we examine whether the impact of a financial crisis on sectors that rely heavily on external sources of finance (e.g., bank loans rather than internally generated cash) varies with the development of the financial system. We find that sectors highly dependent on external finance tend to experience a greater contraction of value added during a crisis in deeper financial systems than in countries with shallower financial systems. We hypothesize that the deepening of the financial system allows sectors dependent on external finance to obtain relatively more external funding in normal periods, so a crisis in such countries would have a disproportionately negative effect on externally dependent sectors. In contrast, since externally dependent firms tend to obtain relatively less external financing in shallower financial systems, a crisis in such countries has less of a disproportionately negative effect on the growth of externally dependent sectors. This line of research helps to demonstrate the costs of having a crisis-prone banking system for the economy as a whole.

Debt Restructuring and Debt Forgiveness

I am continuing work on sovereign debt restructuring and initiatives for debt forgiveness for developing countries. Often used during an economic crisis to avoid the paralysis of massive bankruptcies, across-the-board partial debt forgiveness can in principle help both debtors and creditors by reviving a moribund economy and increasing the likelihood that creditors will at least receive some payment from debtors. Although this effect of removing a so-called debt overhang is often suggested in theory, I found empirical support for the proposition when I collected and analyzed data on the behavior of stock and bond prices around the time of a key Supreme Court decision in the 1930s that effectively relieved debtors of a substantial part of their obligations after the United States stopped using the gold standard. I draw out the parallels between the U.S. situation in the 1930s and Argentina during its recent final crisis when policy makers engaged in an across-the-board debt reduction after breaking the link between the Argentine peso

and the dollar. These findings also have important implications for the efficacy of relief for developing countries with high debt burdens and for bankruptcy reform. I am also gathering data on the impact of going off the gold standard to understand the impact of sharp devaluations, independent of debt restructuring.

Tax Reform and Efficiency

Taxes affect behavior. Most taxes reduce efficiency. Although there is disagreement about the details, these basic results have been long and widely recognized among economists, and have received serious attention in policy circles under both Democratic and Republican administrations including, but not limited to, the White House, the Treasury, and the Congressional Budget Office. For example, in the absence of taxation, a well functioning capital market tends to create capital up to the point where the value of owning it (in terms of increasing the owner's standard of living over time) equals the value of using it. The capital market generates this result because users of capital pay the owners, and only the owners, for its use. If there were a tax on capital income, the users of capital would, in effect, pay two parties for its use, namely the owners and the Treasury. Hence, the value of using capital would exceed the value of owning it. Unless the owners of capital cared as much about making money for the Treasury as about making money for themselves, capital owners would supply capital up to the point where its cost equaled the value of owning it, which, as we said, is short of the value of using it. This is an example of taxes' affecting behavior and reducing efficiency: the capital income tax reduces capital accumulation.

“Political and Economic Perspectives on Taxes’ Excess Burdens” reconsiders income tax reforms with an emphasis on the U.S. experience since 1986. The Tax Reform of 1986 eliminated several income tax deductions and lowered marginal income tax rates, with the intention of raising federal revenues while keeping the adverse incentive effects of taxes to a minimum. But, as the latest administration revisits tax reform, did 1986 have a legacy of increased economic efficiency? Or did 1986 just increase the “efficiency” of the Treasury as a revenue-raising machine, paving the way for income tax increases under the first Bush and Clinton Administrations, and paving the way for Clinton’s uncapping of the payroll tax? My work suggests that the next tax reform must be accompanied by political reform in order to stop, or at least mitigate, the cycle of tax

reform and special tax privileges, which ultimately has little to offer in terms of increased economic efficiency.

Taxes and Market Distortions

“Taxes as Specification Errors” stresses the analogies between the adverse economic effects of taxes, regulations, monopolies, and other market distortions. I analyze public policies as computable dynamic general equilibrium model specification errors, in order to exploit some computational and conceptual advantages for comparing economic models with data. As illustrations, public policies are calculated to rationalize, with respect to the stochastic neoclassical growth model, capital market behavior since WWII and labor market behavior from 1929-50. One conclusion is that capital taxation drives a wedge between consumption growth and the expected pre-tax capital return, in the direction and amount predicted by theory, and that capital taxation is the major intertemporal distortion in the postwar capital market. Second, a good theory of the Great Depression labor market must explain why the measured marginal rate of substitution and marginal product of labor diverged so dramatically between 1929-33 and why the wedge persisted. This paper is forthcoming in the *Review of Economic Dynamics*.

Technical Progress in Innovation

Economists have long been interested in innovation and technological progress. Technological progress is a central theme in many economic models of long-run economic growth, the business cycle, wage differentials and the changing patterns of employment. My recent research focuses on modeling and measuring improvements in the technology of innovation – that is studying what factors define the technology for creating technological progress. Is it possible to speed up the rate of innovation or refocus the resources devoted to innovation in a way that will increase the rate of technological progress? While my work in this area is preliminary some results appear to be taking shape.

I begin by asking some simple questions. If we can increase the rate of innovation, for what types of innovative activities would doing so be most profitable? Should we focus on short-term or long-term projects? Should we focus on projects with considerable private sector interest or projects neglected by the private sector? Should we focus on reducing the cost of innovation or speeding it up?

The basic insight is that many types of innovation have external benefits in that the inventor does not capture the full value of the innovation. This idea is not new and lies at the center of much of the modern theory of technical progress and innovation. In terms of the value of improving innovation, the presence of external benefits has the implication that enhancing output is more important than reducing inputs. Output enhancing innovations are more valuable than input reducing ones (in general, in the case of consumption goods the two are equally valuable). Thus speeding up innovation (e.g. produce the innovation twice as fast) will be more beneficial than cutting the required inputs in half. In terms of timeframe, the best innovations to accelerate are those on the middle horizon, say 15-30 years. Very short term projects are almost as valuable whether they take half as long or not. Very long term projects have very little value either way. In terms of interactions with the private sector, it is important to look on the margin – will

the innovation draw in private resources (thus further enhancing output) or substitute for private inputs (reducing the output enhancing effect).

Estimating the Effect of the Crack Epidemic

Estimating the impact of the crack epidemic on economic and social outcomes has been difficult due to the fact that direct measures of the consumption of crack cocaine are not widely available. In an effort to compensate for this lack of data, Roland Fryer, Paul Heaton, Steve Levitt, and I develop a statistical methodology to infer the spread of crack on a city by city basis. Our methodology relies on the fact that the introduction and widespread usage of crack caused a simultaneous move in many economic, social and health related variables including homicide, employment, emergency room visits, arrests, and infant health. By tracking the co-movement of these variables over time in different cities, we are able to estimate the dates of introduction and diffusion of crack around the country. The results of our statistical methods agree reasonably well with other less quantitative accounts of the spread of crack in various cities. The measures of crack prevalence generated by our study should help in the study of changes in the urban environment in the 1980s and 1990s and the study of many other economic and social phenomena.

The Interaction of Income and Population Growth

The rates of growth of income and population are two of the key variables summarizing the evolution of an economy. The links between income growth and population growth run in both directions. In the Malthusian framework, growth in per-capita income generates an increase in the rate of growth of population which then reduces per-capita income (due to diminishing returns to labor) resulting in a perpetual state of “subsistence” income. In such a world, the rate of growth of technical progress determines an equilibrium (constant) level of per-capita income and an associated equilibrium population growth. Higher rates of technical progress generate higher levels of income and population growth but not sustained growth in incomes. The experience of industrialized economies over the past several hundred years contradicts such a simple model.

In this paper we propose a simple alteration of the Malthusian model to allow for a richer set of income-fertility interactions and find that a unified framework, where fertility responds first positively and then negatively to the level of income, can generate both the Malthusian result and the sustained growth in per-capita incomes witnessed in recent centuries. The key to a transition is a period of rapid progress that allows the level of income to exceed a critical threshold. Even if progress then returns to its old level, per-capita income will continue to grow.

We associate the shift from the subsistence level to the growth regime with a shift to a knowledge based economy in which investments in human capital facilitate the accumulation of knowledge, technological know-how and growing incomes. The increased costs of investing in the human capital of children and the increased opportunity costs of household time have a feedback effect on the household, generating the fall in fertility. This has a reinforcing effect on human capital investment as parents invest more in each of a smaller number of children.

One of the key issues we are trying to address with the model are the implications of below replacement fertility such as that being experienced in many countries of the world today. Will these or other forces limit the fall in population and/or fertility and cause fertility levels to rebound to a level consistent with a stable or growing population? Are there other changes analogous to the forces of human capital investment that come into play as economies get even richer or population levels begin to decline? Those are some of the key questions that remain and some questions to which our ongoing research will provide some insight.

The Economic Value of Improved Health

Robert Topel and I have studied the economic value of increased health and longevity and the value of medical research for several years now. The basic findings are that the historical value of improvements in health and longevity has been enormous. The increased longevity in the U.S. between 1970 and 2000 alone had an economic value of

over 70 trillion dollars (roughly 7 years worth of GDP). Gains from the earlier part of the 20th century were equally impressive.

The results in our earlier work were based on relatively simple models of how people value gains in longevity. Our most recent work has focused on building better economic models for valuing health and longevity over the lifecycle. Our basic approach is to draw on the long economic literature on lifecycle income and consumption patterns and the lifecycle allocation of time to learn how people value consumption and leisure time at different points of their lives. By modeling the values that people place on goods and leisure, and linking those values to data on health and longevity over the lifecycle, we are beginning to build richer models for valuing improvements in the length and quality of life. These models should help us refine and extend our earlier findings by allowing us to add the value of the increase in the quality of life (health) to the value of increased longevity we measured earlier. The preliminary results of our model suggest that gains in the quality of life have been worth as much or more than improvements in longevity.

The Economic Theory of Illegal Goods: The Case of Drugs

Economists have devoted much attention to the effects of excise taxes on prices and outputs, and they have discussed intensively the normative effects of these taxes.

However, most of this analysis has focused on monetary taxes. Non-monetary taxes in the form of criminal and other punishments for illegal production have received little discussion. In this paper, Gary Becker, Michael Grossman and I analyze both the positive and normative effects of the enforcement of laws that make production and consumption of particular goods illegal. We use the supply and demand for illegal drugs as our main example, a topic of considerable interest in its own right, although our general analysis applies to prostitution, restrictions on sales of certain goods to minors, the underground economy, and other activities.

First, we provide a simple graphical analysis that shows how the elasticity of demand for an illegal good is crucial to understanding the effects of punishment to producers on the overall cost of supplying and consuming that good. We then formalize that analysis, add

expenditures by illegal suppliers to avoid detection and punishment, and derive the optimal public expenditures on apprehension and conviction of illegal suppliers. We assume the government maximizes welfare and accordingly takes account of differences between the social and private values of consumption of an illegal good. Optimal enforcement expenditures obviously depend on the extent of this difference, but they also depend crucially on the elasticity of demand for the good. In particular, when demand is inelastic, it would not pay to enforce any prohibition unless the social value of consumption was negative and not merely less than the private value of consumption.

We then compare outputs and prices when a good is legal and taxed with outputs and prices when the good is illegal. Our analysis shows that a monetary tax on a legal good could cause a greater reduction in output and increase in price than would an optimal non-monetary tax. This is so even when we account for producers seeking to go underground to avoid the monetary tax. Indeed, the optimal monetary tax that maximizes social welfare tends to exceed the optimal non-monetary tax. This means, in particular, that it may be easier to fight a war on drugs by legalizing drug use and taxing consumption than by continuing to outlaw the consumption of drugs.

Understanding the Black-White Skills Gap

“Why Has Black-White Skill Convergence Stopped?” demonstrates that, after more than a half century of steady convergence between black and white children in terms of measured skills or attainment levels, skill convergence between black and white children came to a halt around 1990. The gaps that remain are large, and these gaps emerge early in life. The paper documents this pattern with respect to three different types of test score data and three different measures of educational attainment. I also show that black achievement levels are now quite low in large cities and that scores for urban black youth have been constant or falling for an even longer period.

I show in great detail that it is not possible to say that blacks remain less skilled because they rationally expect no return from investing skills since employers will discriminate against them. This argument carries no weight because measured black returns to skills have been at least as high as white returns (and often higher) for at least two decades.

Shrinking resources within families that raise black children may be the most important problem. However, in the past year, I have discovered a significant literature in child development on racial differences in parenting styles. An important challenge for future research is to determine whether or not parenting styles differ by race in ways that affect achievement simply because parental resources differ by race or because racial differences in culture play a role. This paper will appear in the *Handbook of Economics of Education*.

Gender, Race and Lifetime Earnings

As part of a larger research agenda, I have begun work on a project that attempts to measure racial differences for both men and women in potential earnings over prime working years. During the past year, I discovered that, when allocation flags are dealt with properly, one learns from Census data that well over 30 percent of prime age black males simply do not engage in market work in a given year. With so many missing wage

observations for both black men and women, it is hard to measure the potential earnings available to the current generation of black parents. I am working with Victor Chernozhukov from MIT on a method for estimating the median of potential earnings given various worker characteristics.

Potentially Risky Behavior in Response to Medical Breakthroughs

I have continued to work on a project on the behavioral consequences of medical breakthroughs. This is an empirical investigation of whether large, unexpected improvements in medical technology lead to changes in risky behavior. Thus, suppose there is a significant invention, such as a cure for cancer. Once implemented, this will substantially reduce mortality rates. But, I argue, this advance will also induce changes in behavior that can affect mortality.

Some of these behavioral changes can be favorable, such as the freeing up of medical researchers to work on other diseases. But other responses can work the other way. For example, resources (including time, effort, etc.) formerly devoted to avoiding or treating cancer can also be shifted to other activities that people enjoy but which also entail health risks. My project focuses on these latter sorts of responses.

The first phase of the project has analyzed mortality data from the period surrounding the introduction of antibiotics and other anti-bacterial drugs. This was arguably the most important medical advance of the 20th century. So this period should show whether the possibility that medical advances encourage behavior with collateral risks has any empirical content. I found evidence broadly consistent with the view that part of the health benefits of antibiotics was offset by increased mortality from non-infectious diseases. This was true both in the US and most other developed countries. This work is summarized in Stigler Center Working Paper 177.

During the year, I continued work on a newer medical breakthrough, the treatment of heart disease. While there is no single cause and while the effects are not as profound as the antibiotic advance, there has been a notable acceleration in progress against heart disease mortality since around 1970. This acceleration has continued until at least the mid 1990s, so it is harder to make the kind of before-after comparison as for the case of

antibiotics. Nevertheless, I am trying to see if the behavioral response patterns in this case are similar to antibiotics or different.

I am investigating two kinds of behavioral response to the heart disease advances. One is a 'within mortality' response: do the groups most favorably affected by the advance in treatment do things that raise the risk of getting heart disease. One example of this is the well known rise in obesity. This is a major risk factor for heart disease.

I find that the timing and age distribution of the rise in obesity is plausibly related to the medical progress against heart disease. Specifically, there was a marked acceleration of the trend toward obesity among young adults in the late 1970s or early 1980s, which is around a decade after the improvement in heart disease mortality began. This is consistent with a simple cost-benefit model in which young people on the margin of opting for obesity will do so if there is a modest improvement in heart disease treatment. A similar, but older, individual would require a larger improvement in heart disease mortality to make the switch.

I also have been studying the 'across mortalities' response to the improvement in heart disease treatment. As with antibiotics, I want to see if non-heart disease risks respond to the heart disease advance. Specifically, I want to see if progress in non-heart disease mortality changed in any way for the affected age groups once the magnitude of the heart disease advance became clear. A major problem here is that the 1970s were a decade of accelerated mortality improvement generally, not just for heart disease. Thus, disentangling within from across mortality behavioral responses and disentangling both from the effects of broad improvements in medical technology may be difficult.

The difficulty can be illustrated by some intriguing facts. In the mid 1990s there was a notable deceleration in the improvement of non-heart disease mortality (while heart disease mortality continues to improve at above normal rates) among those over 40. Is that deceleration an offsetting 'across mortality' response to the improvement in heart disease treatment? Or is it a 'within mortality' offset to the previous improvement in non-

heart disease mortality? Or neither? I am currently looking for the answers by focusing on the geographic variation in the various health improvement measures. So I ask, for example, whether areas (states and counties) with unusually great improvement in heart disease mortality in the 1970s and 1980s also experienced unusually marked deceleration in non-heart disease improvement in the 1990s.

I have also begun an investigation of across mortality responses in the AIDS epidemic of the 1980s and early 1990s. This episode is interesting, from the point of view of the larger project, because it is one of few examples of retrogression in mortality in a developed economy. This project is in a preliminary data gathering phase.

Finally, I have written a memorial essay about Aaron Director, a founder and leading figure in the application of economics to law, who died at age 102 last year. This will appear in the *Journal of Law and Economics*, of which Director was the first editor.

I returned to The University in January 2005 after serving since Jan 2003 in the U.S. government as the Senior Economic Advisor to the Commissioner of the FDA.

Intellectual Property and Marketing

This project with Gary Becker and Darius Lakdawalla, investigates the relationship between advertising and research and development (R&D). A central tradeoff in providing intellectual property (IP) to spur innovation is that raising the rewards to R&D through stronger intellectual property regulations, such as patents, usually results in allocations that are less desirable after the innovation has been discovered. For example, patents are generally believed by economists to be second-best methods of stimulating R&D as they do so by rewarding the R&D with ex-post inefficient monopoly power. This is particularly relevant for the pharmaceutical industry, for which this central tradeoff has to balance current consumers who want new drugs at the lowest cost against future consumers who will benefit from the R&D that additional profits entail. Previous analysis of intellectual property has focused only on its impact on price-competition. However, in addition to spending a vast amount of resources on R&D, the pharmaceutical industry is also engaged in a substantial amount of non-price competition through marketing of their products, both through so called detailing to doctors and direct-to-consumer advertising to patients. Indeed, pharmaceuticals is one of the leading US industries both in terms of R&D and advertising relative to sales. Previous economic analysis of advertising and intellectual property ignores the impact one has on the other, making positive and normative analysis of the role of intellectual property under advertising infeasible.

This paper attempts to remedy this problem by first analyzing the impact intellectual property design has on the efficient degree of advertising and, vice versa. We empirically analyze the efficiency impact of intellectual property by use of patent-expirations in the U.S. pharmaceutical markets during the period 1990-2003. Such expirations display the interesting pattern that for a majority of drugs there are output *reductions* rather than expansions after the patent expires. The increased competition induced by patent-

expirations seems to reduce, as opposed to expand, output because advertising is reduced more than price when patents expire. Our theoretical and empirical analysis sheds new light on the common claim that patents are second-best methods to stimulate innovation. If output falls when patents expire, and access is thus enhanced to what many people believe are under-utilized medicines, then traditional claims of harms from intellectual property, only considering price-competition, seem overstated.

Valuing New Health Care Technologies

“Surplus Appropriation from R&D and Technology Assessment Procedures” is co-authored with Anupam Bapu Jena, a student at University of Chicago doing a joint MD and PhD in economics degree. The paper addresses how existing methods of adopting new health care technologies affects innovation. This is an important topic because technological change through R&D investments is often argued to be a central force behind the growth in healthcare spending. Valuing the increase in healthcare spending therefore requires a methodology to measure the value of new healthcare technologies brought about by R&D investments. There is a long-standing and growing literature that attempts to assess the value of new technologies by use of so called cost-effectiveness, cost-utility, or cost-benefit analysis (CE). This type of CE analysis has been argued to be central to manage new technologies, their adoptions, and the appropriate amount of health care spending in the future. However, past discussions of CE analysis have typically remained agnostic about the incentives, or lack thereof, these criteria induce for R&D investments.

In particular, although CE analysis has been argued central to managing the adoption of existing new technologies, the dynamic implications of such technology management is less understood. We argue that incorporating R&D incentives dramatically alters the value of standard CE analysis. The basic problem is that static efficiency, the guiding light for evaluating conventional CE analysis, is often inconsistent with dynamic efficiency when R&D is affected, as it presumably is, by technology adoption criteria after technologies have been developed. Our main argument is that this implies that many times dynamically optimal technology assessment differs dramatically from static

assessments, particularly those CE assessments that have been performed in practice. In fact, we argue that generally, traditional CE measures should often be *minimized*, rather than maximized, in order to promote efficiency.

We illustrate the empirical importance of the difference between static and dynamic technology assessment by assessing the value of new drug technologies to treat HIV/AIDS. This disease is perhaps the major disease targeted by public sector R&D in the United States. Given the significant share of public funding for health R&D in general and HIV/AIDS R&D in particular, this is an important substantive case to consider for dynamic evaluation of new health care technology. For the new HIV drugs that came about mainly through discoveries in the mid 1990s, our major finding is that consumer and producer surplus of these drugs has amounted to \$1.33 trillion and \$59 billion dollars, respectively. A consumer surplus of a \$1.33 trillion can be understood by considering that close to 1.5 million U.S. citizens have been infected by HIV since the start of the epidemic and have, on average, enjoyed gains in life expectancy of more than 10 years. With a value of a life-year equal to \$100,000, the added survival has been worth more than \$1 million per individual. The producer surplus comes from the present value of revenues from sales of new HIV drugs—these sales have grown from \$1 billion to \$4 billion annually since the break-through drugs came on the market in 1996. From these revenues, we are able to estimate profits (producer surplus) by netting out the variable costs of production as estimated by generic prices after patent expirations.

The two estimates together imply that consumers enjoy nearly 96% of the total social surplus of these new technologies. This raises the question of whether the small share of surplus appropriated by those investing in R&D means that these technologies are too cost-effective as conventionally measured by CE measures. Patients and health plans are getting too good a deal in the short run which hurts them in the long run as the meager share going to firms provides an insufficient incentive for future R&D. This paper is forthcoming in a conference organized by the NIH Director entitled *Biomedical Innovation and the Economy*.

The Speed-Safety Tradeoff in FDA Drug Approvals.

“Assessing The Safety and Efficacy of the FDA: The Case of PDUFA” is joint with Ernst Berndt (MIT) and Adrian Gottschalk and Matthew Strobeck (MIT/Harvard). Despite FDA’s strict adherence to evidence-based evaluation of products overseen, there exists no generally agreed upon evidence-based methodology to evaluate the agency’s own safety and efficacy. This paper proposes a general methodology to evaluate FDA policies in general and the central speed-safety tradeoff of the agency in particular. We apply this methodology to estimate the welfare effects of a major piece of legislation affecting this tradeoff - The Prescription Drug User Fee Acts (PDUFA). These Acts mandated FDA performance goals in reviewing and acting on drug applications within specified time periods, in return for levying taxes on drug manufacturers. Our methodology uses data on the sales of drugs as well as the review and withdrawal times of the FDA for those drugs to estimate measures of the private and social surplus associated with the agency in general, and the change of the speed-safety tradeoff induced by PDUFA in particular.

We find that PDUFA raised the private surplus of producers, and thus innovative returns, by about \$14 billion (1.3 percent) or \$17 billion (3.7 percent) at real discount rates of 3 percent and 9 percent respectively. Depending on the market-power assumed for producers while on patent, we find that PDUFA raised consumer welfare between \$7 billion and \$19 billion (1.2 percent) or between \$5 billion and \$17 billion at real discount rate of 3 percent and 9 percent respectively. The combined social surplus was raised between \$18 billion and \$31 billion at real discount rates of 3 percent and 9 percent. Converting these economic gains into equivalent health benefits, we find that the faster access to drugs on the market enabled by PDUFA saved the equivalent of 180 to 310 thousand life-years. Alternatively, we estimate an upper bound on the adverse effects of PDUFA based on drugs submitted during PDUFA I/II and subsequently withdrawn for safety reasons and find that about 55.6 thousand life-years were lost. The paper also discusses how our methodology can be used to perform a quantitative and evidence-based evaluation of the desirability of many other FDA policies in the future.

Private and Public Returns to Education

I have worked on a project with Fabian Lange on the social and private benefits to education. A traditional rationale for government support of education is that the social returns to education exceed the private returns. We are seeking quantifiable evidence on the divergence between the private and social returns to education.

There are three main arguments for a difference between private and social returns. First and least quantifiable, educated individuals may simply be better citizens. They are more informed voters, make better neighbors, and are more interesting to talk to, so the social benefits exceed the private returns. Second, critics of education often argue that an individual's years of schooling act as a labor market "signal", serving to distinguish more able individuals from less able ones, even if productivity is not affected. If this is true, the private returns to schooling exceed the social benefits and (some) education is wasteful. Third, an educated workforce may raise social productivity by more than it raises private productivity. For example, interactions among more educated individuals may lead to a faster production and diffusion of new ideas and innovation, which raises economic growth. Private decision makers do not take this kind of externality into account, so if it is important it would reinforce the case for subsidizing education.

In "Externalities, Growth and Schooling" we focus on the second and third issues – signaling and productivity spillovers. This paper studies models of economic growth applied to census data on American states from 1940 to 2000. During this period, income differences between states converged markedly. In particular, the large difference between per capita income in the North and South declined markedly. We apply a spatial equilibrium model and growth accounting techniques to this data, calculating total factor productivity growth by state and the convergence of per-capita incomes. We then relate growth and convergence to (a) changes in observable measures of human capital (education), unobserved but measurable quality (calculated from between-state movers), and a sort of Solow residual. Human capital is a major contributor to both growth and

convergence, though our evidence does not support notions of human capital externalities as important contributors to economic growth. That is, the private and social returns to human capital investments appear to be roughly the same. Accordingly, our results cast doubt on models of economic growth that emphasize positive externalities, as well as on signaling models of education that predict private returns in excess of social returns.

Competitive Bundling

The literature on product bundling is almost exclusively concerned with possible anticompetitive effects of the practice, which allegedly leads to exclusion of potential competitors. In work with Kevin Murphy and Rob Gertner, we offer a pro-competitive interpretation, based on heterogeneous valuations of the components of the bundle. When sellers have varying market power in the bundles components, bundles are better substitutes than are the individual components. Then bundles lead to greater competition and lower prices, at the cost of reduced variety.

Reforming the Welfare State

After 10 years, the Swedish-American team of economists that produced the original group of studies on this topic is revisiting the issues. I will author a study on Swedish labor market performance, and (with Richard Freeman) act as project leader and editor of the resulting NBER volume.

Value of Pace of Medical Innovation

Kevin Murphy and I extend our work on the value of health, dealing with the speed with which medical innovations are brought to market, and the social gains from improvements in that process. This work is described in more detail in Kevin Murphy's research summary earlier in this Annual Report.

The Media's Impact on Regulation

I have continued my research with Alexander Dyck (HBS) on the impact of the media on the functioning of an economic system. In a paper with David Moss (HBS) we have explored the role media play in shaping actual regulation. Motivated to reach big audiences by the lure of large profits, media firms typically seek to transform real events and issues – including public policy issues – into entertaining stories. In so doing, they end up informing the public about these issues and events, thus, they alter the balance of power in favor of consumers' interest.

Consistent with this idea, we document that the rise of investigative journalism through 'muckraking' magazines in the early part of the 20th century helps explain the emergence of important progressive-era legislation. We find that Representatives and Senators from states with high per capita circulations of muckraking magazines are more likely to alter their vote in favor of consumers' interest on issues that were discussed in muckraking magazines.

To clarify the circumstances under which media can serve as a constraint on the political influence of vested interests, and why this constraint is often not more effective, we introduce a simple model of profit-maximizing media. The model suggests the media are particularly effective in this role when the audience is large, when an issue can be more easily converted into entertaining news, and when subscriptions are a more important source of revenues than advertising. We also show that this simple model can help explain the rise and decline of muckraking journalism in the United States. This paper has been presented at the University of Chicago Micro Lunch and to the National Bureau of Economic Research (NBER) Public Economics conference.

Trust and Equity Ownership

I have continued my research with Luigi Guiso (Universita' di Sassari, visiting Chicago) and Paola Sapienza (Northwestern University) on the role of trust. During this year we

wrote a paper on the effect of lack of trust on stock market participation. The underlying idea is very simple. The decision to invest in stocks requires not only an assessment of the risk-return trade-off given the existing data, but also an act of faith (trust) that the data in our possession are reliable, that the overall system is fair. Episodes like the collapse of Enron may change not only the distribution of expected payoffs, but also the fundamental trust in the system that delivers those payoffs. Most of us will not enter a Three-Card Monte game played on the street, even after observing a lot of rounds (and thus getting an estimate of the true distribution of payoffs). The reason is that we do not trust the fairness of the game (and the person playing it). What we claim in this paper is that for many people (especially people unfamiliar with finance), the stock market is not intrinsically different from the Three-Card Monte game. They need to have trust in the fairness of the game and in the reliability of the numbers to invest in it. We focus on this need for trust to explain differences in stock market participation across individuals and across countries.

We identify trust with the subjective probability individuals attribute to the possibility of being cheated. This subjective probability is partly based on objective characteristics of the financial system (the quality of investor protection, its enforcement, etc.) that determine the likelihood of frauds such as Enron and Parmalat. But trust reflects also the subjective characteristics of the person trusting. Differences in educational background rooted in past history (see Guiso, Sapienza, and Zingales (2004)) or in religious upbringing (see Guiso, Sapienza, and Zingales (2003)) can create considerable differences in levels of trust across individuals, regions and countries.

By using the annual Dutch National Bank Household survey complemented with some questions on trust, we show that trusting individuals are significantly more likely to buy stocks and risky assets and, conditional on investing in stock, they invest a larger share of their wealth in it. This effect is economically very important: trusting others increases the probability of buying stock by 50 percent of the average sample probability and raises the share invested in stock by 3.4 percentage points (15.5 percent of the sample mean). This paper was presented at the University of Chicago Finance Lunch, to the NBER

Macroeconomics Summer Meeting and in seminars at New York University and the University of Texas at Austin.

Visitors

Alan Auerbach

Optimal Budget Planning Horizons

Governments around the world have struggled to find the right method of controlling public spending and budget deficits. In the United States, the Budget Enforcement Act of 1990 introduced a budget window, the time period over which estimated effects of legislation were evaluated. Over the years, the length of the budget window has grown, with a ten-year budget window being the recent effective standard.

The basic argument for using a multi-year budget window is that it provides a more accurate picture of legislation's long-run impact and discourages manipulation of the timing of revenues and expenditures to shift borrowing beyond the window. Some have called for using a much longer budget window, to follow the lead of the Social Security and Medicare programs, which estimate fiscal balance over a 75-year period. But this approach gives rise to a different type of problem that is well illustrated by a proposal to resolve the Social Security system's imbalance using a tax increase starting in 2045! Thus, a budget window that is too short permits the shifting of costs beyond the window's endpoint, but a budget window that is too long allows the shifting of fiscal burdens to those whom budget rules aim to protect. This suggests that there may be an "optimal" budget window.

An optimal budget rule is one that places less weight on years further in the future, over and above normal discounting. This reflects two factors: policies announced for the future may not take effect and, if they do, that their impact will be felt more by those whom budget rules are intended to protect. The solution identified here involves the shape of the budget window, rather than restrictions on policies themselves. Thus, the optimal window is more flexible with respect to the economic environment than alternative approaches that would either impose limits on annual budget deficits or simply treat all policies as permanent.

Bank Lending to Opaque Firms

I investigate the application of models with selection to the study of the matching between borrowers and different types of banks. Few studies in banking employ corrections for the selection of bank types by different borrowers in analyzing the conditions banks of different sizes apply to different types of borrowers. In particular, I investigate the effect of banks being large/small, local/not local, specialized in small business lending/not specialized, on collateral, liquidity, maturity and default rates. The analysis employs data from Italy. The tests are based on estimating average treatment effects following the method suggested by Heckman, Ichimura and Todd. Preliminary results show that more opaque firms, identified using accounting requirements for business legal forms, have a higher probability of borrowing from banks that are expected to have a comparative advantage in using soft information in lending decisions, i.e. small, local and specialized banks. I also find that these banks apply *relatively* better conditions to borrowers of increasing opacity, compared to the other banks. Further analysis will be focused on discriminating between comparative advantage, absolute advantage and segmentation as the explanation of the observed sorting between borrowers and banks.

Crime and Credit Markets

This study focuses on an empirical analysis of the effect of crime on the functioning of credit markets. Employing a large data set on Italian banks, I relate a number of different outcomes to crime rates in the borrower's locale. I find that firms located in areas where there is more crime pay a premium on short term loans compared to similar firms in other areas. The premium is about 10 basis points when firms at the 25th and 75th percentiles of crime are compared. These firms post less collateral but appear to have less liquidity available on their credit lines. Two possible mechanisms might be driving the result and are the subject of current investigation. The first mechanism is that banks operating in high crime areas have higher costs and pass these costs on to borrowers. The second, possibly concurrent mechanism, is that banks in high crime areas face a pool of customers that are not only riskier on average but also more opaque. The second effect is

consistent with preliminary results that the premium is charged only by banks that are not chartered in the local market. The results show that not all types of offenses affect the cost of credit. Property crime, theft and robbery do not affect the cost of credit, whereas fraud has a positive effect on the premium charged to firms. Furthermore, the types of crime that are typically believed to render firms more fragile, including mafia-related offenses, presence of criminal organizations and extortion, have a strong positive effect on the cost of credit.

My current work on this topic includes the study of the impact of crime on a number of additional outcome variables. Among these, the interest paid by banks on deposits and other cost variables, loan default rates, loan maturity and on measures of the availability of credit, for example the extent to which firms overdraft on their short term loan facilities.

Tax Evasion and Credit Markets

During my stay at the Center I have started with Luigi Zingales a project on the effect of tax compliance on the development of credit markets. As suggested by a number of theoretical studies, the development of credit markets depends on the availability and quality of information on the projects that entrepreneurs wish to finance. In countries where tax compliance is low, firms are not only likely to provide less information on their economic and financial conditions to the public, but also the quality of such information is likely to be poorer. Using Italian data, we investigate how differences across industries in tax compliance rates and average differences across provinces affect the availability of credit and the nature of credit relationships. At the aggregate level, controlling for industry and province fixed effects, we estimate the effect of the tax compliance rates on the probability that a firm receives credit, based on its presence in the Italian Credit Register, and the default rate of borrowers. In a second step of the study, we plan to use micro data to relate tax compliance to the distance between borrower and lender (a measure of the extent to which soft information can substitute for lack of reliable hard information), the probability of default, duration and relationship turnover, and loan pricing.