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## Program Report

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## International Trade and Investment

**Robert C. Feenstra\***

The International Trade and Investment (ITI) Program does research on patterns of international trade and foreign direct investment; policies designed to influence the level of trade and investment; and their consequences on importing and exporting countries, such as for their wages, growth, the environment, and so on. Empirical work in the Program has benefited from several new datasets covering both U.S. and global trade at a detailed level; these are now available from the NBER (see the accompanying box).<sup>1</sup> In this review, we cover work completed since last the Program Report in Winter 2000/2001, beginning with a new research area dealing with the microeconomics of the trading firm.

### Microeconomics of The Trading Firm

Traditionally, theories of international trade have explained trade patterns by appealing to differences in the factor endowments found in various countries or to cross-country differences in industry productivity. That type of research continues, extending earlier models to allow for multiple industries, factors of production, and countries.<sup>2</sup> However, a new line of research digs deeper into the determinants of trade by allowing for differences across firms and recognizing that only the most productive firms will become exporters. That theoretical prediction receives strong empirical confirmation; generally, the new theory allows for a rich exploration of firm-level differences in datasets for the United States and other countries. Here are summaries of several research areas within this broad topic:

#### *Firm Heterogeneity*

The first way that firms can differ is in terms of productivity. Jonathan Eaton and Samuel Kortum introduced a Ricardian model with

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# NBER Reporter

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heterogeneous firms.<sup>3</sup> In that model, firms receive random productivity draws and compete with other firms producing the identical product, so that only the most productive firm survives within each country. Across countries, however, firms face differing transportation costs on their sales to external markets, so that multiple firms can be producing the same product and selling to different markets.

A second model with heterogeneous firms is attributable to Marc Melitz.<sup>4</sup> His work builds on an earlier model of monopolistic competition and trade in which goods are differentiated. In contrast to other researchers, Melitz allows the firms within an industry to be heterogeneous in their productivities. Each firm has to pay a fixed cost (for example, to develop its differentiated product), so that only the more productive firms will end up being profitable, while the least-productive firms exit the market. Furthermore, Melitz assumes that there is an additional fixed cost of exporting (for example, to market the product abroad), so that only the most productive firms find it profitable to export. This model has been extended to allow for multiple industries with differentiated products in each.<sup>5</sup>

These ideas have been applied to datasets on U.S. and French firms, as well as some for developing countries.<sup>6</sup> For the United States, Andrew B. Bernard, J. Bradford Jensen, and Peter K. Schott have studied the factors leading to the exit of manufacturing firms, including competition from low-wage countries and declining trade barriers.<sup>7</sup> Generally, exits occur less frequently at multi-product plants, at exporters, and at plants paying above average wages. In addition, productivity growth is faster in industries with falling trade costs, and plants in industries with falling trade costs are more likely to die or become exporters. Eaton, Kortum, and Francis Kramarz find that in France, firms differ substantially in export participation, with most firms only selling at home, and that markets in which French firms have a large share are also those where many more firms are exporting.<sup>8</sup>

These empirical applications depend on having firm-level datasets, which are not always available. An alternative is to use product-level trade data. This approach does not allow for the measurement of firm heterogeneity, but does allow for the entry and exit of products across years, as analyzed by Thomas I. Prusa.<sup>9</sup> David Hummels and Peter J. Klenow decompose the growth of world trade into that part attributable to countries exporting new products — what they call the “extensive margin” — and that part attributable to countries

exporting more of the same products — the “intensive margin.” They find that extensive margin accounts for two-thirds of the greater exports of larger economies, and one-third of their imports.<sup>10</sup> Hiau Looi Kee and I estimate the impact of new goods on productivity growth for the exporter, and find that export variety accounts for 13 percent of within-country productivity growth.<sup>11</sup> Conversely, Christian Broda and David E. Weinstein measure the impact of new goods on the welfare of the importer. For the United States, they find that upward bias in the conventional import price index (because of ignoring product variety) is approximately 1.2 percent per year, implying that the welfare gains from cumulative variety growth in imports are 2.8 percent of GDP in 2001.<sup>12</sup>

### *Incomplete Contracts*

Aside from firm heterogeneity, a second theoretical innovation has been to take partial-equilibrium models of incomplete contracts between firms and apply them to a general equilibrium setting with trade. One example of this approach is the work by Pol Antràs dealing with the well known “product cycle,” originally studied by Raymond Vernon. Under this story, new products are developed in advanced countries like the United States or Europe, and only later do these technologies diffuse to developing countries where wages are lower. What factors explain this diffusion? While earlier research on growth models has stressed the imitation of products by developing countries, Vernon’s story instead had the technologies voluntarily transferred abroad, either within the multinational firm or between firms. How are we to explain the decision of the firms to transfer their production abroad?

Antràs specifies that contracts between a firm and its subsidiaries are incomplete, and shows how the dynamics of the product cycle can be described effectively.<sup>13</sup> In particular, he models the Northern firm as having two activities: R and D and production. It is more difficult to write contracts to specify and compensate the R

and D activity, and more difficult still to write these contracts in the South. Over time, however, R and D becomes less important relative to production. With this framework, Antràs solves for the equilibrium time at which the Northern firms will shift production to the South, and for whether the firm will engage in multinational activity there, or arms-length contracts that license its technology to unrelated firms. In other work, Antràs finds that capital-intensive industries are more likely to engage in intra-firm trade across borders, and he offers an incomplete-contracting explanation for this finding.<sup>14</sup>

There are many other papers that explore incomplete contracts and outsourcing. Gene M. Grossman and Elhanan Helpman develop general equilibrium models of outsourcing building upon either the property-rights approach or the incentive-systems approach to the theory of the firm.<sup>15</sup> Gordon Hanson and I test these two approaches using data for processing trade in China, while Keith Head, John Ries, and Barbara J. Spencer examine vertical networks in Japan,<sup>16</sup> and Deborah L. Swenson considers U.S. offshore assembly.<sup>17</sup> Motivated by evidence on the importance of incomplete information and networks in international trade, James E. Rauch and Joel Watson investigate the supply of “network intermediation.”<sup>18</sup> They provide both empirical evidence and a theoretical explanation for this activity. Finally, Diego Puga and Daniel Treffer examine how the tension between innovation and the control over this activity shapes the organization of the firm.<sup>19</sup>

### *Foreign Direct Investment*

Both the monopolistic competition model with heterogeneous firms and the incomplete contracting model can be used to analyze foreign direct investment (FDI). The challenge in the FDI literature has been to also explain why firms need to have ownership in their foreign subsidiaries, rather than just exporting or licensing their technologies abroad. By modeling this decision as being made by heterogeneous firms under incomplete con-

tracts, one can obtain new insights into the determinants of FDI.

Helpman, Melitz, and Stephen R. Yeaple model the decision of heterogeneous firms to serve foreign markets either through exports or FDI.<sup>20</sup> These modes of market access involve different relative costs, some of which are sunk while others vary with sales volume (such as transport costs and tariffs). Relative to investment in a subsidiary, exporting involves lower sunk costs but higher per-unit costs. In equilibrium, only the more productive firms choose to serve the foreign markets, and the most productive among this group will further choose to serve the overseas market via FDI. Testing their predictions on data of U.S. affiliate sales and exports, they confirm that having more productive firms leads to significantly more FDI relative to export sales. Likewise, Head and Ries confirm this prediction for Japanese multinationals.<sup>21</sup>

Prior literature on multinationals has distinguished two main reasons for FDI to occur: “vertical” investment, which takes advantage of lower factor prices abroad; and “horizontal” investment, which takes advantage of proximity to foreign markets by operating abroad. Recent literature has recognized that the rationale for FDI is more complex, though. Grossman, Helpman, and Adam Szeidl expand the set of choices available to the firm to include production of intermediate goods and assembly performed at home, in another Northern country, in the low-wage South, or in several of these locations.<sup>22</sup> Notice that these choices include the so-called “export platform” FDI, under which production occurs in another Northern country for export from that country, as described by James Markusen and co-authors.<sup>23</sup> Grossman and Helpman study how the size of the cost differential between North and South, the extent of contractual incompleteness, the size of the industry, and the relative wage rate affect the organization of industry production.

The ideas that firms can pursue “complex integration strategies,” and that they are heterogeneous in their capabilities, are also central to the work of Yeaple and Volcker Nocke.<sup>24</sup> They

assume that firms' capabilities differ in their degree of international mobility. By allowing capabilities to be traded on an international merger market, these researchers develop a quite general model of cross-border mergers, which may involve the most or the least efficient firms.

Notice that in these theoretical models the productivity of firms affects their decision to engage in FDI. That link works in the opposite direction of the question sometimes asked, as to whether FDI enhances productivity in the host country? Yeaple and Wolfgang Keller investigate this question for the United States, and Matthew J. Slaughter and co-authors for the United Kingdom.<sup>25</sup> Linda Goldberg<sup>26</sup> and Robert E. Lipsey<sup>27</sup> also review evidence on FDI and productivity, along with the impact of foreign firms on wages in the host countries. On the financial side, Ann E. Harrison and Margaret S. McMillan<sup>28</sup> ask whether inward FDI affects the credit constraint facing domestic firms, while Joshua Aizenman examines the links between financial openness and trade flows.<sup>29</sup>

The most direct empirical evidence on the ownership structure of foreign affiliates comes from Mihir A. Desai, C. Fritz Foley, and James R. Hines, Jr.<sup>30</sup> Using data on foreign affiliates of U.S. firms, they study why partial foreign ownership has declined markedly over the last 20 years, in favor of complete foreign ownership. They argue that there is a complementarity between whole ownership and intrafirm trade, suggesting that reduced costs of coordinating global operations, together with regulatory and tax changes, gave rise to the sharply declining propensity of American firms to organize their foreign operations as joint ventures over the last two decades. In related work, Hanson, Raymond J. Mataloni, Jr., and Slaughter investigate the extent to which U.S. affiliates engage in intrafirm purchase of intermediate inputs from their parent firms.<sup>31</sup>

There is also much work dealing with the impact of taxes on FDI. For example, Bruce A. Blonigen and Ron B. Davies show that bilateral tax treaties do not promote new invest-

ment, contrary to the common expectation.<sup>32</sup> Using tax treaties negotiated by the United States and national-level data, they find that treaty formation may actually reduce investment, as predicted by arguments suggesting that treaties are intended to reduce tax evasion rather than to promote foreign investment. Desai, Foley, and Hines also study the ability of U.S. multinationals to avoid paying U.S. taxes and find that "chains of ownership" increasingly are being used to avoid U.S. tax liabilities.<sup>33</sup> However, in that case U.S. FDI abroad is even more sensitive to host-country taxes, because it does not receive credit for those taxes paid on its U.S. liabilities.

## Political Economy of Trade Policy

A second major focus of the ITI program is on the political economy of trade policy. One important policy question is whether countries should pursue unilateral trade reform, multilateral trade reform, or bilateral deals with particular countries, as under customs unions and free trade areas. Research in the ITI program sheds light on these various alternatives.

### *Unilateral, Bilateral, and Multilateral Reform*

On the first question — whether to pursue unilateral trade reform — Pravin Krishna and Devashish Mitra have argued that this action may lead to trade reform in the partner country, too, through changing the voter incentives there.<sup>34</sup> In their research, unilateral reform works to eliminate equilibria in which both countries pursue protectionist policies, and to move the world economy towards freer trade under either majority voting or interest-group lobbies. Grossman and Helpman, in contrast, identify a protectionist bias in majority politics, caused by a conflict between the *ex ante* objectives of national party leaders and the *ex post* objectives of elected legislators. When trade policy is chosen by the majority delegation, and legislators in the minority have limited means to influence choices, the parties

announce trade policies that favor specific factors, and the expected tariff or export subsidy is positive. Positions and expected outcomes monotonically approach free trade as party discipline strengthens.<sup>35</sup>

The second question — whether to pursue bilateral or multilateral reform — can be modeled as a comparison between sequential versus simultaneous bargaining, as studied by Philippe Aghion, Antràs, and Helpman.<sup>36</sup> In the sequential game, a country make deals with a series of other countries, where the bargains negotiated must be consistent with the deals that potentially will be made in the future. Aghion, Antràs, and Helpman show that global free trade is not achieved if the political-economy motive for protection is sufficiently large. Furthermore, the model generates both "building bloc" and "stumbling bloc" effects of preferential trade agreements, to use the terminology of Jagdish Bhagwati. In particular, these researchers find conditions under which global free trade is attained only when preferential trade agreements are permitted to form (a building bloc effect), and conditions under which global free trade is attained only when preferential trade agreements are forbidden (a stumbling bloc effect).

In related work, Kyle Bagwell and Robert W. Staiger analyze a sequential bargaining game in which the countries are constrained by the GATT/WTO provision of most-favored nation (MFN), which states that all GATT/WTO members must be treated equally.<sup>37</sup> This means, for example, that a concession (that is, reduced trade barrier) given to a current negotiating partner must automatically be extended to later partners. Bagwell and Staiger argue that the MFN principle can make it less likely for countries to be willing to offer concessions at early stages of the sequential bargaining process, but that this potential source of conflict can be avoided by two other GATT/WTO principles: renegotiation at later stages, and reciprocity in the concessions made by each country. Incorporating these provisions into the bargaining game allows for an efficient outcome

even under the MFN principle. This general line of research enables Bagwell and Staiger to rationalize a number of GATT/WTO provisions.<sup>38</sup>

In empirical applications, Trefler investigates the 1989 Canada-U.S. Free Trade Agreement, and finds results consistent with the heterogeneous-firm models discussed earlier.<sup>39</sup> Trefler used the experience of Canadian manufacturing industries over 1989-96 to examine the short-run adjustment costs and long-run efficiency gains that flow from trade liberalization. For industries subject to large tariff cuts, the short-run costs included a 15 percent decline in employment and a 10 percent decline in both output and the number of plants. Balanced against these large short-run adjustment costs were long-run labor productivity gains of 17 percent or a spectacular 2 percent per year. Surprisingly, this growth is not attributable to rising output per plant, increased investment, or market share shifts to high-productivity plants. Instead, half of the 17 percent labor productivity growth appears to be caused by favorable plant turnover (entry and exit) and rising technical efficiency. John Romalis also investigates the impact of the Canada-U.S. and the North America Free Trade Agreements on trade between Canada, the United States, and Mexico.<sup>40</sup> He argues that these trade agreements increased North American output and prices in many highly protected sectors by driving out imports from non-member countries.

In other work, Krishna and co-authors investigate the impact of foreign lobbies on tariffs and non-tariff barriers in the United States.<sup>41</sup> They find that foreign lobbying activity has a significant impact on trade policy, and in the predicted direction: tariffs and non-tariff barriers are both negatively related to foreign lobbying activity. Pushan Dutt and Mitra investigated the influence of domestic ideology on trade policies, finding that left-wing governments adopt more protectionist trade policies in capital-rich countries, but more pro-trade policies in labor-rich economies than right-wing ones.<sup>42</sup> Finally, Andrew K. Rose has conducted a series of investigations into whether WTO members have more

liberal trade policy, and higher or more stable trade volumes.<sup>43</sup> Those investigations have received substantial attention in the press, and also have been responded to by Arvind Subramanian and Shang-Jin Wei.<sup>44</sup>

### *Tariffs, Subsidies, and Dumping*

Moving beyond large-scale trade reform to the application of tariffs or subsidies in specific industries, the first question is why such interventions are permitted under the GATT/WTO framework. Bagwell and Staiger argue that the ability to “escape” from GATT obligations to keep tariffs low – as under the escape clause – is a desirable feature of a self-enforcing trade agreement in the presence of uncertainty about future political pressures.<sup>45</sup> They also provide a new interpretation of a feature of the WTO Safeguard Agreement, under which escape clause actions cannot be re-imposed in the same industry for a time period equal to the duration of the most recent escape clause action. A dynamic constraint of this kind can raise the expected welfare of negotiating governments, they find. In other work, Bagwell and Staiger investigate the new rules on subsidies that were added to GATT rules with the creation of the WTO.<sup>46</sup> The GATT subsidy rules typically were viewed as weak and inadequate, while the WTO subsidy rules are seen as significantly stronger. But these researchers argue that the key changes introduced by the WTO subsidy rules ultimately may do more harm than good to the multilateral trading system, by undermining the ability of tariff negotiations to serve as the mechanism for expanding market access.

Douglas A. Irwin investigates the application of the escape clause provision in practice in the United States.<sup>47</sup> There has been a conflict between the U.S. application of these rules (under Section 201 of U.S. trade law) and the WTO procedures. Irwin suggests a method by which the United States can ensure that future decisions conform to the WTO Safeguards Agreement. On the issue of export subsidies, Irwin and Nina Pavcnik model the market for wide-body aircraft, including the

super-jumbo A-380 being marketed by Airbus.<sup>48</sup> They first investigate the effects of the 1992 U.S. — European Union agreement to limit subsidies in civil aircraft, and argue that this raised prices by about 3 percent. Then they simulate the impact of the entry of the A-380 on the demand for other wide-bodied aircraft, notably the Boeing 747. They find that the A-380 could reduce the market share of the 747 by up to 14 percent in the long range wide-body market segment (depending upon the discounts offered on the A-380), but would reduce the market for Airbus’s existing wide-bodies by an even greater margin.

Desai and Hines investigate the market reaction to another U.S. export subsidy: the provision by which corporate income taxes could be reduced by establishing a Foreign Sales Corporation (FSC).<sup>49</sup> When the European Union announced its intention in 1997 to file a complaint before the WTO arguing that the FSC amounted to an illegal export subsidy, share prices of American exporters fell sharply. The share price declines were largest for exporters whose tax situations made the threatened export subsidy particularly valuable, and for those with high profit margins. The latter finding is consistent with strategic trade models in which export subsidies improve the competitive positions of firms in imperfectly competitive markets.

Besides the escape clause, import duties often are applied because of anti-dumping actions, and the use of those provisions in the United States and abroad has been increasing over time, as documented by Irwin.<sup>50</sup> James E. Anderson and Maurizio Zanardi argue that the administration of anti-dumping law by the executive branch in the United States, and not the Congress, is a compelling example of how legislators can avoid taking responsibility for such trade actions while also deterring their political challengers.<sup>51</sup> These authors argue that the political explanation for the anti-dumping program is more compelling than other explanations, such as predatory pricing. Blonigen and Prusa, with various co-authors, also investigate the increasing use of anti-dumping filings along with detailed features of the pro-

gram, such as: administrative reviews in the calculation of anti-dumping duties; discretionary practice by the Department of Commerce; and the prospect of foreign retaliation.<sup>52</sup> Blonigen finds that prior anti-dumping experience leads to greater filing activity and the likelihood of affirmative decisions or suspension agreements, but to significantly lower dumping margins.<sup>53</sup> This suggests that experience does not affect dumping margins as much as it lowers filing costs, leading to the petitioning of weaker cases. Further evidence on the use of anti-dumping petitions and the reaction of firms to other trade policies was presented at a May 10-11, 2002 conference entitled “Firm-level Responses to Trade Policies,” organized by Blonigen.<sup>54</sup>

## Trade and Developing Countries

Researchers in the ITI program are investigating a variety of other topics, some of which focus on developing countries. One example was the conference on “Globalization and Poverty,” organized by Ann Harrison, held in September 10-12, 2004. That conference included contributions by ITI researchers Donald Davis, Hanson,<sup>55</sup> James Levinsohn,<sup>56</sup> Penny Goldberg, and Pavcnik;<sup>57</sup> their work is summarized in the Winter 2004/5 NBER Reporter.<sup>58</sup> Here I describe research in several other areas that is relevant to developing countries.

### *Trade and the Environment*

Research on trade and the environment frequently addresses the issue of whether lower-income countries serve as a “pollution haven” for dirty industries. The conclusion of Harrison and other authors is that the incentives to move industries based on pollution regulations are quite small, and not robust to alternative specifications.<sup>59</sup> Furthermore, foreign plants located in developing countries are more energy efficient and use cleaner types of energy than domestic plants. Arik Levinson and M. Scott Taylor question such conclusions, though, arguing that previous estimates of the relationship between regulatory costs and

trade/investment flows are plagued by estimation problems.<sup>60</sup> Using data on U.S. regulations and manufacturing trade flows among the United States, Canada, and Mexico, these authors find that industries whose abatement costs increased most experienced the largest increases in net imports. For the 20 industries hardest hit by regulation, the change in net imports ascribed to the increase in regulatory costs amounts to more than half of the total increase in trade volume over the period.

Related to the “pollution haven” hypothesis is the general question of whether an increase in international trade is good or bad for the environment. Three measures of environmental quality can be distinguished: environmental regulation, pollution, and the sustainability of resource stocks. Jeffrey A. Frankel and Rose find that increased trade may indeed have a beneficial effect on some forms of pollution, such as SO<sub>2</sub>, as well as regulations, though not on other emissions such as CO<sub>2</sub> (where the free-rider issue is more prevalent).<sup>61</sup> On the third measure — resource stocks — Brian R. Copeland and Taylor provide theoretical reasons to be less than optimistic.<sup>62</sup> They identify characteristics of economies that, when faced with an increase in world prices for resources, may end up depleting their stocks because of common-property problems, or not, depending on the extent to which regulations can evolve.

### *Openness and Growth*

A second area of relevance to developing countries is the link between openness to trade and growth. Dani Rodrik, Roberto Rigobon, and co-authors investigate the linkages between trade and growth, while controlling for variables such as democracy, income, and institutions.<sup>63</sup> Generally, they find that a straight-forward positive relationship between increasing openness and faster growth is not supported by the data. Juan Carlos Hallak and Levinsohn express a similar skeptical viewpoint on the positive relationship between openness and growth, arguing instead that the mechanisms by which trade affect growth should be the subject of investigation.<sup>64</sup>

On the measurement of real GDP and growth, Alan Heston and I, with our co-authors, argue that previous measures from the Penn World Tables conflate productivity growth with terms-of-trade changes.<sup>65</sup> We distinguish real GDP measured on the expenditure side from real GDP measured on the output side: the current measure of real GDP reported in the Penn World Tables is the former. The difference between these two is the terms of trade, that is, an index for each country of actual export and import prices relative to average world export and import prices. Countries that earn lower-than-average prices for their exports, or pay higher-than-average prices for their imports, will have a low terms of trade, and for that reason will have real GDP on the expenditure side less than on the output side. Heston and I find that this is a typical situation for poor countries with below-average export prices.

Why are the export prices low for poorer countries? One possibility is that they are selling lower-quality goods, as discussed by Hallak.<sup>66</sup> In that case, the export prices used to construct real GDP should be quality-corrected. Alternatively, it may be that poorer countries face higher-than-average trade barriers in their export markets, as found by Anderson and Eric van Wincoop.<sup>67</sup> Both higher trade costs and remoteness reduce the prices that countries receive for their exports. Stephen Redding and Schott provide a model describing the relationship between countries’ distance from global economic activity, educational attainment, and economic development.<sup>68</sup> Firms in remote locations face greater trade costs on both exports and intermediate imports, reducing the amount of value added left to remunerate domestic factors of production. Redding and Schott show theoretically that remoteness depresses the skill premium and therefore incentives for human capital accumulation. Empirically, they find that countries with lower market access have lower levels of educational attainment, and that the world’s most peripheral countries are becoming increasingly remote over time.

## Labor Markets

A third research area of relevance to developing countries concerns the labor market. Kala Krishna and co-authors have argued that distortions in that market — attributable to imperfect wage compensation or to credit constraints on financing education — can substantially limit the gains (and even lead to losses) caused by trade.<sup>69</sup> To give one example, McMillan, Rodrik, and Karen Horn Welch report on the widely discussed liberalization of the cashew sector in Mozambique.<sup>70</sup> While the rise in cashew prices brought gains to farmers, it also resulted in unemployment in the urban cashew processing industry, where workers and firms were unwilling to shift to other activities because they did not expect the liberalization to continue. The magnitude of these gains and losses is roughly the same, so the net welfare effect was very small, but with large distributional consequences. This example highlights the importance of trade on affecting labor market outcomes, as has been investigated in several other empirical papers.

Eric Edmonds and Pavcnik study the impact of trade on the use of child labor, recognizing that trade flows are endogenous. Using geography as an instrumental variable, they find that countries that trade more have less child labor.<sup>71</sup> That finding is confirmed in their detailed investigation of the experience of one country: Vietnam.<sup>72</sup> In that case, Edmonds and Pavcnik find that increases in the price of rice (an export crop) were associated with declines in the use of child labor, especially for girls of secondary school age. Overall, rice price increases can account for almost half of the decline in child labor that occurred in Vietnam during the 1990s. Their results suggest that the use of trade sanctions on exports from developing countries to eradicate child labor is unlikely to yield the desired outcome.

In a related context, Harrison and Jason Scorse confirm that finding by investigating actions taken by the U.S. government and by non-governmental organizations (NGOs) to limit “sweat shop” activities in Indonesia.<sup>73</sup> Under the U.S. government threat of withdrawing tariff privileges for Indonesia,

the minimum wage was doubled in real terms. That reduced employment of unskilled workers by as much as 10 percent, but anti-sweatshop activism targeted at textile, apparel, and footwear plants did not reduce employment. Plants targeted by activists were more likely to close, but those losses were offset by employment gains at surviving plants. The message of this study is that pressure from the U.S. government to raise wages was too blunt a tool to be effective, whereas the actions of NGOs were better targeted at particular plants, resulting in higher wages with little or no net loss in employment.

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## World Trade Flows, 1962-2000

A new dataset of worldwide bilateral trade data by commodity, for 1962-2000, is available from [www.nber.org/data](http://www.nber.org/data) (choose: International Trade Data; World Trade Data; NBER-United Nations trade data; documentation is presented in NBER Working Paper No. 11040). Prepared by Robert C. Feenstra and Robert E. Lipsey, with assistance from Haiyan Deng, Alyson C. Ma, Hengyong Mo, and Harry P. Bowen, the data are derived from the United Nations (UN) trade statistics and organized by the 4-digit Standard

International Trade Classification, revision 2, with country codes similar to the UN classification. This dataset updates the Statistics Canada World Trade Database for years 1970-92 that was available from the NBER. In that database, Statistics Canada had revised the United Nations trade data, mostly derived from the export side, to fit the Canadian trade classification and in some cases to add data not available from the export reports. In contrast, the new NBER-UN dataset gives primacy to the trade

flows reported by the importing country, whenever they are available, assuming that these are more accurate than reports by the exporters. If the importer report is not available for a country-pair, however, then the corresponding exporter report is used instead. Corrections and additions are made to the United Nations data for trade flows to and from the United States, exports from Hong Kong and China, and imports into many other countries.

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## Research Summaries

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### Mental Health and Public Policy

Sara Markowitz\*

Mental illnesses are debilitating diseases affecting millions of people each year. These conditions constitute five of the top ten leading causes of disability worldwide. Depression alone is responsible for more than one in every ten years of life lived with a disability.<sup>1</sup> Despite the severity of the burden of mental illness, many cases of mental disorders remain untreated.

Estimates show that about 28 percent of the U.S. adult population in any year has a diagnosable mental or addictive disorder, yet only 8 percent seeks treatment.<sup>2</sup> The burden of depressive disorders lies not only with those afflicted, because others bear the costs as well. Maternal depression, for example, is associated with adverse outcomes for children, including children's behavioral and emotional problems.<sup>3</sup> In the workplace, mental disorders impose costs on both employers and employees, including unemployment, reduced labor supply, absenteeism, disability-related work leaves,

lower perceived workplace productivity, and reduced earnings.<sup>4</sup>

My current research focuses on the ways in which public policy might intervene and improve mental health outcomes. The first set of studies summarized here examines one of the most serious outcomes associated with mental illness: suicide. The goal of this research is to identify policies that have the potential for reducing suicide attempts and completed suicides. The first paper I discuss examines the effectiveness of mandated mental health benefits in reducing suicide rates among adults in the United

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States. As many states have passed and continue to pass regulations regarding the provision of mental health insurance benefits, knowledge of the effectiveness of such legislation is vital to the policy debate. The second set of papers I describe focuses on youth suicidal behaviors and their relationship with alcohol. Alcohol consumption is known to be correlated with suicide, but the causal nature of that relationship is in question. If alcohol consumption indeed is a contributing factor to suicide, then policies that reduce alcohol consumption may also reduce suicides. Treatment for substance abuse and mental health disorders also may be effective in improving the lives of children. In the third section of this article, I discuss research on the propensity for substance abuse and mental health treatment to reduce mental disorders and criminal behaviors among a group of high-risk children in foster care. The last section focuses on another sub-population at high risk for mental disorders: new mothers. This research asks how the length of “maternity leave” influences maternal mental health.

### ***Mandated Mental Health Benefits***

In response to the increasing scope of the problems associated with mental illness, along with improvements in the diagnosis and treatment of mental disorders, a number of states and the federal government have taken steps in recent years to improve access to mental illness services via mandated mental health benefits. Among these mandates are mental health parity laws which prohibit insurance companies from offering plans that place greater financial burden on services for mental health conditions than for physical health conditions. Such laws are designed to lower the price of mental health services faced by insured individuals, improve access to treatment, and ultimately to improve mental health outcomes. However, it is possible that these laws might raise the cost of providing insurance, thereby reducing access.

In a recent study, Jonathan Klick and I examine the question of whether mental health mandates directly con-

tribute to improvements in mental health.<sup>5</sup> The answer to this question is crucial to policymakers at the state and federal levels as they consider implementing and expanding mental health insurance mandates. We use state-level suicide rates as a measure of the mental health of the population, because numerous studies have shown suicide to be strongly correlated with mental illness. Researchers believe that almost all individuals who commit suicide have a diagnosable mental disorder, but only half of people who die by suicide receive any mental health treatment in their lifetimes.<sup>6</sup> As a result, mandated mental health benefits that are successful in increasing access to treatment have the potential to save many lives.

Using state-level data spanning 1981-2000, we consider the effectiveness of different types of mandated mental health benefits in reducing the adult suicide rate. The mandates we examine include laws requiring that mental health benefits be provided on parity with physical health benefits, and laws that simply require that a minimum level of mental health benefits are provided or merely offered. We use instrumental variables to account for potential simultaneity between suicide rates and the adoption of mental health mandated benefits, although the results suggest that simultaneity is not an issue.

Our research shows no statistically significant relationship between the adoption of any type of mental health mandate and adult suicides. Mandated offering laws and parity laws, which represent the majority of the different types of state laws, drive the overall results and each appears to have no effect on suicide rates. However, the presence of mandated benefits that are not on parity with physical health benefits actually might increase the suicide rate. This may occur if mandates raise the cost of providing health insurance, inducing employees or firms to drop health insurance altogether. In sum, this study contributes to the growing consensus in the literature that mental health mandates do not accomplish their desired goals.

### ***Alcohol and Youth Suicide***

Every year, more American young people die from suicide than from all leading natural causes of death combined. Suicide is the third largest cause of death among youth, behind accidents and homicides. The severity of the problem led the Surgeon General of the United States to issue a call to action in 1999: “The nation must address suicide as a significant public health problem and put into place national strategies to prevent the loss of life and the suffering suicide causes.”<sup>7</sup> Currently, there is a dearth of known, effective policies to reduce suicidal behaviors, although previous research has identified several risk factors that are associated with suicidal behaviors: one of the most important of these factors is substance use. I have co-authored a number of papers that examine first, the causal link between alcohol consumption and suicide, and second, the propensity for alcohol control policies to reduce suicidal thoughts, attempts and completed suicides.

To establish causality from substance use to suicide, it is essential to address the non-random nature of substance use and suicidal behaviors. Pinka Chatterji, Robert Kaestner, Dhaval Dave, and I attempt to go beyond simply measuring correlations by using methods that account for non-random selection.<sup>8</sup> In one study, we use an instrumental variable technique that provides evidence of a causal relationship from alcohol and illicit drug consumption to suicidal thoughts and suicide attempts among college students. In this paper, a reduced-form equation is estimated which directly relates the determinants of alcohol and drug use to suicidal behaviors. These results indicate that higher beer prices may be successful in reducing the number of suicidal thoughts and attempts among young adults. However, the precision of the estimates is sensitive to the specification of the model.

In a second study Chatterji, Kaestner, Dave, and I examine the causal relationship from heavy drinking and alcohol abuse to suicidal attempts among teenagers. The lack of

valid instruments in the data used in this study necessitates the use of an empirical approach; this allows us to assess the existence and strength of a causal relationship without relying on identifying assumptions. Our method specifies both an alcohol equation and a suicide equation and acknowledges the interdependence of the two. We use a constrained bivariate probit to gauge the sensitivity of the results to different assumptions about the degree of correlation in the error terms. With this methodology, we can estimate the degree of sorting on unobservable factors using the observed data and identify a lower bound on the causal parameter estimate. The results suggest that a causal relationship between binge drinking and suicide attempts among teenagers is very unlikely. However, the findings do support a causal relationship between clinically defined alcohol use disorders and suicide attempts among girls.

A third paper by Pinka Chatterji, Robert Kaestner, and me focuses on completed suicides among youth in the United States.<sup>9</sup> This paper presents a straightforward reduced-form model of the effectiveness of beer taxes and other alcohol regulatory variables in reducing completed suicides in a panel of states over time. The results indicate that the state excise tax on beer is negatively associated with male suicides, but has no statistically significant association with female suicides. Suicides by males are also positively related to the availability of alcohol, and negatively related to the presence of a 0.08 blood alcohol concentration law and a zero tolerance law for drunk driving. Strict drunk driving laws also may reduce suicides by teenage females. These findings suggest that strict alcohol policies may be effective in reducing suicides, particularly among young males.

### ***Youth, Crime, and Substance Abuse and Mental Health Treatment***

There is a high correlation between crime, substance abuse, and poor mental health. This correlation suggests that factors which reduce substance abuse and improve mental health have the potential to reduce

criminal activities. Alison Evans Cuellar, Anne Libby, and I examine the effectiveness of substance abuse and mental health (SAMH) treatment in reducing crimes committed by a group of at-risk teenagers in the Colorado foster care system.<sup>10</sup> The majority of children in foster care come from abusive or neglectful homes. As a result, these children exhibit more chronic medical, emotional, and psychological problems than other youth.<sup>11</sup> Therefore, these children are considered at high risk for criminal behaviors.

This paper uses juvenile detention data in conjunction with substance abuse and mental health treatment data for youth enrolled in the Colorado state foster care program over a three-year period. Foster care children are entitled to benefits under Medicaid, so Medicaid claims and encounter data provide the information on SAMH treatment for the teenagers in our sample. In this sample, almost half of the youths in foster care receive some form of outpatient or residential treatment for mental health or substance abuse at least once during the sample period. We use duration models to examine the structural determinants of detention, and we analyze the impact of receiving SAMH treatment in delaying or preventing this group of at-risk youth from engaging in criminal behavior.

Our results show that youth who receive SAMH treatment have lower probabilities of being detained for any offense. Accounting for the unobserved heterogeneity makes the magnitude of these effects larger. The conclusions drawn from this study suggest that expansion of health services targeted at these youth may be effective at reducing crime. For violent crime, where the literature shows that substance abuse plays a significant role, stricter alcohol-regulatory policies also may be highly effective in reducing crime.

### ***Length of Maternity Leave and Maternal Mental Health***

Chatterji and I investigate the how the length of maternity leave affects maternal mental health in a sample of mothers who returned to work after childbirth. This paper is

based on the hypothesis that among women who were employed while pregnant and who return to work during the first six months of the child's life, longer leave from work will influence maternal health. A few correlational studies have shown that women who return to work soon after childbirth experience more mental and physical health symptoms than other women, perhaps because of increased stress and obligations. For some mothers, returning to work quickly may be detrimental to mental health; for others, working may be complementary to mental health. Intuitively, the direction of the impact is indeterminate and must be answered empirically. This question is also of interest from a policy perspective. A number of states currently are considering legislation that would provide paid family leave. This policy change likely would increase the length of maternity leave, but at a cost to states, employees, and businesses. Without information about the health impact of longer leave after childbirth, it is difficult to weigh the costs and benefits of these proposed state-level policy changes.

We use data from the National Maternal and Infant Health Survey of 1988 to estimate the effect of length of maternity leave on measures of depression. Ordinary least squares estimates provide baseline estimates, and instrumental variables are used to explain the possibility that length of leave is endogenously determined. Our results indicate that, among employed mothers of infants, delaying returning to work decreases the number or frequency of depressive symptoms. This finding persists regardless of whether instrumental variable methods are used to address the potential endogeneity of returning to work. However, the length of maternity leave is not significantly associated with the probability of meeting a threshold of depressive symptoms that are indicative of clinical depression.

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## Social Returns to Human Capital

### Enrico Moretti\*

My research focuses on different areas in applied microeconomics. One of these areas is the economics of education. My work on this area centers on the issue of social returns to human capital. After 40 years of research on the relationship between education and earnings, economists now have a solid understanding of the private benefits of schooling. But much

less is known about the social returns to education, even though economists have speculated about the possibility of human capital externalities for at least a century. Theory predicts that increases in the overall level of education can benefit society in ways that are not fully reflected in the wages of educated workers. Human capital spillovers may increase productivity over and above the direct effect of education on individual productivity. Furthermore, increases in education also may reduce criminal participation and improve voters' political behavior.

The possibility that the social return to human capital differs from its

private return has tremendous practical importance. For example, the magnitude of the social return to education is a crucial tool for assessing the efficiency of public investment in education, since state and local governments subsidize almost all direct operating costs of primary and secondary educational institutions. In fact, much of the argument for public education is based on the recognition that education not only rewards the educated individual, but also creates a variety of benefits that are shared by society at large.

Despite the significant policy implications and a large theoretical literature that assumes the existence of

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spillovers from education, empirical evidence on the magnitude of these spillovers is limited. My papers in this area try to fill this gap.

## Education, Productivity, and Wages

In three related papers, I focus on the effect of changes in the overall level of human capital on productivity and wages. A large body of *theoretical* literature in macroeconomics and urban economics has argued that productivity spillovers are important determinants of economic growth. These spillovers arise if the presence of educated workers makes other workers more productive. In this case, an increase in aggregate human capital will have an effect on aggregate productivity that is quite different from the effect of an increase in individual education on individual productivity.

Using a unique firm-worker matched dataset, obtained by combining the Census of Manufacturers with the Census of Population, I assess the magnitude of productivity spillovers from education in U.S. cities by estimating plant-level production functions.<sup>1</sup> While other studies have attempted to measure spillovers by looking at cross-city differences in wages, this is the first study to measure spillovers by directly focusing on firms' productivity. I find that the output of plants located in cities that experience large increases in the share of college graduates rises more than the output of similar plants located in cities that experience small increases in the share of college graduates. Furthermore, I find that spillovers between industries that are in the same city and economically (or technologically) close are larger than spillovers between industries in the same city but economically (or technologically) distant. For example, I find that aggregate human capital in the high-tech sector of the city matters more for high-tech plants than aggregate human capital in the low-tech sector of the city; and aggregate human capital in the low-tech sector matters more for low-tech plants than aggregate human capital in high-tech plants. Notably, this result generalizes when I use three alternative measures of economic and technolog-

ical distance: input-output flows, technological specialization as measured by distribution of patents across technologies, and frequency of patent citation. Importantly, the estimated productivity differences between cities with high and low levels of human capital appear to match differences in labor costs between cities with high and low levels of human capital remarkably well. Consistent with a model that includes both standard general equilibrium forces and spillovers, the productivity gains generated by human capital spillovers are offset by increased labor costs.

In a related paper,<sup>2</sup> I estimate productivity spillovers from college education by comparing wages for otherwise similar individuals who work in cities with different shares of college graduates in the labor force. This is one of the first studies (together with Acemoglu and Angrist, 2000) to account for the non-random distribution of human capital across cities in estimating human capital spillovers. I use longitudinal data to estimate a model of non-random selection of workers among cities and account for unobservable city-specific demand shocks using an instrumental variable strategy. I find that a percentage point increase in the supply of college graduates raises high school drop-outs' wages by 1.9 percent, high school graduates' wages by 1.6 percent, and college graduates' wages by 0.4 percent. The effect is larger for less educated groups, as predicted by a conventional demand and supply model. But even for college graduates, an increase in the supply of college graduates increases wages, as predicted by a model that includes conventional demand and supply factors as well as spillovers.

In a third paper,<sup>3</sup> I try to present a unified equilibrium framework with productivity spillovers. The framework indicates that geographically local productivity spillovers can be identified either directly — by comparing the productivity of firms in cities with different overall levels of human capital, holding constant firms' individual characteristics — or indirectly, using factor prices (wages and land prices). My framework also clarifies the relationship between the estimates

obtained from these two empirical strategies. I use this framework to interpret and evaluate the existing literature on human capital spillovers.

## Education and Crime

Economists have long hypothesized that education may reduce the probability that an individual will engage in activities that generate negative externalities. Crime is one such negative externality with enormous social costs. If education reduces crime, then schooling will have social benefits that are not taken into account by individuals. In this case, the social return to education may exceed the private return. Given the large social costs of crime, even small reductions in crime associated with education may be economically important. Despite many theoretical reasons to expect a causal link between education and crime, the empirical research to date is far from conclusive, since previous studies have failed to account for the potential endogeneity of schooling.

Lance Lochner and I analyze the effect of schooling on incarceration using changes in state compulsory attendance laws as an instrument for schooling.<sup>4</sup> Changes in these laws have a significant effect on educational attainment, and we reject tests for reverse causality. We find that schooling significantly reduces the probability of incarceration. Differences in educational attainment between black and white men explain 23 percent of the black-white gap in incarceration rates. We corroborate our findings on incarceration using FBI data on arrests. We find that education has a larger impact on murder, assault, and motor vehicle theft than on other types of criminal activity. We also examine the effect of schooling on self-reported crime in the National Longitudinal Survey of Youth and find that our estimates for imprisonment and arrest are caused by changes in criminal behavior and not educational differences in the probability of arrest or incarceration conditional on crime.

Calculating the social savings from the crime reduction associated with high school graduation is crucial for deriving policy implications. We estimate the savings to be about

\$1,170-\$2,100 per additional high school graduate, or 14-26 percent of the private return. This suggests that a significant part of the social return to completing high school comes in the form of externalities from crime reduction. A single percent increase in the high school completion rate of all men ages 20-60 would save the United States as much as \$1.4 billion per year in reduced costs from crime incurred by victims and society at large.

## Education and Health

Higher levels of education may also result in better health for educated individuals and their children. If parental education indeed improves child health, then conventional estimates of the returns to education that focus only on wages may understate the total benefits of human capital accumulation. Moreover, to the extent that healthier children go on to be more productive and more educated adults, there will be important inter-generational spillovers that analyses of wage effects alone will not capture.

Janet Currie and I examine the effect of maternal education on birth outcomes for children in the United States.<sup>5</sup> We also assess the importance of four channels through which maternal education may improve birth outcomes: use of prenatal care, smoking, marriage, and fertility. We use unique self-collected data on college openings to build an instrument for maternal education. We find that higher maternal education improves infant health. It also raises the probability that a new mother is married, reduces fertility, increases her use of prenatal care, and reduces the chances that she smokes. Hence, our results add to the growing body of literature that suggests that estimates of the returns to education focusing only on increases in wages may significantly understate the total return.

We are continuing to examine issues related to the inter-generational

transmission of human capital in current research, using matched mother-child vital statistics records from California. In a new series of projects, we use confidential information on mother's name and child date of birth to link mothers across deliveries and with their own birth certificate. The result is one of the first large-scale multigenerational, longitudinal samples of women. We are currently using this dataset for three projects on the inter-generational effects of improvements in women's health.

## Education and Voting

Educators and politicians often argue that a more educated electorate enhances the quality of the democratic process. If this is true, then education has social benefits over and above the private return, and Pigouvian subsidies for education may produce more efficient human capital acquisition decisions. Interestingly, this argument is raised not only by those who support a larger role for the government. The same argument resonates with noted advocates of a limited role for government. For example, Adam Smith and Milton Friedman have argued for public subsidies to education on the grounds that a better-educated electorate makes better decisions on policy issues affecting the economy. Yet, the existing empirical evidence on education and citizenship is generally not very informative, as it ignores the potential endogeneity of schooling.

Kevin Milligan, Philip Oreopoulos, and I test whether schooling improves civic participation in the United States and the United Kingdom, as measured by the probability of voting, accounting for the endogeneity of schooling.<sup>6</sup> We also test whether more educated voters have better information on candidates and campaigns. More informed voters are arguably better voters. We find a strong effect of education on voting in the United States. The effect appears to be largely attributable to differences in

voting registration across education groups. Results from the United Kingdom, where people are legally obligated to vote and are actively assisted in registering, show little effect of education on voting. We also find strong and persistent effects of education on civic behavior in both the United States and the United Kingdom. Notably, better-educated adults are more likely to follow election campaigns in the media, be aware of candidates' platforms, discuss politics with others, and associate with a political group.

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# Political and Economic Forces Sustaining Social Security

Casey B. Mulligan\*

Government officials, regardless of their political persuasion, are increasingly serious about Social Security reform. Politicians have long recognized that the success and longevity of their policies depend on the economic and political environments in which they operate. For example, Franklin Delano Roosevelt explained, “We put those [Social Security] payroll contributions there so as to give the contributors a legal, moral, and political right to collect their pensions. With these taxes in there, no damn politician can ever scrap my Social Security program.” (cited in Schlesinger, 1958). In other words, Roosevelt understood that he could not design a program for the elderly without regard for its political future; rather, he needed a design that made it difficult for future politicians to change the Social Security (hereafter, SS) program. Unfortunately, modern proposals and evaluations of changes to the SS system pay little attention to the political and economic forces that have been sustaining the program, and whether the proposals for change could endure those forces. Xavier Sala-i-Martin and I have been working to improve public pension economics along these lines.

## Worldwide Challenges

Our initial step was to create international databases of the history of SS program design, including tax rates, financing methods, revenues, benefit eligibility rules, and benefit formulas.<sup>1</sup> Several interesting patterns emerge. First, the international history of SS includes many examples of well-intentioned reforms that were put in place but ultimately unable to resist the

political forces pushing back towards the old system. Many of these are examples of countries that planned for a fully funded system (namely, a system that pays each cohort benefits equal to its lifetime contributions plus accumulated interest): Chile’s original SS program, Germany’s original program, one of the original French programs, the first U.S. SS law (passed in 1935, scheduled to come into effect in 1937 and to be partially funded, but rescinded in 1939), and Sweden’s first system. A number of individual accounts systems (namely, systems that pay an individual benefits in proportion to his lifetime contributions) also have failed to be politically sustainable, including those in Seychelles, Egypt, St. Vincent, the system for the American clergy, and some African and Caribbean Provident Funds.

Second, public pension budgets have become very large in upper and middle income countries, with the share of labor income collected as SS taxes sometimes exceeding the fraction of the population who are eligible for SS benefits. Normalized by GDP, the U.S. SS budget is small by international standards. Third, the fringe benefit model is ubiquitous: almost all countries (including the United States, with one very recent exception) raise practically all of their SS revenue from payroll taxes on employer and employee, and pay a defined benefit that increases with lifetime earnings and declines with earnings during the beneficiary’s retirement years. Even though economists disapprove of SS benefit formulas that give the elderly so little incentive to work, this feature of public pension system is very common (even the United States had a significant earnings test, until the recent law change).

Fourth, while SS is undoubtedly an intense political issue, very different political regimes employ quite similar public pension systems. One of the very early programs was created in

Emperor Wilhelm’s autocratic German state in the 1880s. Other examples of nondemocratic countries that created such programs are Lenin’s USSR in 1922, Emperor Hirohito’s Japan in 1941, Kuwait in 1976, General Peron’s Argentina in 1946, and General Avila-Camacho’s Mexico in 1943. Examples of democracies with early SS systems include the United Kingdom in 1908, Sweden in 1913, or the United States in 1935.<sup>2</sup> The (presumably nondemocratic) Soviet Union in 1960-90 had a system similar to Western European systems, including retirement at early ages, pay-as-you-go, and payroll taxes (although not “paid by employees”). These basic similarities with American and Western European programs did not change under Gorbachev and thereafter, as the former Soviet citizens began to enjoy democracy.

Gil, Sala-i-Martin, and I<sup>3</sup> report on nine dynamic case studies — Greece, Portugal, Spain, Italy, Argentina, Brazil, Chile, Peru, and Uruguay — for the period 1960-90. These countries were selected based on their extreme political changes, or for their economic and demographic similarities to countries with extreme changes. With the exception of Greece and Chile, we find that formerly nondemocratic countries do not, relative to their democratic neighbors, change their program after experiencing democracy. Similarly, formerly democratic countries do not change their program when becoming nondemocratic. Greece is an exception, because spending grew slowly under the 1967-74 military regime — relative to spending growth before and after the regime and relative to contemporaneous spending growth in democratic countries. We find an opposite pattern in Chile: most of the spending growth from 1925-80 occurred under nondemocratic regimes, and payroll tax rates reached extremely high levels under General Pinochet. Multiple regression

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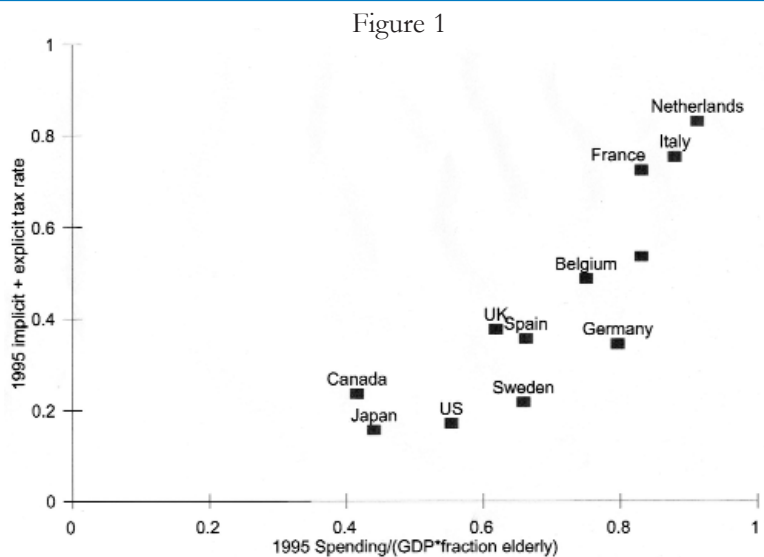
studies of the determinants of SS spending,<sup>4</sup> holding constant population age or per capita income, find neither a significant partial correlation between democracy and SS spending's share of GDP, nor a significant interaction between democracy and the other variables in a spending regression. The multiple regression framework also shows how democracies and nondemocracies are quite similar in terms of their use of retirement tests, earnings tests, or in their splitting of the payroll tax between employer and employee. Whatever problems SS programs may have today, they cannot be blamed on the democratic process.

## New Estimates of Social Security's Winners and Losers

SS programs tax workers and pay benefits to the elderly, so it is often concluded that the elderly come out ahead, especially if the program had been small or nonexistent during their working years. By the same logic, the larger the program, the more the elderly benefit. However, this calculus ignores the fact that the elderly usually must retire in order to receive their benefits. When eligibility is conditioned on beneficiary earnings or labor force status, SS benefits help the elderly less than they cost the Treasury because the elderly change their labor market behavior in order to increase their benefit. In principle, a larger program might hurt the elderly if it also involved larger work disincentives. The calculations in Figure 1 show how this is a very real possibility. The horizontal axis measures the amount of SS spending, normalized by GDP and the size of the elderly population (obviously richer and older countries spend more on SS). The vertical axis measures the incentive to retire, in terms of a marginal tax rate on beneficiary earnings. The retirement incentive comes both from an explicit payroll tax and from the tax implicit in the policy of reducing or delaying benefit payments with the beneficiary's earnings. The elderly would obviously prefer a program that is far to the right because the program would be spending more on them, but would also prefer a program

that is near the bottom because the program would provide the freedom to work while receiving their benefits. It is possible that the elderly would be better off with a program like Spain's or Germany's than with an Italian or

years to the retirement years — the current SS system as well as a mandatory retirement accounts program — hurts the poor and helps those who would be paying for welfare programs for the elderly. In this way, public pen-



Source: C. Mulligan, "Induced Retirement, Social Security, and the Pyramid Mirage," NBER Working Paper No. 7679, April 2000.

Dutch program, even though the latter are spending more money, because the former make it "easier" (as compared to Italy or Netherlands) to work while collecting benefits.

Another reason that a dollar of benefits may be worth less than a dollar to an SS program participant is that the benefits are paid later in life, and the participant may desire funds earlier in life. Here I am not simply referring to the time value of money, because the government discounts future cash flows at the interest rate, and so do many households. However, some households — presumably the poorer and younger ones — are borrowing constrained and would prefer to have funds now rather than during their retirement years, even if the latter were returned with interest.<sup>5</sup> Another factor relevant for poor households is that, in the absence of having their own retirement savings, they could attempt to live off welfare programs during their elder years. For these two reasons any mandatory public program that reallocates cash flows from the working

sion or retirement savings programs with voluntary participation may be more beneficial to the poor than are programs that mandate participation.

## The Politics of Retirement

Clearly SS affects retirement, in part by allowing elderly people to afford a life of leisure, and in part by reducing the pecuniary gain to working during old age. But retirement may also affect SS policy, and a series of our papers explore some of the possibilities. One possibility is that retirement creates job opportunities or raises wages for the young, that SS policy was designed for this purpose, and that SS has continued to grow by serving this purpose. However, this is at best a small part of the story, because it may be that the private sector generates too much retirement rather than too little, and even if public policy were needed to encourage retirement, the optimal amount of retirement could be implemented with a much smaller budget.<sup>6</sup>

The AARP may be the most

potent interest group in the United States, and the “R” does not stand for “old.” The growth of retirement, in part because of SS but also because of changes in the private sector, has created a large and cohesive political group. The group has served to defend and expand public pension budgets, which in turn has increased the number of retirees. A full model of SS must consider the simultaneous determination of retirement and SS spending. We have taken some steps in this direction by modeling the allocation of time together with political competition among interest groups. In particular, we suggest that (nonoccupational) interest groups whose members work less are more successful. One reason is that groups working less have more time for political activities. But perhaps more important is the possibility that, when people do not work, then the amount of political issues they might worry about is smaller so they might concentrate their efforts on getting a pension or a transfer. In other words, retired people are, when it comes to the politics of age, more single-minded than workers because the latter also have to worry about the politics of occupation.

## Implications for the Future of Social Security

Our findings help bring the future of SS into better focus. Without denying that the pay-as-you-go, fringe benefit model of public pensions has significant problems, our data do not give much credence to the view that SS problems are the result of “bad ideas” which are unfortunately and inexplicably hatched by policymakers, and which can be rectified merely by giving some combination of voters, politicians, and bureaucrats a better economic education. The model has per-

sisted in too many countries for too many decades, and has shown itself to be more persistent than some well-intentioned legislation to the contrary. The size and design of SS is likely determined by political and economic fundamentals, such as interest group size, cohesion, the demand for retirement, population growth rates, the demand for insurance, and so on.

What exactly were the fundamentals that influenced the design of SS, and helped the program grow over so many decades? Regardless of how we answer this question, the historical persistence of the pay-as-you-go, fringe benefit model — even at times in the face of legislation to the contrary — suggests that the fundamentals (whatever they may be) are themselves persistent. Hence, at least some reform legislation will prove to evolve in the direction of the laws it replaced.

Retirement is one of the key economic and political fundamentals. Retirement and SS have a mutually reinforcing relationship — SS encourages retirement and retirement creates an interest group cohesive enough to successfully defend the program. *Ceteris paribus*, reforms that remove or relax earnings and retirement tests would, by reducing retirement, help slow the growth of the program (or the growth of elderly programs more generally). But even reforms removing, say, retirement tests, might have an income effect on retirement in the other direction. In any case, we expect that the reforms most consistent with slow elderly spending growth are those that do the most to encourage work by the elderly.

Of course, there are important non-SS factors influencing retirement and its relationship with the political process. For example, campaign finance reform, if it is successful at reducing the influence of “big money,” may by subtraction increase the rela-

tive influence of the retired, who have enjoyed their political success without many political action dollars (remember that the AARP was an avid supporter of the latest campaign finance reform). Changing health and mortality patterns will also help determine the number of retirees, and thereby impact SS spending. These factors and more may ultimately determine Social Security’s future.

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<sup>1</sup> X. Sala-i-Martin, “A Positive Theory of Social Security,” *Journal of Economic Growth*, 1996, and C. B. Mulligan and X. Sala-i-Martin, “Internationally Common Features of Public Old-Age Pensions, and Their Implications for Models of the Public Sector,” *Advances in Economic Analysis & Policy*, 2004.

<sup>2</sup> The POLITY IV (2000) project rates each of the regimes mentioned in the text (and many others) in terms of their degree of democracy on a 0 to 10 scale (10 most democratic): Germany (1), USSR (0), Japan (5), Kuwait (0), Argentina (0), Mexico (0), UK(8), Sweden (10), and US(10).

<sup>3</sup> C. B. Mulligan, R. Gil, and X. Sala-i-Martin, “Social Security and Democracy,” NBER Working Paper No. 8958, May, 2002.

<sup>4</sup> Previous studies include D. Cutler and R. Johnson, “The Birth and Growth of the Social Insurance State,” *Public Choice*, 120 (1-2) (July 2004), pp. 87-121, and P. Lindert, “The Rise of Social Spending, 1880-1930,” *Explorations in Economic History*, 31 (1) (January 1994), pp. 1-37.

<sup>5</sup> Mulligan and Philipson show how poor households may discount future cash flows at twice (or more) than the SS program does. C. B. Mulligan and T. J. Philipson, “Merit Motives and Government Intervention: Public Finance in Reverse,” NBER Working Paper No. 7698, May 2000.

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# Policy Evaluation in Macroeconomics

Stephanie Schmitt-Grohe and Martin Uribe\*

Much of our recent research has been devoted to developing and applying tools for the evaluation of macroeconomic stabilization policy. This choice of topic is motivated by the fact that by the late 1990s empirical research using macroeconomic data from industrialized countries had cast compelling doubts on the ability of the neoclassical growth model to provide a satisfactory account of aggregate fluctuations. As a response, the new Keynesian paradigm emerged as an alternative framework for understanding business cycles. One key difference between the neoclassical and the new Keynesian paradigms is that in the latter, the presence of various nominal and real distortions provides a meaningful role for stabilization policy, opening the door once again, after decades of dormancy, for policy evaluation.

## Optimal Fiscal and Monetary Policy Under Sticky Prices

A well-known result in macroeconomic theory is that optimal fiscal and monetary policy features smooth distortionary income tax rates and highly volatile and unpredictable inflation rates. The intuition behind this result is straightforward: surprise inflation is equivalent to a lump-sum tax on nominal asset holdings. The Ramsey planner finances innovations in the fiscal budget, such as government spending shocks or unexpected declines in the tax base, through surprise changes in the price level. In this way, distortionary tax rates can be kept relatively stable over time. In calibrated model economies, under the Ramsey policy, the public would be accustomed to

seeing inflation rates jumping from -15 percent to +15 percent from one year to the next. This result is completely at odds not only with observed inflation behavior but also with the primary goal of central banks around the world, namely, price stability.

We argue that the price stability goal of central banks can indeed be justified on theoretical grounds.<sup>1</sup> One key assumption of existing studies on optimal monetary and fiscal policy is that there are no impediments to nominal price adjustments. We relax this assumption and instead assume that product prices are sticky.

Obviously, by making price changes costly, we expect to obtain the result that under the Ramsey policy inflation is less volatile than in an economy with flexible prices. But our findings go way beyond our expectations. The introduction of a minuscule amount of price stickiness, less than ten times the degree of price stickiness estimated for the U.S. economy, suffices to make price stability the overriding goal of optimal monetary policy. Specifically, even when firms are assumed to be able to change prices every three to four weeks, the optimal volatility of inflation is below 0.52 percent per year, which is 13 times smaller than the optimal inflation volatility predicted under full price flexibility.

One may naturally expect that the reduced inflation volatility under the Ramsey plan would have to be compensated by increased unpredictability in income tax rates. But this is not the case. The Ramsey planner finances surprises to the fiscal budget mainly through adjustments in the stock of public debt. By using government debt as a shock absorber, the Ramsey planner can smooth tax rates over time. For instance, an unexpected fiscal deficit calls for a permanent increase in debt in the amount of the fiscal deficit and a small but permanent increase in taxes equal in size to the interest payments on the additional debt. Consequently, tax rates and govern-

ment debt display a near random walk property. It follows that the mere introduction of a small amount of price stickiness resurrects the classical Barro<sup>2</sup> tax-smoothing result. This result stands in contrast to those obtained under flexible prices. In this case, tax rates inherit the stochastic process of the underlying shocks, and thus, in general, will not display the near-random walk property.

Our investigation delivers three additional results of interest for the computation of Ramsey policies. First, we show that stationary Ramsey equilibria can be computed accurately by solving a first-order approximation to the Ramsey optimality conditions ignoring the implementability constraint. (Of course, this constraint must be taken into account in deriving the Ramsey optimality conditions.) Second, we show that in the economic environments we analyze, first-order accurate solutions to the Ramsey problem are virtually identical to second-order accurate solutions. Finally, and more importantly, in the case of flexible prices, with or without imperfect competition in product markets, we show that the Ramsey problem admits an exact numerical solution.<sup>3</sup> We demonstrate that the exact numerical solution to the Ramsey problem is remarkably similar to the first-order accurate solution. These results are significant in light of the fact that first-order approximations to Ramsey problems can be computed fairly easily.

## Developing Tools For Policy Evaluation

One obstacle we encountered early on in research summarized here was the lack of appropriate tools for evaluating stabilization policies in the context of distorted economies. An important part of our effort was devoted therefore to developing such tools.

Most models used in modern

\* Schmitt-Grohe is a Research Associate, and Uribe a Faculty Research Fellow, in the NBER's Program on Economic Fluctuations and Growth. They are also professors of economics at Duke University. Their profiles appear later in this issue.

macroeconomics are too complex to allow for exact solutions. For this reason, researchers have appealed to numerical approximation techniques. One popular and widely used approximation technique is a first-order perturbation method delivering a linear approximation to the policy function. One reason for the popularity of first-order perturbation techniques is that they do not suffer from the “curse of dimensionality.” That is, problems with a large number of state variables can be handled without many computational demands. Because models that are successful in accounting for many aspects of observed business cycles are bound to be large,<sup>4</sup> this advantage of perturbation techniques is of particular importance for policy evaluation. However, first-order approximation techniques suffer from serious limitations when applied to welfare evaluation. The problem is that when welfare is evaluated using a first-order approximation to the equilibrium laws of motion of endogenous variables, some second- and higher-order terms of the equilibrium welfare function are omitted while others are included. Consequently, the resulting criterion is inaccurate to order two or higher. This inaccuracy may result in spurious welfare rankings. For instance, in a recent paper Jinill Kim and Sunghyun Kim<sup>5</sup> show that in a simple two-agent economy, a welfare comparison based on an evaluation of the utility function using a linear approximation to the policy function may yield the erroneous result that welfare is higher under autarky than under full risk sharing.

In general, a correct second-order approximation of the equilibrium welfare function requires a second-order approximation to the policy function. This is what we set out to accomplish in a recent article.<sup>6</sup> There, we derive a second-order approximation to the solution of a general class of discrete-time rational expectations models. Our main theoretical contribution is to show that for any model belonging to this general class, the coefficients on the terms linear and quadratic in the state vector in a second-order expansion of the decision rule are independent of the volatility of the exogenous shocks. In other words, these coeffi-

cients must be the same in the stochastic and the deterministic versions of the model. Thus, up to second order, the presence of uncertainty affects only the constant term of the decision rules. But the fact that only the constant term is affected by the presence of uncertainty is by no means inconsequential. For it implies that up to second order the unconditional mean of endogenous variables in general can be significantly different from their non-stochastic steady state values. Thus, second-order approximation methods in principle can capture important effects of uncertainty on, for example, average rate-of-return differentials across assets with different risk characteristics, or on the average level of consumer welfare. An additional advantage of higher-order perturbation methods is that, like their first-order counterparts, they do not suffer from the curse of dimensionality. This is because, given the first-order approximation to the policy function, finding the coefficients of a second-order approximation simply entails solving a system of linear equations.

Our main practical contribution is the development of a set of MATLAB programs that compute the coefficients of the second-order approximation to the solution to the general class of models described above. This computer code is publicly available at our websites.

## Optimal Operational Monetary Policy for the U.S. Economy

After the completion of the second-order approximation toolkit, we felt that we were suitably equipped to undertake a systematic and rigorous evaluation of stabilization policy. A contemporaneous development that helped to facilitate our work was the emergence of estimated medium-scale dynamic general equilibrium models of the U.S. economy with the ability to explain the behavior of a relatively large number of macroeconomic variables at business-cycle frequency.<sup>7</sup>

A central characteristic of the studies on optimal monetary policy that existed at the time we initiated our

research on policy evaluation was that they were conducted in the context of highly stylized environments. One important drawback of that approach is that highly simplified models are unlikely to provide a satisfactory account of cyclical movements except for a few macroeconomic variables of interest. For this reason, the usefulness of this strategy to produce policy advice for the real world is necessarily limited.

In a recent paper<sup>8</sup>, we depart from the extant literature by conducting policy evaluation within the context of a rich theoretical framework capable of explaining observed business cycle fluctuations for a wide range of nominal and real variables. Following the lead of Miles Kimball<sup>9</sup>, we emphasize the importance of combining nominal and real rigidities in explaining the propagation of macroeconomic shocks. Specifically, the model features four nominal frictions — sticky prices, sticky wages, money in the utility function, and a cash-in-advance constraint on the wage bill of firms — and four sources of real rigidities: investment adjustment costs, variable capacity utilization, habit formation, and imperfect competition in product and factor markets. We assume aggregate fluctuations to be driven by supply shocks, which take the form of stochastic variations in total factor productivity, and demand shocks stemming from exogenous innovations to the level of government purchases. David Altig and his co-authors<sup>10</sup> argue that the model economy for which we seek to design optimal operational monetary policy indeed can explain the observed responses of inflation, real wages, nominal interest rates, money growth, output, investment, consumption, labor productivity, and real profits to productivity and monetary shocks in the postwar United States. In this respect, our paper aspires to be a step forward in the research program of generating monetary policy evaluation that is of relevance for the actual practice of central banking.

In our quest for the optimal monetary policy scheme we restrict attention to what we call operational interest rate rules. By an operational interest-rate rule we mean an interest-rate rule

that satisfies three requirements. First, it prescribes that the nominal interest rate is set as a function of a few readily observable macroeconomic variables. In the tradition of John Taylor's seminal 1993 paper,<sup>11</sup> we focus on rules whereby the nominal interest rate depends on measures of inflation, aggregate activity, and possibly its own lag. Second, the operational rule must induce an equilibrium satisfying the zero lower bound on nominal interest rates. And third, operational rules must render the rational expectations equilibrium unique. This last restriction closes the door to expectations-driven aggregate fluctuations.

The object that monetary policy aims to maximize in our study is the expectation of lifetime utility of the representative household conditional on a particular initial state of the economy. Our focus on a conditional welfare measure represents a fundamental departure from most existing normative evaluations of monetary policy, which rank policies based upon unconditional expectations of utility.<sup>12</sup> Unconditional welfare measures ignore the welfare effects of transitioning from a particular initial state to the stochastic steady state induced by the policy under consideration.<sup>13</sup> Indeed, we document that under plausible initial conditions, conditional welfare measures can result in different rankings of policies than the more commonly used unconditional measure. This finding highlights the fact that transitional dynamics matter for policy evaluation.

In our welfare evaluations, we depart from the widespread practice in the neo-Keynesian literature on optimal monetary policy of limiting attention to models in which the nonstochastic steady state is undistorted. Most often, this approach involves assuming the existence of a battery of subsidies to production and employment financed by lump-sum taxes that are aimed at eliminating the long-run distortions originating from monopolistic competition in factor and product markets. The efficiency of the deterministic steady-state allocation is assumed for purely computational reasons. It allows the use of first-order approximation techniques to evaluate

welfare accurately up to second order.<sup>14</sup> This practice has two potential shortcomings. First, the instruments necessary to bring about an undistorted steady state (for example, labor and output subsidies financed by lump-sum taxation) are empirically unconvincing. Second, it is not clear ex ante whether a policy that is optimal for an economy with an efficient steady state will also be so for an economy where the instruments necessary to engineer the nondistorted steady state are unavailable. For these reasons, we refrain from making the efficient-steady-state assumption and instead work with a model whose steady state is distorted.

Departing from a model whose steady state is Pareto efficient has a number of important ramifications. One is that to obtain a second-order accurate measure of welfare it no longer suffices to approximate the equilibrium of the model up to first order. Instead, we obtain a second-order accurate approximation to welfare by solving the equilibrium of the model up to second order. Specifically, we use our second-order methodology and computer code.

Our numerical work suggests that, in the model economy we study, the optimal operational interest-rate rule takes the form of a real-interest-rate targeting rule. It features an inflation coefficient close to unity, a mute response to output, no interest-rate smoothing, and is forward looking. The optimal rule satisfies the Taylor principle because the inflation coefficient is greater than unity albeit very close to 1. Optimal operational monetary policy calls for significant inflation volatility. This result stands in contrast to those obtained in the related literature. The main element of the model driving the desirability of inflation volatility is indexation of nominal factor and product prices to 1-period lagged inflation. Under the alternative assumption of no indexation or indexation to long-run inflation, the conventional result of the optimality of inflation stability reemerges.

<sup>1</sup> S. Schmitt-Grohe and M. Uribe, "Optimal Fiscal and Monetary Policy under Sticky Prices," NBER Working Paper No. 9220,

September 2002, and *Journal of Economic Theory*, 114, (February 2004), pp. 198-230.

<sup>2</sup> R. J. Barro, "On the Determination of Public Debt," *Journal of Political Economy*, 87, (1979), pp. 940-71.

<sup>3</sup> S. Schmitt-Grohe and M. Uribe, "Optimal Fiscal and Monetary Policy under Imperfect Competition," NBER Working Paper No. 10149, December 2003, and *Journal of Macroeconomics*, 26, (June 2004), pp. 183-209.

<sup>4</sup> See for example, F. Smets and R. Wouters, "Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach," *European Central Bank*, April 21, 2004; and L. J. Christiano, M. Eichenbaum, and C. Evans, "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy," NBER Working Paper No. 8403, July 2001.

<sup>5</sup> J. Kim and S. H. Kim, "Spurious Welfare Reversals in International Business Cycle Models," *Journal of International Economics*, 60, (2003), pp. 471-500.

<sup>6</sup> S. Schmitt-Grohe, and M. Uribe, "Solving Dynamic General Equilibrium Models Using a Second-Order Approximation to the Policy Function," NBER Technical Working Paper No. 282, October 2002, and *Journal of Economic Dynamics and Control*, 28, (January 2004), pp. 755-75.

<sup>7</sup> See the papers by Christiano, Eichenbaum, and Evans and Smets and Wouters cited earlier.

<sup>8</sup> S. Schmitt-Grohe and M. Uribe, "Optimal Operational Monetary Policy in the Christiano-Eichenbaum-Evans Model of the U.S. Business Cycle," NBER Working Paper No. 10724, September 2004.

<sup>9</sup> K. S. Kimball, "The Quantitative Analytics of the Basic Neomonetarist Model," NBER Working Paper No. 5046, March 1996, and *Journal of Money, Credit and Banking*, 27, (November 1995), pp. 1241-77.

<sup>10</sup> D. Altig, L. J. Christiano, M. Eichenbaum, and J. Linde, "Technology Shocks and Aggregate Fluctuations," manuscript, Northwestern University, 2003.

<sup>11</sup> J. Taylor, "Discretion versus Policy Rules in Practice," *Carnegie Rochester Conference Series on Public Policy*, 39, (December 1993), pp. 195-214.

<sup>12</sup> Exceptions are R. Kollmann, "Welfare Maximizing Fiscal and Monetary Policy Rules," mimeo, University of Bonn, March 2003; and our "Optimal Simple And Implementable Monetary and Fiscal Rules,"

NBER Working Paper No. 10253, January 2004.

<sup>13</sup> J. Kim, S. Kim, E. Schaumburg, and C. Sims, "Calculating and Using Second Order Accurate Solutions of Discrete Time

Dynamic Equilibrium Models," mimeo, Princeton University, 2003.

<sup>14</sup> This simplification was pioneered in J. J. Rotemberg and M. D. Woodford, "Interest Rate Rules in an Estimated Sticky Price

Model," NBER Working Paper No. 6618, June 1998, and in J. B. Taylor, ed., *Monetary Policy Rules*, Chicago: University of Chicago Press, 1999, pp. 57-119.



## NBER Profile: Enrico Moretti

Enrico Moretti is a Faculty Research Fellow in the NBER's Program on Education and an Associate Professor of Economics at the University of California, Berkeley. He received his undergraduate degree in economics from Bocconi University in Milan and his Ph.D. in economics from Berkeley in 2000. Before joining the Berkeley faculty, he was an Assistant Professor of Economics at the University of California

at Los Angeles. He was also a Visiting Scholar at Columbia Business School in 2002, and is a Research Fellow of the Centre for Economic Policy Research in London and IZA in Bonn.

Moretti lives in San Francisco with his fiancée, Ilaria Salvadori. He enjoys outdoor activities, like backpacking and bird watching. He is also interested in independent films and photography.

## NBER Profile: Casey B. Mulligan

Casey B. Mulligan is a Research Associate in the NBER's Programs on Public Economics, Economic Fluctuations and Growth, Monetary Economics, and Asset Pricing. He is also a professor of economics at the University of Chicago.

Mulligan first came to the University of Chicago in 1991 as a graduate student, and received his Ph.D. in economics there in 1993. In addition to his position in Chicago's economics department, he has been a Visiting Professor teaching public economics at Harvard University, Clemson University, and the Irving B. Harris Graduate School of Public Policy Studies at the University of Chicago.

Mulligan is author of the 1997 book *Parental Priorities and Economic Inequality*, which studies economic models of, and statistical evidence on, the intergenerational transmission of economic status. His recent research is concerned with

capital and labor taxation, with particular emphasis on tax incidence and positive theories of public policy.

Mulligan is affiliated with a number of professional organizations and is the recipient of numerous awards and fellowships, including from the National Science Foundation, the Alfred P. Sloan Foundation, the Smith-Richardson Foundation, and the John M. Olin Foundation.

True to his name, Mulligan is an avid golfer who perpetually believes that the next shot will be better than the previous one. Sometimes known as "The Ping Man" to his Flossmoor, IL neighbors, Mulligan has an accurate short game which conflicts with errant tee shots to produce a 10 handicap. Mulligan closely follows NFL football, and is a dedicated fan of numerous losing sports teams including Chicago's Bears and Bulls.





## NBER Profile: *Stephanie Schmitt-Grohe*

Stephanie Schmitt-Grohe is a professor of economics at Duke University, a Research Associate of the National Bureau of Economic Research, and a research affiliate at London's Centre for Economic Policy Research. She received her doctorate in economics in 1994 from the University of Chicago.

Before coming to Duke University in July of 2003, she taught at Rutgers University and was an economist in the Division of Monetary Affairs at the Board of Governors of the Federal Reserve System. She also has held visiting positions at the European Central Bank, Goethe University in Frankfurt, and Princeton University.

Schmitt-Grohe's research and writ-

ings have focused primarily on macroeconomic issues, in particular monetary and fiscal policy. Currently, she is serving as an associate editor of the *Journal of Money, Credit, and Banking* and the *Journal of the European Economic Association*.

Schmitt-Grohe is married to Martin Uribe, who also teaches at Duke and is her frequent co-author. They and their sons, Cristobal and Imanol, live in Durham, North Carolina, surrounded by camellias planted by the wife of the late Joseph Spengler, past president of the American Economic Association. She enjoys skiing, windsurfing, and the movies, but now her children are her favorite pastime.

## NBER Profile: *Martin Uribe*

Martin Uribe is a Faculty Research Fellow of the National Bureau of Economic Research and a professor of economics at Duke University. He joined the Duke faculty in 2003 after spending five years on the faculty at the University of Pennsylvania and four years in Washington at the Division of International Finance of the Board of Governors of the Federal Reserve System. He has also held visiting positions at the Goethe Universitat

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Uribe received his PhD from the University of Chicago in 1994. His research lies in the fields of international finance and monetary economics. His work focuses on explaining business cycles in emerging economies and on the design of optimal monetary and fiscal policies. He also serves as Associate Editor for the *Journal of*

*International Economics* and the *Journal of Money, Credit, and Banking*.

Uribe is an avid reader, diligently working his way down the list of 100 best novels published since 1900 compiled by the Modern Library, a division of Random House. He loves Argentine rock, and works with a constant live audio stream of his favorite Cordobesian radio station, [www.radiocadena3.com.ar](http://www.radiocadena3.com.ar), pouring out of his speakers.

## Conferences

### IASE: New Perspectives on Economic History

The NBER and El Colegio de Mexico jointly sponsored a meeting of the Inter-American Seminar on Economics in Mexico City on December 3 and 4. This Seminar focused on “New Perspectives in Economic History.” NBER Research Associate Sebastian Edwards of University of California, Los Angeles, and Gerardo Esquivel and Graciela Marquez of El Colegio de Mexico, organized the following program:

**Michael D. Bordo**, NBER and Rutgers University, and **Christopher M. Meissner**, NBER and King’s College, “Financial Crises, 1880-1913: The Role of Foreign Currency Debt”  
Discussant: Carlos Marichal, El Colegio de Mexico

**Luis Catao**, International Monetary Fund, “Sudden Stops and Currency Crises: The Periphery in the Classical Gold Standard”  
Discussant: Lorenza Martinez, Banco de Mexico

**Noel Maurer**, Harvard Business School, and **Stephen Haber**, NBER and Stanford University,

“Related Lending and Economic Performance: Evidence from Mexico”  
Discussant: Enrique Cardenas, Secretaria de la Funcion

**Gerardo della Paolera** and **Martin Grandes**, The American University of Paris, “The True Measure of Country Risk: A Primer on the Interrelations between Solvency and the Polity Structure of Emerging Markets: Argentina 1886-92”  
Discussant: Aldo Mussachio, Harvard Business School

**Kenneth L. Sokoloff**, NBER and University of California, Los Angeles, and **Eric M. Zolt**, University of California, Los Angeles, “Inequality and the Evolution of Institutions of Taxation: Evidence from the Americas”  
Discussant: Fausto Hernandez-Trillo, CIDE

**Sebastian Edwards**, “Establishing Credibility: The Role of Foreign Advisors in Chile’s 1955-8 Stabilization Program”  
Discussant: Nora Lustig,

Universidad de las Americas-Puebla

**Leandro Prados de la Escosura**, Universidad Carlos III Madrid, “International Inequality in OECD Countries and Latin America, 1870-1990”  
Discussant: Luis Felipe Lopez-Calva, ITESM

**Pedro Lains**, Universidade de Lisboa, “Growth in a Protected Environment: Portugal 1870-1950”  
Discussant: Carlos Ponzio, Harvard University

**Aurora Gomez-Galvarriato**, CIDE, “The Political Economy of Protectionism: The Evolution of Labor Productivity, International Competitiveness, and Tariffs in the Mexican Textile Industry, 1900-50”  
Discussant: Daniel Lederman, The World Bank

**Gerardo Esquivel** and **Graciela Marquez**, “The Economic Effects of Closing the Economy: The Mexican Experience in the Mid-Twentieth Century”  
Discussant: Gustavo Del Angel, CIDE

**Bordo** and **Meissner** assemble data on nearly 30 countries from 1880 to 1913 and examine debt crises, currency crises, banking crises, and twin crises. They pay special attention to the role of foreign currency and gold clause debt, currency mismatches, and debt intolerance. The authors uncover fairly robust evidence that more foreign currency debt leads to a higher chance of having a debt crisis or a banking crisis. However, they also find that countries with noticeably different backgrounds and strong institutions — such as Australia, Canada, New

Zealand, Norway, and the United States — deftly managed their exposure to hard currency debt, generally avoided having too many crises, and never had severe financial meltdowns. Moreover, a strong reserve position seems to be correlated with a lower likelihood of a debt crisis, currency crisis, or a banking crisis. Thus it appears that foreign currency debt is dangerous when mismanaged. Bordo and Meissner also observe that countries with previous default histories seem prone to debt crises even at seemingly low debt-to-revenue ratios.

While the pre-1914 gold standard typically is viewed as a successful system of fixed exchange rates, several countries in the system’s periphery experienced dramatic exchange rate adjustments. **Catao** relates this phenomenon to a combination of sudden stops in international capital flows along with domestic financial imperfections that heightened the pro-cyclicality of the monetary transmission mechanism. He shows that while all net capital importers during the period occasionally faced such “sudden stops,” the higher elasticity of mone-



tary expansion to capital inflows, and disincentives to reserve accumulation in a subset of these countries, made them more prone to currency crashes.

**Maurer** and **Haber** argue that neither looting nor credit misallocation are *necessary outcomes* of related lending. On the contrary, related lending often exists as a response by bankers to high costs of information and contract enforcement. The authors examine a banking system in which there was widespread related lending, but in which the institutions were constructed so as to give bank directors strong incentives to monitor one another in order to protect their capital and reputations: Mexico from 1888 to 1913. They find little evidence, during this 25-year period, of tunneling or credit misallocation. In fact, the banking system was remarkably stable, and manufacturing enterprises that received related loans performed at least as well as their competitors.

**Della Paolera** and **Grandes** construct the true measure of country risk for Argentina over the important 1886-92 period, at the end of which occurred the first widespread emerging-market capital and debt crisis. This risk measure, computed as a weighted average of sovereign and sub-sovereign default risk premiums, acknowledges the importance of the political structure of an emerging market economy in determining its degree of participation and its strategies in international debt markets. The lessons learned here are key to understanding the recent build up of debt that drove the surprising collapse of the Argentine currency board and the financial system in early 2002. Moreover, this research informs policymakers and investors about the “correct” way to assess country risk in federal countries where sub-sovereign entities are fiscally interdependent and potential time inconsistencies and sovereign moral hazards exist. Incidentally, the true measure of country risks differs from the typical sovereign risk spread by 200 to 350 basis points when liquidity crunches and political upheaval in Argentina after July 1890 had taken place.

**Sokoloff** and **Zolt** turn to history to gain a better perspective on how and why tax systems vary. They focus

on the societies of the Americas over the nineteenth and twentieth centuries, for two major reasons. First, despite this region having the most extreme inequality in the world, the tax structures of Latin America generally are recognized as among the most regressive, even by developing country standards. Second, as has come to be widely appreciated, the colonization and development of the Americas constitute a natural experiment of sorts: beginning more than 500 years ago, a small number of European countries established colonies in diverse environments across the hemisphere; the different circumstances meant that largely exogenous differences existed across these societies, not only in national heritage, but also in the extent of inequality. How did this inequality influence the design and implementation of tax systems? Several salient patterns emerge. The United States and Canada (like Britain, France, Germany, and even Spain) were much more inclined to tax both wealth and income during their early stages of growth, and into the twentieth century, than developing countries are today. Although the U.S. and Canadian federal governments were similar to those of their counterparts in Latin America in relying primarily on the taxation of foreign trade (overwhelmingly tariffs) and the use of excise taxes, the greater success or inclination of state (provincial) and local governments in North America to tax wealth (primarily in the form of property or estate taxes) and income (primarily in the form of business taxes), as well as the much larger relative sizes of these sub-national governments in North America, accounted for a radical divergence in the overall structure of taxation. Tapping these progressive sources of government revenue, state and local governments in the United States and Canada, even before independence, began directing substantial resources toward public schools, improvements in infrastructure involving transportation and health, and other social programs. In contrast, the societies of Latin America, which had come to be characterized soon after initial settlement by rather extreme inequality in wealth, human capital, and political influence,

tended to adopt tax structures that were significantly less progressive in incidence and these societies manifested greater reluctance or inability to impose local taxes to fund local public investments and services. Moreover, these patterns persisted, well into the twentieth century — indeed up to the present day. The apparent association between initial inequality and the institutions of taxation and public finance is all the more intriguing in that the authors find corresponding patterns across different regions of the United States and across different countries of Latin America.

**Edwards** discusses different theoretical views of the role of outside advisors, focusing on an important historical stabilization episode in Chile, one of the countries with the longest history of chronic inflation in the world. Of the many stabilization programs adopted to tackle this problem, the 1955-8 package implemented with the advice of the U.S. consulting firm of Klein-Saks is one of the most interesting. Edwards argues that these foreign advisors gave *initial credibility* to the stabilization program launched in 1955; they played the role of independent, non-partisan, technocratic arbiters. And, it was precisely because they were foreigners that they could rise above the political fray and suggest a specific program whose main components were rapidly approved by a highly divided Congress. The fact that the program was very similar to one proposed earlier by the government — and rejected by Congress — underscores the view that, while locals are suspect of being excessively partisan, foreigners are often (but not always) seen as independent policy brokers. But providing *initial credibility* was not enough to ensure success. In spite of supporting trade reform, foreign exchange rate reform, and the deindexation of wages, Congress failed to act decisively on the fiscal front. Consequently, the fiscal imbalances that had plagued Chile for a long time were reduced, but not eliminated. In 1957 a sharp drop in the international price of copper — the country’s main export — resulted in a major decline in fiscal revenue and in an increase in the fiscal deficit. The Klein-Saks Mission

recommended a series of belt-tightening measures, but politicians had had enough of orthodoxy. No adjustment was made, and inflationary expectations once again shifted for the worse. By October of 1958 the Mission had left the country, and an opportunity for achieving stability had been lost.

Has the gap between developed countries and Latin America widened over time? Using the tools of the inequality literature, **Prados de la Escosura** assesses long-run inter-country inequality in terms of real (purchasing power-adjusted) GDP per head and an “improved” human development index as an indicator of welfare in present-day OECD and Latin America. He observes a long-term rise in income inequality for this sample of countries, with the deepening gap between OECD and Latin America as its main determinant. Contrary to a widespread view, Latin America fell behind in terms of income in the late twentieth century. In terms of human development, inequality has declined over time, but the gap between OECD and Latin America has remained largely unchanged.

From 1870 to 1913, the Portuguese economy expanded slowly and diverged from the European core. In contrast,

Portugal achieved higher growth in the interwar period and partially caught up to the levels of labor productivity of Western Europe. According to **Lains**, higher growth in Portugal after World War I occurred within the framework of protection, increasing state intervention, and capital deepening. Agriculture responded more positively than industry, revealing important changes in its structure that favored output with higher levels of factor productivity. Changes in agriculture also were associated with higher levels of investment in the sector.

**Gomez-Galvarriato** compares prices, costs, and productivity levels of a Mexican textile mill (Compania Industrial Veracruzana S.A., or CIVSA) circa 1911 with those of mills in the United States and Great Britain and studies the evolution of textile tariff protection. Surprisingly, CIVSA proved to be relatively competitive by 1911. However, its international standing deteriorated after that. Two institutional factors explain why CIVSA’s productivity levels lagged behind. First were rigid wage-lists that appeared in 1912 and remained unchanged for several decades, preventing the industry from adopting new technology. Second was a protectionist tariff poli-

cy that allowed the *status quo* imposed by the wage-lists to prevail.

**Esquivel** and **Marquez** investigate some of the economic effects of closing the Mexican economy in the mid-twentieth century. They first document the commercial policy that took place between 1930 and 1950 to illustrate the workings of the protectionism that was implemented in those years. Then, using Industrial Census data, they look at three aspects of the economy that could have been affected by this commercial policy: output and employment effects, labor composition effects, and regional dispersion effects. Theory would have predicted some of these effects, particularly those related to labor markets and economic activity. However, the regional dispersion of industrial activity does not seem to have been affected by commercial policy. Instead, patterns of regional dispersion suggest that history matters in terms of industrial location.

The University of Chicago Press plans to publish these papers in an NBER Conference Volume. Its availability will be announced in a future issue of the NBER Reporter. They are also available at “Books in Progress” on the NBER’s website.

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## Enhancing Productivity

The Seventeenth Annual TRIO Conference, so-named because it is jointly sponsored by the NBER, the Centre for Economic Policy Research (CEPR), and the Tokyo Center for Economic Research (TCER), took place on December 10 and 11 in Tokyo. This year's conference focused on "Enhancing Productivity." It was organized by Takeo Hoshi, NBER and University of California, San Diego; Dale Jorgenson, Harvard University; and Masahiro Kuroda, Keio University and TCER. The program was:

**Dale W. Jorgenson, and Koji Nomura**, Keio University, "Information Technology and the Japanese Growth Recovery"  
Discussants: Fumio Hayashi and Yosuke Okada, TCER

**Dale W. Jorgenson, and Kazuyuki Motohashi**, TCER, "Information Technology and the Japanese Economy"  
Discussants: Takeo Hoshi, and Takanobu Nakajima, TCER

**Kazushige Shimpo**, Keio University, "Structural Change and Economic Growth in Japan: Inter-Industry Effects of Productivity Growth"  
Discussants: Tsutomu Miyagawa, TCER, and Franck Portier, CEPR

**Jiro Nemoto**, TCER, and **Mika Goto**, Central Research Institute of Electric Power Industry, "Productivity, Efficiency, Scale Economies, and Technical Change: A New Decomposition Analysis of TFP Applied to the Japanese

Prefectures"  
Discussants: Kazushige Shimpo, Keio University, and Akio Torii, Yokohama National University

**Paul Beaudry**, NBER and University of British Columbia, and **Franck Portier**, CEPR and Universite des Sciences Sociales de Toulouse, "Stock Prices, News, and Economic Fluctuations" (NBER Working Paper No. 10548)  
Discussants: Sadao Nagaoka, and Jiro Nemoto, TCER

**Yosuke Okada**, TCER, "Competition, R&D, and Productivity in Japanese Manufacturing Industries"  
Discussants: Hiroki Kawai, Keio University, and Kazuyuki Motohashi

**Jorgenson** and **Motohashi** compare sources of economic growth in Japan and the United States from 1975 through 2002, focusing on the role of information technology (IT). After adjusting the Japanese data to conform to U.S. definitions, in order to provide a rigorous comparison between the two economies, they find that the share of the Japanese gross domestic product devoted to investment in computers, telecommunications equipment, and software rose sharply, and the rate of total factor productivity growth increased, after 1995. The contribution of IT to economic growth was almost the same in the two countries. However, the contributions of labor input and other sources of growth in Japan lagged far behind those in the United States.

**Nemoto** and **Goto** propose a new method of decomposing productivity change into technical advance, efficiency change, and scale effects. Their approach, based on the Hicks-Moorsteen-Bjurek productivity index,

is a synthesis of the Törnqvist and Malmquist productivity indexes that have been widely used in the literature. To prove its effectiveness, the authors apply this proposed methodology to an examination of the productivity of the Japanese economy using data on 47 prefectures from 1980-2000. Their results reveal that both supply and demand shocks drove procyclical productivity, and that their relative importance was mixed.

**Beaudry** and **Portier** show that the joint behavior of stock prices and total factor productivity favors a view of business cycles driven largely by a shock that does not affect productivity in the short run — and therefore does not look like a standard technology shock — but rather affects productivity with substantial delay, and therefore does not look like a monetary shock. One structural interpretation for this shock is that it represents news about future technological opportunities which is first captured in stock prices. The authors show that this shock caus-

es a boom in consumption, investment, and hours worked that precedes productivity growth by a few years. Moreover, this shock explains about 50 percent of business cycle fluctuations.

Using newly available panel data on around 10,000 firms in Japanese manufacturing for the years 1994-2000, **Okada** provides some empirical evidence that competition, as measured by lower levels of industrial mark-ups, enhances productivity growth, controlling for R and D and other industrial characteristics. R and D competition, as measured by increased numbers of R and D doers, is also positively associated with a higher rate of productivity growth. Moreover, market power, as measured by either market share or price-cost margin, has a negative impact on productivity levels for R and D-performing firms.

The papers presented at the TRIO conference will be published in the *Journal of the Japanese and International Economies*.

## International Capital Flows

Research Associate Sebastian Edwards of University of California, Los Angeles, organized an NBER Conference on International Capital Flows that took place in California on December 16-18. The following papers were discussed:

**Nicolas Magud**, University of Oregon, and **Carmen M. Reinhart**, NBER and University of Maryland, “Controls on International Borrowing: An Evaluation of Alternative Methods Used to Restrict Capital Inflows”  
Discussant: Martin Feldstein, NBER and Harvard University

**Laura Alfaro**, Harvard University, and **Sebnem Kalemli-Ozcan** and **Vadym Volosovych**, University of Houston, “Capital Flows in a Globalized World: The Role of Policies and Institutions”  
Discussant: Gerd Haeusler, International Monetary Fund

**Kristin J. Forbes**, NBER and MIT, “The Microeconomic Evidence on Capital Controls: No Free Lunch”  
Discussant: Charles Calomiris, NBER and Columbia University

**Ilan Goldfajn**, PUC-Rio, and **Andre Minella**, Central Bank of Brazil, “Capital Flows and Controls in Brazil: What Have We Learned?”  
Discussant: Peter Garber, NBER and Brown University

**Simon Johnson** and **Natalia Tamirisa**, International Monetary Fund, “Malaysian Capital Controls: An Assessment”  
Discussant: Peter Henry, NBER and Stanford University

**Kathryn M. E. Dominguez** and **Linda M. Tesar**, NBER and University of Michigan, “International Borrowing and Macroeconomic Performance in Argentina”  
Discussant: Nicolas Magud

**Basant K. Kapur**, National University of Singapore, “Capital Flows and Exchange Rate Volatility: Singapore’s Experience”  
Discussant: Anusha Chari, University of Michigan

**Sebastian Edwards**, “Capital Controls, Sudden Stops, and Current Account Reversals”  
Discussant: Alan Taylor, NBER and University of California, Davis

**Barry Eichengreen**, NBER and University of California, Berkeley; **Ricardo Hausman**, Harvard University; and **Ugo Panizza**, Interamerican Development Bank, “Currency Mismatches, Debt Intolerance, and Original Sin: Why They Are Not the Same and Why it Matters” (NBER Working Paper No. 10036)  
Discussant: Joshua Aizenman,

NBER and University of California, Santa Cruz

**Linda Goldberg**, Federal Reserve Bank of New York, “The International Exposure of U.S. Banks”  
Discussant: Matias Braun, NBER and University of California Los Angeles

**Eswar Prasad** and **Shang-Jin Wei**, International Monetary Fund, “The Chinese Approach to Capital Flows”  
Discussant: Michael Dooley, NBER and University of California, Santa Cruz

**Marcus Noland**, Institute for International Economics, “South Korea’s Experience with International Capital Flows”  
Discussant: Gita Gopinath, University of Chicago

**Kevin Cowan**, Inter-American Development Bank, and **Jose de Gregorio**, Central Bank of Chile, “International Borrowing, Capital Controls, and the Exchange Rate: The Chilean Experience”  
Discussant: Aaron Tornell, NBER and University of California, Los Angeles

**Ila Patnaik**, Indian Express, and **Ajay Shah**, Ministry of Finance, New Delhi, “India’s Experience with Capital Flows”  
Discussant: Takatoshi Ito, NBER and University of Tokyo

The literature on capital controls has (at least) four very serious apples-to-oranges problems: 1) There is no unified theoretical framework (say, as in the currency crisis literature) to analyze the macroeconomic consequences of controls; 2) there is significant heterogeneity across countries and time in the capital control measures implemented; 3) there are multiple definitions of what constitutes a “success” (capital controls are a single policy instrument — but there are many policy objectives); and 4) the empirical studies lack a common methodology — furthermore these are significantly

“overweighted” by a couple of country cases (Chile and Malaysia). **Magud** and **Reinhart** attempt to address some of these shortcomings by: being very explicit about what measures are construed as capital controls — they not only document the more drastic differences across countries/episodes between controls on inflows and outflows but also the more subtle differences in types of inflow or outflow controls. Also, given that success is measured so differently across studies, they “standardize” (where possible) the results of over 30 empirical studies summarized in the paper. They also bring to bear

the experiences of less well-known episodes than those of Chile and Malaysia. The standardization is accomplished by constructing two indexes of capital controls: Capital Controls Effectiveness Index (CCE Index) and Weighted Capital Control Effectiveness Index (WCCE Index). The difference between them lies only in that the WCCE controls for the differentiated degree of methodological rigor applied to drawing conclusions in each of the papers considered. With these indexes, the results are: Capital controls on inflows seem to make monetary policy more independent, to alter the compo-

sition of capital flows, and to reduce real exchange rate pressures (evidence more controversial). Capital controls on inflows do not seem to reduce the volume of net flows (hence, the current account balance). Finally, in Malaysia, controls reduce outflows, and may leave room for more independent monetary policy; in other countries, there is little systematic evidence of “success” (however, defined).

**Alfaro, Kalemli-Ozcan, and Volosovych** describe the patterns of international capital flows during 1970-2000. Then they examine the determinants of capital flows and capital flow volatility in this period. They find that institutional quality is an important determinant of capital flows. Historical determinants of institutional quality have a direct effect on today’s foreign investment. Policy has a significant role in explaining the increase in the level of capital flows and their volatility. Local financial structure, measured as the share of bank credit in total, is associated with high volatility of capital flows.

Macroeconomic analyses of capital controls face a number of imposing challenges and have yielded mixed results to date. **Forbes** takes a different approach and surveys an emerging literature that evaluates various microeconomic effects of capital controls and capital account liberalization. Several key themes emerge. First, capital controls tend to reduce the supply of capital, raise the cost of financing, and increase financial constraints — especially for smaller firms, firms without access to international capital markets, and firms without access to preferential lending. Second, capital controls can reduce market discipline in financial markets and the government, leading to a more inefficient allocation of capital and resources. Third, capital controls significantly distort decisionmaking by firms and individuals, as they attempt to minimize the costs of the controls or even evade them outright. Fourth, the effects of capital controls can vary across different types of firms and countries, reflecting different pre-existing economic distortions. Finally, capital controls can be difficult and costly to enforce, even in countries with sound institutions and low levels of corruption. This microeconomic evidence on

capital controls suggests that they have pervasive effects and often generate unexpected costs. Capital controls are no free lunch.

**Goldfajn and Minella** provide stylized facts about the balance of payments (current account cycles, capital flows cycles, composition, and debt accumulation) in Brazil over the last three decades. They examine the volatility of capital flows, both in general and during financial crises, and they estimate the relationship between capital flows and macroeconomic performance. Finally, they describe the evolution of capital controls in Brazil and evaluates the benefits and costs of further capital account liberalization.

**Johnson and Tamirisa** assess the capital controls imposed in Malaysia in September 1998. They find no evidence that Malaysia is a clear case of successful application of capital controls: both benefits and costs of controls appear small. Imposed late in the crisis and untested by any serious pressure, controls do not appear to have been essential for Malaysia’s recovery or for financial and corporate sector restructuring. Their political economy role also is difficult to ascertain. Although the stock market initially interpreted the capital controls as favoring firms connected to the Prime Minister, it could not subsequently discern to what extent such firms actually received special advantages. It remains to be seen if the episode was associated with a broader weakening of institutions and of investors’ perceptions of Malaysia as a desirable destination for investment.

**Dominguez and Tesar** provide an overview of the major economic events in Argentina from the adoption of the convertibility plan in 1991 to the collapse of the exchange rate regime in 2001. They review the key components of the Convertibility Plan and the responses of financial markets and the macroeconomy to the economic and financial reforms embodied in the Plan. They also describe the impact of external shocks that buffeted the economy between 1991 and 1999 and the sequence of policy decisions and reforms that took place over that period. Finally, they discuss the eventual collapse of the currency board and the response of the economy to the re-

imposition of capital controls.

Singapore’s experience with international capital flows over the past two decades or so has been rather benign because of strong fundamentals and generally well-conceived macroeconomic policies. **Kapur** begins by briefly discussing the 1998 experience of Hong Kong, another city-state with a well developed banking system and equities market, which operates on a Currency Board (CB) system (although with some differences from Singapore’s CB system). The discussion serves to identify some “areas of vulnerability” in the Hong Kong set-up at that time. Next Kapur discusses Singapore’s policy background and early experience, and in the light of Hong Kong’s experience is better able to appreciate how Singapore’s policy framework served to circumvent or minimize important vulnerabilities. Particular attention is paid to Singapore’s exchange-rate policy, and its policy of non-internationalization of the Singapore dollar. Then Kapur shows how Singapore emerged relatively unscathed from the 1997 Asian Crisis. Finally, he discusses Singapore’s debt markets and shows how, under the imperative of promoting the development of its bond markets, the non-internationalization policy has been progressively relaxed, while key safeguards have been retained.

**Edwards** uses a broad multi-country dataset to analyze the relationship between restrictions to capital mobility and external crises. His analysis focuses on two manifestations of external crises: sudden stops of capital inflows and current account reversals. Edwards deals with two important policy-related issues: first, does the extent of capital mobility affect countries’ degree of vulnerability to external crises; and second, does the extent of capital mobility determine the depth of external crises — as measured by the decline in growth — once the crises occur? Overall, his results cast some doubts on the assertion that increased capital mobility has caused heightened macroeconomic vulnerabilities. He finds no systematic evidence suggesting that countries with higher capital mobility tend to have a higher incidence of crises, or tend to face a higher probability of having a crisis, than countries with lower mobili-

ty. These results do suggest, however, that once a crisis occurs, countries with higher capital mobility tend to face a higher cost, in terms of growth decline.

Recent years have seen the development of a large literature on balance-sheet factors in emerging-market financial crises. **Eichengreen, Hausmann, and Panizza** discuss three concepts widely used in this literature. Two of them — “original sin” and “debt intolerance” — seek to explain the same phenomenon, namely, the volatility of emerging-market economies and the difficulty these countries have in servicing and repaying their debts. The debt-intolerance school traces the problem to institutional weaknesses of emerging-market economies that lead to weak and unreliable policies, while the original-sin school traces the problem instead to the structure of global portfolios and international financial markets. The literature on currency mismatches, in contrast, is concerned with the consequences of these problems and with how they are managed by the macroeconomic and financial authorities. Thus, the hypotheses and problems to which these three terms refer are analytically distinct. The tendency to use them synonymously has been an unnecessary source of confusion.

**Goldberg** documents the changing international exposures of U.S. bank balance sheets since the mid-1980s, and through 2004. U.S. banks continue to have positions that are heavily concentrated in Europe, with more volatile flows to other regions of the world. While U.S. bank exposure to Europe has remained high, in recent years some claims on Latin American countries have declined. Goldberg explores the composition of these declines, by type of flow and type of U.S. bank extending international claims. Claims from larger banks with foreign exposures tend to be less volatile than claims from smaller banks. Portfolio motives, as captured by GDP growth rates and interest rates, appear differentially important for claims on Europe versus Latin America, and this importance has changed over time.

**Prasad and Wei** systematically examine the evolution of capital inflows into China, both in terms of

volumes and composition and from a cross-country perspective. They then discuss these developments in the context of a burgeoning literature on financial globalization and analyze the relative importance of various determinants of the composition of China’s capital inflows. Finally, they provide a detailed analysis of the reasons for the dominance of FDI in China’s capital inflows.

**Noland** describes the South Korea case, which is unique in its unparalleled combination of sustained prosperity, capital controls, and financial crisis. Over a period of several decades, South Korea experienced rapid sustained growth in the presence of capital controls. These controls, and the de-linking of domestic and international financial markets, were an essential component of the country’s state-led development strategy. As the country developed, opportunities for easy technological catch-up eroded, requiring more sophisticated corporate and financial sector decisionmaking. But decades of financial repression had bequeathed a bureaucratized financial system and a formidable constellation of incumbent stakeholders opposed to transition to a more market-oriented development model. The liberalization undertaken in the early-1990s was less a product of textbook economic analysis than of parochial politicking. Though systemic risk was sufficiently high that South Korea might well have experienced a financial crisis regardless of capital account liberalization, the capital account liberalization program affected the timing, magnitude, and particulars of the 1997-8 crisis. Despite considerable reforms undertaken in the wake of the crisis, there is still concern about both South Korean lending culture and the capacity of South Korean authorities to successfully regulate the more complex financial system. The main lesson of the South Korean case appears to be that while the state-led model may deliver impressive gains, transitioning out of this approach once it has run its course presents an exceedingly complex challenge of political economy.

**Cowan and Gregorio** analyze the Chilean experience with capital flows,

discussing the role played by capital controls, financial regulations, and the exchange rate regime. Their focus is on the period after 1990, when Chile returned to international capital markets. The authors also discuss the early 1980s, when a currency collapse triggered a financial crisis despite stricter capital controls on inflows than in the 1990s and stricter currency matching requirements on banking. Cowan and Gregorio conclude that financial regulation and the exchange rate regime are at the center of capital inflow experiences and financial vulnerabilities. Rigid exchange rates induce vulnerabilities, which may lead to sharp capital account reversals. They also discuss two important characteristics of the Chilean experience since the 1990s: first, the fact that most international borrowing is done directly by corporations and is not intermediated by the banking system; second, the implications of the free trade agreements of Chile and the United States regarding capital controls.

**Patnaik and Shah** note that from the early 1990s onwards, India has engaged in policies involving trade liberalization, strong controls on debt flows, and encouragement for portfolio flows and FDI. While relatively little FDI has come to the country, substantial portfolio flows have occurred. Gross portfolio flows amounted to as much as 7 percent of GDP in 2003-4. These new policies of opening up to portfolio flows and FDI were accompanied by a pegged exchange rate. From 2001 to 2004, there has been tension between capital flows and the pegged exchange rate regime. Pegging led to a substantial reserves accumulation, and a current account surplus. In April 2004, when the costs of sterilized intervention became more transparent, the currency regime appears to have changed with a doubling of the nominal rupee-dollar returns volatility. The goal of the early 1990s — finding a sustainable way to augment investment using current account deficits — has not been achieved.

These papers will be published by the University of Chicago Press in an NBER Conference Volume. They are also available at “Books in Progress” on the NBER’s website.

## Sixth Annual Conference in India

On January 14-18, 2005 the NBER and India's National Council for Applied Economic Research (NCAER) again brought together a group of NBER economists and about forty economists from Indian universities, research institutions, and government departments for their sixth annual conference in India. **Mihir A. Desai** and **Martin S. Feldstein**, NBER and Harvard University, organized the conference jointly with **Suman Bery** and **Shashanka Bide** of NCAER.

The U.S. participants were: Richard Clarida, NBER and Columbia University; Angus Deaton, NBER and Princeton University; Mihir A. Desai, Martin S. Feldstein, and Kenneth Rogoff, NBER and Harvard University; Esther Duflo, NBER and MIT; Robert Feenstra, NBER and University of California, Davis; Robert J. Gordon, NBER and Northwestern University; Alan Gustman, NBER and Dartmouth College; Ann Harrison, NBER and University of California,

Berkeley; Anne O. Krueger, on leave from the NBER at the IMF; and Karthik Muralidharan, Harvard University.

After introductory remarks about the U.S. and Indian economies by NBER President Feldstein and Bimal Jalan of NCAER, the participants discussed: international and domestic finance; trade and capital flows; growth; poverty and rural development; outsourcing; and social security reforms.

## Conference on Mexican Immigration

An NBER Conference on Mexican Immigration, organized by George J. Borjas, NBER and Harvard University, was held in Cambridge on February 11 and 12. The following papers were discussed:

**David Card**, NBER and University of California, Berkeley, and **Ethan Lewis**, Federal Reserve Bank of Philadelphia, "The Diffusion of Mexican Immigrants During the 1990s: Explanations and Impacts"  
Discussant: George Johnson, University of Michigan

**Francine D. Blau**, NBER and Cornell University, and **Lawrence M. Kahn**, Cornell University, "Gender and Assimilation Among Mexican Americans"  
Discussant: Joseph G. Altonji, NBER and Yale University

**Gordon H. Hanson**, NBER and University of California, San Diego, "Emigration, Labor Supply, and Earnings in Mexico"  
Discussant: David Autor, NBER and MIT

**George J. Borjas** and **Lawrence F. Katz**, NBER and Harvard University, "The Evolution of the Mexican-Born Workforce in the United States"  
Discussant: Jeffrey Grogger, NBER and University of Chicago

**Edward P. Lazear**, NBER and Stanford University, "The Slow Assimilation of Mexicans in the United States"  
Discussant: Charles C. Brown, NBER and University of Michigan

**Robert Fairlie**, University of California, Santa Cruz, and **Christopher Woodruff**, University of California, San Diego, "Mexican Entrepreneurship: A Comparison of Self-Employment in Mexico and the United States"  
Discussant: David Neumark, NBER and Public Policy Institute of California

**Susan Richter** and **J. Edward Taylor**, University of California, Davis; and **Antonio Yunez-Naude**, El Colegio de Mexico, "Impacts of Policy Reforms on Labor Migration

from Rural Mexico to the United States"  
Discussant: David Jaeger, College of William and Mary

**Kurt Unger**, CIDE, "Economic Development and Mexican Out-Migration"  
Discussant: Chinhui Juhn, NBER and University of Houston

**Pablo Ibarrran**, Inter-American Development Bank, and **Darren Lubotsky**, University of Illinois, Urbana-Champaign, "Mexican Immigration and Self-Selection: New Evidence from the 2000 Mexican Census"  
Discussant: Cordella Reimers, Hunter College – CUNY

**Brian Duncan**, University of Colorado at Denver, and **Stephen Trejo**, University of Texas at Austin, "Ethnic Identification, Intermarriage, and Unmeasured Progress by Mexican Americans"  
Discussant: Harry Holzer, Georgetown University

*(Continued on next page)*

**Card** and **Lewis** present some simple evidence on the causes and consequences of the widening geographic diffusion of Mexican immigrants. A combination of demand-pull and supply-push factors explains 85 percent of the variation across major cities in the rate of Mexican inflows during the 1990s, and helps illuminate the single most important trend in the destination choices of new Mexican immigrants: the move away from Los Angeles. Like their predecessors, recent Mexican immigrants have relatively low levels of education. Card and Lewis show that inflows of Mexican immigrants lead to systematic shifts in the relative supply of low-education labor in a city, opening up the question of how different local labor markets are adopting to substantial differences in relative supply. The authors also find that most of the differences across cities in the relative supply of low-education labor (or Mexican labor) are absorbed by changes in skill intensity *within* narrow industries. Such adjustments could be explained readily if Mexican immigrant inflows had large effects on the relative wage structures of different cities. But this analysis suggests that relative wage adjustments are small.

**Blau** and **Kahn** use 1994-2003 CPS data to examine gender and assimilation of Mexican Americans, both within and across generations. They find that source country patterns, particularly the more traditional gender division of labor in the family in Mexico, strongly influence the outcomes and behavior of Mexican immigrants on arrival in the United States. Both male and female immigrants have much lower levels of education than the third-generation, nonhispanic white reference group. Gender differences in educational attainment among immigrants are minimal. Controlling for education and other characteristics, upon arrival in the United States, immigrant women are more likely to be married with a spouse present, have higher fertility, and to supply much less labor than the reference group. Male immigrants are somewhat likelier to be working. *Ceteris paribus* wage differences between female immigrants and nonhispanic whites, upon arrival, are

less marked than labor supply differences, and they tend to be smaller than comparable wage gaps for men, although both show a deteriorating wage position of immigrants beginning in the 1980s. After twenty years, the large initial immigrant hours shortfall for women has been virtually eliminated, but there is no evidence of positive wage assimilation for women. As a less educated group, immigrants of both sexes experience substantial shortfalls in hours (especially for women) and wages relative to nonhispanic whites (when education is not controlled for). For both men and women, rising educational attainment in the second generation contributes to a considerable narrowing of the gaps in raw labor supply (again especially for women) and wages with nonhispanic whites, but there is no evidence of intergenerational convergence in education, labor supply, or wages beyond the second generation. Even over time in the United States, immigrant women and men remain more likely to be married. This changes by the second and third generation. In contrast, Mexican immigrant women's higher fertility actually tends to increase with time in the United States. And, while the size of the Mexican American-nonhispanic white fertility differential declines across generations, it is not eliminated.

**Hanson** examines changes in labor supply and earnings across regions of Mexico during the 1990s. He focuses on individuals born in states with either high-exposure or low-exposure to emigration, as measured by historical data on state migration to the United States. During the 1990s, rates of external migration and internal migration were higher among individuals born in high-migration states. Consistent with positive selection of emigrants in terms of skill, emigration rates appear to be highest among individuals with earnings in the top half of the wage distribution. Controlling for regional differences in the distribution of observable characteristics and for initial regional differences in earnings, the distribution of male earnings in high-migration states shifted to the right relative to low-migration states. Over the decade,

average hourly earnings in low-migration states fell relative to high-migration states by 6-9 percent.

**Borjas** and **Katz** use data from 1900 through 2000 to document the evolution of the Mexican-born workforce in the U.S. labor market. Interestingly, the share of Mexican immigrants in the U.S. workforce *declined* steadily beginning in the 1920s before beginning to rise in the 1960s; it was not until 1980 that the relative number of Mexican immigrants in the U.S. workforce was at the 1920 level. Borjas and Katz find that Mexican immigrants have much less educational attainment than either native-born workers or non-Mexican immigrants. These differences account for nearly three-quarters of the very large wage disadvantage suffered by Mexican immigrants in recent decades. Second, although the earnings of non-Mexican immigrants converge to those of their native-born counterparts as the immigrants accumulate work experience in the U.S. labor market, this type of wage convergence has been much weaker on average for Mexican immigrants than for other immigrant groups. Third, although native-born workers of Mexican ancestry have levels of human capital and earnings that far exceed those of Mexican immigrants, the economic performance of these native-born workers lags behind that of native workers who are not of Mexican ancestry. Much of the wage gap between the two groups of native-born workers can be explained by the large difference in educational attainment between the two groups. Fourth, the large Mexican influx in recent decades widened the U.S. wage structure by adversely affecting the earnings of less-educated native workers and improving the earnings of college graduates. These wage effects in turn, have lowered the prices of non-traded goods and services that are low-skill labor intensive.

By almost any measure, immigrants from Mexico have performed worse and become assimilated more slowly than immigrants from other countries. But Mexico is a huge country, with many high ability people who could fare very well in the United States. Why have Mexicans done so



badly? According to **Lazear**, the answer is primarily immigration policy. The United States lets in far more immigrants from Mexico than from any other country. As a result, there are large Mexican enclaves in the United States. Theory and evidence suggests that those who live in highly concentrated communities do not assimilate as quickly, have lower wages, and poorer educational attainment. The fact that Mexicans live in highly concentrated communities explains some, but not all of the difference between their performance and that of other immigrants. The rest may be a result of immigration policy, through which the bulk of Mexicans enter the United States on the basis of family ties, rather than job skills.

**Fairlie** and **Woodruff** start with the large difference between self-employment rates in Mexico and among Mexican immigrants in the United States and examine the components of this difference. The male and female self-employment rates in Mexico are 25.8 and 17.0 percent, respectively. In comparison, male and female Mexican immigrants in the United States have self-employment rates of only 6.0 and 6.1 percent, respectively. For males, 22.1 percent of the nonagricultural labor force in Mexico is self employed, compared with only 6.2 percent of the immigrant nonagricultural labor force in the United States. None of this difference is explained by the sectoral composition of the non-agricultural labor force. Rather, the difference is explained by higher rates of self-employment within sectors in Mexico compared to the United States. The authors go on to compare the determinants of self-employment in the two countries and find some interesting differences. For example, the positive relationship between self-employment and age is stronger in Mexico than in the United States. Also, there are large gaps between levels of self-employment in Mexico and the United States which are entirely due to differences in the structures of the economy and would be even larger if not for the favorable characteristics of the U.S. population — mainly being older and more educated on average. These dif-

ferences may be attributable to country-level differences in institutions, production technologies, tax rates, and other economic factors between the two countries. The authors conclude that roughly the entire Mexican immigrant/U.S. total gap in levels of self-employment is explained by differences in measurable characteristics. Also, there is some evidence suggesting that, for both men and women, Mexican immigrant self-employment rates may be higher for those who reside in the United States legally and are fluent in English and, for men, among those who live in ethnic enclaves.

Using new survey data from Mexico, **Richter**, **Taylor**, and **Yunez-Naude** estimate a dynamic econometric model to test the effect of policy changes on the flow of migrant labor from rural Mexico to the United States and to test for differential effects of policy changes on male and female migration. They find that both IRCA and NAFTA reduced the share of rural Mexicans working in the United States. Increased U.S. border enforcement had the opposite effect. The impacts of these policy variables are small compared with those of macroeconomic variables. The influence of policy and macroeconomic variables is small compared with that of migration networks, as reflected in past migration by villagers to the United States. The effects of all of these variables on migration propensities differ, quantitatively and in some cases qualitatively, by gender.

**Unger** describes migratory activity from Mexican communities, associating its intensity with local economic development. He highlights three main characteristics of migration: first, about 96 percent of the municipalities in Mexico have migratory activity, and 509 of them at a high intensity. Second, the number of urban communities engaged in migration is larger than the rural group. Third, migration originating from the traditional states of migration in the past, those in the Central Western region (Zacatecas, Michoacan, Guanajuato, Durango, Aguascalientes, Jalisco, and San Luis Potosi), remains very high. Unger goes on to estimate the differentiated impact of out-migration in relation to

the size, wealth, wages, and productivity of each municipality. He finds a negative and significant effect of size for all the municipalities, as well as for when urban and rural municipalities are treated separately. For urban municipalities, there is a negative relation between wages and migratory intensity, indicating that migration occurs from small communities where economic conditions are worst. For urban, rural municipalities in the Southern region, there is a positive relation between income and migratory intensity, suggesting a “poverty trap” where there is not the minimum wealth for migration to occur. Other indicators are only significant for urban communities, indicating that migration takes place from the poorest municipalities with lower wages, and that individuals prefer to migrate in order to receive higher salaries than if they stayed at home. Finally, Unger observes convergence in per capita income among rich and poor communities over time. On the whole, his results suggest that migration contributes to the catching up of poorer communities.

**Ibarraran** and **Lubotsky** use data from the 2000 Mexican Census to examine how the education and socioeconomic status of Mexican immigrants to the United States compares to that of non-migrants in Mexico. The primary conclusion here is that migrants tend to be less educated than non-migrants. This finding is consistent with the idea that the return to education is higher in Mexico than in the United States, and thus the wage gain to migrating is proportionately smaller for high-educated Mexicans than it is for lower-educated Mexicans. The authors also find that the degree of negative selection of migrants is stronger in Mexican counties that have a higher return to education.

Using Census and CPS data, **Duncan** and **Trejo** show that U.S.-born Mexican Americans who marry non-Mexicans are substantially more educated and proficient in English, on average, than those who marry co-ethnics (whether they be Mexican-Americans or Mexican immigrants). The non-Mexican spouses of intermarried Mexican-Americans also pos-

sess relatively high levels of schooling and English proficiency, compared to the spouses of endogamously married Mexicans. The human capital selectivity of Mexican-American intermarriage generates corresponding differences in the employment and earnings of Mexican-Americans and their spouses. Moreover, the children of intermarried Mexican-Americans are much less like-

ly to be identified as Mexican than are the children of endogamous Mexican marriages. These forces combine to produce strong negative correlations between education, English proficiency, employment, and earnings of Mexican-American parents and the chances that their children retain a Mexican ethnicity. Such findings raise the possibility that selective ethnic

“attrition” might bias observed measures of intergenerational progress for Mexican-Americans.

These papers will appear in a volume published by the University of Chicago Press. They can also be found at “Books in Progress” on the NBER’s website.

## Academic Science and Entrepreneurship: Dual Engines of Growth?

The NBER’s Working Group on Entrepreneurship and the Innovation Policy and the Economy group will be holding a series of conferences on entrepreneurship and the economy, with generous support from the Ewing Marion Kauffman Foundation. The first conference, which took place on April 1 and 2, 2005, focused on academic science and entrepreneurship. The idea that academic science is an engine of growth, creating technological opportunities for industrial innovation as well as future scientific research, is well known and studied. However, little is known about the role of academic entrepreneurship, faculty participation in commercialization of their inventions, and new firm creation in the innovation process. The papers presented in this conference covered a broad array of issues related to the real impacts of academic entrepreneurship, including the effectiveness of different mechanisms for transferring technology, the profile of participants, and the role of public and institutional policies in framing their incentives.

NBER Research Associates Adam B. Jaffe of Brandeis University, Joshua Lerner of the Harvard Business School, Scott Stern of the Kellogg School of Management, and Marie C. Thursby of Georgia State University, organized the conference. The following papers were discussed:

**Daniel W. Elfenbein**, University of California, Berkeley, “Publications, Patents, and the Market for

University Inventions”  
Discussant: Ashish Arora, Carnegie Mellon University

**Dirk Czarnitzki**, Katholieke Universiteit Leuven, and **Andrew A. Toole**, Rutgers University, “Biomedical Academic Entrepreneurship through the SBIR Program”  
Discussant: Wesley M. Cohen, NBER and Duke University

**Richard A. Jensen** and **Celestine O. Chukumba**, University of Notre Dame, “University Invention, Entrepreneurship, and Start-Ups”  
Discussant: Suzanne Scotchmer, NBER and University of California, Berkeley

**Scott Shane**, Case Western Reserve University, and **Deepak Somaya**, University of Maryland, “The Effects of Patent Litigation on University Licensing Efforts”  
Discussant: Stuart Graham, Georgia Institute of Technology

**Thomas Hellmann**, University of British Columbia, “The Role of Patents for Bridging the Science to Market Gap”  
Discussant: Arvids Ziedonis, University of Michigan

**Jeffrey L. Furman**, NBER and Boston University, and **Megan MacGarvie**, Boston University, “Early Academic Science and the Birth of Industrial Research Laboratories in the U.S.

Pharmaceutical Industry”  
Discussant: Kenneth L. Sokoloff, NBER and University of California, Los Angeles

**Jinyoung Kim** and **Sangjoon Lee**, SUNY Buffalo, and **Gerald Marschke**, SUNY Albany, “The Influence of University Research on Industrial Innovation”  
Discussant: Adam B. Jaffe

**Pierre Azoulay**, NBER and Columbia University; **Waverly Ding**, University of California, Berkeley; and **Toby Stuart**, Columbia University, “The Determinants of Faculty Patenting Behavior: Demographics or Opportunities?”  
Discussant: Iain M. Cockburn, NBER and Boston University

**Swastika Mukherjee**, Georgia Institute of Technology; **Jerry Thursby**, Emory University; and **Marie Thursby**, “Are There Real Effects of Licensing on Academic Research? A Life Cycle View”  
Discussant: Joshua Lerner

**Fiona Murray**, MIT, and **Scott Stern**, “Do Formal Intellectual Property Rights Hinder the Free Flow of Scientific Knowledge? An Empirical Test of the Anti-Commons Hypothesis”  
Discussant: Paula Stephan, Georgia State University

*(Continued on next page)*

Taking as the unit of analysis the disclosure of an invention by a faculty member to the university technology transfer office, **Elfenbein** examines the factors that lead some inventions to be sold while others are not. In particular, he analyzes the degree to which inventors' academic publications, their experience with disclosure and licensing, and the patent status of the invention are correlated with the likelihood that the invention will be purchased by a commercial buyer and the terms of the deal that result. Elfenbein finds that an inventor's prior experience with, and success in, commercialization is positively correlated with the likelihood of finding a commercial buyer and with the levels of non-contingent payments in the resulting licenses. Controlling for prior experience, inventions made by inventors with more extensive publication records are more likely to find commercial buyers, and the publication records of these inventors are positively correlated with the resulting non-contingent payments but are not correlated with the contingent payment structure of the licensing contracts. Although the majority of inventions are licensed prior to patent awards, the receipt of a patent significantly increases the likelihood that the invention will be licensed. Inventors' publications and experience matter more in the absence of patent awards; conversely, patent awards are critical only when inventors' commercialization experience is limited. Overall, these findings paint a complex picture about the process whereby inventions are matched with buyers and the role of different types of information in enabling potential buyers to form valuations of the given invention.

**Toole** and **Czarnitzki** describe the U.S. Small Business Innovation Research (SBIR) program, a policy that fosters academic entrepreneurship. They highlight the two main characteristics of the program that make it attractive as an entrepreneurship policy: early-stage financing and scientist involvement in commercialization. Using unique data on NIH-supported biomedical researchers, the authors trace the incidence of biomedical entrepreneurship through

SBIR and describe some of the characteristics of these individuals. To explore the importance of early-stage financing and scientist involvement, they complement their individual-level data with information on scientist linked and non-linked SBIR firms.

**Chukumba** and **Jensen** examine the question of when commercialization of university inventions occurs in start-up firms instead of established firms. The authors construct a theoretical model that predicts that start-ups are more likely if their opportunity cost of development and commercialization is lower, because of less profitable alternatives, or if the university's technology transfer officer's (TTO) opportunity cost of searching for a partner among established firms is greater. Using data from the Association of University Technology Managers, the National Venture Capital Association Yearbook for 1993-2002, and the National Research Council, the authors find that inventor quality and TTO experience have a positive impact on start-ups and licenses to established firms. They find too that venture capital spending and equity performance, as measured by the S&P 500, are positively related to start-ups. Also, there is evidence that capital costs have a negative influence on startups.

One of the effects of increased patenting by universities over the past 20 years has been a rise in the use of lawsuits by universities to enforce their patent rights. **Shane** and **Somaya** thus ask: "What effects does patent litigation have on university efforts to license technology?" They conduct interviews with directors of technology licensing offices (TLOs) at 13 Carnegie I research universities and empirically analyze licensing data for 116 Carnegie I research universities from 1991 through 2000. The authors find that patent litigation has an adverse effect on overall university licensing activity. Their interviews with TLO directors suggest that this adverse effect occurs because litigation takes the time and attention of licensing officers away from marketing technologies and establishing licenses. Given the adverse effects of litigation on licensing, why do universities litigate? The qualitative evidence suggests

that universities litigate when they believe that they can overcome the perceived risks and financial and organizational demands of litigation. Specifically, they litigate when university TLOs are less reliant on industry funding and can take a more aggressive posture towards private firms; when they have a stronger financial base of royalty income; when they have more licensing and litigation experience; and when they license less exclusively. **Hellmann** examines an ex-post rationale for patenting scientific discoveries. In his model, scientists do not know which firms can use their discoveries, and firms do not know which scientific discoveries might be useful for them. To bridge this gap, either or both sides need to engage in costly search activities. Patents determine the appropriability of scientific discoveries, which affects the scientists' and firms' willingness to engage in search. Patents increase (decrease) dissemination when scientists' (firms') search is sufficiently elastic. Hellman's model also examines the role of universities. Patents facilitate the delegation of search activities to the universities' technology transfer offices, which enables efficient specialization. Rather than distracting scientists from doing research, patenting may be a complement to doing research.

**MacGarvie** and **Furman** investigate the rise of industrial research laboratories in the U.S. pharmaceutical industry between 1927 and 1946. Their evidence suggests that institutional factors, namely the presence of universities dedicated to research, played a crucial role in the establishment and diffusion of private pharmaceutical research laboratories. Specifically, the authors show that the establishment of industrial pharmaceutical laboratories between 1927 and 1946 is positively and significantly correlated with the extent of local university research (as measured by the number of science and chemistry PhDs, while controlling for other observable factors likely to influence the geographic distribution of industrial research). These core results are robust to a number of specifications and to correcting for the simultaneous influence of private firms on university programs. Both historical

anecdotal evidence and analyses of the birth of chemical engineering programs suggest that private firms also played important roles in shaping the development and extent of university research agendas. Supplementing these core results with case histories that are illustrative of early university-industry interaction and an examination of the determinants of university-industry research cooperation, the authors find that while the presence of industrial facilities helped shape the direction of university research programs, there was a significant, positive, and causal effect running from university research to the growth of industrial research laboratories in the first half of the twentieth century in the United States.

**Kim, Lee, and Marschke** use U.S. patent records to examine the role of research personnel as a pathway for the diffusion of ideas from university to industry. By examining an inventor's patenting history contained in the patent data, the authors can determine whether an inventor on a firm's patent had appeared previously as an inventor on a patent assigned to a university. Appearing on a patent assigned to a university is evidence that the inventor had exposure to university research, either directly as a university researcher or through some form of collaboration with university researchers. The authors also use data from the Dissertation Abstracts to establish whether the inventor has an advanced degree (doctorate or masters), another measure of exposure to university research. They find a steady increase in university influence in both measures over the period 1979-97. Moreover, in their analysis of the pharmaceutical and semiconductor industries over the decade of the 1990s, they find: 1) the pharmaceutical industry makes greater use of inventors with university backgrounds than the semiconductor industry; 2) the percentage of patents assigned to firms that involved inventors with a university background increased substantially in both industries; and 3) large and highly capitalized firms in both industries and young firms in the pharmaceutical industry are disproportionately active

in the diffusion of ideas from the university sector.

**Azoulay, Ding, and Stuart** examine the individual, contextual, and institutional determinants of faculty patenting behavior in a panel dataset spanning the careers of 3,884 academic life scientists. Using a combination of discrete time hazard rate models and fixed effects logistic models, the authors find that that patenting events are preceded by a flurry of publications, even holding constant time-invariant scientific talent and the latent invariability of a scientist's research. Moreover, the magnitude of the effect of this flurry is influenced by context, such as the presence of coauthors who patent and the patent stock of the scientist's university. Whereas previous research emphasized that academic patenters are more accomplished on average than their non-patenting counterparts, these findings suggest that patenting behavior is also a function of scientific opportunities. This has important implications for the public policy debate surrounding academic patenting.

A prominent issue in the debates over faculty involvement in university licensing is whether financial incentives associated with licensing have diverted faculty from basic toward applied research (Stephan and Levin, 1996). In their paper, **Thursby, Thursby, and Mukherjee** present a life cycle model of faculty research that allows them to examine this and related issues. In the model, the faculty member can engage in applied and/or basic research and can earn income both as current salary and as license income. Both types of research have consumption value and both contribute to income, because publications are rewarded in salary. Thus, as in Levin and Stephan (1991), there is a consumption motive for research that does not decline over the life cycle and a financial motive that does. In this case, however, there is an additional motive for applied research, which does not decline over the life cycle. Applied work that is licensed provides a future income stream that continues regardless of work effort.

While the potential for intellectual property rights to inhibit the diffusion of scientific knowledge is at the heart of several contemporary policy debates, evidence for the "anticommons effects" has been anecdotal. A central issue in this debate is how intellectual property rights over a given piece of knowledge affect the propensity of future researchers to draw upon that knowledge in their own scientific research activities. **Murray and Stern** develop and implement an empirical approach to uncover this effect, exploiting two key aspects of the process of disclosing and protecting scientific knowledge: scientific knowledge receiving formal IP often also appears in the form of scientific research articles (a phenomena they refer to as a "patent-paper pair"); and patents are granted with a substantial lag, often many years after the knowledge is initially disclosed through paper publication. The knowledge associated with a patent-paper pair therefore diffuses within two distinct intellectual property environments: one associated with the pre-grant period and another after formal IP rights are granted. Relative to the expected citation pattern for publications with a given quality level, anticommons theory predicts that the citation rate to a scientific publication should fall after formal IP rights associated with that publication are granted. Employing a differences-in-differences estimator for 169 patent-paper pairs (and including a control group of other publications from the same journal for which no patent is granted), the authors find evidence for a modest anticommons effect. While publications linked to patent grants are associated with a higher overall citation rate, the citation rate after the patent grant declines by between 9 and 17 percent. This decline becomes more pronounced with the number of years elapsed since the date of the patent grant, and is particularly salient for articles whose authors do research within the public sector.

These papers will be published in the *Journal of Economic Behavior and Organization*.

## Twentieth Annual Conference on Macroeconomics

The NBER's Twentieth Annual Conference on Macroeconomics took place in Cambridge on April 8 and 9. Mark Gertler, NBER and New York University, and Kenneth S. Rogoff, NBER and Harvard University, organized this program:

**Andrew T. Levin**, Federal Reserve Board; **Alexai Onatski**, Columbia University; **John C. Williams**, Federal Reserve Bank of San Francisco; and **Noah Williams**, NBER and Princeton University, "Monetary Policy Under Uncertainty in Micro-Founded Macroeconomic Models"

Discussants: Giorgio Primaceri, NBER and Northwestern University, and Carl Walsh, University of California, Santa Cruz

**Thomas Lubik**, Johns Hopkins University, and **Frank Schorfheide**,

University of Pennsylvania, "A Bayesian Look at the New Open Economy Macroeconomics"

Discussants: Paolo Pesenti, Federal Reserve Bank of New York, and Chris Sims, NBER and Princeton University

**Diego Comin** and **Thomas Philippon**, NBER and New York University, "The Rise in Firm-Level Volatility: Causes and Consequences"

Discussants: Daron Acemoglu, NBER and MIT, and Jan Eberly, NBER and Northwestern University

**Alberto Alesina** and **Edward Glaeser**, NBER and Harvard University, and **Bruce Sacerdote**, NBER and Dartmouth College, "Work and Leisure in the U.S. and Europe: Why So Different?"

Discussants: Lars Ljungqvist,

Stockholm School of Economics, and Richard Rogerson, NBER and Arizona State University

**Stephanie Schmitt-Grohe** and **Martin Uribe**, NBER and Duke University, "Optimal Fiscal and Monetary Policy in a Medium-Scale Macroeconomic Models"

Discussants: Jesus Fernandez-Villaverde, University of Pennsylvania, and Michael Woodford, NBER and Columbia University

**Robert E. Hall**, NBER and Stanford University, "Job Loss, Job Finding, and Unemployment in the U.S. Economy over the Past 50 Years"

Discussants: Steven Davis, NBER and University of Chicago, and John Kennan, NBER and University of Wisconsin

**Levin, Onatski, Williams, and Williams** estimate a second-generation micro-founded model of the U.S. economy using Bayesian methods. They examine the characteristics of optimal monetary policy in the model, where the policy objective is the maximization of welfare of the representative household. Their results point to the central role of labor markets and wage setting in affecting welfare and the design of monetary policy. The authors show that a parsimonious implementable rule targeting wage inflation closely mimics the outcomes of the fully optimal Ramsey policy. Finally, they examine the impact of parameter uncertainty as measured by their estimated sampling variation, and find that their simple rule is robust to this uncertainty.

**Lubik** and **Schorfheide** develop a small-scale two-country model following the New Open Economy Macroeconomics (NOEM) paradigm. Under autarky the model specializes to the familiar three-equation New Keynesian dynamic stochastic general equilibrium (DSGE) model. The authors discuss three challenges to successful estima-

tion of DSGE models: potential model misspecification, identification problems, and model size. They argue that prior distributions and Bayesian estimation techniques are useful for coping with these challenges. They apply these techniques to the two-country model and fit it to data from the United States and the Euro Area. They then compare parameter estimates from closed and open economy specifications, study the sensitivity of parameter estimates to the choice of prior distribution, examine the propagation of monetary policy shocks, and assess the model's ability to explain exchange rate movements. Most notably, they find that the estimated nominal rigidity in the United States is smaller in the open economy version of the model than in the closed economy model. Moreover, 20 percent of the exchange rate fluctuations can be explained by structural shocks. According to their estimates, monetary policy shocks do not play an important role for exchange rate fluctuations.

**Comin** and **Philippon** document that the recent decline in aggregate volatility has been accompanied by a

large increase in firm-level risk. The negative relationship between firm and aggregate risk seems to be present across industries in the United States and across OECD countries. Firm volatility increases after deregulation, and is linked to research and development spending as well as to access to external financing. Further, R and D intensity is associated with a lower correlation of sectoral growth with the rest of the economy.

Americans average 25.1 working hours per person of working age per week, but the Germans average 18.6 hours. The average American works 46.2 weeks per year, while the average French person works 40 weeks per year. Why do western Europeans work so much less than Americans? Recent work argues that these differences result from higher European tax rates, but the vast empirical labor supply literature suggests that tax rates can explain only a small amount of the differences in hours between the United States and Europe. Another popular view is that long-standing European "culture" can explain these differences, but Europeans worked more than Americans as late as

the 1960s. **Alesina, Glaeser, and Sacerdote** argue that European labor market regulations, advocated by unions in declining European industries who argued “work less, work all,” explain the bulk of the difference between the United States and Europe. These policies do not seem to have increased employment, but they may have had a more society-wide influence on leisure patterns because of a social multiplier by which the returns to leisure increase as more people are taking longer vacations.

**Schmitt-Grohe and Uribe** study Ramsey-optimal fiscal and monetary policy in a medium-scale model of the U.S. business cycle. The model features a rich array of real and nominal rigidities that have been identified in the recent empirical literature as salient in explaining observed aggregate fluctuations. The main result of the paper is that price stability appears to be a central goal of optimal monetary policy. Under an income tax regime, the optimal inflation rate is 0.5 percent per year with 1.1 percent volatility. This

result is surprising because the model features a number of frictions which, in isolation, would call for a volatile rate of inflation: in particular, non-state-contingent nominal public debt, no lump-sum taxes, and sticky wages. Under an income tax regime, the income tax rate is quite stable, with a mean of 30 percent and a standard deviation of 1.1 percent. Simple monetary and fiscal rules implement a competitive equilibrium that mimics well the one induced by the Ramsey policy. When the fiscal authority is allowed to tax capital and labor income at different rates, optimal fiscal policy is characterized by a large and volatile subsidy on capital.

New data compel a new view of events in the labor market during a recession. Unemployment rises entirely because jobs become harder to find. Recessions involve no increases in the flow of workers out of jobs. Another important finding from new data is that a large fraction of workers departing jobs move to new jobs without intervening unemployment. **Hall** esti-

mates separation rates and job-finding rates for the past 50 years, using historical data informed by detailed recent data. The separation rate is nearly constant while the job-finding rate shows high volatility at business cycle and lower frequencies. Hall reviews modern theories of fluctuations in the job-finding rate. The challenge to these theories is to identify mechanisms in the labor market that amplify small changes in driving forces into fluctuations in the job-finding rate of the (high) magnitude actually observed. In the standard theory developed over the past two decades, the wage moves to offset driving forces and the predicted magnitude of changes in the job-finding rate is tiny. New models overcome this property by invoking a new form of sticky wages or by introducing information and other frictions into the employment relationship.

These papers and discussions will be published by the MIT Press. The volume’s availability will be announced in a future issue of the *Reporter*.

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### Productivity

The NBER's Program on Productivity met in Cambridge on December 10. Program Director Ernst R. Berndt, also of MIT, chose the following papers to discuss:

**Rupert Harrison**, IFS and UCL; **Jordi Jaumandreu**, UC3M; **Jacques Mairesse**, NBER and INSEE-CREST; and **Bettina Peters**, ZEW, "Does Innovation Stimulate Employment? A Firm-Level Analysis Using Comparable Micro Data on Four European Countries"

**Nicole Nestoriak**, Bureau of Economic Analysis, "Endogenous Technology and Local Labor Market Skills"

**Walter Oi**, University of Rochester, "Effort, Firm Size, and Productivity"

**Fiona Murray**, MIT, and **Scott Stern**, NBER and Northwestern University, "Do Formal Intellectual Property Rights Hinder the Free Flow of Knowledge? An Empirical Test of the Anti-Commons Hypothesis"  
(See "Academic Science and

*Entrepreneurship*" earlier in this issue.)

**James D. Adams**, NBER and Rensselaer Polytechnic Institute; **J. Roger Clemmons**, University of Florida; and **Paula E. Stephan**, Georgia State University, "How Rapidly Does Science Leak Out?"

**Jonathan S. Skinner** and **Douglas L. Staiger**, NBER and Dartmouth College, "Technology Adoption from Hybrid Corn to Beta Blockers"

**Harrison**, **Jaumandreu**, **Mairesse**, and **Peters** study the impact of process and product innovations introduced by firms on their employment growth. They derive and estimate a model relating employment growth to process innovations and to the growth of sales attributable to innovative and unchanged products with comparable firm-level data from France, Germany, Spain, and the United Kingdom from the Third European Community Innovation Survey (covering the period 1997-2000). The results for manufacturing show that, although process innovation tends to displace employment, its effects on compensation are more significant. Product innovation is associated with employment growth. In the service sector there is less evidence of displacement effects, and the growth in sales of new products accounts for a non-negligible proportion of employment growth.

Despite the focus on the effects of new technologies and highly skilled workers in contributing to economic growth and explaining increasing wage inequality, the use of these new technologies and workers is not necessarily widespread. Why not? **Nestoriak** proposes one answer: there is considerable geographic variation in the avail-

ability of skilled workers, and this variation together with labor market frictions forces firms to consider the skill mix of their local labor market before making an investment decision, thereby leading to endogenous technology. While previous studies of this phenomenon have focused on macro-level changes in the relative supply and demand of skilled labor, **Nestoriak** uses cross-sectional variation in the availability of skilled labor in local labor markets to determine whether otherwise similar firms invest differently in high technology capital depending upon the locally available skill mix. She uses employer-employee matched data to examine the relationship between an establishment's investment in high technology and local labor market skill, at the same time controlling for the firm's skill mix, industry, and type. Her results predict that a single standard deviation increase in local labor market skill will lead to a roughly 10 percent increase in technology investment, holding other characteristics of the firm constant. These results are robust to a series of different specifications, including different measures of local labor market skill and definitions of the local labor market.

In 1820, Western Europe's per

capita income was twice that of the rest of the world. For 2000, the cross-national data reveal that 800 million people in 11 industrialized nations had per capita incomes above \$25,000, while 5 billion persons in 111 less developed countries had per capita incomes below \$8,000. **Oi** presents a production-function model that attributes much of the income growth to technical progress where innovations can be of the process, cost-reducing type or can create truly new final products. A worker can be more productive by acquiring more education or agreeing to put forth more effort. Proxies for effort intensity are available and can be used to measure the labor input. Productivity and wages are positively related to firm size, which in turn depends on superior management and should be explicitly included in the production function. Self-service, chain stores, and discount warehouse stores are retail formats resulting from organizational innovations. Labor productivity in the United States is higher than that in any other country because of the adoption of these institutional innovations. Franchising is a way of mass-producing a service, but its main product is the opportunity for business success, a topic developed in this

paper. Finally, markets in the United States are subject to fewer regulations, and firms are not constrained by a self-containment hypothesis. Oi extends the theory of productivity in three directions: 1) Effort intensity surely affects labor and total factor productivity. 2) Firm size affects productivity because big firms adopt effort-intensive methods of production and organizational practices that are not economical for small firms. Size, in turn, depends on the managerial input. And, 3) a higher rate of new product introductions is conducive to a faster rate of productivity growth.

**Adams, Clemmons, and Stephan** measure the speed of diffusion of scientific research by field and sector of the U.S. economy. Their dataset comes from the Institute for Scientific Information (ISI). The ISI data consist of about 2.4 million scientific papers having at least one author in the top 110 universities, and of 232 thousand papers having at least one author in the top 200 U.S. R&D firms. This evidence covers the majority of scientific research in the United States during 1981-99. The authors find that the most common (modal) lag for research done by one U.S. university and later cited by another U.S. univer-

sity is 2.85 years for the baseline field (chemistry), 4.25 years for the slowest diffusing field (computer science), and 1.75 years for the fastest diffusing field (physics). The equally weighted average of these lags across all fields is about 3.5 years. Modal lags for citations between U.S. firms and U.S. firms citing U.S. universities are similar, about 3.5 years. However, these similarities in speed of diffusion conceal substantial differences in the rapidity with which science leaks out across industries and fields, and the modal lags differ by two years and more in these dimensions of the data. Using the same methodology, researchers have found modal lags of five years based on patent data. Taken together, the findings on scientific papers and patents suggest that the speed of diffusion of science is 30 percent faster than the speed of diffusion of technology. These results seem consistent with the idea that Open Science promotes more rapid dissemination of information than Proprietary Technology.

In his classic 1957 study of hybrid corn diffusion, Griliches emphasized the importance of economic incentives and profitability in the adoption of new technology, and this focus has

continued in the economics literature. But there is a distinct literature with roots in sociology emphasizing the structure of organizations, informal networks, and “change agents.” Returning to a 40-year debate between Griliches and the sociologists, **Skinner** and **Staiger** consider state-level factors associated with the adoption of a variety of technological innovations: hybrid corn and tractors in the first half of the twentieth century, computers, and the treatment of heart attacks during the last decade. First, they find that some states consistently adopted new effective technology, whether hybrid corn, tractors, or effective treatments for heart attacks such as Beta Blockers. Second, the adoption of these new highly effective technologies was closely associated with measures of state-level social capital (and education), but not per capita income, density, or (in the case of Beta Blockers) with expenditures on heart attack patients. Economic models are useful in identifying why some regions are more likely to adopt early, but sociological barriers — perhaps related to a lack of social capital or informational networks — potentially can explain why other regions lag far behind.

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## Economic Fluctuations and Growth

The NBER's Program on Economic Fluctuations and Growth met at the Federal Reserve Bank of San Francisco on February 4. NBER Research Associates John Kennan, University of Wisconsin, and Robert Shimer, University of Chicago, organized the meeting. These papers were discussed:

**George-Marios Angeletos** and **Iván Werning**, NBER and MIT, "Crises and Prices: Information Aggregation, Multiplicity, and Volatility"

Discussant: Harold L. Cole, NBER and University of California, Los Angeles

**Rasmus Lentz**, Boston University, and **Dale T. Mortensen**, Northwestern University, "An Empirical Model of Growth Through Product Innovation"  
Discussant: Robert E. Hall, NBER and Stanford University

**Rodolfo E. Manuelli** and **Ananth Seshadri**, University of Wisconsin, "Human Capital and the Wealth of Nations"  
Discussant: Robert E. Lucas, Jr., NBER and University of Chicago

**Alwyn Young**, NBER and University of Chicago, "The Gift of the Dying: The Tragedy of AIDS and the Welfare of Future African

Generations"  
Discussant: Peter J. Klenow, NBER and Stanford University

**Pol Antràs**, NBER and Harvard University; **Luis Garicano**, University of Chicago; and **Esteban Rossi-Hansberg**, Stanford University, "Offshoring in a Knowledge Economy"  
Discussant: Raquel Fernandez, NBER and New York University

**Boyan Jovanovic**, NBER and New York University, "The Product Cycle and Inequality"  
Discussant: Hugo Hopenhayn, University of California, Los Angeles

Crises — such as currency attacks, bank runs, and riots — can be described as times of non-fundamental volatility. **Angeletos** and **Werning** argue that crises also are times when endogenous sources of information are closely monitored and thus an important part of the phenomena. The authors study the role of endogenous information in generating non-fundamental volatility by introducing a financial market in a coordination game where agents have heterogeneous information about the fundamental. The equilibrium price aggregates information without restoring common knowledge. In contrast to the case with exogenous information, they find, uniqueness may not be obtained as a perturbation from common knowledge: multiplicity is ensured when individuals observe fundamentals with small idiosyncratic noise. Interestingly, multiplicity also may emerge in the financial price. Finally, when the equilibrium is unique, it becomes more sensitive to non-fundamental shocks as private noise is reduced.

Productivity dispersion across firms is large and persistent, and worker reallocation among firms is an important source of productivity growth. **Lentz** and **Mortensen** estimate the structure of an equilibrium model of growth through innovation. The model is a

modified version of the Schumpeterian theory of firm evolution and growth developed by Klette and Kortum (2002). The dataset is a panel of Danish firms that includes information on value added, employment, and wages. The model's fit is good and the structural parameter estimates have interesting implications for the aggregate growth rate and for the contribution of worker reallocation to it.

Perhaps no question has attracted as much attention in the economics literature as "Why are some countries richer than others?" **Manuelli** and **Seshadri** revisit the development problem and find that only relatively small (of, at most, 27 percent) differences in Total Factor Productivity (TFP) are required to explain the large differences in output per worker. The authors estimate the (long-run) elasticity of output with respect to TFP to be around 8, and find a substantial impact associated with (exogenous) changes in life expectancy and fertility. The key difference between their model and other recent work in this area is that they use theory to estimate the stocks of human capital, and they allow the quality of human capital to vary across countries. They find that the cross-country differences in average human capital stocks are large.

**Young** simulates the impact of the

AIDS epidemic on future living standards in South Africa. He emphasizes two competing effects. On the one hand, the epidemic is likely to have a detrimental impact on the human capital accumulation of orphaned children. On the other hand, widespread community infection lowers fertility, both directly through a reduction in the willingness to engage in unprotected sexual activity, and indirectly by increasing the scarcity of labor and the value of a woman's time. Young finds that even with the most pessimistic assumptions about reductions in educational attainment, the fertility effect dominates. The AIDS epidemic, on net, enhances the future per capita consumption possibilities of the South African economy.

How does the formation of cross-country teams affect the organization of work and the structure of wages? **Antràs**, **Garicano**, and **Rossi-Hansberg** propose a theory of the assignment of heterogeneous agents into hierarchical teams, where less skilled agents specialize in production and more skilled agents specialize in problem solving. The authors first analyze the properties of the competitive equilibrium of the model in a closed economy, and show that the model has a unique and efficient solution. Then they study the equilibrium of a two-

country model (North and South), where countries differ in their distributions of ability, and in which agents in different countries can join with others in teams. The authors refer to this type of integration as globalization. Globalization leads to better matches for all southern workers but only for the best northern workers. As a result, the authors show that globalization in-

creases wage inequality in the South but not necessarily in the North. They also study how globalization affects the size distribution of firms and the patterns of consumption and trade in the global economy.

**Jovanovic** explains how the product cycle relates to inequality. In the model, both phenomena arise because skilled people have a comparative ad-

vantage in making new, high-tech products. Product innovation thereby creates differential incentives to accumulate skill. The model explains a 10:1 income differential between people and a 7:1 differential between countries. Tariff policies and intellectual-property protection have a much larger effect than in some other models.

## Industrial Organization

The NBER's Program on Industrial Organization, directed by Nancy L. Rose of MIT, met in Stanford on February 4 and 5. Patrick Bajari, NBER and Duke University, and Ali Hortacsu, NBER and University of Chicago, organized the meeting. These papers were discussed:

**Bart J. Bronnenberg**, University of California, Los Angeles, and **Sanjay K. Dhar** and **Jean-Pierre Dube**, University of Chicago, "Endogenous Sunk Costs and the Geographic Distribution of Brand Shares in Consumer Package Goods Industries"  
Discussant: Jonathan Levin, Stanford University

**Jerry Hausman**, NBER and MIT, and **Ephraim Leibtag**, U.S. Department of Agriculture,

"Consumer Benefits from Increased Competition in Shopping Outlets: Measuring the Effect of Wal-Mart"  
Discussant: Steven T. Berry, NBER and Yale University

**Gautam Gowrisankaran**, NBER and Washington University, and **John Krainer**, Federal Reserve Bank of San Francisco, "The Welfare Consequence of ATM Surcharges: Evidence from a Structural Entry Model"  
Discussant: Jeremy Fox, University of Chicago

**Angelique Augereau**, McKinsey and Co.; **Shane Greenstein**, NBER and Northwestern University; and **Marc Rysman**, Boston University, "Coordination vs. Differentiation in a Standards War: 56K Modems"  
Discussant: Katja Seim, Stanford University

**Ricard Gil**, University of California, Santa Cruz, "Decision Rights and Vertical Integration in the Movie Industry"  
Discussant: Francine LaFontaine, NBER and University of Michigan

**Judith A. Chevalier**, NBER and Yale University, and **Austan Goolsbee**, NBER and University of Chicago, "Are Durable Goods Consumers Forward Looking? Evidence from College Textbooks"  
Discussant: Alan Sorensen, NBER and Stanford University

**Alma Cohen**, and **Liran Einav**, Stanford University, "Estimating Risk Preferences from Deductible Choice"  
Discussant: Mark Israel, Northwestern University

**Bronnenberg**, **Dhar**, and **Dube** describe the industrial market structure in the consumer package goods (CPG) industries using a unique database spanning 31 industries and the 50 largest U.S. metropolitan markets. They establish that market concentration has a lower bound in advertising-intensive industries, even as market size grows large. They also find a fixed number of advertised brands within an industry across markets of varying size. However, there is a proliferation in the number of non-advertised brands in the larger markets. Finally, the authors collect historic entry dates for two of their industries and find that order-of-entry has a strong impact

on the rank-order of shares in a market. The historic rollout of brands across markets also introduces spatial covariance within a brand's geographic distribution of shares. A similar spatial covariance pattern emerges in advertising. The relationship between advertising and market shares suggests a role for advertising in the formation of long-run industrial market structure.

**Hausman** and **Leibtag** estimate consumer benefits from the entry and expansion of "supercenters" (that is, extremely large stores that sell a variety of products) into markets for food. They use a discrete choice model for households' choice of supercenters versus traditional outlets for food, and

panel data for households — this enables them to follow shopping patterns over time and to allow for a fixed effect in shopping behavior. Most households shop at both supercenters and traditional outlets during the period studied. Given a model of shopping behavior, the authors then find the benefits of supercenters to be substantial. They do not estimate the costs to workers at supercenters who receive lower wages and benefits, but they find the effects of supercenter entry and expansion to be sufficiently large that, overall, it is extremely likely that the expansion of supercenters does confer a significant benefit to consumers.

**Gowrisankaran** and **Krainer** esti-

mate a structural model of the market for automatic teller machines (ATMs) in order to evaluate the implications of regulating ATM surcharges on ATM entry and consumer and producer surplus. The authors use data on firm and consumer locations, and exploit a source of local quasi-experimental variation: the state of Iowa banned ATM surcharges during the sample period, while the state of Minnesota did not. The authors find that a ban on ATM surcharges reduces ATM entry by about 12 percent, increases consumer welfare by about 10 percent, and lowers producer profits by about 10 percent. Total welfare remains about the same under regimes that permit or prohibit ATM surcharges and is about 17 percent lower than the surplus maximizing level. These findings can help to shed light on the theoretically ambiguous implications of free entry on consumer and producer welfare for differentiated products industries in general and ATMs in particular.

56K modems were introduced under two competing incompatible standards. **Augereau, Greenstein, and Rysman** show the importance of competition between Internet Service Providers (ISPs) in the adoption process. They show that ISPs were less likely to adopt the technology that more competitors adopted. This result is particularly striking given that industry participants expected coordination on one standard or the other. The authors speculate about the role of ISP differentiation in preventing the market from achieving standardization until a standard setting organization intervened.

**Gil** analyzes how variation in firm boundaries affects economic outcomes in the movie industry. In this industry, a movie distributor contracts with different exhibitors to show its movie on their screens. Because of

incompleteness in these contracts, specifying ownership of decision rights over screen use is important. Since **Gil** observes the same movie showing in the same period at different organizational forms in the Spanish movie industry, he exploits this variation to study differences in outcomes across organizational forms. The evidence indicates that integrated theaters show their own movies for two weeks longer than other movies. These differences decrease as the certainty of movie performance and theater size increase. The control that integrated firms have on their own theaters as distribution channels leads movies of uncertain audience appeal to be shown at distributor-own theaters. As a consequence, integrated firms specialize in the distribution of this type of movies more than non-integrated firms do.

Popular wisdom holds that publishers repeatedly revise college textbooks in order to kill off the secondary market for used books. However, many neo-classical authors argue that, if consumers are forward-looking, such behavior should not be profitable; consumers' willingness to pay for new books will fall if they know that they can't resell their used books. Using a large new dataset on all textbooks sold in psychology, biology and economics in the ten semesters from 1997 to 2001, **Chevalier** and **Goolsbee** estimate a demand system for textbooks by college students and test whether textbook consumers are forward looking. Their estimates strongly support the view that students are forward looking and that, when they buy their textbooks, they take into account the probability that they will not be able to resell their books at the end of the semester because of a new edition release. The demand estimates do suggest, however, that students are overly optimistic in their forecasts and that

there are also some important frictions in the market for used books that can affect publisher revision decisions. Simulation results suggest that students are sufficiently forward-looking, and that publishers cannot raise revenues by accelerating current revision cycles, even if revising were costless to the authors.

Choosing a higher insurance premium and a lower level of deductible means that by paying more with certainty, the insured pays less in the case of an accident, thereby facing lower risk. Unlike the decision of whether to insure or not, which may involve other preference-based explanations, deductible choice likely is driven primarily by risk and risk aversion. **Cohen** and **Einav** use a large dataset on deductible choices in auto insurance contracts to estimate the distribution of risk preferences in their sample. Their structural model allows for unobserved heterogeneity in both risk exposure (probability of an accident) and risk aversion, and they estimate the joint distribution of the two. Ex-post claim information separately identifies the marginal distribution of risk. The joint distribution of risk and risk aversion then is identified by the deductible choice. The authors find that individuals in their sample on average have an estimated absolute risk aversion that is higher than other estimates found in the literature. Using annual income as a measure of wealth, **Cohen** and **Einav** find an average two-digit coefficient of relative risk aversion. They also find that females are, on average, more risk averse than males, and that proxies for income and wealth are related positively to absolute risk aversion. Finally, they find that unobserved heterogeneity in risk preferences is higher relative to that of risk, and that unobserved risk is positively correlated with unobserved risk aversion.

## Insurance Workshop

The NBER's Working Group on Insurance, directed by NBER Research Associate Kenneth A. Froot of Harvard Business School and Howard Kunreuther of the University of Pennsylvania's Wharton School, met in Cambridge on February 18. In addition to the presentation of papers, discussed here, there were two interesting panel discussions at the meeting. The first, on the future of terrorism insurance, was moderated by Kunreuther; the panelists were Dwight Jaffee of University of California, Berkeley, Kent Smetters, NBER and University of Pennsylvania, Richard Thomas of American International Group, and Brian Melas, Liberty Mutual Insurance. The second panel, which Froot moderated, discussed the role of brokers in insurance and reinsurance markets. The panelists were: William Berkeley, W. R. Berkley Corporation; Neil Doherty, University of Pennsylvania; Phil Edmundson, William Gallagher Associates; and Gordon Stewart, Insurance Information Institute.

**Finkelstein, Poterba, and Rothschild** develop a framework for analyzing the efficiency and distributional effects of restrictions on characteristic-based pricing in insurance markets, such as regulations precluding pricing on the basis of gender or genetic tests. The effects of such regulations depend crucially on the structure of the private insurance market, and on whether there is residual unobserved heterogeneity when characteristic-based pricing is allowed. The authors illustrate these points with respect to a particular insurance market: the United Kingdom market for retirement annuities. Their stylized model indicates that gender-based restrictions redistribute resources toward women, who have longer life expectancies than men, and do so at modest efficiency costs. In particular, the efficiency costs of redistribution through the annuity market are an order of magnitude lower than many estimates of the costs of redistribu-

The following papers were also discussed:

**Amy Finkelstein**, NBER and Harvard University; **James M. Poterba**, NBER and MIT; and **Casey Rothschild**, MIT, "Redistribution by Insurance Market Regulation: The Effect of Banning Gender-Based Retirement Annuities"

Discussant: Jeffrey R. Brown, NBER and University of Illinois at Urbana-Champaign

**George Zanjani**, Federal Reserve Bank of New York, "Regulation, Capital, and the Evolution of Organizational Form in U.S. Life Insurance"

Discussant: David Moss, Harvard University

**Alexander Muermann** and **Stephen H. Shore**, University of Pennsylvania, "Spot Market Power and Futures Market Trading"  
Discussant: Christian Laux, Goethe-University Frankfurt

tion through the income tax system.

**Zanjani** studies the influence of the legal environment and economic conditions on the form taken by life insurance company incorporations between 1900 and 1949. He identifies three key factors associated with mutual formation: low initial capital requirements for mutuals; regulatory favoritism; and economic distress. Mutuals were formed almost exclusively in states offering an explicit advantage in the form of reduced initial capital requirements. This suggests that the mutual form's disadvantage in raising capital, in conjunction with rising capital requirements and the elimination of such regulatory favoritism, may have contributed to the decline in its use.

**Muermann** and **Shore** observe that when a spot market monopolist participates in the futures market, he has an incentive to adjust spot prices to make his futures market position more profitable. Rational market makers in futures take this into account

**Stephen P. D'Arcy**, University of Illinois; **Richard A. Derrig**, Automotive Insurers Bureau of Massachusetts; and **Herbert I. Weisberg**, Correlation Research, Inc., "The Economics of Insurance Fraud Investigation: Evidence of a Nash Equilibrium"  
Discussant: Richard Phillips, Georgia State University

**David Dranove** and **Anne Gron**, Northwestern University, "Has the Malpractice Crisis in Florida Really Affected Access to Care?"  
Discussant: Kathleen McGarry, NBER and University of California, Los Angeles

**Tyler Leverly** and **Martin F. Grace**, Georgia State University, "Dupes or Incompetents? An Examination of Management's Impact on Property Liability Insurer Distress"  
Discussant: Arthur Murton, Federal Deposit Insurance Corporation

when they set prices. Spot market power thus creates a moral hazard problem which parallels the adverse selection problem in models with inside information. This moral hazard not only reduces the optimal amount of hedging for those with and without market power, but also makes complete hedging impossible. When market makers cannot distinguish orders placed by those with and without market power, market power provides a venue for strategic trading and market manipulation. The monopolist will strategically randomize his futures market position and then use his market power to make this position profitable. Furthermore, traders without market power can manipulate futures prices by submitting orders that could be interpreted as being submitted by the spot market monopolist.

The behavior of insurance companies investigating insurance fraud follows one of several Nash Equilibria under which companies consider the

cost savings on a portion, or all, of the total claim. This behavior can reduce the effectiveness of investigations and cost reductions if the suboptimal equilibrium prevails, and can lead to higher insurance premiums. **D'Arcy, Derrig,** and **Weisberg** examine alternative cooperative arrangements that could reduce or eliminate this potential inefficiency. Empirically, no-fault auto data for independent medical examinations in Massachusetts show that investigation produces a net savings of about 8 percent and that the investigation frequency is likely more than is theoretically optimal.

**Dranove** and **Gron** examine the effects of the recent malpractice "crisis" in Florida on access to care and physician activity levels at three intervals over a six-year period: namely 1997, 2000, and 2003. They focus on two specialties particularly hard hit by malpractice insurance increases, neuro-

surgery and obstetric, and compare access to care and activity levels before and after 2000 when the large premium increases begin. Within each specialty, **Dranove** and **Gron** define a high-risk group which they compare to other procedures in the specialty, as well as to an unrelated set of lower risk diagnoses. They find that travel times for craniotomies have increased by approximately five minutes. This increase is statistically significant but economically small. Travel times for high risk deliveries increased by one minute, but the increase is not significant compared to changes for low risk treatments. The number of surgeons who perform only a handful of procedures has fallen during the crisis.

Managers usually receive the blame for their firm's failure, but the extent to which a firm's failure is related to management's ability, as opposed to factors outside its control, is an open question.

Using DEA frontier efficiency methods to develop proxies for the managerial quality of property-liability insurers, **Leverly** and **Grace** discover that the ability of managers to use inputs efficiently in the production process influences both the amount of time a firm spends in distress and the likelihood of a firm's insolvency. Utilizing an original definition of financial distress, the authors find that superior managers are able to remove their firm from financial distress sooner than relatively less adept managers. Managerial quality, measured in the year of the firm's final entrance into distress, also decreases subsequent guarantee fund assessments. While good management as measured here is related to performance, bad luck is still an apparent reason for a significant number of property-liability insurer insolvencies.

## Cohort Studies

The NBER's Working Group on Cohort Studies met in Cambridge on February 25. NBER Research Associate **Dora L. Costa** of MIT directs the group and organized the meeting.

The NBER's Working Group on Cohort Studies investigates changes in well being across generations, with a strong focus on health. The premise of the working group is that each generation is marked by particular lifetime experiences that affect it throughout the life cycle and that are transmitted to their children either through social conditioning or, in the case of some health conditions, through direct biological mechanisms. To understand the present we therefore need to look not only at early life conditions but also at the experience of previous generations. This requires the creation of new longitudinal datasets that cover the entire twentieth century, because many of the dramatic changes in life expectancy, health, and leisure and the consumer goods revolution occurred during the first half of the twentieth century. Assessing the

importance of these changes in turn requires the quantification of the contribution of non-market goods to the national income accounts. The group's members therefore consist of specialists in economic history, family economics, health economics, and productivity. Many of the group's members are also closely involved with Robert Fogel's P01 Early Indicators of Later Work Levels, Disease, and Death that is creating longitudinal micro-level data on the first generations to reach age 65 at the beginning of the twentieth century.

These papers were discussed at the meeting:

**Douglas Almond**, NBER and Columbia University, and **Kenneth Y. Chay**, NBER and University of California, Berkeley, "The Long-Run and Intergenerational Impact of Poor Infant Health: Evidence from Cohorts Born During the Civil Rights Era"

**Trevon D. Logan**, Ohio State University, "On the Nutrition-Stature Hypothesis"

**Hoyt Bleakley**, University of California, San Diego, and **Fabian Lange**, Yale University, "Chronic Disease Burden and the Interaction of Education, Fertility, and Growth"

**Karen Norberg**, Washington University, "Is the Sex Ratio at Birth a Social Indicator?"

**Joseph Burton**, University of Chicago; **Robert Fogel**, NBER and University of Chicago; and **Sven Wilson**, Brigham Young University, "Declining Disparities in Infant Mortality in the United States: Preliminary Results from a Sample of Ward Level Data"

**Lorens A. Helmchen**, University of Illinois at Chicago, and **Louis Nguyen**, Harvard Medical School, "Tangible Human Capital: The Effects of Amputations on Later Life Outcomes of Union Army Veterans"

*(Continued on next page)*

The 1960s witnessed the greatest reduction in the mortality rates of black relative to white infants of the last 50 years. **Almond** and **Chay** use these dramatic changes to evaluate the long-run effects of health conditions in early life. The annual Natality Detail files provide information on the characteristics and health risk factors of the universe of mothers giving birth in the United States, as well as the birth outcomes of their infants. The authors link these data to the infant health conditions that prevailed in the state and year in which the mother was born. Their analysis compares differences in the health and birth outcomes of black and white mothers born in the late 1960s to those of mothers born in the early 1960s, after controlling for age of the mother and the year in which she gave birth. Almond and Chay find that black women born in 1967-9 have substantially lower risk factor rates as adults and are much less likely to give birth to an infant with low birth weight and APGAR scores than black women born in 1961-3. The between-cohort gains for white women are small to non-existent, consistent with the smaller health improvements for white infants born during the 1960s. Further, the between-cohort relative gains are significantly larger for black women born in Mississippi than for black women born in Alabama. The authors conclude that the social policies that led to the infant health improvements (for example, hospital desegregation, Medicaid, Food Stamps) may have had long run and intergenerational health benefits. Also, studies of changes in racial health disparities over the life cycle and over time could be severely biased by not accounting for the significant changes in the health of black birth cohorts.

Social scientists who study stature have advanced markedly different hypotheses concerning the relationship between income, nutrition, and stature. Economic historians hypothesize that households in the nineteenth century substituted away from carbohydrates and fiber and towards protein and fat as their incomes rose. Anthropometric historians assert that the same gains in stature can be explained by increased nutrient intake

without any nutritional substitution. **Logan** tests these hypotheses using the 1888 Cost of Living Survey. He shows that the income elasticity of fiber is greater than or equal to the income elasticity of protein, fat, or sugar — contrary to the nutritional substitution posited by economic historians. A food modified Engel curve reveals that the shares of carbohydrates, fat, and sugar in the diet vary with household income, but the shares of protein and fiber do not. However, Logan does find that the share of protein from animal sources increases with household income. In looking at the diet in terms of calories, he rejects the hypothesis of income-elasticity equality between cereal and meat calories, and also between cereal and dairy calories. He also finds that the diets of late nineteenth century industrial workers were surprisingly balanced by modern standards.

**Bleakley** and **Lange** provide new evidence on the appropriate model of the economic and demographic transition. They analyze the eradication of hookworm disease in the American South (c. 1910). In previous work, Bleakley showed that the eradication of hookworm disease led to a significant increase in school attendance and literacy. This study shows that the increase in human capital investment was accompanied by a decrease in fertility that was both economically and statistically significant. A decline in the hookworm infection rate from 40 to 20 percent is associated with a decline in fertility that amounts to 40 percent of the entire fertility decline observed in the American South between 1910 and 1920. The relative change in fertility and schooling caused by hookworm eradication is approximately equal to aggregate co-movements during the period considered. The authors argue that this is consistent with models of the fertility transition emphasizing economic incentives rather than changing cultural attitudes and birth control technologies. Furthermore, the data support models emphasizing intergenerational altruism. Variables affecting children's economic prospects affect parental fertility decisions. One consequence of this finding is that changes in the economic opportunities faced by parents directly are not neces-

sary to explain the economic and demographic transition.

Could the sex ratio at birth be influenced by the family structures into which children are being born? All over the world, there are slightly more boys born than girls, but among African-Americans the proportion of male births is lower than among whites — and the reason for this difference is unknown. **Norberg** investigates the empirical and theoretical questions raised by a new finding: that parents' partnership status at the time of a child's conception predicts offspring's sex. First, in a sample of 86,436 human births pooled from five U.S. population-based surveys, she finds 51.5 percent male births reported by respondents who were living with a spouse or partner before the child's conception or birth, and 49.9 percent male births reported by respondents who were not. Because household type was observed before conception, the effect could not be explained by paternal bias against daughters; it also was unexplained by parental age, education, income, ethnicity, and year of observation, and was larger when comparisons were made between siblings. This effect was of similar magnitude in births occurring before and after legalization of abortion in the United States. Norberg further investigates the possible role of sex-selective abortion, by examining the effects of the legalization of abortion on ethnicity, state, and year-specific aggregate counts of male and female births. Here, she finds that legalization of abortion immediately reduced the proportion of male births by about 1.5 births in 1000, among both whites and blacks, and among married and unmarried mothers; in other words, the effect of legalization of abortion is about 10 percent of the magnitude of the effect of partnership status, and seems most consistent with the use of abortion to avert the birth of children at risk for sex-linked genetic disorders. Furthermore, legalization of abortion did not change the estimated effects of ethnicity or partnership status. In both the individual-level and aggregate data, Norberg finds that household type explains at least half of the black/white difference in the sex ratio at birth. The effect is also of the right

magnitude to explain many reported associations between child sex and family composition after birth.

**Burton, Fogel, and Wilson** take up the case of the infant mortality rate (IMR) during the first half of the twentieth century in the United States. They present first results from an analysis of ward-level data in the 24 largest U.S. cities in 1900. Their initial findings show that: 1) absolute variation in IMR across wards was strikingly high at the turn of the century in all the U.S. cities for which they have data; 2) the decline in intra-city variation was both profound and rapid; and 3) the year-to-year variation in IMR within wards was often substantial. They illustrate these findings with a case study of Milwaukee. In 1900, IMR by ward ranged from 104 per thousand in the lowest ward to 350 per thousand in the

highest. Even though the city average of 175 was significantly higher than the national average of about 125, four wards actually had lower than average IMR. By 1918, the range in Milwaukee had fallen from 19 to 108. This illustrates how the use of relative disparity ratios tells a very incomplete and potentially misleading story of the trend in disparities. The absolute variation in Milwaukee fell from 246 in 1900 to 89 in 1900, but the ratio between the worst and best wards actually increased from 3.4 to 5.7. The authors show that relative disparity measures can frequently show that disparities are worsening when the trends in absolute differences between groups show significant improvement.

Apart from the loss of life, the loss of limbs was arguably the most immediate, and enduring, human cost of the

U.S. Civil War. **Helmchen and Nguyen** use a representative sample of more than 30,000 Union Army veterans to study the long-term medical, social, economic, and psychological effects of amputations in this population. The large size and the representative nature of the sample, combined with the diverse set of outcome measures and the long time horizon that they cover, allow the authors to estimate the cost that an amputation imposed on a veteran. By exploiting variation in anatomic level and function that was lost, they analyze how amputees compensated for their new but irreversible disability in the manual-labor-intensive work environment of the United States in the second half of the nineteenth century. This work also has implications for contemporary societies where amputations resulting from landmines are still a concern.

## National Security

The NBER's Working Group on National Security, directed by NBER President Martin Feldstein of Harvard University, met in Cambridge on February 25. These papers were discussed:

**Ilyana Kuziemko and Eric Werker**, Harvard University, "How Much is a Seat on the Security Council Worth? Foreign Aid and Bribery at the United Nations"

**Chris Rohlfs**, University of Chicago, "How Much Did the U.S. Government Value its Troops' Lives in World War II? Evidence from

Dollar-Fatality Tradeoffs in Land Battles"

**Daniel L. Chen**, University of Chicago, "Islamic Resurgence during the Indonesian Financial Crisis"

**Claude Berrebi**, RAND Corporation, and **Esteban F. Klor**, Hebrew University, "On Terrorism and Electoral Outcomes: Theory and Evidence from the Israeli-Palestinian Conflict"

**Hugh Rockoff**, NBER and Rutgers University, "Until It's Over, Over There: The U.S. Economy in World

War I" (NBER Working Paper No. 10580)

**Change-Tai Hsieh**, University of California, Berkeley, and **Enrico Moretti**, NBER and University of California, Berkeley, "Did Iraq Cheat the United Nations? Underpricing, Bribes, and the Oil for Food Program"

**Matthew Gentzkow**, University of Chicago, and **Jesse M. Shapiro**, Harvard University, "Media Bias and Reputation"

Ten of the 15 seats on the UN Security Council are held by rotating members serving two-year terms. Using country-level panel data, **Kuziemko and Werker** find that foreign aid receipts can rise substantially during a rotating member's tenure on the Security Council: U.S. economic aid increases by 77 percent and UN development aid rises by 42 percent to countries that serve during a typical important year for the council. The authors find that the positive effect of

the Security Council on aid is much greater during years when key diplomatic events take place. Further, the increase in aid disappears immediately after a rotating member's tenure ends. The aid increases are larger for small countries and non-democratic countries. These results are consistent with U.S. and UN aid being used to influence the votes of rotating members. While German foreign aid displays remarkably similar patterns to that of the United States and the UN, the aid

outlays of other major donor nations seem unaffected by the Security Council status of recipients.

**Rohlfs** uses battle-level data to estimate the rate at which the U.S. Army traded dollars for fatalities in World War II. Using data from 164 engagements, he estimates the effects of American and German troops and tanks on mission accomplishment and U.S. battle fatalities. He supplements these data with cost estimates compiled from archived U.S. Army records.

Rohlf's finds that the Army could have reduced fatalities by increasing its use of tanks and decreasing its use of ground troops. In 2003 dollars, his preferred estimates suggest that this policy would have cost \$1 million to \$2 million per life saved. This figure appears roughly similar to citizens' willingness-to-pay to avoid fatality risk.

In one paper, **Chen** exploits relative price shocks induced by the Indonesian financial crisis to demonstrate a causal relationship between economic distress and religious intensity and to ask why it exists. Using pre-crisis wetland hectares and government occupation as instruments, and dryland hectares and service occupation as "placebo instruments," Chen estimates the impact of economic distress on religious intensity. Economic distress stimulates Koran study and Islamic school attendance but does not stimulate other social activities or secular school attendance. The results seem attributable to the role of religion as ex-post social insurance: credit availability reduces the effect of economic distress on religious intensity by roughly 80 percent; religious intensity alleviates the need for alms or credit to meet basic needs at the peak of the crisis; and religious institutions facilitate consumption smoothing among villagers. Chen explains these findings in a model where religious intensity represents the degree of social insurance in which people participate, and social sanctions facilitate the function of religion as ex-post insurance. Together, these results show that religious intensity responds to economic forces: alleviating risk may mitigate fundamentalist tendencies. In a second paper, Chen exploits differences in religious intensity across Indonesia before and during the Indonesian financial crisis, and relative price shocks induced by the crisis, to identify the effect of economic distress on the relationship between religious intensity and social violence. He finds that religious intensity before the crisis and social violence after the crisis are strongly associated. Social violence is negatively associated with other social activities. Religious intensity is more strongly linked with social violence in regions that are more economically distressed. In other words, eco-

nomically distressed appears to have a causal impact on the link between religious intensity and social violence. Credit availability mitigates this effect. Chen explains these findings in a model where high marginal utilities during economic distress increase incentives for group conflict which in turn increases the budget of insurance groups. With volatility, religions with stronger sanctions or violence are more stable and successful. As volatility declines, benign groups and religions become relatively successful.

**Berrebi** and **Klor** investigate the interaction between terror attacks and electoral outcomes in Israel. They analyze a dynamic model of reputation that captures the salient characteristics of this conflict. The theoretical model generates two precise empirical predictions about the interaction between terrorism and electoral outcomes: the relative support for the right-wing party should increase after periods with high levels of terrorism and decrease after periods of relative calm; and, the expected level of terrorism is higher when the left-wing party is in office than during the term of the right-wing party. The authors test these hypotheses with a newly created dataset on terrorist attacks in Israel between 1990 and 2003. The first hypothesis is strongly supported by data culled from public opinion polls about the Israeli electorate's political preferences. As to the second hypothesis, the results support the theoretical prediction for three of the four Israeli governments that served during the time period studied. That is, terror attacks escalated when left-wing governments served and decreased during the terms in office of right-wing governments.

The process by which the U.S. economy was mobilized during World War I was the subject of considerable criticism both at the time and since. Nevertheless, when viewed in the aggregate, the degree of mobilization achieved during the short period of active U.S. involvement was remarkable. The United States entered the war in 1917 having made only limited preparations. In 1918, the armed forces were expanded to include 2.9 million sailors, soldiers, and marines; 6 percent of the labor force in the 15-to-

44 age bracket. Overall in 1918, one fifth or more of the nation's resources was devoted to the war effort. By the time the Armistice was signed in 1919, a profusion of new weapons was flowing from American factories. **Rockoff** describes how mobilization was achieved so quickly, including how it was financed, and some of its long-term consequences.

From 1997 through early 2003, the UN Oil for Food Program allowed Iraq to export oil in exchange for humanitarian supplies. **Hsieh** and **Moretti** measure the extent to which this program was corrupted by Iraq's attempts to deliberately set the price of its oil below market prices in an effort to solicit bribes, both in the form of direct cash bribes and in the form of political favors, from the buyers of the underpriced oil. The authors infer the magnitude of the potential bribe by comparing the gap between the official selling price of Iraq's two crude oils (Basrah Light and Kirkuk) and the market price of several comparison crude oils during the Program to the gap observed prior to the Program. They find consistent evidence that underpricing of Basrah Light averaged \$1 per barrel from 1997 through 1999 and reached a peak (almost \$3 per barrel) from May 2000 through September 2001. The estimated underpricing declined quickly after the UN introduced a retroactive pricing scheme that reduced Iraq's ability to set the price of its oil. The evidence on whether Kirkuk was underpriced is less clear. Notably, episodes of underpricing of Basrah Light are associated with a decline in the share of major oil multinationals among the oil buyers, and an increase in the share of obscure individual traders. The observed underpricing of Iraqi oil suggests that Iraq generated \$5 billion in rents through its strategic underpricing. Of this amount, the authors estimate that Iraq collected \$0.7 to \$2 billion in bribes (depending on Iraq's share of the rents implied by the price gap), or roughly 1 to 3 percent of the total value of oil sales under the Program. Finally, they find little evidence that underpricing was associated with increases in the relative supply or declines in the relative demand of Iraqi oil.

A Bayesian consumer who is uncer-



tain about the quality of an information source will infer that the source is of higher quality when its reports conform to the consumer's prior expectations. **Gentzkow** and **Shapiro** use this fact to build a model of media bias in which firms slant their reports toward

the prior beliefs of their customers in order to build a reputation for quality. Bias emerges in this model even though it can make all market participants worse off. The model predicts that bias will be less severe when consumers receive independent evidence

on the true state, and that competition between independently owned news outlets will reduce bias. The authors present a variety of empirical evidence consistent with these predictions.

## Productivity

The NBER's Program on Productivity met in Cambridge on March 4. Research Associates Ernst R. Berndt of MIT and Wolfgang Keller of the University of Texas organized this program:

**Anusha Chari** and **Paige P. Ouimet**, University of Michigan, and **Linda L. Tesar**, NBER and University of Michigan, "Acquiring Control in Emerging Markets: Evidence from the Stock Market" Discussant: Lee G. Branstetter, NBER and Columbia University

**Mary Hallward-Driemeier** and **Giuseppe Iarossi**, The World Bank, and **Kenneth L. Sokoloff**, NBER and University of California, Los Angeles, "Exports and

Manufacturing Productivity in East Asia: A Comparative Analysis with Firm-Level Data" Discussant: Eli Berman, NBER and University of California, San Diego

**Barbara M. Fraumeni** and **Lawrence R. McNeil**, Bureau of Economic Analysis, "International Spillovers and the R&D Satellite Account" Discussant: Ernst R. Berndt

**Johannes Van Biesebroeck**, NBER and University of Toronto, "Cross-Country Conversion Factors for Sectoral Productivity Comparisons" Discussant: Robert E. Lipsey, NBER and Queens College

**Diego Comin**, NBER and New York University, and **Bart Hobijn**, Federal Reserve Bank of New York, "Neoclassical Growth and the Adoption of Technologies" (NBER Working Paper No. 10733) Discussant: Peter Howitt, NBER and Brown University

**Chiara Criscuolo** and **Jonathan E. Haskel**, University of London, and **Matthew J. Slaughter**, NBER and Dartmouth College, "Why are Some Firms More Innovative? Knowledge Inputs, Knowledge Flows, and the Role of Global Engagement" Discussant: Amil Petrin, NBER and University of Chicago

When firms from developed markets acquire firms in emerging markets, market-capitalization-weighted monthly joint returns show a statistically significant increase of 1.8 percent. Panel data estimations of **Chari**, **Ouimet**, and **Tesar** suggest that the value gains from cross-border M&A transactions stem from the transfer of majority control from emerging-market targets to developed market acquirers — joint returns range from 5.8 percent to 7.8 percent when majority control is acquired. Announcement returns for acquirer and target firms estimate the distribution of gains and, on average, show a statistically significant increase of 2.4 percent and 6.9 percent, respectively. The evidence suggests that the stock market anticipates significant value creation from cross-border transactions that involve emerging market targets leading to substantial gains for shareholders of both acquirer and target firms.

**Hallward-Driemeier**, **Iarossi**, and **Sokoloff** use new plant-level data from East Asian countries to explore patterns of manufacturing productivity. Domestically-owned firms that export and firms with foreign ownership are significantly more productive than those that produce solely for domestic consumption — and the productivity gaps are larger the less developed the local market. The possible endogeneity of export orientation is addressed using characteristics at the time of establishment as instruments. It is not simply that more productive firms self-select into exporting; rather, firms that explicitly target export markets make systematically different decisions regarding investment, training, technology and inputs, and thereby raise their productivity.

The Bureau of Economic Analysis (BEA) has initiated a National Science Foundation (NSF) funded project to produce an official BEA/NSF R&D Satellite Account (R&DSA). **McNeil**

and **Fraumeni** present a possible trade-based methodology for estimating cross-border R&D spillovers, which reflects an important component of the overall project, because spillovers may be formally integrated into the official BEA/NSF R&DSA. Beginning with Coe and Helpman (1995), they evaluate four methodologies used to estimate the impact of international R&D spillovers on economic growth. They select Xu and Wang (1999) as the most appropriate model for calculating net outward spillovers. Based on their calculations, **Fraumeni** and **McNeil** conclude that including cross-border R&D spillovers would increase 1990 U.S. Gross Domestic Product by 0.33 percent.

International comparisons of productivity have used exchange rates or purchasing power parity (PPP) to make output comparable across countries. While aggregate PPP holds rather well in the long run, sectoral deviations are

very persistent. Differences in the importance of nontradables by sector exacerbate the problem. This raises the need for a currency conversion factor at the same level of aggregation as the output that is compared. **Van Biesebroeck** maps prices from household expenditure surveys into the industrial classification of sectors and adjusts for taxes and international trade to obtain a sector-specific PPP. The few previous studies that accounted for sectoral price differences only constructed similar conversion factors for a single year. Using detailed price data for 1985, 1990, 1993, and 1996, he is the first to test whether such sectoral PPPs adequately capture differential changes in relative prices between countries. For some industries — notably agriculture, mining, and less sophisticated manufacturing sectors — the indices prove adequate. For most other industries, aggregate PPP is superior.

**Comin** and **Hobijn** introduce a growth model of technology diffusion and endogenous Total Factor Productivity (TFP) levels at the sector and aggregate level. At the aggregate level, the model behaves as neoclassi-

cal growth model. The goal for this model is to bridge the gap between the theoretical and empirical studies of technology adoption and economic growth. First of all, the authors use the model to show how one unified theoretical framework is broadly consistent with the observed dynamics of economic growth and many different measures of technology adoption, such as adoption rates, capital-to-output ratios, and output ratios. Second, they estimate the model using a broad range of technological adoption measures, covering 17 technologies and 21 industrialized countries over the past 180 years. This allows them to show how its predicted adoption patterns fit those observed in the data. Finally, they estimate the disparities in sectoral productivity levels as well as aggregate TFP that can be attributed to the differences in the range of technologies in use across countries. These disparities are almost completely determined by the quality of the worst technology in use, rather than by the quality of the newest technology that has just been adopted, or by the number of technologies in use. Further, they find that the TFP component attributable to the

range of technologies used is highly correlated with overall sectoral TFP differences across countries, although the variance is smaller.

Why do some firms create more knowledge than others? This question is typically answered in many literatures with reference to a production-function model in which new ideas spring from the interaction of researchers and the existing stock of knowledge. But there is very little empirical evidence on production functions for new ideas. In this paper **Criscuolo**, **Haskel**, and **Slaughter** estimate knowledge production functions for several thousand U.K. firms covering their operations from 1994 through 2000. They focus in particular on the hypothesis from the trade literature that globally engaged firms — either multinationals or exporters — are more innovative. They find that globally engaged firms do generate more ideas than their purely domestic counterparts. This is not just because they use more researchers. Importantly, it is also because they draw on a larger stock of ideas through sources such as suppliers and customers, and, for multinationals, their intra-firm worldwide pool of information.

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## Development of the American Economy

The NBER's Program on the Development of the American Economy, directed by Claudia Goldin of Harvard University, met in Cambridge on March 5. These papers were discussed:

**Reuven Glick**, Federal Reserve Bank of San Francisco, and **Alan M. Taylor**, NBER and University of California, Davis, "Collateral Damage: The Economic Impact of War, 1870-1997"

**Kevin O'Rourke**, NBER and Trinity College, "The Worldwide Economic Impact of the Revolutionary and

Napoleonic Wars"

**Lee Alston**, NBER and University of Colorado; **Kara Gorski**, Analysis Group; **Jeffrey A. Jenkins**, Northwestern University; and **Tomas Nonenmacher**, Allegheny College, "The Salary Grab of 1873 and the Coalition of Reform"

**Richard H. Steckel**, NBER and Ohio State University, "Fluctuations in a Dreadful Childhood: Synthetic Longitudinal Height Data, Relative Prices, and Weather in the Short-Term Health of American Slaves"

**Howard Bodenhorn**, NBER and Lafayette College, "The Economic Consequences of Colorism and Complexion Homogamy in the Black Community: Some Historical Evidence"

**Dora L. Costa**, NBER and MIT, and **Matthew E. Kahn**, Tufts University, "Forging a New Identity: The Costs and Benefits of Diversity in Civil War Combat Units for Blacks Slaves and Freeman" (NBER Working Paper No. 11013)

Conventional wisdom in economic history suggests that wars can be enormously disruptive of economic activity, and especially of international trade. Yet nothing is known empirically about these effects in large samples. **Glick** and **Taylor** study all known bilateral trade data and all known wars for all countries since the 1870s. Using the gravity model, they examine the contemporaneous and lagged effects of international conflict on the trade of belligerent nations and neutrals, controlling for other determinants of trade. They find large and persistent effects of wars on trade, and hence on national and global economic welfare. A rough accounting indicates that such costs might be of the same order of magnitude as the "direct" costs of war, such as lost human capital, as illustrated by case studies of World War I and World War II.

**O'Rourke** uses a variety of quantity and (especially) price evidence to assess the economic impact of the wars of 1793-1815 in a number of countries and regions. He provides price evidence for Britain, France, the Netherlands, Sweden, the United States, Peru, West Africa, and Southeast Asia; he concludes that the embargoes and blockades associated with the war had profound disrupting effects on world-wide trade. The arguments of contemporary commentators, as well as historians such as Eli Heckscher, that smuggling made these

policies ineffective, are shown to be off the mark. **O'Rourke** also calculates welfare losses for four countries: Britain, France, the United States, and Sweden. The results for the United States are remarkably close to **Irwin's** results, despite the different methods that **O'Rourke** uses. The results also show that the welfare losses associated with wartime trade disruption in Britain were much smaller than those in France and the United States.

**Alston**, **Gorski**, **Jenkins**, and **Nonnenmacher** examine the politics surrounding the Salary Grab, a legislative initiative passed on the last day of the 42nd Congress (March 3, 1873) that increased congressional salaries by 50 percent and made the pay hike retroactive to the first day of the Congress, nearly two years earlier. The authors argue that opposition within Congress to the Salary Grab was part of a larger reform movement in the early 1870s, which also targeted other areas of government excess and corruption, like congressional franking, spoils-based civil service appointments, and the *Crédit Mobilier* scandal. Specifically, they posit that a "coalition of reform" emerged in the 42nd Congress, composed of New England elites and anti-monopolist Midwesterners, who espoused a philosophy of "good government," wherein public servants would be comprised of the "best men" possible, such as those from privileged backgrounds who

would act selflessly and promote the greater good. Examining congressional roll-call votes on the Salary Grab, franking, and civil service reform, the authors find significant overlap in individual-level vote choice, which is explained by variables that tap this "coalition of reform." The liberal reformers were largely unsuccessful in creating a true "reform party" and expediting a broad reform agenda at the congressional level, but their efforts allowed reform to become a viable issue in party politics throughout the late-nineteenth century as well as within the press. These early reform efforts helped set the stage for the Progressive Era reforms of the early-twentieth century.

For over a quarter century, anthropometric historians have struggled to identify and measure the numerous factors that affect adult stature, which depends upon diet, disease, and physical activity from conception to maturity. **Steckel** simplifies this problem by assessing nutritional status in a particular year using synthetic longitudinal data created from measurements of children born in the same year but measured at adjacent ages. These data are abundantly available from 28,000 slave manifests housed at the National Archives. **Steckel** links this evidence with annual measures of economic conditions and new measures of the disease environment to test hypotheses of slave owner behavior. Height-by-

age profiles furnish clear evidence that owners substantially managed slave health. The short-term evidence shows that weather affected growth via exposure to pathogens, and that owners modified net nutrition in response to sustained price signals.

Whether measured by social rank, occupational status, or educational levels, newlyweds tend to resemble one another. The pattern of like marrying like, which anthropologists label status homogamy, is observed across time and place, and is true among both commoners and the nobility. **Bodenhorn** investigates *complexion homogamy* (light marries light and dark marries dark) in the

African-American community. The evidence reveals a marked pattern of complexion homogamy dating back to the mid-nineteenth century. The evidence also reveals that the convention of complexion homogamy had meaningful economic ramifications. Complexion homogamous marriages among light-skinned blacks resulted in households with higher literacy rates, higher occupational status, and greater wealth.

By the end of the Civil War, over 186,000 black men had fought for the Union Army, and roughly three quarters of these men were former slaves. Because most of the black soldiers who served were illiterate farm work-

ers, the war exposed them to a much broader world. The war experience of these men depended upon their peers, their commanding officers, and where their regiment toured. These factors affected the later life outcomes of black slaves and freemen. **Costa** and **Kahn** document both the short-run costs and long-run benefits of participating in a diverse environment. In the short run, the combat unit benefited from company heterogeneity because it built social capital and minimized shirking. In the long run, men's human capital and the acquisition of information were best served by fighting in heterogeneous companies.

## Entrepreneurship

The NBER's Working Group on Entrepreneurship met in Cambridge on March 11. The Group's Director Josh Lerner of NBER and Harvard University organized this program:

**Manju Puri**, NBER and Duke University, and **David T.**

**Robinson**, Duke University, "Optimism, Work/Life Choices, and Entrepreneurship"  
Discussant: Dirk Jenter, MIT

**Francisco J. Buera**, Northwestern University, "A Dynamic Model of Entrepreneurship with Borrowing Constraints: Theory and Evidence"  
Discussant: Boyan Jovanovic, NBER and New York University

**Yael Hochberg**, Cornell University, and **Alexander Ljungqvist** and **Yang Lu**, New York University, "Who You Know Matters: Venture Capital Networks and Investment Performance"

Discussant: Jesper Sorensen, MIT

**Steven N. Kaplan**, NBER and University of Chicago; **Berk A. Sensoy**, University of Chicago; and **Per Stromberg**, SIFR, "What are Firms? Evolution from Birth to Public Companies"

Discussant: Thomas Hellmann, University of British Columbia

**Paul Gompers**, **Josh Lerner**, and **David Scharfstein**, NBER and

Harvard University; and **Anna Kovner**, Harvard University, "Venture Capital Investment Cycles: The Role of Experience and Specialization"

Discussant: Robert Gibbons, NBER and MIT

Panel Discussion: "Inside the 'Black Box' of the Entrepreneurial Firm: Key Questions"

**Amar Bhide**, Columbia University; **Desh Deshpande**, Chairman and Co-Founder, Sycamore Networks; and **Bengt Holmstrom**, NBER and MIT

**Puri** and **Robinson** present some of the first large-scale survey evidence linking optimism to significant work/life choices. Using the Survey of Consumer Finance, they create a novel measure of optimism based on life expectancy biases. They find that entrepreneurs are more optimistic than non-entrepreneurs. Further, more optimistic people in general work harder, and anticipate longer age-adjusted work careers. Optimism correlates not just to work related choices but also to other significant life choices, such as remarriage and stock market participation. Optimistic people are more likely to remarry, and are more likely to own

stock. The authors also relate optimism to risk preferences. They find that entrepreneurs are more risk loving than non-entrepreneurs. However, the correlation between risk taking and optimism is low, suggesting that attitudes toward risk and optimism explain different aspects of decisionmaking.

**Buera** studies the interaction between individuals' savings and the decision to become an entrepreneur. His model has one simple threshold property: able individuals who start with wealth above a certain amount purposely save to become entrepreneurs, while those who start below this threshold fall into a "poverty trap" and

remain wage earners forever. The model also generates a well-defined transition of individuals from wage earners to entrepreneurs — a major focus of recent empirical work. Although the probability of becoming an entrepreneur as a function of wealth is increasing for low wealth levels — as predicted by standard static models — it is decreasing for higher wealth levels. Buera uses the model to address two quantitative questions: are poverty traps of quantitative importance in models where agents can overcome them by savings? And, how costly are borrowing constraints for small businesses in the United States?

Provided there are not strong decreasing returns to scale, poverty traps remain substantial. To answer the second question, Buera estimates the dynamic model using U.S. data. Welfare costs are significant, around 6 percent of lifetime consumption, but poverty traps turn out to be unimportant for the U.S. economy.

Many financial markets are characterized by strong relationships and networks, rather than arm's-length, spot-market transactions. **Hochberg, Jungqvist, and Lu** examine the performance consequences of this organizational choice in the context of relationships established when Venture Capitalists (VCs) syndicate portfolio company investments. Using a comprehensive sample of U.S.-based VCs over the period 1980 to 2003, the authors find that VC funds whose parent firms enjoy more influential network positions have significantly better performance, as measured by the proportion of portfolio company investments that are successfully exited through an initial public offering or a sale to another company. Similarly, the portfolio companies of better networked VC firms are significantly more likely to survive to subsequent rounds

of financing and to eventual exit. The magnitude of these effects is economically large, and is robust to a wide range of specifications. This suggests that the benefits of being associated with a well-connected VC are more pronounced in later funding rounds. Once the authors control for network effects in their model of fund and portfolio company performance, the importance of how much investment experience a VC has is reduced, and in some specifications, eliminated.

**Kaplan, Sensoy, and Stromberg** study how firm characteristics evolve from early business plan to initial public offering to public company for 49 venture capital financed companies. The average time elapsed is almost six years. The authors 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. Their 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, nonhuman capital aspects of the businesses

appear more stable than the human capital aspects.

**Gompers, Kovner, Lerner, and Scharfstein** examine how organizational structure affects behavior and performance among different types of venture capital organizations. Consistent with the view that industry-specific experience and human capital enable organizations to react to investment opportunities, they find that venture capitalists with the most industry experience increase their investments the most when industry investment activity accelerates. Those venture capitalists react to an increase more than do venture capital organizations with relatively little industry experience, and those with considerable experience but in other industries. The increase in investment rates does not adversely affect the success of these transactions to a significant extent. This is consistent with the view that when firms are diversified in other sectors, it is difficult to redeploy human and financial capital from those other sectors. The evidence conflicts with the efficient internal capital market perspective, as well as the view that entrants are critical to explaining the expansion of venture capital within an industry.

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## Urban Economics

The NBER's Working Group on Urban Economics met in Cambridge on March 11. This group brings together scholars who work on the economics of cities. The overarching theme of the group is the causes and consequences of metropolitan density, but it is interested in all areas of economics that touch on urban life. For example, the group has a strong interest in local public finance and local tax issues. Agglomeration economies, which are so important to the success of cities, are also of primary concern. More generally, the group is interested in real estate, urban poverty, race relations and segregation in cities, urban crime, local amenities, and transportation technologies.

The American city is undergoing a massive transformation as high-density cities of the nineteenth century are replaced by the lower-density, car-oriented cities of today. As a result, this is a particularly exciting period to study the economics of urban areas. The group will meet one or two times per year, and at some future point will try to assemble current research into an NBER conference volume.

Edward Glaeser of NBER and Harvard University, who directs the Working Group, organized this program:

**J. Vernon Henderson**, NBER and Brown University, and **Anthony J.**

**Venables**, London School of Economics, "The Dynamics of City Formation: Finance and Governance"  
Discussant: Jose Scheinkman, Princeton University

**Joel Waldfoegel**, NBER and University of Pennsylvania, "The Median Voter and the Median Consumer: Local Private Goods and Residential Sorting"  
Discussant: Yannis Ioannides, Tufts University

**Gilles Duranton** and **Henry G. Overman**, London School of Economics, and **Laurent Gobillon**, Institut National d'Etudes Demographiques, "Does Local Taxation Affect Business Decisions?"  
Discussant: Thomas Holmes, NBER and University of Minnesota

**Stuart S. Rosenthal**, Syracuse University, and **William C. Strange**, University of Toronto, "The Attenuation of the Agglomeration Economies: A Manhattan Skyline Approach"  
Discussant: Denise DiPasquale, City Research

**Michael Greenstone**, NBER and MIT, and **Justin Gallagher**, MIT, "Does Hazardous Waste Matter?"

Evidence from the Housing Market and the Superfund Program"  
Discussant: Joseph Gyourko, University of Pennsylvania

**Esteban Rossi-Hansberg**, Stanford University, and **Pierre-Daniel Sarte** and **Raymond Owens**, Federal Reserve Bank of Richmond, "Urban Growth and the Location of Economic Activity in Cities"  
Discussant: Glenn Ellison, NBER and MIT

**Sanghoon Lee**, University of Minnesota, "Ability Sorting and Consumer City"  
Discussant: Edward Glaeser

**Karen Kopecky** and **Ming Hon Suen**, University of Rochester, "Suburbanization and the Automobile"  
Discussant: Matthew Kahn, Tufts University

**Nathaniel Baum-Snow**, University of Chicago, "The Effects of Changes in the Transportation Infrastructure on Suburbanization: Evidence from the Construction of the Interstate Highway System"  
Discussant: Edward Glaeser

**Henderson** and **Venables** examine city formation in a country whose urban population is growing steadily over time, with new cities required to accommodate this growth. In contrast to most of the literature, they allow for immobility of housing and urban infrastructure, and investment in these assets is made on the basis of forward-looking behavior. In the presence of these fixed assets, cities form sequentially, without the population swings in existing cities that arise in current models. Equilibrium city size, absent government, may be larger or smaller than is efficient, depending on how urban externalities vary with population. Efficient formation of cities

involves local government borrowing to finance development. The institutions governing land markets, leases, local taxation, and local borrowing and debt affect the efficiency of outcomes. The authors explore the effects of different fiscal constraints, and show that borrowing constraints lead cities to be larger than is efficient.

When provision of a product entails fixed costs, it will be made available only if enough people want it. Some products are produced and consumed locally, so their provision requires not only a large group favoring the product but also a large number *nearby*. Just as there is an incentive for individuals to sort into a community whose median voter

shares their preferences for local public goods, so product markets may provide an analogous incentive for sorting into a community whose consumers share preferences for private goods. Using zipcode level data on chain restaurants and restaurants overall, **Waldfoegel** documents how the mix of locally available restaurants responds to the local mix of consumers. His three findings are: first, based on survey data on chain restaurant patronage, restaurant preferences differ substantially by race and education. Second, there is a strong relationship between restaurants and population at the zip code level, suggesting that restaurants' geographic markets are small. Third,

the mix of locally available chain restaurants is sensitive to the zipcode demographic mix by race and by education. Hence, differentiated product markets provide a benefit — proximity to preferred restaurants — to persons in geographic markets whose customers tend to share their preferences.

**Duranton, Gobillon, and Overman** use plant-level data for U.K. manufacturing establishments to study the impact of local taxation on employment growth. The empirical strategy pairs establishments across jurisdictional boundaries and uses difference-in-difference methods to estimate the impact of taxation. This methodology improves on existing work because it corrects for both unobserved establishment heterogeneity and for unobserved local effects. The initial results suggest that local taxation has a negative impact on employment growth.

**Rosenthal and Strange** estimate the effect of agglomeration on wages using a geographical approach (based on how much activity is close) rather than a political one (based on how much activity takes place in a given city). They develop “Manhattan Skyline” instruments: geological variables that predict the scale of urban development but are exogenous to a wage equation. These instruments are unique in their ability to predict differences in development within cities. Using 2000 Census data, the authors derive four key results: first, there is a wage premium associated with local employment density. Specifically, wages increase roughly 3.5 percent for every additional 100,000 full-time workers present within five miles. Second, proximity to educated workers has a larger effect, an instance of human capital externalities. Keeping the number of workers within five miles constant and endowing 10,000 less-educated workers with college education raises wages by roughly 3 percent. Third, and most important, both the urbanization and the human capital effects attenuate with distance: the effect of additional activity within five to 25 miles is one half to one quarter as large as the effect of activity within five miles. However, in some models, agglomeration effects persist out to 100 miles, so there are agglom-

eration economies at work at both the city and the regional level. Fourth, the benefit received from agglomeration depends on a worker’s education. Usually, the benefit is greater for less educated workers. This is not always the case, though. Scientists and lawyers, for example, benefit substantially from proximity to college educated workers. For scientists, wages increase roughly 6 percent for every additional 10,000 college educated workers within five miles.

Under the Superfund program, the EPA initiates remedial clean-ups of hazardous waste sites where the release of hazardous substances poses imminent and substantial risks to public health and/or the environment. **Greenstone and Gallagher** estimate the capitalization into housing prices of the announcement that a site will be cleaned-up as part of the Superfund program. Their estimates suggest that the presence of a Superfund site in a census tract is associated with an approximately 6 percent increase in median house prices in that tract and the immediately neighboring tracts roughly 20 years after sites became eligible for a Superfund clean-up. This finding implies that a site’s placement on the Superfund eligible list is associated with an approximately \$40 million (2000 dollars a year) increase in property values 20 years later. This is roughly equivalent to the authors’ best estimate of the mean costs of a Superfund cleanup. They also find evidence of sorting in response to the clean-ups, so that 20 years later the tracts with these sites within their borders have larger populations and a decline in the fraction of households on public assistance

**Rossi-Hansberg, Sarte, and Owens** document several empirical regularities regarding the evolution of urban structure in the largest U.S. metropolitan areas over the period 1980-90. These regularities relate to changes in resident and employment population, occupations, and to the number and size of establishments in different sections of the city. The authors then propose a theory of urban structure that emphasizes the location and integration decisions of firms. In particular, firms can decide to locate their headquarters and operation plants in

different regions of the city. Given that cities experienced positive population growth throughout the 1980s, the authors show that their theory can account for the various facts documented in the first part of the paper.

Average wages tend to increase with city size. Most explanations of this urban wage premium focus on productivity spillovers. **Lee** proposes a consumption-side explanation. The claim is that the wide consumption variety found in large cities is more important to high-skill (hence high-income) workers than low-skill workers, and thus the higher wages found in large cities are attributable to the selection of high-skill workers choosing to live there. A testable implication of the theory, distinguished from productivity-based theories, is that urban wage premiums may be negative for high-skill workers. Lee confirms this with data on the medical profession. At the top skill level, there is a substantial urban wage discount: doctors in large cities are paid 9 percent less than their peers in small cities.

In 1910 the average American city was a small and densely populated place and fewer than 1 percent of Americans owned a car. By 1970, almost every family in the United States owned at least one automobile. Not only did city size grow between 1910 and 1970, but city population also became more evenly spread around the city center: this was suburbanization. **Kopeccky and Suen** develop a model of a linear city in which agents choose whether to own a car and where to live. With declining automobile prices and rising incomes, their model is able to match the data on car ownership and decentralization for the period 1910 to 1970.

Between 1950 and 1990, the aggregate population of center cities in the United States declined by 16 percent despite national population growth of 64 percent. **Baum-Snow** assesses the extent to which the construction of new limited-access highways has contributed to center city population decline. Using planned portions of the interstate highway system as a source of exogenous variation, he estimates that the population living in center cities would have grown by 6 percent if

the interstate highway system had not been built. Calibrations of a land use and commuting model imply that one new highway passing through a center

city reduces the center city population by about 18 percent, a magnitude that is consistent with estimates from the data. Further, observed changes in the

spatial distribution of the population in metropolitan areas following new highway construction are consistent with theoretical predictions from the model.

## International Finance and Macroeconomics

The NBER's Program on International Finance and Macroeconomics met in Cambridge on March 18. NBER Research Associates Menzie D. Chinn, University of Wisconsin, Madison, and Andres Velasco, Harvard University, organized this program:

**Linda S. Goldberg**, Federal Reserve Bank of New York, and **Michael W. Klein**, NBER and Tufts University, "Establishing Credibility: Evolving Perceptions of the European Central Bank"  
Discussant: John H. Rogers, Federal Reserve Board

**Anna Pavlova**, MIT, and **Roberto Rigobon**, NBER and MIT, "Flight

to Quality, Contagion, and Portfolio Constraints"

Discussant: Gita Gopinath, NBER and University of Chicago

**Ross Levine**, NBER and University of Minnesota, and **Sergio L. Schmukler**, World Bank, "Internationalization and the Evolution of Corporate Valuation" (NBER Working Paper No. 11023)  
Discussant: Anusha Chari, University of Michigan

**Cedric Tille**, Federal Reserve Bank of New York, "Financial Integration and the Wealth Effect of Exchange Rate Fluctuations"  
Discussant: Pierre-Olivier Gourinchas, NBER and University

of California, Berkeley

**Doireann Fitzgerald**, University of California, Santa Cruz, "A Gravity View of Exchange Rate Disconnect"  
Discussant: Nelson Mark, NBER and University of Notre Dame

**Giancarlo Corsetti**, European University; **Philippe Martin**, University of Paris-1 Pantheon Sorbonne; and **Paolo Pesenti**, Federal Reserve Bank of New York, "Productivity Spillovers, Terms of Trade, and the Home Market Effect"  
Discussant: Mark Melitz, NBER and Harvard University

The credibility of a central bank's anti-inflation stance, a key determinant of its success, may reflect institutional structure or, more dynamically, the history of policy decisions. The first years of the European Central Bank (ECB) provide a natural experiment for considering whether, and how, central bank credibility evolves. In this paper, **Goldberg** and **Klein** first present a model demonstrating how the high-frequency response of asset prices to news reflects market perceptions of the anti-inflation stance of a central bank. Empirical tests of this model, regressing both the change in the slope of the German yield curve and the change in the euro/dollar exchange rate on the surprise component of U.S. price news, suggest significant breaks in the market's perception of the policy stance of the ECB during its first five years of operation. The dates of these breaks are linked to the policies undertaken by the ECB. Similar tests on the response of the slope of the U.S. yield curve to price news during

this period fail to find comparable breaks in market perceptions of the conduct of monetary policy by the Federal Reserve.

**Pavlova** and **Rigobon** examine the co-movement among stock market prices and the terms of trade within a three-country, Center-Periphery dynamic equilibrium model in which agents in the Center country face portfolio constraints. In this model, international transmission occurs through the terms of trade, through the common discount factor for cash flows, and finally through an additional channel reflecting the tightness of the portfolio constraints. Portfolio constraints generate endogenous wealth transfers to or from the Periphery countries. These implicit transfers are responsible for creating contagion among the terms of trade of the Periphery countries, as well as among their stock market prices. Under a portfolio constraint limiting investment of the Center country in the stock markets of the Periphery, stock prices also exhibit a

flight to quality. A negative shock to one of the Periphery countries depresses stock prices throughout the Periphery, while boosting the stock market in the Center.

By documenting the evolution of Tobin's "q" before, during, and after firms internationalize, **Levine** and **Schmukler** provide evidence on the bonding, segmentation, and market timing theories of internationalization. Using new data on 9,096 firms across 74 countries over the period 1989-2000, they find that Tobin's "q" does not rise after internationalization, even relative to firms that do not internationalize. Instead, "q" rises significantly one year before internationalization and during the internationalization year. But, then "q" falls sharply in the year after internationalization, relinquishing the increases of the previous two years. To account for these dynamics, the authors show that market capitalization rises one year before internationalization and remains high, while corporate assets increase during



internationalization. The evidence supports models stressing that internationalization facilitates corporate expansion, but challenges models stressing that internationalization produces an enduring effect on “q” by bonding firms to a better corporate governance system.

A striking development of the U.S. economy in the 1990s has been the large impact of exchange rate movements on the U.S. international position. Because of the substantial leverage in the U.S. position, with U.S. investors short in dollar securities and long in foreign securities, a depreciation of the dollar leads to a large capital gain for the United States. **Tille** shows that this effect is concentrated for movements against European currencies, as Asian currencies make up only a small share of the foreign currency securities held by U.S. investors. He incorporates this valuation channel into a simple general equilibrium model and analyzes the international transmission of monetary shocks. He finds that the valuation effect of exchange rate movements is a major dimension, dwarfing the usual effects

through the trade balance. In addition, the valuation effect of exchange rate movements on welfare operates even when prices are fully flexible.

The empirical “gravity” equation is extremely successful in explaining bilateral trade. **Fitzgerald** shows how a multi-country model of specialization and costly trade (a micro-founded gravity model) can be used to explain empirical exchange-rate puzzles. One such puzzle is that nominal exchange rates are enormously volatile, but that this volatility does not appear to affect inflation. The gravity model is very successful in explaining this puzzle. In a sample of 25 OECD countries in the post-Bretton Woods period, the gravity prediction of inflation substantially outperforms the purchasing power parity prediction. The gravity prediction matches the volatility of actual inflation, and tracks its path closely. The superior performance of the gravity prediction is explained primarily by the fact that it takes account of the interaction of specialization with home bias. The stability of inflation in very open economies is also explained by the fact that the size of bilateral

trade is negatively correlated with bilateral exchange rate volatility.

**Corsetti, Martin, and Pesenti** analyze the welfare implications of international spillovers related to productivity gains, changes in market size, or government spending. They introduce trade costs and endogenous varieties in a two-country general-equilibrium model with monopolistic competition, drawing a distinction between productivity gains that enhance manufacturing efficiency and gains that lower the cost of firms’ entry and of product differentiation. The model suggests that countries with lower manufacturing costs have higher GDP but supply a smaller number of goods at a lower international price. Countries with lower entry and differentiation costs also have higher GDP, but supply a larger array of goods at improved terms of trade. The sign of the international welfare spillovers depends on terms of trade, but also on consumers’ taste for variety. Higher domestic demand has macroeconomic implications that are similar to those of a reduction in firms’ entry costs.

## Children’s Program

The NBER’s Program on Children, directed by Research Associate Jonathan Gruber of MIT, met in Cambridge on April 1. They discussed these papers:

**Brian A. Jacob**, NBER and Harvard University, and **Lars Lefgren**, Brigham Young University, “An Investigation of Objective and Subjective Performance Measure: New Evidence from the Education Sector”

**Susan Dynarski**, NBER and Harvard University, “Can States Increase their Stock of College Graduates?”

**Byron F. Lutz**, MIT, “Post Brown vs. The Board of Education: The Effects of the End of Court Ordered Desegregation”

**Jens Ludwig**, Georgetown University, and **Douglas L. Miller**,

University of California, Davis, “Does Head Start Improve Long-Term Outcomes? Evidence from a Regression Discontinuity Designs”

**Eric V. Edmonds**, NBER and Dartmouth College, and **Salil Sharma**, Dartmouth College, “Investments in Children Vulnerable to Bondage”

**Jacob and Lefgren** examine the relationship between objective and subjective measures of performance in the education sector. Specifically, they ask three questions: Can principals identify effective teachers, defined as those who produce the largest improvement on standardized exams? Do principals discriminate against teachers with certain characteristics?

How do principals form assessments of teachers? To answer these questions, they combine a rich set of administrative data linking student achievement scores to individual teachers with a survey of principals. They find that principals can identify the best and worst teachers in their schools fairly well, but have less ability to distinguish between teachers in the mid-

dle of the ability distribution. In all cases, however, objective value-added measures are better able to predict actual effectiveness than principal reports. There is also some evidence that principals discriminate against male and untenured teachers and in favor of teachers with whom they have a closer personal relationship. Finally, the authors find that in forming their

assessments, principals focus disproportionately on the recent experience of the teacher and are imperfect Bayesians, failing to appropriately account for the noisy performance signals they receive.

Half of college students drop out before completing a degree. While there is strong evidence that financial aid can increase college entry, there is little evidence that it increases degree completion or even years of completed schooling. This is an important evidentiary gap, since it is completed schooling that is rewarded by the labor market. **Dynarski** exploits the introduction of two large state financial aid programs to estimate the impact of aid on completed schooling. She finds that the aid programs increase the share of the population that completes a college degree by 3.7 percentage points and the share that attempts any education beyond high school by 2 percentage points. There are sharp decreases in the share of students completing only a year or two of college. The effects are strongest among women, especially nonwhite and Hispanic women. While her estimation strategy cannot separately identify the effect of aid on entry and persistence, she establishes fairly tight bounds on the persistence effect, concluding that the aid

programs reduce the college dropout rate by 7 to 14 percent.

Nearly 40 years after *Brown v. the Board of Education*, three Supreme Court decisions dramatically altered the legal environment for court-ordered desegregation in the early 1990s. Lower courts have released numerous school districts from their desegregation plans as a result. Over the same period racial segregation increased in public schools — a phenomenon which has been termed resegregation. Using a unique dataset, **Lutz** finds that dismissal of a court-ordered desegregation plan results in a gradual, moderate increase in racial segregation and an increase in black dropout rates and black private school attendance. There is no evidence of any effect on white attendance patterns, school expenditures, or property values.

**Ludwig** and **Miller** exploit a new source of variation in Head Start funding to identify the program's long-term effects. In 1965 the Office of Economic Opportunity (OEO) provided technical assistance to the 300 poorest counties in the United States to develop Head Start funding proposals, but did not provide similar assistance to other counties. The authors show that the result is a substantial difference in Head Start funding and participation

rates in those counties just above and below OEO's poverty-rate cutoff for technical assistance, differences that seem to have persisted through at least the 1970s. This discontinuity in Head Start funding and participation is associated with discontinuities in educational attainment.

A fundamental question in the human capital literature is whether property rights over human capital influence investments in children. Empirical work in this area has proven difficult, because it is a challenge to identify variation in property rights in the data. **Edmonds** and **Sharma** consider the importance of the ability to appropriate returns on investments in children by examining how vulnerability to debt-bondage affects education, child labor, and fertility. They observe substantially more child labor, lower schooling attendance and attainment, and significantly elevated fertility in families vulnerable to debt-bondage in the plains of Nepal. They argue that the fact that bondage is inherited coupled with the intrinsic risk of bondage among the vulnerable population creates insecurity in property rights over human capital that are important in understanding these increases in child quantity and declines in quality.

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## International Trade and Investment

The NBER's Program on International Trade and Investment met in Cambridge on April 1 and 2. Research Associate Bruce Blonigen, University of Oregon, organized the meeting. The program was:

**David Hummels**, NBER and Purdue University, and **Volodymyr Lugovskyy**, University of Memphis, "Trade in Ideal Varieties: Theory and Evidence"

**James Harrigan**, Federal Reserve Bank of New York, "Airplanes and Comparative Advantage"

**Linda S. Goldberg** and **Cedric Tille**, Federal Reserve Bank of New

York, "Vehicle Currency Use in International Trade"

**Doireann Fitzgerald**, University of California, Santa Cruz, "A Gravity View of Exchange Rate Disconnect" (See "International Finance and Macroeconomics" earlier in this issue)

**Gianmarco I.P. Ottaviano**, Università di Bologna and CEPR, and **Giovanni Peri**, NBER and University of California, Davis, "Gains from Diversity: Theory and Evidence from Immigration in U.S. Cities"

**Diego Puga** and **Daniel Trefler**, NBER and University of Toronto,

"International Trade and Domestic Institutions: The Medieval Response to Globalization"

**Joshua Aizenman**, NBER and University of California, Santa Cruz, and **Ilan Noy**, University of Hawaii, "Endogenous Financial and Trade Openness: Efficiency and Political Economy Considerations"

**Raymond Fisman**, NBER and Columbia University; **Peter Moustakkerski**, Booz Allen Hamilton; and **Shang-Jin Wei**, NBER and International Monetary Fund; "Offshoring Tariff Evasion: Evidence from Hong Kong as Entrepôt Trader"

Models with constant-elasticity of substitution preferences are commonly used in the international trade literature because they provide a tractable way to handle product differentiation in general equilibrium. However, this tractability comes at the cost of generating a set of counter-factual predictions regarding cross-country variation in export and import variety, output variety, and prices. **Hummels** and **Lugovskyy** ask whether a generalized version of Lancaster's "ideal variety" model can better match the facts. In this model, entry causes crowding in variety space, so that the marginal utility of new varieties falls as market size grows. Crowding is partially offset by income effects, as richer consumers will pay more for varieties closer matched to their ideal types. The authors show theoretically and confirm empirically that declining marginal utility of new varieties results in: a higher own-price elasticity of demand (and lower prices) in large countries and a lower own-price elasticity of demand (and higher prices) in rich countries. The model's predictions about cross-country differences in the number and size of establishments are also empirically confirmed.

Airplanes are a fast but expensive means of shipping goods, a fact which

has implications for comparative advantage. **Harrigan** develops a Ricardian three-country model with a continuum of goods that vary by weight and hence transport cost. Comparative advantage depends on relative air and surface transport costs across countries and goods, as well as on stochastic productivity. In the model, countries that are far from their export markets will have low wages and tend to specialize in high value/weight products, which will be shipped on airplanes. Less remote exporters will have higher wages, and will tend to specialize in low value/weight products that will be sent by ship, train, or truck. **Harrigan** confirms these implications using detailed data on U.S. imports from 1990 to 2003. Distance from the United States and air shipment are associated with much higher import unit values.

Although currency invoicing in international trade transactions is central to the transmission of monetary policy, the forces motivating the *choice* of currency have long been debated. **Goldberg** and **Tille** introduce a model wherein agents involved in international trade can invoice in the exporter's currency, the importer's currency, or a third-country vehicle currency. The model is designed to contrast the con-

tribution of macroeconomic variability with that of industry-specific features in the selection of an invoice currency. The authors show that producers in industries with high demand elasticities are more likely than producers in other industries to display herding in their choice of currency. This industry related force is more influential than local macroeconomic performance in determining producers' choices. Drawing on data on invoice currency use in exports and imports for 24 countries, **Goldberg** and **Tille** document that the dollar is the currency of choice for most transactions involving the United States. The dollar is also used extensively as a vehicle currency in international trade flows that do not directly involve the United States. Consistent with the results of the model, this last finding is largely attributable to international trade in reference-priced and organized-exchange traded goods. Although the magnitude of business-cycle volatility matters for invoicing of more differentiated products, it is less central for invoicing non-differentiated goods.

The recent empirical literature generally finds negative (or weakly negative) effects of the inflows of immigrants on the wages and employment of U.S.-born workers within a skill group. **Ottaviano** and **Peri** begin by

revealing an empirical regularity apparently at odds with these findings: in a panel of city-level data over time (1970-2000), the inflows of immigrants are robustly and positively associated with average wages, employment, and value of housing of U.S.-born citizens. Using instrumental variables correlated with inflow-of-immigrants but orthogonal to any city-specific shock, the authors show that this correlation is likely to be, at least in part, causal. They reconcile these two findings by showing that if foreign-born workers provide skills (and produce services) that are not perfectly substitutable for those provided by U.S.-born workers, then migration generates overall gains (average positive effects) as well as distributional effects that, in relative terms, hurt some skill groups (negative relative effect). The authors provide a simple model that quantifies the impact of immigrants on average wages of U.S.-born workers. For an increase in foreign-born workers of 6 percent of the initial U.S. employment (as experienced by the United States in the 1990-2000 decade), the average wages of U.S. workers increase by 2 percent of their levels. Finally, the authors simulate a more complete model of open city-economies that, using structural parameter values, does fairly well at reproducing the response of average wages, price of housing, and internal migration of U.S.-born to an immigration shock.

International trade places unique demands on local capital markets, demand that can translate into investor protection rights and a richer domestic financial system. It also can lead to rent-seeking behavior on the part of local elites and a crowding out of

domestic financial service providers. **Puga** and **Trefler** explore the conditions under which international trade can be a positive or negative influence on domestic institutions by examining how Venice coped with the spectacular rise of international trade during the period 1100-1350. In particular, they show that early pressures on financial markets led to the rise of important institutional innovations such as the *commenda*. The *commenda* allowed Venice to mobilize capital from small investors and small entrepreneurs. This led to both a rapid growth rate and to considerable income mobility. By 1324, the merchant class had sufficient resources to internally finance trade. As a result, the mobilization of capital — along with its positive effects on income mobility — were no longer in the interests of the emerging nobility. The consequence was that the nobility placed severe restrictions on the *commenda* and other institutions favorable to growth. This led to the long-run entrenchment of a rent-seeking nobility and, ultimately, to the decline of Venice.

**Aizenman** and **Noy** study the endogenous determination of financial and trade openness. First, they outline channels leading to two-way feedback between the different modes of openness; next, they identify this feedback empirically. They find that a single standard deviation increase in commercial openness is associated with a 9.5 percent increase in de-facto financial openness (percent of GDP), controlling for political economy and macroeconomic factors. Similarly, an increase in de-facto financial openness has powerful effects on future trade openness. While *de-jure* restrictions on capi-

tal mobility do not affect *de-facto* financial openness, *de-jure* restrictions on the current account have large adverse effects on commercial openness, suggesting that it is much easier to overcome restrictions on capital account convertibility than restrictions on commercial trade. Having established (Granger) causality, the authors investigate the relative magnitudes of these directions of causality using the decomposition test developed in Geweke (1982). They find that almost all of the linear feedback between trade and financial openness can be accounted for by G-causality from financial openness to trade openness (53 percent) and from trade to financial openness (34 percent). The residual is attributable to simultaneous correlation between the two measures.

Traditional explanations for high rates of indirect trade have focused on the role of specialized agents in processing and distribution. **Fisman**, **Moustakerski**, and **Wei** provide an alternative explanation based on the differential ability to evade tariffs from some trade entrepôts. Using data on exports to mainland China, the authors find that the fraction of goods routed through Hong Kong (rather than sent directly) is positively correlated with the Chinese tariff rates, both in the cross section and in differences, even though there is no legal tax advantage to sending goods via Hong Kong. Further, this pattern holds for both differentiated and homogeneous products. As a control, the authors also examine indirect exports to China via Singapore, another entrepôt with less scope for evasion; there is no correlation between indirect export rates and tariff rates in this case.

## Behavioral Finance

The NBER's Working Group on Behavioral Finance met in Cambridge on April 9. Organizers Nicholas C. Barberis and Robert J. Shiller, both of NBER and Yale University, chose these papers for discussion:

**Andrea Frazzini**, Yale University, and **Owen A. Lamont**, NBER and Yale University, "Dumb Money: Mutual Fund Flows and the Cross Section of Stock Returns"

Discussant: David Musto, University of Pennsylvania

**Alok Kumar**, University of Notre Dame, "Who Gambles in the Stock Market?"

Discussant: Stefan Nagel, Stanford University

**Lauren Cohen**, University of Chicago; **Karl B. Diether**, Ohio State University; and **Christopher J. Malloy**, London Business School, "Supply and Demand Shifts in the Shorting Market"

Discussant: Jeremy Stein, NBER and Harvard University

**Harrison Hong**, Princeton University, and **Jialin Yu**, Columbia University, "Gone Fishin': Seasonality in Speculative Trading and Asset Prices"

Discussant: Narasimhan Jegadeesh, Emory University

**Nicolae Garleanu**, University of Pennsylvania; **Lasse Pedersen**, NBER and New York University; and **Allen M. Poteshman**, University of Illinois, "Demand-Based Option Pricing"

Discussant: Oleg Bondarenko, University of Illinois

**Pedro Santa-Clara**, NBER and University of California, Los Angeles, and **Alessio Saretto**, University of California, Los Angeles, "Option Strategies: Good Deals and Margin Calls"

Discussant: Stephen Figlewski, New York University

**Frazzini** and **Lamont** use mutual fund flows as a measure of individual investor sentiment for different stocks. They find that high sentiment predicts low future returns. Fund flows are dumb money – by reallocating across different mutual funds, retail investors reduce their wealth in the long run. This dumb money effect is strongly positively related to the value effect. High sentiment also is associated with high corporate issuance, which may be interpreted as companies increasing the supply of shares in response to investor demand.

**Kumar** asks whether socioeconomic and psychological factors that are known to influence lottery purchases lead to excess investment in lottery-type stocks. His results indicate that, unlike institutional investors, individual investors prefer stocks with lottery-type features. The demand for lottery-type stocks increases during bad economic times; such demand shifts have an influence on the returns of lottery-type stocks. In the cross-section, factors that induce greater expenditure in lotteries also induce greater investment in lottery-type stocks: poor, young men who live in urban, Republican-dominated regions and belong to specific minority (African-American and Hispanic) and religious (Catholic) groups invest more in lottery-type stocks. Additionally, investors

who exhibit a stronger preference for lottery-type stocks experience greater mean under-performance. Collectively, the evidence indicates that people's attitudes toward gambling are reflected in their stock investment choices and stock returns.

Using proprietary data on stock loan fees and stock loan quantities from a large institutional investor, **Cohen**, **Diether**, and **Malloy** examine the link between the shorting market and stock prices. With a unique identification strategy, the authors are able to isolate shifts in the supply and demand for shorting. They find that shorting demand is an economically and statistically important predictor of future stock returns. The magnitude of this effect is large: an increase in shorting demand leads to negative abnormal returns of 2.54 percent in the following month. Further, the authors find that the shorting market is an important mechanism for private information revelation into prices. Specifically, they show that these results are stronger in environments with less public information flow, and that net of shorting costs, trading strategies based on their identification strategy yield over 3 percent per month on average.

**Hong** and **Yu** develop and test a theory of seasonality in trading activity and asset prices based on heterogeneous beliefs and short-sales con-

straints. The theory predicts that trading of all types, including speculative trades, declines when investors are away on vacation, but only the prices of those assets with sufficient divergence in opinion will drop at the same time. They test this hypothesis using data from the U.S. and Chinese stock markets. As predicted, they find that turnover in the U.S. stock market drops significantly in the summer (when investors are gone fishin') and that the prices of dot-com and liquid, high turnover stocks are lowest during the summer when compared to other stocks. In China, where investors go on vacation only during the Chinese New Year (January and February), turnover and the prices of speculative stocks bottom out during the first two months of the year. The authors rule out alternative explanations, such as seasonal variations in liquidity.

**Garleanu**, **Pedersen**, and **Poteshman** model the demand-pressure effect on prices when options cannot be hedged perfectly. Their model shows that demand pressure in one option contract increases its price by an amount proportional to the variance of the unhedgeable part of the option. Similarly, the demand pressure increases the price of any other option by an amount proportional to the covariance of their unhedgeable parts. Empirically, the authors identify aggre-

gate positions of dealers and end users using a unique dataset and show that demand-pressure effects help to explain well-known option-pricing puzzles. First, end users are net long index options, especially out-of-the-money puts, which helps to explain their apparent expensiveness and the smirk. Second, demand patterns help to explain the cross section of prices and the skews of single-stock options.

**Santa-Clara** and **Saretto** investigate the risk and return of a wide variety of trading strategies involving options on

the S&P 500. They consider naked and covered positions, straddles, strangles, and calendar spreads, with different maturities and levels of moneyness. Overall, they find that strategies involving short positions in options generally compensate the investor with very high Sharpe ratios, which are statistically significant even after taking into account the non-normal distribution of returns. Furthermore, the authors find that the strategies' returns are substantially higher than warranted by asset pricing models. They also find that the returns to

the strategies could be justified only by jump risk if the probability of market crashes were implausibly higher than it has been historically. Santa-Clara and Saretto conclude that the returns to option strategies constitute a very good deal. However, exploiting this good deal is extremely difficult. They find that trading costs and margin requirements severely condition the implementation of option strategies. Margin calls force investors out of a trade precisely when it is losing money.

## Monetary Economics

The NBER's Program on Monetary Economics met in Cambridge on April 15. Organizers Lars E.O. Svensson and Mark W. Watson, both of NBER and Princeton University, chose these papers to discuss:

**Refet S. Gurkaynak, Brian Sack, and Eric T. Swanson**, Federal Reserve Board, "Do Actions Speak Louder than Words? The Response of Asset Prices to Monetary Policy Actions and Statements"  
Discussant: Kenneth Kuttner, NBER and Oberlin College

**Robert J. Tetlow and Brian Ironside**, Federal Reserve Board, "Real-time Model Uncertainty in the United States: The Fed from 1996-2003"  
Discussant: Peter Ireland, NBER and Boston College

**Yuriy Gorodnichenko**, University of Michigan, and **Matthew D. Shapiro**, NBER and University of Michigan, "Monetary Policy When Potential Output is Uncertain: Understanding the Growth Gamble of the 1990s"

Discussant: N. Gregory Mankiw, NBER and Harvard University

**Martin L. Weitzman**, Harvard University, "A Unified Bayesian Theory of Equity Puzzles"  
Discussant: Angelo Melino, University of Toronto

**Jean Boivin and Marc P. Giannoni**, NBER and Columbia University, "DSGE Models in a Data Rich-Environment"  
Discussant: Christopher Sims, NBER and Princeton University

**Gurkaynak, Sack, and Swanson** investigate the effects of U.S. monetary policy on asset prices using a high-frequency event-study analysis. They ask whether these effects are adequately captured by a single factor — changes in the federal funds rate target — and find that they are not. Instead, they find that two factors are required. These factors have a structural interpretation as a "current federal funds rate target" factor and a "future path of policy" factor, with the latter closely associated with FOMC statements. The authors measure the effects of these two factors on bond yields and stock prices using a new intraday dataset going back to 1990. According to their estimates, monetary policy actions and statements both have important but differing effects on asset

prices, with statements having a much greater impact on longer-term Treasury yields.

**Tetlow and Ironside** study 30 vintages of FRB/US, the main macroeconomic model used by the Federal Reserve Board staff for forecasting and policy analysis since the model's inception in the mid-1990s. To do this, they exploit archives of the model code, coefficients, baseline databases, and stochastic shock sets stored after each FOMC meeting over the period from July 1996 to November 2003. They document the changes in the model properties that occurred during this period — a surprisingly large and consequential set — and compute optimal Taylor-type rules for each vintage. The period of study saw important changes in the U.S. economy with

a productivity boom, a stock market boom and bust, a recession, the Asia crisis, the Russian debt default, corporate governance scandals, and an abrupt change in fiscal policy. The authors compare these ex ante optimal rules against plausible alternatives. They find that model uncertainty is a substantial problem and that efficacy of purportedly optimal policy rules should not be taken on faith.

The Fed kept interest rates low and essentially unchanged during the late 1990s despite a booming economy and record-low unemployment. These interest rates were accommodative by historical standards. Nonetheless, inflation remained low. How did the Fed succeed in sustaining rapid economic growth without fueling inflation and inflationary expectations? In retro-

spect, it is evident that the productive capacity of the economy increased. Still, as events unfolded there was uncertainty about the expansion of the capacity of the economy and therefore about the sustainability of the Fed's policy. **Gorodnichenko** and **Shapiro** provide an explanation for the success of the Fed in accommodating noninflationary growth in the late 1990s. They show that if the Fed is committed to reverse policy errors it makes because of unwarranted optimism, inflation can remain in check, even if the Fed keeps interest rates low because of this optimism. In particular, a price level target — either strict or partial — can serve to anchor inflation even if the public believes that the Fed is overly optimistic about shifts in potential output. The authors show that price level targeting is superior to inflation targeting in a wide range of situations. This paper also provides econometric evidence that, in contrast to earlier periods, the Fed has recently put substantial weight on the price level in setting interest rates.

In expositions of the equity premium, risk-free rate, and excess volatility

puzzles, the subjective distribution of future growth rates has its mean and variance calibrated to past sample averages. **Weitzman** shows that proper Bayesian estimation of uncertain structural growth parameters adds an irreducible fat-tailed background layer of uncertainty that can explain all three puzzles parsimoniously by one unified theory. The Bayesian statistical-economic equilibrium has just one degree of freedom, yet the data-generating process of the model simultaneously matches all three empirically observed values of the equity premium, risk-free rate, and excess volatility.

Standard practice for the estimation of dynamic stochastic general equilibrium (DSGE) models maintains the assumption that economic variables are measured properly by a single indicator and that all relevant information for the estimation is adequately summarized by a small number of data series, whether or not measurement error is allowed. However, recent empirical research on factor models has shown that information contained in large datasets is relevant for the evolution of important macroeconomic

series. This suggests that conventional model estimates and inference based on estimated DSGE models are likely to be distorted. **Boivin** and **Giannoni** propose an empirical framework for the estimation of DSGE models that exploits the relevant information from a data-rich environment. This framework provides an interpretation of all information contained in a large dataset through the lenses of a DSGE model. The estimation involves Bayesian Markov-Chain Monte-Carlo (MCMC) methods extended so that the estimates can, in some cases, inherit the properties of classical maximum likelihood estimation. The authors apply this estimation approach to a state-of-the-art DSGE monetary model. Treating theoretical concepts of the model — such as output, inflation, and employment — as partially observed, they show that the information from a large set of macroeconomic indicators is important for accurate estimation of the model. This also allows them to improve the forecasts of important economic variables.

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## International Trade and Organizations

The NBER's Working Group on International Trade and Organizations met in Cambridge on April 16. NBER Research Associate Gordon H. Hanson, University of California, San Diego, organized this program:

**Volker Nocke**, University of Pennsylvania, and **Stephen Yeaple**, NBER and University of Pennsylvania, "An Assignment Theory of Foreign Direct Investment"

(NBER Working Paper No. 11003)

**Robert C. Feenstra**, NBER and University of California, San Diego, and **Yongmin Chen**, University of Colorado, "Buyer Investment, Product Variety, and Intrafirm Trade"

**Arnaud Costinot**, Princeton University, "Contract Enforcement, Division of Labor, and the Pattern of Trade"

**Nathan Nunn**, University of Toronto, "Relationship-Specificity, Incomplete Contracts, and the Pattern of Trade"

**Bilgehan Karabay**, University of Virginia, and **John McLaren**, NBER and University of Virginia, "Outsourcing and the Invisible Handshake"

**Nocke** and **Yeaple** develop an assignment theory to analyze the volume and composition of foreign direct investment (FDI). Firms conduct FDI by engaging either in greenfield investment or in cross-border acquisitions. Cross-border acquisitions involve firms trading heterogeneous corporate assets to exploit complementarities, while greenfield FDI involves building a new plant in the foreign market. In equilibrium, greenfield FDI and cross-border acquisitions co-exist, but the composition of FDI between these modes varies with firm and country characteristics. Firms engaging in greenfield investment are systematically more efficient than those engaging in cross-border acquisitions. Furthermore, most FDI takes the form of cross-border acquisitions when factor price differences between countries are small, while greenfield investment plays a more important role for FDI from high-wage into low-wage countries.

**Chen** and **Feenstra** study a simple model of buyer investment and its effect on the variety and vertical structure of international trade. They distinguish between two kinds of buyer investment, "flexible" and "specific," and analyze their interactions with the entry and pricing incentives of suppliers. The authors show that there can be multiple equilibria in the variety of products traded, and that less product variety is associated with more intrafirm trade. The possibility of multiple equilibria is consistent with the observation that some similar economies, such as Taiwan and South Korea, differ substantially in their export varieties to the

United States. The paper's formal empirical analysis confirms the negative correlation between product variety and intrafirm trade.

**Costinot** analyzes the impact of imperfect contract enforcement on the extent of the division of labor and the pattern of trade. He considers a world economy comprising two large countries, with a continuum of goods and one factor of production, labor. Each good is characterized by its complexity, defined as the number of elementary tasks that must be performed to produce one unit. There are increasing returns to scale in the performance of each task, which creates gains from the division of labor. When contracts are not perfectly enforced, the trade-off between these gains and transaction costs pins down the size of productive teams across sectors in each country. When the two countries open up to trade, the country where teams are larger under autarky — in efficiency units of labor — specializes in the more complex goods. In this model, it is the country where the product of institutional quality and workers' productivity is larger. Institutions and productivity levels are complementary sources of comparative advantage. The model predicts that when institutional improvement and productivity gains occur in developed countries, all countries gain, but when they occur in developing countries, developed countries may be hurt.

When relationship-specific investments are necessary for production, under-investment occurs if contracts cannot be enforced. The efficiency

loss from under-investment will differ across industries depending on the importance of relationship-specific investments in the production process. As a consequence, a country's contracting environment may be an important determinant of comparative advantage. To test for this, **Nunn** constructs measures of the efficiency of contract enforcement across countries and the relationship-specificity of investments across industries. He finds that the contracting environment is an important determinant of comparative advantage. Countries with better contract enforcement specialize in industries that rely heavily on relationship-specific investments. This is true even after controlling for traditional determinants of comparative advantage, such as endowments of human capital, physical capital, and natural resources.

**Karabay** and **McLaren** study a model of long-term employment relationships in which employers attempt to smooth wage fluctuations for risk-averse workers, in effect selling insurance to workers at the same time that they buy their labor. The availability of international outsourcing can sharpen the incentive to renege on these wage-smoothing commitments, thus raising the volatility of wages. However, the cost of this increased volatility is borne by employers in equilibrium, since they now must pay higher expected wages. Employers thus can be made worse off or better off by the effects of outsourcing overall: The indirect effect of the weakened ability to insure workers at least partly negates the direct effect of easier access to labor.



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## Bureau Books

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*NBER Macroeconomics Annual 2004*, edited by Mark Gertler and Kenneth S. Rogoff, is available from the MIT Press for \$35.00 in paperback and \$70.00 clothbound. *The NBER Macroeconomics Annual* presents, extends, and applies pioneering work in macroeconomics and stimulates work by macroeconomists on important policy issues. Each paper in the Annual is followed by

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Gertler and Rogoff are NBER Research Associates in the Programs on Monetary Economics and International

Finance and Macroeconomics, respectively. Gertler is the Henry and Lucey Moses Professor of Economics at New York University; Rogoff is the Thomas D. Cabot Professor of Public Policy and Economics at Harvard University.

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