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## Program Report

### International Trade and Investment

Robert C. Feenstra\*

In the three years since the International Trade and Investment Program (ITI) was last reviewed, the most active area of research has dealt with the decline in the relative wages of unskilled workers in the United States and other industrial countries. The question is whether this decline is explained by increased trade attributable to globalization, or by skilled-biased technological change caused by the increased use of computers. Researchers from several programs at the NBER are participating in this debate, but I review here only the contributions of members of ITI program. Following this, I summarize activities in four other areas of our research: trade and growth; regional trade agreements; the impact of trade policies, including political economy, "strategic" trade policy, and antidumping policy; and a relatively new area dealing with trade, resources, and the environment.

A good deal of the research in this program has become more empirical in its scope, reflecting both the interests of the members and the availability of data. Contributing to this availability, Robert Lipsey, Harry Bowen, and I have released three CD-ROMs: "U.S. Imports, 1972-1994"; "World Trade Flows, 1970-1992"; and "U.S. exports, 1972-1994, With Other Data."<sup>1</sup> The first and third of these include U.S. trade data at the most disaggregate level available, and distinguish over 10,000 commodities per year. The second CD-ROM includes the United Nations world trade data, which have been purchased from Statistics Canada under a license that allows for widespread distribution. Each of these can be ordered for \$50 from the Publications Department at the NBER (the CD-ROM dealing with world trade flows is available to academic users only).

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## Globalization and Wages

During the 1980s, the wages of unskilled workers in the United States fell for the first time in the post-war years, both in real terms and relative to the wages of more highly-skilled workers. There is little disagreement on the basic facts of this "wage gap," but a good deal of disagreement on both its causes and the appropriate research methods for uncovering them. One way to estimate the impact of trade is to measure the amount of skilled and unskilled labor embodied in U.S. imports and exports, and to add these amounts onto existing labor supplies: this is the "factor content" approach. While trade economists, for example see Edward E. Leamer,<sup>2</sup> have tended to doubt the validity of this approach, Paul R. Krugman recently has argued that it is valid under some circumstances.<sup>3</sup> Robert Z. Lawrence and Carolyn L. Evans have used this approach to calculate that even a fivefold increase in U.S. imports from developing countries would have only a modest impact on wages.<sup>4</sup>

Another popular method is to compare the change in the prices of goods across industries with the factor intensities of skilled and unskilled labor used in production. According to the Stolper-Samuelson theorem, in order for trade to explain the decline in the relative wage of unskilled labor, there should be a fall in the prices of goods using unskilled labor. Leamer argues that this approach can account for the change in relative wages observed during the 1970s (what he calls the "Stolper Samuelson" decade), but not during the 1980s.<sup>5</sup> Similarly, Robert E. Baldwin and Glen G. Cain find that changes in the prices of goods during the 1980s cannot explain much of the change in wages, with the exception of the decline in relative wages among the

least educated workers, for which trade could have been an important contributory factor.<sup>6</sup>

In view of this rather ambiguous link between prices and wages, two schools of thought have emerged on the proximate cause of the decline in relative wages of the unskilled. The first notes that many industries in the United States and abroad have increased their relative demand for skilled workers, despite the fact that their relative wage has increased. This evidence points strongly to an outward shift in the demand for skilled workers within industries, which can be explained by skilled-biased technological change, including the widespread adoption of computers during the 1980s. This view is taken by Lawrence, who cites supporting evidence that United States multinationals have increased their relative demand for skilled (or non-production) workers in much the same manner across their parent plants and foreign affiliates.<sup>7</sup> Krugman also argues that the technological change is global in nature, which explains why it has essentially the same effect on wages as a skill-biased technological change in a closed economy, and he suggests that trade itself is not that important.<sup>8</sup>

The second school of thought holds that the foreign outsourcing of stages of production also will shift demand towards skilled labor in the United States, and therefore, is fully compatible with the demand shifts that have occurred. Gordon Hanson and I take this view and examine the impact of foreign outsourcing on the relative demand for non-production workers in the United States and Mexico.<sup>9</sup> It turns out that outsourcing from the United States can account for about 20 percent of the shift towards nonproduction workers in the 1980s, but it accounts for a much larger portion of the labor shift in Mexico, as Hanson and Ann Harrison

also find.<sup>10</sup> In comparison, the increased use of computers in the United States can account for about 30 percent of the shift towards skilled labor, which is above that for outsourcing, but not substantially so.<sup>11</sup>

Outsourcing is measured in these studies by estimating the imported intermediate inputs within each industry, expressed as a share of total materials or costs. Jose Campa and Linda Goldberg have made this calculation over four countries, and find an increase in foreign outsourcing during the 1980s from the United States, Canada, and the United Kingdom, but not for Japan, where the share of imported intermediate inputs was smaller and declined over the 1980s.<sup>12</sup> An alternative view of outsourcing focuses on just the activities of multinational firms, as Matthew Slaughter, and Lael Brainard and David Riker do.<sup>13</sup> They all find that employment in the parent plants of multinationals complements rather than substitutes for employment in the affiliate plants. This seems to contradict the idea that corporations can shift production offshore easily; these results are therefore more supportive of the first school of thought.

Rather than focusing on wages per se, Dani Rodrik takes a broader look at the impacts of globalization.<sup>14</sup> He finds that countries that are more open to trade have a larger share of gross national product devoted to government expenditures. He interprets these expenditures as a "safety net" needed to protect workers from greater external risk through terms of trade variability. However, as globalization also has increased the mobility of capital, the ability of governments to fund these social expenditures is reduced: it becomes necessary to rely more on labor than on capital taxation. If this trend continues for too long, there could be a backlash in terms of increased demands for protection.

This debate also has led to a rethinking of the theoretical foundations among trade, wages, and the location of production. Krugman and Anthony J. Venables have considered a model in which at intermediate levels of transport costs (low enough to promote trade but high enough to prevent factor price equalization), a core-periphery pattern emerges: countries in the core will have manufacturing agglomerated in them, while those in the periphery suffer from low wages.<sup>15</sup> Kiminori Matsuyama demonstrates a similar pattern of agglomeration and uneven incomes across countries.<sup>16</sup> James Markusen and Venables also allow multinational firms to choose their location of production, and they introduce high- and low-skilled labor into each country.<sup>17</sup> They find that multinationals can increase the skilled-unskilled wage gap in the high income country and, under some circumstances, in the low income country as well.

Donald R. Davis has considered the implication of globalization in a model that contrasts the flexible wages of American with the fixed wages of Europe.<sup>18</sup> In this setting, it turns out that the impact of globalization — for example the entry of the newly industrialized countries — is very different than if wages are uniformly flexible. In particular, the brunt of the new supplying countries is borne by European unemployment when those wages are fixed, and does not affect American wages as would occur if both regions had flexible wages. The impact of technological change also depends on the prevailing factor markets institutions in each country, which serves to emphasize that the impact of globalization cannot be assessed independently of conditions in a country's trading partners.

## Trade and Endogenous Growth

Current research in the program has focused on empirically assessing the various theories linking trade with endogenous growth. An essential element of these models is the idea that knowledge will diffuse across borders, making it possible for firms in one country to benefit from R and D activity done abroad. The extent to which these knowledge spillovers actually occur is an open question. David Coe and Elhanan Helpman, with Alexander Hoffmaister and Tamim Bayoumi, have examined the links among total factor productivity in each country, its own R and D expenditures, and those of its trading partners.<sup>19</sup> They find that the trading partners' R and D has a surprisingly large impact on a country's productivity.

Jonathan Eaton and Samuel Kortum introduce greater structure onto the spillovers by using data on patent activity, and in particular, the patents that firms from each country take out in another country.<sup>20</sup> Like Coe and Helpman, they also find a large impact of spillovers. Lee Branstetter also relies on patent data, and focuses on the firm-level productivity performance of American and Japanese corporations.<sup>21</sup> The potential spillovers between these firms are measured by the overlap in the categories where they have each obtained patents, and these are regressed on various measures of firms' performance. He finds that there is a significant spillover of knowledge between the American and Japanese corporations, but this does not occur in the reverse direction.

Another way that trade will induce growth is through its effect on investment, both domestic and foreign. Richard Baldwin, with Elena Seghezza and Rikard Forslid, has investigated the impact of openness on investment using a modified Tobin's-q

approach.<sup>22</sup> Their empirical work on a cross-section of countries suggests that openness promotes growth through its impact on investment, and that protection retards growth. This hypothesis finds more limited support from Ann E. Harrison, who examines a broad range of potential determinants of growth.<sup>23</sup> Rodrik focuses on Taiwan and South Korea, and argues that the investment boom in both these countries was critical to their future growth success, but that increased openness was probably a consequence rather than a cause of the investment.<sup>24</sup> At a theoretical level, Joshua Aizenman and Nancy Marion have further examined the impact on a country's investment of uncertainty due to openness.<sup>25</sup>

Turning to foreign investment, Eaton and Akiko Tamura argue that outflows of investment from advanced countries such as the United States and Japan are conduits of knowledge transfer and growth.<sup>26</sup> Firms in these countries need to choose between exporting and foreign investment as alternative means of serving the foreign markets. Eaton and Tamura capture this decision in a modified "gravity model," which relates exports and foreign investment to country size and other characteristics. From the viewpoint of the destination country, the desirability of the investment inflows depends on its impact on local wages. A number of researchers, including Brian Aitken, Hanson, Harrison, and Lipsey, have documented the positive impact of investment inflows on wages for various countries.<sup>27</sup>

The behavior of the government also should be considered as a determinant of growth. Rodrik argues that the presence of a professional bureaucracy is an important component of the East Asia success story.<sup>28</sup> James Rauch develops a model of endogenous government behavior in which internal promotion can be

used to influence the actions of bureaucrats, and thereby avoid corruption.<sup>29</sup> Barbara Spencer examines a model where the government allocates quota licenses in a non-uniform fashion to firms that are otherwise identical.<sup>30</sup> Surprisingly, it turns out that this bureaucratic control sometimes can achieve a better outcome than would a uniform allocation of quotas, such as through a market mechanism.

Given that any of the economic explanations for growth can explain only a portion of the cross-country variation, some researchers are looking to less conventional explanations. John Helliwell examines whether measures of "social capital" can help to explain the rapid growth rates of the Asian economies, and also the differences among the regional growth rates across American states and Canadian provinces.<sup>31</sup> Rauch explores how social capital — measured by networks of individuals — can influence trade patterns.<sup>32</sup> He distinguishes between organized exchanges for homogeneous products, where prices are announced, and differentiated products for which prices are not announced, so that information passed through networks becomes important. Andrew Rose and I develop an unconventional measure of openness which measures the time at which countries begin to export various commodities, and we use this measure to establish an ordering of countries or commodities.<sup>33</sup> We show that the ordering of countries established by this criterion is correlated with either their level or growth of GDP per capita.

## Regional Trade Agreements

Current research on trade patterns has led to the surprising finding that even when tariffs are close to zero, the movement of goods is still many

times greater within a country than across national borders: this is sometimes referred to as a "home bias" provided by national borders. For example, Shang-Jin Wei<sup>34</sup> has found that an OECD country purchases about two and one-half times as much from itself as from an otherwise identical foreign country; Helliwell<sup>35</sup> finds that Quebec trades even more with the rest of Canada—and less with the United States—than the other Canadian provinces do; while Charles Engel and John Rogers<sup>36</sup> find similar evidence of a break occurring at national borders by looking at the variability of prices. David Richardson and Pamela Smith have further examined the ability of an endowment-based model to explain the trade of U.S. states, as has James Harrigan for the OECD countries.<sup>37</sup> Holger Wolf has shown that the tendency for "home bias" extends equally well to subnational units within the United States, suggesting that it is caused more by the clustering of production than by the presence of national borders.<sup>38</sup>

The possibility of eliminating the "invisible" barrier attributable to national borders provides one motivation for regional trade agreements, consisting of free trade between neighboring or politically-aligned countries. Other motivations, assessed by John Whalley,<sup>39</sup> include: the use of regional trade agreements to underpin domestic policy reforms (as with Mexico in NAFTA); the desire to achieve firmer market access with large trading partners (as with Canada in NAFTA); the use of agreements to strengthen collective bargaining power in multilateral negotiations (as with the European Union); and the use of regional negotiations as a threat to driving multilateral negotiations forward.

Kyle Bagwell and Robert W. Staiger analyze the last of these reasons: the link between regional and

multilateral agreements.<sup>40</sup> They use a repeated game model to show how multilateral trade agreements can be sustained, where any deviations from this agreement are punished by reversion to the Nash equilibrium tariffs. It turns out that the reciprocity and non-discrimination, which are two pillars of GATT, arise as part of the equilibrium strategies in this repeated game. The question the authors pose is whether regional trade agreements, which allow for preferential treatment of member countries, help or hinder the achievement of multilateral agreements. They find that the free trade areas (which do not require a common external tariff among the member countries) pose a threat to multilateral agreements, but that customs unions (which require a common external tariff) can be consistent with the multilateral agreement.

Kala Krishna and Anne O. Krueger also make the distinction in their work between free trade agreements and customs union.<sup>41</sup> Because the former do not require member countries to have a common external tariff, firms selling into the area would want to enter through the country with the minimum tariff. To avoid this, free trade areas must adopt complicated "rules of origin," that specify the rules under which any particular good can cross the border duty-free within the area. These rules of origin generate a substantial production distortion and deadweight loss within the area. For these and other reasons, Krueger concludes that free trade areas are always inferior to customs unions.<sup>42</sup> Krishna and Jiandong Ju further investigate the effects of a free trade area that does not use rules of origin.<sup>43</sup>

Alessandra Casella also examines regional trade blocs, and argues that the gains from enlarging the bloc are received disproportionately by the small countries.<sup>44</sup> Her empirical work

provides mixed evidence on this hypothesis. The proliferation in the numbers of regional trade agreements suggests that the countries involved perceive advantages above and beyond the traditional gains from trade. Raquel Fernandez discusses a number of non-traditional benefits from an agreement, including credibility, signaling, bargaining power, insurance and coordination.<sup>45</sup> Magnus Blomstrom and Ari Kokko consider the impact of regional integration on direct investment flows.<sup>46</sup>

## Political Economy of Trade Policy

Gene Grossman and Elhanan Helpman have continued work on their project incorporating political economy considerations into the formation of trade policy.<sup>47</sup> Their models allow politicians to be influenced by campaign contributions in their determination of trade policy; this is designed to maximize the joint welfare of the lobby and the government or politicians. This framework results in a number of empirically testable propositions regarding the cross-sectoral structure of tariffs, as well as differences in average rates of protection across countries.

For example, sectors without an organized lobby have a rate of protection that is related positively to the level of imports (holding fixed the import demand elasticity). But for sectors with an organized lobby, the level of protection is related negatively to the ratio of imports to exports. This reflects the fact that sector-specific owners have more to gain when production (and therefore exports) is higher, while the deadweight loss of a tariff is smaller when consumption (and therefore imports) is lower. Penny Goldberg and Giovanni Maggi find that this hypothesis is supported by the data.<sup>48</sup> In addition, they estimate that the weight given to consumer welfare in the government's

objective function is surprisingly high: 50 to 88 times higher than the weight given to contributions.

Political economy considerations also motivate the recent work of James E. Anderson. He examines a new definition of the effective rate of protection (ERP), as the uniform tariff that is equivalent to the actual differentiated tariff structure in its effect on rents to residual claimants in a sector.<sup>49</sup> The new ERP is equivalent to the old ERP under a special set of circumstances; otherwise, it is an improved method for thinking about the impact of protection on interest groups in an industry. In other work, Anderson has examined the budget constraint faced by the government, in the case where tariff revenue cuts must be offset by distortionary taxation.<sup>50</sup> He argues that in practice this reduces the desirability of tariff cuts, and illustrates this using data from South Korea.

Douglas A. Irwin has analyzed the political economy of several historical tariff episodes. He examines voting patterns from the British general elections of 1923 to distinguish between two hypotheses: that the voting took place according to class or factor lines (that is, labor versus capital), or that the voting took place along industry or occupation lines.<sup>51</sup> Irwin finds greater support for the latter hypothesis, which is consistent with a specific-factors model of production. In joint work with Randall S. Kroszner, Irwin examines voting patterns leading to the passage of the Smoot-Hawley Tariff in the United States in 1930.<sup>52</sup> They find significant evidence of "log-rolling coalitions" among Senators with otherwise unrelated constituencies. Irwin also has estimated the degree to which the Smoot-Hawley Tariff can explain the subsequent fall in United States trade, and more generally, the extent to which the Great Depression influenced the subsequent shifts in U.S. policy.<sup>53</sup>

## Imperfect Competition and "Strategic" Trade Policy

The industry that arguably has received the most trade policy attention throughout the 1980s and 1990s is automobiles. The import competition faced by U.S. producers during the 1980s was offset by the application of a "voluntary" export restraint (VER) with Japan. Because this is an industry with a small number of producers, there seems to be some potential that the national benefits of a "strategic" trade policy might apply. Steven Berry, James Levinsohn, and Ariel Pakes investigate this using a model that allows for oligopoly behavior.<sup>54</sup> They find that the VER shifted profits towards U.S. producers quite substantially, but despite this, it failed to be in the U.S. interest because the rents were given away to the Japanese firms.

The VER had the further effect of encouraging foreign investment into the United States, so that by the end of the decade it was redundant. Attention then shifted to the auto parts industry, which had a very low foreign market share in Japan. In an effort to expand this share, the Clinton administration threatened a 100 percent tariff on thirteen Japanese luxury cars, unless the Japanese agreed to expand their purchases of auto parts. Levinsohn examines what the impact of that policy would have been, and finds that the reduction in profits of the Japanese manufacturers would have been very large indeed.<sup>55</sup> Surprisingly, the increase in U.S. profits would have been very modest, since most consumers would have switched to European or other Japanese models. Thus, this policy would have failed the test of a "strategic" trade policy.

However, the threat of this tariff still had an effect, since the Japanese agreed to purchase more automobile

parts just 12 hours before the tariff was to be applied. Krishna and John Morgan examine how the effectiveness of a threat depends on having it linked to the market with the desired goal: in this case, the threat was made to the same Japanese firms that could implement the increase in purchases of auto parts.<sup>56</sup> They argue that under these conditions, a market share target can be implemented with fairly weak informational and administrative requirements. Barbara Spencer, Ruth Raubitschek, and Jota Ishikawa also examine the scope for "strategic" policies when firms rely on intermediate inputs.<sup>57</sup> They show that the potential benefits from export subsidies are enhanced if the intermediate inputs are supplied by domestic firms, but not if they are supplied by foreign firms.

Deborah L. Swenson empirically examines the auto parts agreement, focusing on the purchase of American parts by Japanese affiliates in the United States.<sup>58</sup> The question here is whether the Japanese affiliates will ever purchase as great a share of U.S.-made parts as do American firms. Swenson finds that the Japanese firms do respond to exchange rate changes, so that an appreciation of the yen leads to greater purchases of American parts. These firms also have been buying more U.S.-made parts over time, but there is still a significant bias in their demand towards Japanese-made parts.

Michael Knetter and Penny Goldberg consider the impact of the exchange rate on firms' decisions.<sup>59</sup> This work also is motivated also by issues of imperfect competition, and in particular, uses evidence on the pricing behavior of firms to determine their market conduct. A natural experiment arises when an exporting firm is selling to several different markets, and its exchange rate to these markets changes non-uniformly. Since the level of costs to these markets

can be controlled for, the resulting changes in the prices can be attributed to strategic pricing decisions on the part of the firm. Generally, firms pass through only a portion of exchange rate changes in their export prices. A good example is *The Economist* magazine, studied by Knetter,<sup>60</sup> Atish Ghosh, and Holger Wolf.<sup>61</sup> This magazine sells for considerably different prices across continents, and these are plausibly the result of intentional price discrimination; the time-sensitive nature of the product makes international arbitrage too costly.

## Antidumping Policy

Antidumping policies are used more frequently than other trade policies available to firms facing import competition. This is perhaps not surprising in view of the finding that antidumping policies lead to an increase in import prices even in cases where duties are not actually applied. Thomas J. Prusa was the first to measure this effect.<sup>62</sup> He found that when an antidumping action was initiated by a domestic firm, if a positive finding of dumping was made, there would be an opportunity for the domestic firm and the foreign firms to reach a "negotiated" settlement. Needless to say, this has had the effect of increasing prices even when duties are not applied. Price increases also have been found by Staiger and Frank Wolak.<sup>63</sup> They look at the initial phase of an antidumping investigation, when United States government agencies are collecting information on the prices charged by foreigners. During this period, it is possible to find a statistically significant increase in import prices, because the foreign firms are trying to minimize the chances of being found guilty of dumping. Furthermore, Staiger and Wolak find that United States firms facing competition from Canada and Mexico are more likely to file antidumping petitions to ob-

tain this trade-restricting effect, even if a duty is not expected to be ultimately applied.

Another way that antidumping policy leads to price increases is through the distinction between countries named in an antidumping investigation, and other countries selling essentially the same products in the United States, that are not named in the investigation. Prusa finds the investigation itself has the effect of restricting imports and raising the price from the countries named in the investigation; of course, these effects persist and are amplified if duties are applied.<sup>64</sup> Moreover, he finds that there is significant trade diversion towards countries that are not named in the investigation, and on which duties are not applied. Prusa and Wendy Hansen<sup>65</sup> investigate the process of "cumulating" the imports from named countries when assessing whether dumping has occurred. By aggregating over all "like" imports from named countries, it is more likely that the imports will compose a significant share of domestic consumption, and that there will be a positive finding of injury to the domestic industry.

## Trade, Resources, and the Environment

A relatively new area of research has dealt with the impact of international trade on resources and the environment. James Brander and Scott Taylor examine the gains from trade when a country has one sector producing from a renewable resource.<sup>66</sup> Producers in that sector make their decisions on the basis of short-run profits, and their yield depends on the stock of the resource available. This creates an intertemporal externality that is not corrected for by the market. In this setting, free trade can lead to a (long-run) fall in the utility of the country that exports the resource-based good, since it is

induced to harvest more rapidly. Brander and Taylor further show that this loss in utility applies to a "consumer" country exporting the renewable resource to a "conservationist" country that regulates its harvest.<sup>67</sup>

The possibility of losses for one country also arises in the model of trade and the environment that Brian Copeland and Scott Taylor consider.<sup>68</sup> In this case, one "dirty" industry creates pollution that is a negative externality on the other "clean" industry located in the same country. If the country exporting the "dirty" industry remains diversified in the trade equilibrium, then it can suffer a welfare loss, because of the negative consequences on its "clean" industry. Copeland and Taylor have extended this analysis to the impact of pollution controls and capital mobility on the international location of pollution-intensive industries, and on the resulting levels of worldwide pollution.<sup>69</sup> Markusen also has examined the impact of locational choice on pollution levels.<sup>70</sup> He argues that multinationals do not increase the production-reallocation effect caused by environmental regulations, since these reallocations still occur across firms in different countries in the absence of multinationals. Finally, Whalley broadly discusses the direction of trade and environmental regulations in the WTO following the Singapore meeting of December 1996.<sup>71</sup>

## Conferences and Other Activities

The ITI holds two regular program meetings each year: a one- or two-day meeting in the spring, and a four- or five-day meeting in the summer. In addition, the group typically holds one topic-based conference every second year. The most recent of these was held in October 1995, and resulted in the NBER volume *The Impact of U.S. Trade Protection*

and Promotion Policies (Chicago: University of Chicago Press, 1997). A few of these papers have been discussed here, and they are all reviewed in the Fall 1995 NBER Reporter. In addition, a number of researchers in the ITI program contributed chapters to the *Handbook of International Economics*, Vol. 3 (Amsterdam: Elsevier Science, 1995), edited by Gene Grossman and Kenneth Rogoff, and these have not been discussed here.

<sup>1</sup> R. C. Feenstra, "U.S. Imports, 1972–1994: Data and Concordances," NBER Working Paper No. 5515, March 1996; R. C. Feenstra, R.E. Lipsey, and H. P. Bowen, "World Trade Flows, 1970–1992, with Production and Tariff Data," NBER Working Paper No. 5910, January 1997; R. C. Feenstra, "U.S. Exports, 1972–1994: With State Exports and Other U.S. Data," NBER Working Paper No. 5990, April 1997.

<sup>2</sup> E. E. Leamer, "What's the Use of Factor Contents?," NBER Working Paper No. 5448, February 1996.

<sup>3</sup> P. R. Krugman, "Technology, Trade, and Factor Prices," NBER Working Paper No. 5355, November 1995.

<sup>4</sup> R. Z. Lawrence and C. L. Evans, "Trade and Wages: Insights from the Crystal Ball," NBER Working Paper No. 5633, June 1996.

<sup>5</sup> E. E. Leamer, "In Search of Stolper-Samuelson Effects on U.S. Wages," NBER Working Paper No. 5427, January 1996.

<sup>6</sup> R. E. Baldwin, "The Effects of Trade and Foreign Direct Investment on Employment and Relative Wages," NBER Working Paper No. 5037, February 1995; R. E. Baldwin and G. G. Cain, "Shifts in U.S. Relative Wages: The Role of Trade, Technology, and Factor Endowments," NBER Working Paper No. 5934, February 1997.

<sup>7</sup> R. Z. Lawrence, "Trade, Multinationals, & Labor," NBER Working Paper No. 4836, August 1994.

<sup>8</sup> P. R. Krugman, "Technology, Trade, and Factor Prices," NBER Working Paper No. 5355, November 1995.

<sup>9</sup> R. C. Feenstra and G. H. Hanson, "Foreign Investment, Outsourcing and Relative Wages," NBER Working Paper No. 5121, May 1995; and "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras," NBER Working Paper No. 5122, May 1995.

<sup>10</sup> R. C. Feenstra and G. H. Hanson, "Globalization, Outsourcing, and Wage Inequality," NBER Working Paper No. 5424, January 1996, and the Errata distributed for this paper; G. H. Hanson and A. Harrison, "Trade, Technology, and Wage Inequality," NBER Working Paper No. 5110, May 1995.

<sup>11</sup> R. C. Feenstra and G. H. Hanson, "Productivity Measurement and the Impact of Trade and Technology on Wages: Estimates for the U.S., 1972–1990," forthcoming as an NBER Working Paper.

<sup>12</sup> J. Campa and L. S. Goldberg, "The Evolving External Orientation of Manufacturing Industries: Evidence from Four Countries," NBER Working Paper No. 5919, February 1997.

<sup>13</sup> M. J. Slaughter, "Multinational Corporations, Outsourcing, and American Wage Divergence," NBER Working Paper No. 5253, September 1995; S. L. Brainard and D. A. Riker, "Are U.S. Multinationals Exporting U.S. Jobs?," NBER Working Paper No. 5958, March 1997; and "U.S. Multinationals and Competition from Low Wage Countries," NBER Working Paper No. 5959, March 1997.

<sup>14</sup> D. Rodrik, "Why Do More Open Economies Have Bigger Governments?," NBER Working Paper No. 5537, April 1996; and "Trade, Social Insurance, and the Limits to Globalization," NBER Working Paper No. 5905, January 1997.

<sup>15</sup> P. R. Krugman and A. J. Venables, "Globalization and the Inequality of Nations," NBER Working Paper No. 5098, April 1995; and "The Seamless World: A Spatial Model of International Specialization," NBER Working Paper No. 5220, August 1995.

<sup>16</sup> K. Matsuyama, "Why Are There Rich and Poor Countries? Symmetry-Breaking in the World Economy," NBER Working Paper No. 5697, August 1996.

<sup>17</sup> J. R. Markusen and A. J. Venables, "Multinational Firms and The New Trade Theory," NBER Working Paper No. 5036, February 1995; "Multinational Production Skilled Labor and Real Wages," NBER Working Paper No. 5483, March 1996; and "The Theory of Endowment, Intra-Industry, and Multinational Trade," NBER Working Paper No. 5529, April 1996; J. R. Markusen, A. J. Venables, D. E. Konan, and K. H. Zhang, "A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services," NBER Working Paper No. 5696, August 1996.

<sup>18</sup> D. R. Davis, "Does European Unemployment Prop up American Wages?," NBER Working Paper No. 5620, June 1996; "Technology, Unemployment, and Relative Wages in a Global Economy," NBER Working Paper No. 5636, June 1996; and "Trade Liberalization and Income Distribution," NBER Working Paper No. 5693, August 1996.

<sup>19</sup> D. T. Coe, E. Helpman, and A. Hoffmaister, "North-South R&D Spillovers," NBER Working Paper No. 5048, March 1995; T. Bayoumi, D. T. Coe, and E. Helpman, "R&D Spillovers and Global Growth," NBER Working Paper No. 5628, June 1996.

<sup>20</sup> J. Eaton and S. Kortum, "International Patenting and Technology Diffusion," NBER Working Paper No. 4931, November 1994; "Trade in Ideas: Patenting and Productivity in the OECD," NBER Working Paper No. 5049, March 1995; and "Engines of Growth: Domestic and Foreign Sources of Innovation," NBER Working Paper No. 5207, August 1995.

<sup>21</sup> L. Branstetter, "Are Knowledge Spillovers International or Intranational in Scope? Microeconomic Evidence from the U.S. and Japan," NBER Working Paper No. 5800, October 1996.

<sup>22</sup> R. E. Baldwin and E. Seghezza, "Testing for Trade-Induced Investment-Led Growth," NBER Working Paper No. 5416, January 1996; R. E. Baldwin and R. Forslid, "Trade Liberalization Endogenous Growth: A q-Theory Approach," NBER Working Paper No. 5549, April 1996; R. E. and E. Seghezza, "Trade-Induced Investment-led Growth," NBER Working Paper No. 5582, May 1996.

<sup>23</sup> A. Harrison, "Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries," NBER Working Paper No. 5221, August 1995.

<sup>24</sup> D. Rodrik, "Getting Interventions Right: How South Korea and Taiwan Grew Rich," NBER Working Paper No. 4964, December 1994; and "Trade Strategy, Investment, and Exports: Another Look at East Asia," NBER Working Paper No. 5339, November 1995.

<sup>25</sup> J. Aizenman and N. Marion, "Volatility, Investment and Disappointment Aversion," NBER Working Paper No. 5386, December 1995; J. Aizenman, "New Activities, the Welfare Cost of Uncertainty, and Investment Policies," NBER Working Paper No. 5825, November 1996; J. Aizenman and N.P. Marion, "Volatility and the Investment Response," NBER Working Paper No. 5841, November 1996.



- 26 J. Eaton and A. Tamura, "Japanese and U.S. Exports and Investment as Conduits of Growth," NBER Working Paper No. 5457, February 1996.
- 27 R. E. Lipsey, "Foreign-Owned Firms and U.S. Wages," NBER Working Paper No. 4927, November 1994; B. Aitken, G. H. Hanson, and A. E. Harrison, "Spillovers, Foreign Investment, and Export Behavior," NBER Working Paper No. 4967, December 1994; B. Aitken, A. E. Harrison, and R. E. Lipsey, "Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela and the United States," NBER Working Paper No. 5102, May 1995.
- 28 D. Rodrik, "TFPG Controversies, Institutions, and Economic Performance in East Asia," NBER Working Paper No. 5914, February 1997.
- 29 J. E. Rauch, "Choosing a Dictator: Bureaucracy and Welfare in Less Developed Polities," NBER Working Paper No. 5196, July 1995.
- 30 B. J. Spencer, "Quota Licenses for Imported Capital Equipment: Could Bureaucrats Ever Do Better than the Market?," NBER Working Paper No. 5695, August 1996.
- 31 J. F. Helliwell, "Economic Growth and Social Capital in Asia," NBER Working Paper No. 5470, February 1996.
- 32 J. E. Rauch, "Networks versus Markets in International Trade," NBER Working Paper No. 5617, June 1996; and "Trade and Search: Social Capital, Sogo Shosha, and Spillovers," NBER Working Paper No. 5618, June 1996.
- 33 R. C. Feenstra and A. K. Rose, "Putting Things in Order: Patterns of Trade Dynamics and Growth," NBER Working Paper No. 5975, March 1997.
- 34 S. J. Wei, "Intra-National versus International Trade: How Stubborn are Nations in Global Integration?," NBER Working Paper No. 5531, April 1996.
- 35 J. F. Helliwell, "Do National Borders Matter for Quebec's Trade?," NBER Reprint No. 2078, October 1996.
- 36 C. Engel and J. H. Rogers, "Regional Patterns in the Law of One Price: The Roles of Geography vs. Currencies," NBER Working Paper No. 5395, December 1995.
- 37 J. D. Richardson and P. J. Smith, "Sectoral Growth Across U.S. States: Factor Content, Linkages, and Trade," NBER Working Paper No. 5094, April 1995; J. Harrigan, "Technology, Factor Supplies and International Specialization: Estimating the Neoclassical Model," NBER Working Paper No. 5722, August 1996.
- 38 H. C. Wolf, "Patterns of Intra- and Inter-State Trade," NBER Working Paper No. 5939, February 1997.
- 39 J. Whalley, "Why Do Countries Seek Regional Trade Agreements?," NBER Working Paper No. 5552, May 1996.
- 40 K. Bagwell and R. W. Staiger, "Protection and the Business Cycle," NBER Working Paper No. 5168, July 1995; "Reciprocal Trade Liberalization," NBER Working Paper No. 5488, March 1996; "Strategic Export Subsidies and Reciprocal Trade Agreements: The Natural Monopoly Case," NBER Working Paper No. 5574, May 1996; "Regionalism and Multilateral Tariff Cooperation," NBER Working Paper No. 5921, February 1997; and "Reciprocity, Non-discrimination and Preferential Agreements in the Multilateral Trading System," NBER Working Paper No. 5932, February 1997.
- 41 K. Krishna and A. Krueger, "Implementing Free Trade Areas: Rules of Origin and Hidden Protection," NBER Working Paper No. 4983, January 1995.
- 42 A. O. Krueger, "Free Trade Agreements versus Customs Unions," NBER Working Paper No. 5084, April 1995.
- 43 J. Ju and K. Krishna, "Market Access and Welfare Effects of Free Trade Areas without Rules of Origin," NBER Working Paper No. 5480, March 1996.
- 44 A. Casella, "Large Countries, Small Countries, and the Enlargement of Trade Blocs," NBER Working Paper No. 5365, November 1995.
- 45 R. Fernandez, "Returns to Regionalism: An Evaluation of Non-Traditional Gains from RTAs," NBER Working Paper No. 5970, March 1997.
- 46 M. Blomstrom and A. Kokko, "Regional Integration and Direct Investment," NBER Working Paper No. 6019, April 1997.
- 47 G. Grossman and E. Helpman, "Foreign Investment with Endogenous Protection," NBER Working Paper No. 4876, November 1994; and "Electoral Competition and Special Interest Politics," NBER Working Paper No. 4877, November 1994; E. Helpman, "Politics and Trade Policy," NBER Working Paper No. 5309, November 1995.
- 48 P. K. Goldberg and G. Maggi, "Protection for Sale: An Empirical Investigation," NBER Working Paper No. 5942, February 1997.
- 49 J. E. Anderson, "Effective Protection Redux," NBER Working Paper No. 5854, December 1996.
- 50 J. E. Anderson, "Trade Reform with a Government Budget Constraint," NBER Working Paper No. 5827, November 1996.
- 51 D. A. Irwin, "Industry or Class Cleavages over Trade Policy? Evidence from the British General Election of 1923," NBER Working Paper No. 5170, July 1995.
- 52 D. A. Irwin and R. S. Kroszner, "Log-Rolling and Economic Interests in the Passage of the Smoot-Hawley Tariff," NBER Working Paper No. 5510, March 1996.
- 53 D. A. Irwin, "The Smoot-Hawley Tariff: A Quantitative Assessment," NBER Working Paper No. 5509, March 1996; "Changes in U.S. Tariffs: Prices or Policies?," NBER Working Paper No. 5665, July 1996; and "From Smoot-Hawley to Reciprocal Trade Agreements: Changing the Course of U.S. Trade Policy in the 1930s," NBER Working Paper No. 5895, January 1997.
- 54 S. Berry, J. Levinsohn, and A. Pakes, "Voluntary Export Restraints on Automobiles: Evaluating a Strategic Trade Policy," NBER Working Paper No. 5235, August 1995.
- 55 J. Levinsohn, "CARWARS: Trying to Make Sense of U.S.-Japan Trade Frictions in the Automobile and Automobile Parts Markets," NBER Working Paper No. 5349, November 1995.
- 56 K. Krishna and J. Morgan, "Implementing Results-Oriented Trade Policies: The Case of the U.S.-Japanese Auto Parts Dispute," NBER Working Paper No. 5680, July 1996.
- 57 R. R. Raubitschek and B. J. Spencer, "High-Cost Domestic Joint Ventures and International Competition: Do Domestic Firms Gain?," NBER Working Paper No. 4804, July 1994; J. Ishikawa and B. J. Spencer, "Rent-Shifting Export Subsidies with an Imported Intermediate Product," NBER Working Paper No. 5458, February 1996.
- 58 D. L. Swenson, "Explaining Domestic Content: Evidence from Japanese and U.S. Auto Production in the U.S.," NBER Working Paper No. 5495, March 1996.
- 59 M. M. Knetter, "Why are Retail Prices in Japan so High?: Evidence from German Export Prices," NBER Working Paper No. 4894, October 1994; P. K. Goldberg and M. M. Knetter, "Measuring the Intensity of Competition in Export Markets," NBER Working Paper No. 5226, August 1995; and "Goods Prices and Exchange Rates:

*What Have We Learned?*, NBER Working Paper No. 5862, December 1996.

<sup>60</sup> M. M. Knetter, "The Segmentation of International Markets: Evidence from The Economist," NBER Working Paper No. 5878, January 1997.

<sup>61</sup> A. R. Ghosh and H. C. Wolf, "Pricing in International Markets: Lessons From The Economist," NBER Working Paper No. 4806, July 1994.

<sup>62</sup> T. J. Prusa, "The Trade Effects of U.S. Antidumping Actions," NBER Working Paper No. 5440, January 1996.

<sup>63</sup> R. W. Staiger and F. A. Wolak, "Differences in the Uses and Effects of Antidumping Law Across Import Sources," NBER Working Paper No. 4846, September 1994.

<sup>64</sup> T. J. Prusa, "The Trade Effects of U.S. Antidumping Actions," NBER Working Paper No. 5440, January 1994.

<sup>65</sup> W. L. Hansen and T. J. Prusa, "Cumulation and ITC Decision-Making: The Sum of the Parts is Greater than the Whole," NBER Working Paper No. 5062, March 1995.

<sup>66</sup> J. A. Brander and M. S. Taylor, "International Trade and Open Access Renewable Resources: The Small Open Economy Case," NBER Working Paper No. 5021, February 1995; and "Open Access Renewable Resources: Trade and Trade Policy in a Two-Country Model," NBER Working Paper No. 5474, March 1996.

<sup>67</sup> J. Brander and M. S. Taylor, "International Trade Between Consumer and

Conservationist Countries," NBER Working Paper No. 6006, April 1997

<sup>68</sup> B. R. Copeland and M. S. Taylor, "Trade, Spatial Separation, and the Environment," NBER Working Paper No. 5242, August 1995.

<sup>69</sup> B. R. Copeland and M. Scott Taylor, "A Simple Model of Trade, Capital Mobility, and the Environment," NBER Working Paper No. 5898, January 1997.

<sup>70</sup> J. R. Markusen, "Costly Pollution Abatement, Competitiveness, and Plant Location Decisions," NBER Working Paper No. 5490, March 1996.

<sup>71</sup> J. Whalley, "Trade and Environment Beyond Singapore," NBER Working Paper No. 5768, September 1996.

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## Research Summaries

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### Environmental Tax Policy Using a Two-Part Instrument

Don Fullerton\*

One important goal of tax policy is economic efficiency. In some cases, this requires raising revenue and avoiding changes in relative prices that may distort taxpayer behavior and create "excess burden." In other cases, however, economic efficiency might require changes in relative prices: for example, taxing the "negative externalities" from alcohol, tobacco, and disposal of household or industrial waste. (Negative externalities include injuries, second hand smoke, and aesthetic costs.)

A second goal of tax policy is administrative efficiency. This is often best achieved by taxes on market transactions, for which the tax base can be measured and verified most easily. Taxes can apply to wages paid by an employer, interest paid by a

bank, dividends reported by a broker, and the sale of cigarettes and alcohol as reported by retail establishments.<sup>1</sup>

But what about disposal of household and industrial waste? To achieve economic efficiency, these activities should be taxed, but they are often not market transactions that can be verified by a third party. In such cases, a "two-part instrument" might resolve the conflict.<sup>2</sup> Instead of directly taxing waste, a two-part instrument would raise the relative price of waste indirectly through both a tax and a subsidy on other activities that *are* market transactions. This policy combination can change relative prices in the same way as a tax on waste, but each tax or subsidy can be verified by invoices. Thus, the two-part instrument might better achieve both economic and administrative efficiency.

In the next sections, I clarify the theory behind this idea and provide a few examples. The following sections consider interactions with other taxes and the issue of scarcity rents.

#### Any Tax Can be Set to Zero

Taxpayers long have known that government can tax them both when they earn and again when they spend; most economists recognize that one such tax is redundant. Generally speaking, a tax that takes half of your gross paycheck is equal to a tax that doubles the price of everything you buy. As a consequence, for any system of tax rates on different commodities, any one tax can be set to zero. Revenue can be raised by a tax on all forms of income. Then all the desired relative prices of the different commodities can be achieved by a set of taxes and subsidies on goods other than the untaxed good.<sup>3</sup> One simple example is a political promise not to tax cigarettes, which can be circumvented by a tax on all income and a subsidy to all goods except cigarettes.

The best actual example of a two-part instrument is a deposit-refund system. A tax is first paid at the store on some item(s), and then returned if

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and when the item (or its container) is recycled. The result is a tax that remains on the good when it is not recycled. But this idea can be applied much more generally. Even the U.S. income tax operates on such a principle, using a withholding tax collected by employers that may exceed the tax due. If so, a refund is paid if and when the taxpayer files properly.

## Other Examples

Suppose that a government wants to tax all household waste disposal in order to reduce landfill costs and negative externalities (like truck noise, odor, and groundwater contamination). A tax per bag of garbage might be difficult to implement, administer, and enforce.<sup>4</sup> It also can induce illegal dumping. Under some conditions, however, the jurisdiction can: tax everything bought at the store, through a general sales tax; provide a partial subsidy to all regular garbage, through free curbside collection; and provide a higher subsidy to all recycling.<sup>5</sup> This combination leaves a partial tax on garbage, but it leaves the highest rate of tax on anything *not* put into regular garbage or recycling — that is, anything dumped illegally.<sup>6</sup>

Second, suppose policymakers want to tax some polluting emissions from a factory, and cannot measure those emissions through such devices as the “continuous emissions monitoring” (CEM) equipment used on large power plants. Ease of measurement and enforcement may vary for toxic or nontoxic emissions that are gaseous, liquid, or solid. (The emissions can be viewed as a necessary input to production with its own downward-sloping marginal product schedule, since additional emissions are successively less crucial to production.) The desired substitution in production from this “dirty” input to other “clean” inputs then can be achieved by a subsidy to all clean inputs. This subsidy tends to reduce

the equilibrium price of output, which might encourage more purchases of this good. That effect can be avoided by a simple excise tax on the output. The result is a two-part instrument. The tax on output is equivalent to a tax on all inputs at the same rate. This tax is refunded on clean inputs, leaving an implicit tax on the dirty input. Each tax and subsidy applies only to market transactions which have invoices to verify the tax base.

The idea of a two-part instrument is perhaps most important in a case where the emissions are difficult to measure and the tax is difficult to enforce. Therefore, a third example might be emissions from the millions of motor vehicles in this country that are owned by many individuals who might tamper with on-board devices or avoid remote sensing stations designed to measure the tax that each person owes. Even without tampering, measurement might be expensive. Preliminary findings indicate that all the desired incentive effects of an emissions tax can be achieved by the combination of a tax on each fuel and a subsidy at the appropriate rate on each abatement technology including methanol, compressed natural gas, or other alternative fuel vehicles.<sup>7</sup> Thus the measurement of emissions is unnecessary.

A fourth example involves the environment through common-property natural resources, such as water, that tend to be overused if not priced properly. Groundwater is hard to price explicitly, since a landowner can take as much as desired for free. Yet efficiency may require a price that covers the “scarcity rent” or any negative externality from depletion of the aquifer. The scarcity rent is the amount that others would be willing to pay for the water if they had the opportunity. An example of a negative externality is the reduction in springwater necessary for maintaining certain endangered species. If a

farmer uses groundwater for irrigation along with other inputs in production, then a two-part instrument could tax the agricultural output, and subsidize all of the inputs other than water.<sup>8</sup>

## When Government Needs Revenue

With no revenue constraint, or the availability of lump sum taxes, the “first-best” tax on a polluting input is equal to “marginal environmental damages.” The firm is then faced with the full social cost of using that input. The two-part instrument taxes output and subsidizes other inputs, all at rates based on the same concept, marginal environmental damages.<sup>9</sup>

Now, suppose that revenue must be raised using distorting taxes that affect labor supply and saving decisions. Perhaps the two-part instrument could help to raise revenue by imposing a higher tax and paying a lower subsidy. This suggestion is related to the “double dividend hypothesis,” that an environmental tax can help both to fix an environmental problem and to raise revenue for use in reducing other distorting taxes.<sup>10</sup> Some have inferred that this second-best pollution tax rate should exceed marginal environmental damages. Recent research finds the reverse, though: the pollution tax raises output prices and reduces the real net wage, so it distorts labor decisions as well as the consumption mix.<sup>11</sup>

What about the two-part instrument? Whatever the desired rate of tax on the dirty input, the same change in relative prices can be achieved by a tax on output that is returned on clean inputs. Thus the subsidy must match the tax. If second-best considerations reduce the desired-but-unenforceable tax on emissions, then they reduce both parts of the two-part instrument. Revenue considerations do not suggest raising the tax and reducing the subsidy.<sup>12</sup>

## Scarcity Rents

The point about revenue and the double-dividend hypothesis relates to my recent research with Gib Metcalf.<sup>13</sup> The double dividend literature has suggested that a revenue-raising instrument, for example a pollution tax, can provide higher welfare than a non-revenue-raising instrument, such as quotas, permits, or command-and-control (CAC) restrictions on emissions. All of these policies can provide the same environmental improvement, and all raise the cost of production, but only the tax generates revenue that can be used to reduce distorting taxes on labor.

For example, the Clean Air Act Amendments of 1990 restrict emissions by using permits that are handed out to firms. The requirement to use these valuable permits raises the cost of production, and thus lowers the real net wage, but the scarcity rent goes to permit recipients. We show that the double-dividend debate should focus not on whether an environmental policy raises revenue, but on whether it creates scarcity rents that are left in private hands. Only if government sells all permits (or has a 100 percent profits tax) can it capture the scarcity rent and use that revenue to offset the reduction in the real net wage by cutting the labor tax.

Regulators can impose different kinds of CAC restrictions. If they simply restrict emissions, then they create scarcity rents that must be covered by a higher price of output. In contrast, regulators can require a reduction in emissions *per unit* of output. If it applies equally to all firms, and does not limit entry, then this policy does not create scarcity rents. For small changes, this "technology restriction" has no first-order effect on the cost of production. It does have first-order effects on the environment, however. So this *non-revenue-raising* policy unambiguously improves welfare, just like the revenue-raising emissions tax.

To clarify further that raising revenue is not the crucial distinction, one can compare an environmental tax that raises revenue to an environmental subsidy that costs revenue. One might think that an environmental subsidy would provide less welfare, since it must be financed by raising other distorting taxes. Yet the environmental subsidy has exactly the same effects as the environmental tax! The tax on a dirty input raises the cost of production. This in turn raises the price level, and would reduce the real net wage except for the fact that the revenue can be used to cut the labor tax. Symmetrically, the subsidy to a clean input reduces the cost of production. This reduces the price level, and would raise the real net wage except for the fact that the subsidy needs to be financed by raising the labor tax. Either way the real net wage is unaffected, so labor supply distortions are unaffected.<sup>14</sup>

Fully specified, both of these policies are revenue-neutral. The two-part instrument (environmental subsidy financed by a higher labor tax) is equivalent to the emissions tax (with revenue used to lower the labor tax). The crucial distinction is not whether the environmental policy raises revenue, but whether it restricts the quantity of emissions in a way that creates a scarcity rent that is left in private hands, rather than captured by government and used to offset the effect of higher output prices.

<sup>1</sup> For a discussion of tax systems that optimize administrative costs as well as tax rates, see J. Slemrod, "Optimal Taxation and Optimal Tax Systems," *Journal of Economic Perspectives* 4, 1 (Winter 1990), pp. 157-78.

<sup>2</sup> The terminology of a "two-part instrument" first appears in D. Fullerton, "Environmental Levies and Distortionary Taxation: Comment," *American Economic Review* 87, 1 (March 1997), pp. 245-51.

<sup>3</sup> These arguments are formalized in D. Fullerton and A. Wolverton, "The Case for a Two-Part Instrument: Presumptive Tax and Environmental Subsidy," NBER Working Paper No. 5993, April 1997.

<sup>4</sup> A particular garbage pricing program is studied for a sample of households in D. Fullerton and T. Kinnaman, "Household Responses to Pricing Garbage by the Bag," *American Economic Review* 86, 4 (September 1996), pp. 971-84.

<sup>5</sup> D. Fullerton and T. Kinnaman, "Garbage, Recycling, and Illicit Burning or Dumping," NBER Reprint No. 2024, January 1996, and *Journal of Environmental Economics and Management* 29, 1 (July 1995), pp. 78-91.

<sup>6</sup> The equivalence is broken if the good is taxed upon purchase in one jurisdiction and recycled in a different jurisdiction without a matching policy. Thus the policy might need to be implemented by a state, rather than local government. Also, the subsidy need not be paid per item. A payment per ton can provide the recycling plant with incentives to obtain more materials from households. Finally, a related set of taxes and subsidies can encourage firms to design their products to use the right amount of packaging and degree of recyclability. See D. Fullerton and W. Wu, "Policies for Green Design," NBER Working Paper No. 5594, May 1996.

<sup>7</sup> D. Fullerton and S. West, "Two-Part Instruments for the Control of Vehicle Emissions: Derivation and Numerical Implementation," work in progress.

<sup>8</sup> D. Fullerton and M. Mathis, "Achieving Optimal Use of Water," work in progress.

<sup>9</sup> In a first-best model, without revenue constraints, explicit closed-form solutions for the necessary tax and subsidy rates are provided in D. Fullerton and A. Wolverton, "The Case for a Two-Part Instrument..."

<sup>10</sup> A review of this literature is provided by L. Goulder, "Environmental Taxation and the Double Dividend: A Reader's Guide," *International Tax and Public Finance* 2, 2 (August 1995), pp. 157-83.

<sup>11</sup> A. L. Bovenberg and R. A. de Mooij, "Environmental Levies and Distortionary Taxation," *American Economic Review* 84, 4 (September 1994), pp. 1085-9.

<sup>12</sup> D. Fullerton, "Environmental Levies and Distortionary Taxation: Comment," *American Economic Review* 87, 1 (March 1997), pp. 245-51.

<sup>13</sup> D. Fullerton and G. Metcalf, "Environmental Controls, Scarcity Rents, and Pre-Existing Distortions," NBER Working Paper No. 6091, July 1997.

<sup>14</sup> *Ibid.*

# Tax Policy and Investment

R. Glenn Hubbard\*

Much of my recent research has focused on determinants of business fixed investment and how tax policy affects investment decisions in both the short and the long run. This article briefly reviews my work in three areas of this research. First, I describe challenges in applying the economic intuition of the neoclassical family of models. Second, I summarize my work on complications raised by capital-market imperfections and lumpy investment projects. Finally, I explore the implications of recent empirical work for normative analysis of tax policy.

## Modeling Investment: Back to the Future

Policymakers in the United States and other industrial economies evidently believe that business fixed investment responds strongly to tax changes (given the frequency with which governments manipulate tax policy parameters). Hence it is disturbing that models emphasizing the net return to investing — the “neoclassical” family of dynamic models emphasizing the role of the user cost of capital, or  $Q$ , or estimating the Euler equation for the choice of the capital stock — are defeated by *ad hoc* models in forecasting “horse races,” and that structural variables frequently are found to be economically or statistically insignificant.

The problem is seen easily in aggregate data. Movements of aggregate

variables, including investment, over the business cycle are determined simultaneously; disentangling the marginal impact of a single forcing variable is difficult. For example, an exogenous increase in aggregate demand might lead firms to be more optimistic about their sales prospects and to purchase more investment goods; it also might be expected at least in the short run to lead to higher interest rates. If we examine the correlation between investment and the interest rate, we might even find that the sign is the opposite of that predicted by the neoclassical theory. While an instrumental variables procedure might allow us to overcome this simultaneity problem, the estimator is only as good as the instruments, and good instruments are in short supply. Microeconomic data, however, provide a rich additional source of variation; my own work has focused on tests using firm-level data.

Conventional empirical tests of neoclassical models assume convex costs of adjusting the capital stock and attempt to estimate a parameter related to marginal adjustment costs.<sup>1</sup> Jason Cummins, Kevin Hassett, and I note that conventional estimated coefficients on fundamental variables in firm-level panel data for the United States and other countries are very small, implying implausibly large marginal costs of adjustment.<sup>2</sup> Such estimates imply very small effects of permanent investment incentives on investment.

In my research, I have focused on two general explanations of the failure to estimate significant tax effects on investment: measurement error in fundamental variables and misspecification of costs of adjusting the capital stock.

A major problem in using investment models based on  $Q$  or the user

cost of capital to estimate effects of tax changes on investment is that measurement error in  $Q$  or the user cost of capital may bias downward the estimated coefficient. On a statistical level, Cummins, Hassett, and I estimate neoclassical models in firm-level data using first differences and longer differences (as opposed to the usual fixed-effects, within-group estimator) to address measurement error problems. We find lower adjustment costs and a greater response of investment to fundamentals.<sup>3</sup> In other work, I depart from the strategy of using proxies for marginal  $Q$  and rely on the firms's Euler equation to model the investment decision. Using Compustat data for the United States, Anil Kashyap, Toni Whited, and I could not reject the frictionless neoclassical model for most firms, and the estimated adjustment cost parameters are more reasonable than those found in estimates of  $Q$  models. Very similar results are reported for European manufacturing firms by Cummins, Trevor Harris, and Hassett and for investment in overseas subsidiaries of U.S. multinational corporations by Cummins and myself.<sup>4</sup>

Again, one reason the data may not appear to favor neoclassical models over accelerator models is a simultaneous equations problem. To the extent that data incorporate exogenous changes in both the real interest rate and the intercept of the investment function, aggregate demand shocks may dominate the hypothesized negative relationship between investment and the user cost of capital. In this case, the estimated coefficient on the user cost of capital (or  $Q$ ) will be “too small,” leading to adjustment costs that are “too large.” Such simultaneity increases apparent accelerator effects, because positive shifts of the investment function raise both investment

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and output. Conventional instrumental variables have not proved very helpful in addressing the simultaneity problem.

Cummins, Hassett, and I argue that major tax reforms offer periods in which there is exogenous cross-sectional variation in the user cost of capital or tax-adjusted  $Q$ . We demonstrate that major tax reforms also are associated with significant firm- and asset-level variation in key tax parameters (such as the effective rate of investment tax credit and the present value of depreciation allowances). Hence tax variables are likely to be good instruments for the user cost of  $Q$  during tax reforms. We estimate significantly greater responses of investment to the user cost of  $Q$  following U.S. tax reforms in 1962, 1971, 1981, and 1986 than in other periods; we also find significantly greater responsiveness of investment to fundamentals following tax reforms in 14 countries than that detected using firm-level panel data for those countries.<sup>5</sup>

### Complications: Capital-Market Imperfections and Lumpy Investment

Not all firms face the frictionless capital markets I described for the neoclassical models. Therefore tests may not be able to ascertain whether the observed sensitivity of investment to financial variables differs across firms and whether these differences in sensitivity explain the weak apparent relationship between the measured user cost (or  $Q$ ) and investment. My research in this area has integrated information and incentive problems in the investment process by moving beyond the assumption of representative firms by examining firm-level panel data in which firms can be grouped into high-net-worth and low-net-worth categories. For the latter category, changes in net worth

or internal funds affect investment, holding constant underlying investment opportunities (desired investment). Following my work with Steven Fazzori and Bruce Petersen,<sup>6</sup> many empirical researchers have placed firms into groups as *a priori* financially constrained or financially unconstrained.

Two aspects of the conclusions of this research are noteworthy in the context of measuring incentives to invest. First, numerous empirical studies have found that proxies for internal funds have explanatory power for investment, holding constant  $Q$ , the user cost, or accelerator variables.<sup>7</sup> This suggests that tax policy may have effects on investment by constrained firms beyond those predicted by neoclassical approaches. (Indeed, returning to the accelerator analogy, Ben Bernanke, Mark Gertler, and Simon Gilchrist argue that this literature describes a "financial accelerator."<sup>8</sup>) In particular, the quantity of internal funds available for investment is affected by the average tax on earnings from existing projects. In this sense, average as well as marginal tax rates faced by a firm can affect its investment decisions.<sup>9</sup>

Second, empirical studies by me and by others generally find that the frictionless neoclassical model is rejected only for the groups of firms that *a priori* are financially constrained.<sup>10</sup> Hence, while the shadow value of internal funds may not be well captured for some firms in standard representations of the neoclassical approach, the neoclassical model with convex adjustment costs yields reasonable estimates for most firms of the response of investment to fundamentals and to tax parameters.

The small estimated sensitivity of investment to fundamentals and tax variables in conventional empirical approaches led some researchers to suggest that adjustment costs may be nonconvex (one example being "irre-

versible" investment).<sup>11</sup> Hassett and I argue, however, that much of U.S. investment is in the form of capital goods with well-operating secondary markets.<sup>12</sup> Cummins, Hassett, and I also use firm-level data to investigate whether there was evidence of bunching of investment around tax reforms. We estimate transition probabilities among various ranges of investment rates over the year prior to, of, and after the tax reform and find no evidence that firms with large investment were likely to have lower investment in prior or subsequent years. Indeed, only a very tiny fraction of the sample was ever found to transit from high-investment to low-investment states.<sup>13</sup>

In part, the conclusions of such studies may differ because of differences in the level of aggregation. At a sufficiently fine level of disaggregation, all investment looks lumpy. The plant-level evidence suggests that investment appears lumpy, but the firm-level evidence does not corroborate this. However, there may be interesting differences between the investment behavior of plants and firms, as might be the case if, for example, managerial attention is limited and only a fraction of a firm's plants adjust their capital in a given year. Clearly, reconciling the plant-level and firm-level results is an important topic for future research.

### Rethinking Tax Policy

My research suggests that tax incentives for investment are important components of the net return to investing and that the short-term and long-term responses of investment to permanent tax incentives are large. The deeper policy question remains: Would permanent investment incentives to increase the stock of business fixed capital raise economic welfare?

A scenario under which investment incentives might have an especially large impact on the quantity of

investment without dissipation in the prices of investment goods is one in which firms' demand for capital is responsive to changes in the user cost of capital and in which capital goods are supplied perfectly elastically. While it is implausible that the supply function for most individual capital goods manufacturers is perfectly elastic, the effective supply of capital goods to a given domestic market might well be highly elastic in the long run if the world market for capital goods is open. Investment incentives would raise prices of capital goods in the short run if the supply of capital goods is highly inelastic.

Using data for the United States and ten other countries, Hassett and I find that local investment tax credits have a negligible effect on prices paid for capital goods — indeed, we find that the capital goods prices for most countries are very highly correlated and that the movements of these over time are consistent with the “law of one price.” In addition, using disaggregated data on asset-specific investment good prices and tax variables for the United States, we find that tax parameters have no effect on capital goods prices.<sup>14</sup> Taken together, these tests suggest that the effects of investment tax policy have not been muted in a significant way by upward-sloping supply schedules for capital goods.

While it is instructive to ask how effective investment incentives are at increasing the fixed capital stock, a still more important question remains: What is the social value of the increase in the fixed capital stock?

Hassett and I review comparisons of “golden rule” levels of the capital stock or net investment relative to output to their actual values over the period from 1980 to 1994. For benchmark parameter values, equipment investment and capital stocks are below their “golden rule levels” (assuming 1980–94 is sufficiently

long to characterize a steady state), while residential investment and the residential capital stock, which received significant tax subsidies over this time period, are near or above their golden rule levels.<sup>15</sup> Such findings suggest that, by raising the stock of equipment capital, investment incentives have positive social returns.

The finding of substantial short-term and long-term effects of the user cost of capital on business investment has applications for current policy debates. In particular, I have focused on the consequences of a reduction in inflation and a switch from an income tax to a broad-based consumption tax for user cost of capital and investment.

Many economists have argued that, under fairly general assumptions, a reduction in the rate of inflation provides a relatively costless stimulus to business fixed investment by reducing the user cost of capital. Darrel Cohen, Hassett, and I derive the effect of inflation on the user cost and investment under various assumptions about sources of financing and about the openness of capital markets. We estimate that, if the United States were a closed economy, a single-percentage point decline in inflation from its current level lowers the user cost by about 0.5 percentage points. The effect is smaller, but still economically significant, if one assumes that the United States is a price-taker on international debt markets.<sup>16</sup> All else being equal, this “tax cut” would, provide a stimulus to investment.

Under the income tax, the user cost of capital is influenced by the corporate tax rate, investment incentives, and the present value of depreciation allowances. Under a broad-based consumption tax, taxes do not distort business investment decisions. In addition, given current U.S. tax policy, the user cost is lower

under a consumption tax than under an income tax. Hassett and I estimate that, all else being equal, a move to a consumption tax would stimulate the demand for equipment investment significantly.<sup>17</sup>

Of course, other aggregate variables are also likely to change if such a large change to the tax code were adopted. For example, nominal interest rates and the supply of savings are likely to change. While it is difficult to say how large the net stimulus to investment would be, the consensus of the recent investment literature suggests that the partial equilibrium impact on investment may be quite large.

## New Directions

My current work on investment focuses on two areas: studying how managers choose “hurdle rates” in evaluating investment projects and examining links between plant-level and firm-level investment decisions. The study of “investment” offers a lens through which to learn more about organizational decisionmaking and links between “financial” and “real” decisions.

<sup>1</sup> See the review in K.A. Hassett and R. G. Hubbard, “Tax Policy and Investment,” NBER Working Paper No. 5683, July 1996.

<sup>2</sup> J.G. Cummins, K.A. Hassett, and R.G. Hubbard, “A Reconsideration of Investment Behavior Using Tax Reforms as National Experiments,” NBER Reprint No. 1946, February 1995, and Brookings Papers on Economic Activity (1994:2), pp. 1–74; and “Tax Reforms and Investment: A Cross-Country Comparison,” NBER Reprint No. 2102, December 1996, and Journal of Public Economics 62 (1996), pp. 237–73.

<sup>3</sup> J.G. Cummins, K.A. Hassett, and R.G. Hubbard, “A Reconsideration of Investment Behavior...”

<sup>4</sup> R.G. Hubbard, A.K. Kashyap, and T.M. Whited, “Internal Finance and Firm Investment,” NBER Reprint No. 2004, September 1995, and Journal of Money, Credit, and Banking 27 (August 1995),

pp. 683–701; J.G. Cummins, T.S. Harris, and K.A. Hassett, "Accounting Standards, Information Flows, and Firm Investment Behavior," and J.G. Cummins and R.G. Hubbard, "The Tax Sensitivity of Foreign Direct Investment: Evidence from Firm-Level Panel Data," in *The Effects of Taxation on Multinational Corporations*, M. Feldstein, J.R. Hines, and R.G. Hubbard, eds. Chicago: University of Chicago Press, 1995.

<sup>5</sup> J.G. Cummins, K.A. Hassett, and R.G. Hubbard, "A Reconsideration of Investment Behavior..." and "Tax Reforms and Investment..." and "Have Tax Reforms Affected Investment?", in *Tax Policy and the Economy*, Vol. 9, J.M. Poterba, ed. Cambridge: MIT Press, 1995. For an early emphasis on the importance of focusing on tax, rather than nontax, variation in the user cost of capital, see M. Feldstein and J. Flemming, "Tax Policy, Corporate Saving, and Investment Behavior in Britain," *Review of Economic Studies*, 38, October 1971.

<sup>6</sup> S.M. Fazzari, R.G. Hubbard, and B.C. Petersen, "Financing Constraints and Corporate Investment," *Brookings Paper on Economic Activity* (1988:1), pp. 141–95; C.W. Calomiris and R.G. Hubbard, "Internal Finance and Investment:

*Evidence from the Undistributed Profits Tax of 1937–1938*," *Journal of Business* 68 (October 1995), pp. 443–82; M. Gertler and R.G. Hubbard, "Financial Factors in Business Fluctuations," in *Financial Market Volatility: Causes and Consequences*, Federal Reserve Bank of Kansas City, 1988; R.G. Hubbard, "Introduction," in *Asymmetric Information, Corporate Finance, and Investment*, R.G. Hubbard, ed., Chicago: University of Chicago Press, 1990; R.G. Hubbard and A.K. Kashyap, "Internal Net Worth and the Investment Process: An Application to the U.S. Agriculture," *Journal of Political Economy* 100 (June 1992), pp. 506–34; and R.G. Hubbard, A.K. Kashyap, and T.M. Whited, op. cit.

<sup>7</sup> See the review of studies in R.G. Hubbard, "Capital-Market Imperfections and Investment," NBER Working Paper No. 5996, April 1997.

<sup>8</sup> B.S. Bernanke, M. Gertler, and S. Gilchrist, "The Financial Accelerator and the Flight to Quality," *Review of Economics and Statistics* 78 (February 1996), pp. 1–15.

<sup>9</sup> S.M. Fazzari, R.G. Hubbard, and B.C. Petersen, "Investment, Financing Decisions, and Tax Policy," *American Economic Review* 78 (May 1988), pp. 200–5.

<sup>10</sup> See the review and examination of studies in R.G. Hubbard, "Capital-Market Imperfections and Investments," *Journal of Economic Literature*, forthcoming, 1997.

<sup>11</sup> I explore this linkage between the literatures in R.G. Hubbard, "Investment Under Uncertainty: Keeping One's Options Open," *Journal of Economic Literature* 32 (December 1994), pp. 1816–31.

<sup>12</sup> K.A. Hassett and R.G. Hubbard, "Tax Policy and Investment," in *Fiscal Policy: Lessons from Economic Research*, A.J. Auerbach, ed. Cambridge: MIT Press, 1997.

<sup>13</sup> J.G. Cummins, K.A. Hassett, and R.G. Hubbard, "A Reconsideration of Investment Behavior..."

<sup>14</sup> K.A. Hassett and R.G. Hubbard, "The World Market for Capital Goods: Does Local Policy Affect Prices?," mimeo, Columbia University, 1996.

<sup>15</sup> K.A. Hassett and R.G. Hubbard, "Tax Policy and Investment..."

<sup>16</sup> D. Cohen, K.A. Hassett, and R.G. Hubbard, "Inflation and the User Cost of Capital: Does Inflation Still Matter?," mimeo, Columbia University, 1997.

<sup>17</sup> J.G. Cummins, K.A. Hassett, and R.G. Hubbard, "A Reconsideration of Investment Behavior..."

## Evaluating Age Discrimination Laws

David Neumark\*

The Age Discrimination in Employment Act (ADEA) was enacted by Congress in 1968 to "promote employment of older persons based on their ability rather than age; to prohibit arbitrary age discrimination in employment; to help employers and workers find ways of meeting problems arising from the impact of age on employment." Originally, the ADEA protected workers aged 40–65. Later amendments first prohibited mandatory retirement before the age of 70, and then outlawed it altogether. In recent years, age dis-

crimination has come to represent a significant proportion of the complaints filed with the Equal Employment Opportunity Commission. For example in 1990, just over 10,000 complaints of age discrimination were filed under the ADEA, compared with around 43,000 complaints filed under Title VII of the Civil Rights Act for alleged discrimination based on race or sex.

### Arguments For and Against Age Discrimination Laws

The fact that workers file age discrimination complaints under the ADEA does not, in and of itself, indicate that discrimination against older workers exists and should be addressed in the same manner as race and sex discrimination. There are

two reasons to be cautious regarding this interpretation. First, there is an absence of prima facie evidence of discrimination against older workers. If anything, older workers tend to fare better than younger workers. One of the most robust empirical facts in labor economics is the "age-earnings profile," which captures the increases in earnings that workers experience over most of their career. In addition, older workers tend to have higher non-labor income and lower unemployment rates than younger workers. This contrasts with evidence regarding race and sex differences in labor markets; while economists and others continue to debate the source of these differences, there is no question that the earnings of women and minorities are lower.

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Second, an influential model of the age-earnings profile seriously calls into question the virtue of age discrimination legislation, especially the prohibition of mandatory retirement. In this model (developed by Edward P. Lazear) employers, in order to elicit effort from workers, initially pay workers less than the value of their productivity in exchange for promises of future wages that will exceed the value of their productivity. Mandatory retirement ages are then necessary to induce high-wage workers to leave the firm eventually. In Lazear's model, these contracts are efficient from society's perspective, and workers find them desirable even though they include mandatory retirement. However, once workers reach the mandatory retirement age, they would prefer to continue working at their current wage, and the ADEA gives them the right to do so. This led Lazear to conclude that the ADEA's ban on mandatory retirement would generate efficiency losses.<sup>1</sup>

Thus, the wisdom of legislation that prohibits age discrimination rests on a few key questions. First, is there firmer evidence of discrimination against older workers, particularly in the period predating the ADEA and the growth in age discrimination complaints? Second, does Lazear's model provide the best explanation of the employment relationship, and of age-earnings profiles in particular? If it does, then legislation prohibiting age discrimination, including mandatory retirement, may do more harm than good. Alternatively, if other models better explain the age-earnings profile, such as the general human capital model in which the age-earnings profile reflects increases in productivity, then such legislation is less likely to have detrimental effects. Finally, even if Lazear's model does provide the best explanation of the age-earnings profile, might age discrimination legislation actually

strengthen such contracts, rather than weakening them? Much of my research over the past four years has addressed these questions.

## **Was There Age Discrimination?**

It is difficult to draw inferences regarding the existence of discrimination even for demographic groups that are relatively low paid, let alone for older workers who are not low paid on average. To attempt to assess whether age discrimination in the labor market was a serious problem in the period surrounding the development of the ADEA, Richard Johnson and I examine evidence from the 1960s and 1970s as reported by older workers.<sup>2</sup> We compare labor market outcomes for older workers who claim that they have experienced age discrimination on the job with outcomes for workers who do not report age discrimination. Self-reports of discrimination are clearly problematic, primarily because they may reflect negative outcomes that in fact are unrelated to discrimination. However, we are able to mitigate this problem by using other information to account for differences in these negative outcomes, including measures of job satisfaction. We also contrast the results for white men with those for black men, who may be more likely to attribute negative job outcomes to race discrimination. We find that about 3 percent of our sample of older male workers report age discrimination by their current employer in the form of demotions, layoffs, or failure to be promoted. A similar percentage report other forms of age discrimination in the workplace, such as difficulty getting hired. Moreover, workers who report age discrimination by their current employer are much more likely to leave that employer, thus facing substantial earnings losses. This evidence suggests that age discrimination in

the workplace may be (or may have been) a serious problem, at least for some workers, which provides some basis for age discrimination legislation.

## **Models of the Age-Earnings Profile**

I use information from a number of sources to test alternative models of the age-earnings profile. The central question in this research is how earnings and productivity rise over the life cycle. Perhaps the best way to study this question is with actual data on earnings and productivity. However, such data are difficult to come by, prompting other approaches as well. For example, Paul Taubman and I tested theoretical implications of the general human capital model that did not require productivity data.<sup>3</sup> This model predicts that although different workers will choose careers and investments resulting in flatter or steeper age-earnings profiles, in equilibrium (under some conditions) the present value of the profiles for similar workers will be equal. In contrast in the Lazear model, steeper age-earnings profiles are associated with higher productivity, and hence with higher present value of earnings. For a variety of specifications and assumptions, the evidence that we find is most consistent with the general human capital model.

However, in another study Johnson and I test an additional implication of the general human capital model: that at older ages, depreciation of human capital should outweigh new investment, and earnings should start to fall.<sup>4</sup> In contrast, the Lazear model does not necessarily predict this. Well-known estimates of age-earnings profiles from standard cross-sectional datasets yield evidence of declining earnings at older ages, consistent with this prediction. However, a more careful analysis of

longitudinal data, especially taking account of the interaction of workers' earnings and employment with the Social Security system, yields considerably weaker evidence of declining earnings. This may call into question a stylized fact that often is viewed as supporting the general human capital model.

An alternative approach to inferring whether earnings rise faster than productivity is to ask whether there appear to be gains to owners of firms from shedding older workers. If older workers are overpaid, and if they can be shed without loss of reputation that damages the ability of employers to enter into Lazear-type contracts in the future, then in fact there may be such gains. Researchers studying corporate takeovers have suggested that one of the motivations for hostile takeovers may be to recapture the higher wages paid to older workers.<sup>5</sup> Such takeovers enable firms to cut employment of older workers. Perhaps because takeover targets often are resold, or because the employment cuts occur under the burden of heavy debt, the effects on reputation may be small. In two studies, I explore the joint hypothesis that hostile takeovers target older workers' wages which exceed their productivity, and that these "extramarginal" wage payments exist.<sup>6</sup> In one of the studies — the one with superior data — I find that older workers are paid more than their marginal product, consistent with Lazear's model, and that hostile takeovers target these excess payments.

The most compelling evidence on the age-earnings profile may come from data that permit us to measure both earnings and productivity over the life cycle. Judith Hellerstein and I carried out one such study using data on Israeli manufacturing plants.<sup>7</sup> We combine standard data used to estimate production functions with information on labor costs and on the age structure of plants' workforces. This

enables us to estimate differentials in relative pay and productivity of older versus younger workers. Consistent with the general human capital model, we find, increases in earnings with age mirror increases in productivity. However, a related study with Hellerstein and Kenneth Troske, using data on manufacturing plants in the United States, reaches different conclusions.<sup>8</sup> In these data, using the same production function approach, we find that older workers are paid more than younger workers, but are quite a bit less productive, by perhaps 20 percent.

Unfortunately for those hoping for a definitive answer regarding the best model of the age-earnings profile, the evidence to date does not paint a consistent picture. Some evidence suggests that earnings rise with productivity, while other evidence suggests that workers indeed are underpaid when young and overpaid when old. Things can be even more complicated than this, as there are other explanations of rising age-earnings profiles. In particular, workers may prefer that their earnings rise over time because this serves as a forced-saving mechanisms. Workers can in this way enjoy higher consumption at older ages when they might otherwise have difficulty saving. In fact, I find that people who use forced-saving mechanisms — including overpayment of income taxes and receipt of a refund check, without interest, each spring — also are more likely to have steeper age-earnings profiles.<sup>9</sup>

Thus, the jury is still out. Some evidence supports the general human capital model's explanation of the rising age-earnings profile. If this model is largely correct, then it is difficult to see why age discrimination legislation would be harmful. Employers may sometimes dismiss or otherwise mistreat older workers because of discriminatory tastes, and the legislation might reduce this type of behav-

ior. At the same time, my research and that of others<sup>10</sup> finds some evidence in favor of Lazear's model of long-term incentive contracts, in which age discrimination legislation might be harmful.

## **The Effects of Age Discrimination Laws**

Even if Lazear's model best describes the age-earnings profile and the employment relationship, it is conceivable that by strengthening employment contracts, age discrimination laws increase efficiency. While age discrimination laws (including the prohibition of mandatory retirement) restrict employers from terminating employees involuntarily based on age, firms still may offer financial incentives to induce retirement at specific ages. In addition, mandatory retirement as it existed in the past may not have been a very important determinant of retirement age.<sup>11</sup> Further, by prohibiting age discrimination in layoffs, the ADEA may inhibit firms from opportunistically reneging on long-term implicit contracts with older workers. Thus, by providing a means for workers to enforce Lazear-type contracts, the ADEA may encourage workers to enter into them.

Wendy Stock and I currently are investigating these two competing views of age discrimination laws. We consider the effects of such legislation on the steepness of age-earnings profiles, a proxy for the use of Lazear contracts.<sup>12</sup> We can identify the effects of age discrimination laws from states that passed such legislation before the federal government did. We find that age discrimination laws lead to steeper age-earning profiles in the labor market. This is consistent with age discrimination laws strengthening the bonds between workers and firms, leading to greater use of Lazear contracts in labor markets, and hence possibly increasing

labor market efficiency.

Assessing evidence on labor market discrimination is difficult, because we rarely have information on all of the factors, including productivity, that affect earnings. Even among those who agree that there is discrimination, there are disagreements regarding the appropriate remedy. Because of the absence of prima facie evidence of worse labor market outcomes for older workers, and perhaps also because influential theoretical work in labor economics suggests that age discrimination laws may be detrimental, legislation prohibiting age discrimination may be viewed less sympathetically than laws prohibiting discrimination by race or sex.<sup>13</sup> However, there is evidence suggesting that age discrimination was and may remain a real problem in labor markets. Thus, even if age discrimination laws restrict one means by which employers may enter into efficient employment relationships with workers, the net effect of these laws may be beneficial.

<sup>1</sup> E. P. Lazear, "Why Is There Mandatory Retirement?" *Journal of Political Economy* Vol. 87, 1979, pp. 1261-84.

<sup>2</sup> R. W. Johnson and D. Neumark, "Self-Reported Age Discrimination, Job Separations, and Employment Status of Older Workers: Evidence from Self-Reports," NBER Working Paper No. 5619, June 1996.

<sup>3</sup> D. Neumark and P. Taubman, "Why Do Wage Profiles Slope Upwards? Tests of the General Human Capital Model," *Journal of Labor Economics*, Vol. 13, October 1995, pp. 736-61.

<sup>4</sup> R. W. Johnson and D. Neumark, "Wage Declines Among Older Men," *Review of Economics and Statistics*, Vol. 78, November 1996, pp. 740-8.

<sup>5</sup> A. Shleifer and L. H. Summers, "Breach of Trust in Hostile Takeovers," in *Corporate Takeovers: Causes and Consequences*, A. J. Auerbach, ed., Chicago: University of Chicago Press, (1988) pp. 33-56.

<sup>6</sup> J. Gokhale, E. L. Groshen, and D. Neumark, "Do Hostile Takeovers Reduce Extramarginal Wages? An Establishment-Level Analysis," *Review of Economics and Statistics*, Vol. 77, August 1995, pp. 470-85; D. Neumark and S. Sharpe, "Rents and Quasi-Rents in the Wage Structure: Evidence from Hostile Takeovers," *Industrial Relations*, Vol. 35, April

1996, pp. 145-79.

<sup>7</sup> J. K. Hellerstein and D. Neumark, "Are Age-Earnings Profiles Steeper Than Productivity Profiles? Evidence From Israeli Firm-Level Data," *Journal of Human Resources*, Vol. 30, Fall 1995, pp. 89-112.

<sup>8</sup> J. K. Hellerstein, D. Neumark, and K. Troske, "Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations," NBER Working Paper No. 5626, June 1996.

<sup>9</sup> D. Neumark, "Are Rising Wage Profiles a Forced-Savings Mechanism?" *Economic Journal*, Vol. 105, January 1995, pp. 95-106.

<sup>10</sup> For example, see L. Kotlikoff and J. Gokhale, "Estimating a Firm's Age-Productivity Profile Using the Present Value of Workers' Earnings," *Quarterly Journal of Economics*, Vol. 107, 1992, pp. 1215-42.

<sup>11</sup> R. V. Burkhauser and J. F. Quinn, "Is Mandatory Retirement Overrated? Evidence from the 1970s," *Journal of Human Resources*, Vol. 18, 1983, pp. 337-58.

<sup>12</sup> D. Neumark and W. A. Stock, "Age Discrimination Laws and Labor Market Efficiency," mimeograph, 1997.

<sup>13</sup> See, for example, L. Friedman, *Your Time Will Come*, New York, NY: Russell Sage Foundation, (1984).



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## NBER Profile: *Don Fullerton*

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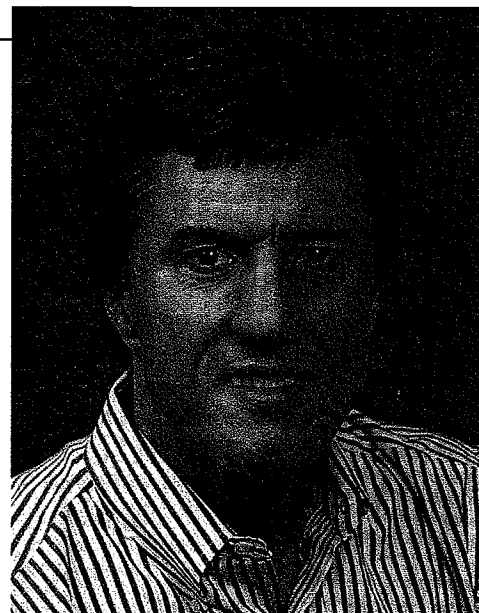
Don Fullerton is a Research Associate in the NBER's Program on Public Economics and a professor of economics at the University of Texas, Austin. He received his B.A. from Cornell University and his Ph.D. from the University of California, Berkeley. Prior to coming to "UT," Fullerton taught at Princeton, the University of Virginia, and Carnegie-Mellon University.

In addition to his teaching, Fullerton was a National Fellow at the Hoover Institution at Stanford University from 1983-4; he was Deputy Assistant Secretary of the Treasury for Tax Analysis from 1985-7, during the debate about the Tax Reform Act of 1986; and, he was an Olin Fellow at the NBER in 1988-9.

Fullerton, who has published numerous articles on taxation and

has a particular interest in environmental economics, is one of the editors of the *Journal of Environmental Economics and Management*. He also is the Director of the American Economic Association's Summer Minority Program: in this program, qualified minority undergraduates recommended by their professors receive a stipend and tuition for an 8-week preparatory session prior to enrolling in economics Ph.D. programs.

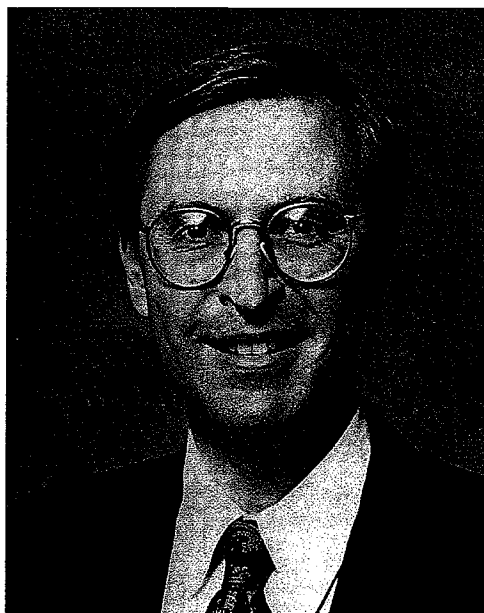
Fullerton's wife, Jo Worthy, holds a Ph.D. in education from the University of Virginia; has done post-doctoral work at the University of Pittsburgh; and is an assistant professor of education at the University of Texas. They have a son Jared, 15, and a daughter, Jenna, 9. In fact, Fullerton says "I used to have hobbies, but now I have kids..."



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## NBER Profile: *Glenn Hubbard*

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Hubbard teaches courses on public economics, corporate finance, and money and financial markets. His current research includes an examination of effects of tax policy on business decisionmaking, an economic analysis of Medicare, a project on how managers choose "hurdle rates," and a study on the saving and portfolio allocation decisions of the wealthy. He is the author of numerous professional publications (and a textbook, *Money, the Financial System, and the Economy*, 2nd ed.,

Addison, Wesley, 1997) and editor of five NBER volumes in corporate finance or taxation. In addition to his teaching and research, Hubbard has served as Deputy Assistant Secretary of the U.S. Treasury Department and as a policy consultant to the U.S. Department of the Treasury, Department of Energy, and Department of State, the Internal Revenue Service, the Federal Reserve Board, the Federal Reserve Bank of New York, the National Science Foundation, the U.S. House of Representatives' Ways and Means Committee, and the Senate Finance Committee.

When not on an airplane, Hubbard lives in Manhattan with his wife Constance and their son "Raph," 6. Hubbard enjoys restaurant hopping (participating), baseball (watching), trying to keep up with his son on computer skills, and attempting to nudge a major political party to the center.

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## NBER Profile: *Charles R. Hulten*

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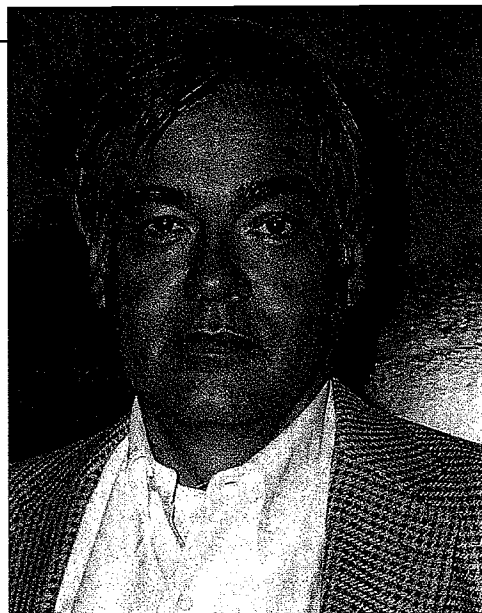
Charles R. Hulten is Professor of Economics at the University of Maryland, where he has taught since 1985, and a research associate in the NBER's Program on Productivity. Both his undergraduate and Ph.D. degrees are from the University of California, Berkeley. Since 1985, Hulten also has been Chairman of the NBER's Conference on Research in Income and Wealth (CRIW).

CRIW was formed in 1936 at the instigation of the University Committee of the NBER, representatives of eight government agencies, and six universities. Its first chair was Simon Kuznets; its first secretary was Milton Friedman. This cooperative venture has produced almost 60 published volumes: the series of *Studies in Income and Wealth*. CRIW now holds a conference every one to two

years to discuss issues of economic measurement; the proceedings are published by the NBER.

Before joining the University of Maryland faculty, Hulten was a Senior Research Associate at the Urban Institute (1978–85) and Assistant Professor of Economics at Johns Hopkins University (1971–8). He also has been a Visiting Professor of Economics at the European Institute of Business Administration; a Visiting Scholar at American Enterprise Institute; and a Visiting Research Scholar at the World Bank. He has combined a career of teaching and research in the areas of productivity analysis, economic growth and capital formation, and tax policy and the measurement of economic depreciation.

Hulten is married to Nancy P. Humphrey. His hobbies are "good

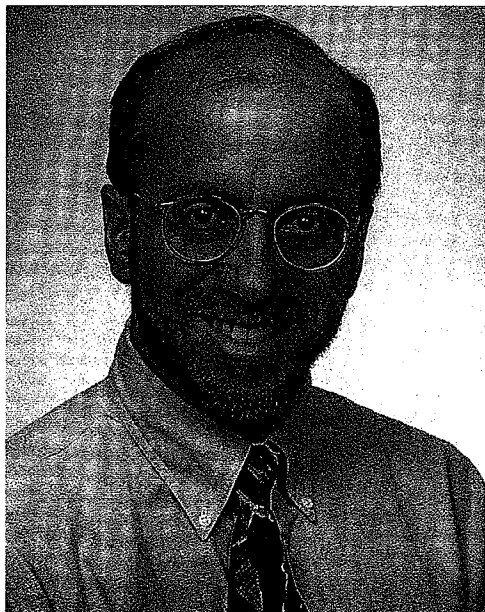


wine," fine art (viewing, not owning), travel, and watching the Oakland Raiders football team.

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## NBER Profile: *David Neumark*

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David Neumark is an NBER Research Associate in the Programs on Labor Studies and Aging and a professor of economics at Michigan State University. He received his B.A. from the University of Pennsylvania in 1982 and his Ph.D. in economics from Harvard University in 1987.

From 1987 to 1989, Neumark was an economist in the Division of Research and Statistics of the Federal Reserve Board of Governors. In 1989, he became an assistant professor at the University of Pennsylvania; in 1994, he moved to Michigan State University as a full professor. He currently holds a Special Emphasis Research Center Award from the National Institute on Aging.

Neumark was also an NBER Faculty Research Fellow from 1989–94, when he became an NBER Research Associate. His work in labor studies has been published in many professional journals and books.

Neumark and his wife, Donna, who is a nursing researcher at Michigan State about to begin work on her doctorate, have two children, ages 6 and 7. When he is not teaching his kids to "hit line drives, backhands, and the upper corner of the soccer goal," Neumark enjoys reading, camping, playing softball, and lifting weights.

## Conferences

### The Economic Analysis of Substance Use

The NBER recently sponsored a project on substance use and abuse, directed by Research Associates **Frank J. Chaloupka**, University of Illinois, Chicago; **Michael Grossman**, CUNY; and **Henry Saffer**, Kean College, and **Warren K. Bickel**, University of Vermont. The culmination of this project was a conference, held in Cambridge on March 27-8, which integrated the econometric and behavioral research produced by the economists and behavioral psychologists involved. The program for the two-day meeting was:

**Donald S. Kenkel**, Cornell University, and **Ping Wang**, Pennsylvania State University, "Are Alcoholics in Bad Jobs?"

**Kenneth Silverman** and **Elias Robles**, Johns Hopkins University, "Employment as a Drug Abuse Treatment Intervention: A Behavioral Economic Analysis." Discussants: **Sharon Hall**, University of California, San Francisco, and **John Mullahy**, NBER and University of Wisconsin, Madison.

**Robert Kaestner**, NBER and Baruch College, "Does Drug Use Cause Poverty?"

**Marilyn Carroll**, University of

Minnesota, "Income Alters the Relative Reinforcing Effects of Drug and Nondrug Reinforcers."

Discussants: **Steven Harsh**, Science Applications International, and **Christopher Ruhm**, Council of Economic Advisers.

**Robert L. Ohsfeldt** and **Elli Capilouto**, University of Alabama-Birmingham, and **Raymond G. Boyle**, Health Partners Group, Health Foundation, "Tobacco Taxes, Smoking Restrictions, and Tobacco Use."

**Warren K. Bickel** and **Gregory J. Madden**, University of Vermont, "The Behavioral Economics of Smoking."

Discussants: **Kenneth E. Warner**, University of Michigan, and **Neil Grunberg**, Uniformed Services University.

**Solomon W. Polachek** and **Norman Spear**, SUNY-Binghamton, and **Jerry Sarbaun**, Whitman College, "The Effects of Price Changes on the Consumption of Alcohol in Alcohol-Experienced Rais."

**Rudy E. Vuchinich** and **Gathie A. Simpson**, Auburn University, "Delayed Reward Discounting in Alcohol Abuse."

Discussants: **Michael Hilton**, National Institute on Alcohol Abuse and Alcoholism, and **Thomas Babor**, University of Connecticut.

**Frank J. Chaloupka**, **Michael Grossman**, and **John A. Tauras**, University of Illinois, Chicago, "The Demand for Cocaine and Marijuana by Youth."

**Stephen T. Higgins**, University of Vermont, "Some Potential Contributions of Reinforcement and Consumer Demand Theory to Reducing Cocaine Use."

Discussants: **Charles R. Schuster**, Wayne State University, and **Jonathan Caulkins**, Carnegie-Mellon University.

**Henry Saffer** and **Frank J. Chaloupka**, "Demographic Differentials in the demand for Alcohol and Illicit Drugs."

**Nancy M. Petry**, University of Connecticut, and **Warren K. Bickel**, "A Behavioral Economic Analysis of Polydrug Abuse in Heroin Addicts."

Discussants: **Mark Kleiman**, University of California, Los Angeles, and **A. Thomas McLellan**, University of Pennsylvania.

**Kenkel** and **Wang** show that, if they are employed, male alcoholics are less likely than nonalcoholic men to receive a variety of fringe benefits, and are more likely to be injured on the job, and to work for smaller firms. The value of the lost fringe benefits is about \$450 per alcoholic. Alcoholics are also more likely to be in blue-collar occupations, in which they earn an estimated 15 percent

less than their nonalcoholic peers.

**Silverman** and **Robles** seek to identify an effective employment-based treatment intervention for chronically unemployed methadone patients. They find that the utility of employment as a drug abuse treatment intervention depends, in large part, on the extent to which it is used to arrange substantial monetary reinforcement for abstinence from drugs,

and on the opportunity cost of drug use (that is, the cost in lost wages or jobs of continuing to use drugs). They conclude that employment could serve a valuable role in the treatment of hard-core drug abuse. They confirm, as has been shown in controlled clinical trials, that it is among the more effective drug abuse treatments currently in use.

**Kaestner** describes the relation-



ship between drug use and poverty and explores, in a preliminary fashion, the question of whether drug use causes poverty. Using a sample drawn from the National Household Survey of Drug Abuse and another from the National Longitudinal Survey of Youth, he concludes that drug use does cause greater poverty.

**Carroll** concludes that price and availability of nondrug alternatives are major determinants of drug intake. Changes in income dramatically alter preferences between drugs and alternatives; however, income has less of an effect on drug intake than on consumption of the alternatives. She concludes that the optimal formula for reducing/preventing drug intake would be low income, high drug price, and availability of inexpensive alternative nondrug reinforcers.

**Ohsfeldt, Boyle, and Capilouto** find that individuals living in areas with higher cigarette tax rates tend to be less likely to smoke cigarettes, while those living in areas with higher tax rates on snuff tend to be less likely to use snuff. Smoking restrictions generally are associated with reduced cigarette use, but some types of laws restricting smoking are associated with greater snuff use. Finally, higher cigarette tax rates are associated with greater snuff use, but higher snuff tax rates are not associated with greater cigarette use. This suggests the possibility that increases in cigarette excise tax rates may induce substitution into snuff, at least among some young male cigarette smokers.

Using the results of the behavioral economic studies they have conducted over the last eight years, **Bickel and Madden** find that economic principles and concepts are relevant and do pertain to individual smokers. Moreover, the demand curve obtained in their experiments has wide generality. They conclude

that these studies can inform policy-makers, because their laboratory model demonstrates economic principles and examines the potential consequences of using broad ranges of the independent variable beyond what is typical in the natural economy; and, their results tend to be consistent with overall U.S. demand.

**Sarbaum, Polachek, and Spear** run two experiments on rats that have been exposed to alcohol (ethanol). The first studies rats' responses to a 100 percent versus a 400 percent "increase in the price" of ethanol. In general, the rats respond only moderately to a 100 percent increase, but more dramatically to the 400 percent increase. In the second experiment, the rats respond to increased ethanol "prices" but not to the cue reflecting future price increases. In general, the results from the two experiments show that economic models of consumer choice are a useful tool for studying the consumption of ethanol. In addition, the experiments provide some evidence supporting habit formation, but not "rational addiction."

**Vuchinich and Simpson** find no difference between heavy and light social drinkers in their choices between a highly probable small amount of money and a less probable larger amount of money. Comparing heavy and problem drinkers versus light drinkers, they find a positive relation between temporal discounting and addiction: the heavier drinking is associated with money now, not later.

**Chaloupka, Grossman, and Tauras** find that youth demand for cocaine is sensitive to price. In addition, increased sanctions for the possession of cocaine and marijuana have a negative and statistically significant impact on youth cocaine and marijuana use. However, very large increases in the monetary fines which

can be imposed for first offense possession would be necessary to achieve meaningful reductions in use. Finally, sanctions for the sale, manufacture, or distribution of cocaine and marijuana have little impact on youth cocaine and marijuana use.

**Higgins** underscores the fundamental role of reinforcement in the genesis and maintenance of cocaine use, and illustrates how that knowledge in combination with consumer-demand theory might be translated into effective strategies for reducing cocaine use.

**Saffer and Chaloupka** show that compared to the total population, racial and ethnic minorities consume more cocaine, but less or equal amounts of alcohol, marijuana, and heroin. Also, there is a consistent pattern of negative own-price effects for alcohol and illicit drugs, and a complementarity between alcohol and illicit drugs. The own-price effects do not differ substantially among demographic groups. The pattern of complementarity between alcohol and illicit drugs suggests that alcohol taxes also reduce drug use.

**Bickel and Petry** simulate the purchase of drugs as their price, or individual income, varies. They find that the demand for heroin and cocaine is income elastic, with purchases rising in greater proportion than income. Marijuana, alcohol, and valium purchases do not vary significantly as a function of income. The drug choices in this simulation were correlated with drug use as determined by urinalysis testing. These results point up the utility of a behavioral economics approach for characterizing polydrug abuse.

A project report on substance abuse, including these papers and their discussion, will be published by the University of Chicago Press. The volume's availability will be announced in the *NBER Reporter*.

## Twelfth Annual Conference on Macroeconomics

The NBER's Twelfth Annual Conference on Macroeconomics was held in Cambridge on April 4 and 5. The conference organizers, Ben S. Bernanke of Princeton University and Julio J. Rotemberg of MIT, put together this program:

**Marvin Goodfriend**, Federal Reserve Bank of Richmond, and **Robert King**, NBER and University of Virginia, "The New Neoclassical Synthesis and the Role of Monetary Policy."

Discussants: Ellen McGrattan, Federal Reserve Bank of Minneapolis, and Olivier J. Blanchard, NBER and MIT.

**Julio J. Rotemberg** and **Michael Woodford**, NBER and Princeton University, "An Optimization-Based Econometric Framework for the Evaluation of Monetary Policy."

Discussants: Jeffrey Fuhrer, Federal Reserve Bank of Boston, and Bennett T. McCallum, NBER and Carnegie Mellon University.

**Peter Klenow** and **Andres Rodriguez**, University of Chicago, "The Neoclassical Revival in Growth Economics: Has it Gone Too Far?"

Discussants: Charles Jones, Stanford University, and N. Gregory Mankiw, NBER and Harvard University.

**Michael Gavin**, Inter-American Development Bank, and **Roberto Perotti**, Columbia University, "Fiscal Policy in Latin America."

Discussants: Torsten Persson and Aaron Tornell, NBER and Harvard University.

**Martin S. Feldstein**, NBER and Harvard University, and **Andrew**

**Samwick**, NBER and Dartmouth College, "The Economics of Profunding Social Security and Medicare Benefits."

Discussants: Rao Aiyagari, Federal Reserve Bank of Minneapolis, and Laurence Kotlikoff, NBER and Boston University.

**Christopher Carroll**, NBER and Johns Hopkins University, and **Wendy Dunn**, Johns Hopkins University, "Unemployment Expectations, Jumping G's, Triggers, and Household Balance Sheets."

Discussants: Simon Gilchrist, Boston University, and Angus Deaton, NBER and Princeton University.

The Neoclassical Synthesis of the 1960s was based on three sometimes conflicting principles of macroeconomics: that practical policy advice was an essential end; that short-run price stickiness was central to economic fluctuations; and that models should be based on optimization. Macroeconomics now is moving toward a New Neoclassical Synthesis, which **Goodfriend** and **King** describe. They find that the New Neoclassical Synthesis rationalizes an activist monetary policy: a simple system of inflation targets. Under this neutral monetary policy, real quantities evolve as suggested in the literature on real business cycles. The authors use the new synthesis to address several issues that must be resolved in order to make this inflation targeting regime practical, including: the response to oil shocks; the choice of price index; the design of a mandate; and the required structure of variations in short-term nom-

inal interest rates when these are the monetary authority's instrument.

**Rotemberg** and **Woodford** consider a simple model of output, interest rate, and inflation determination in the United States, and use it to evaluate alternative rules by which the Fed may set interest rates. The model is derived from optimizing behavior under rational expectations, both on the part of the purchasers of goods (who choose quantities to purchase given the expected path of real interest rates) and on the part of the sellers of goods (who set prices on the basis of the expected evolution of demand). The authors find that the monetary policy rule that most reduces the variability of inflation (and is best on this account) requires highly variable interest rates, which in turn is possible only in the case of a high average inflation rate. But even a policy that minimizes the expected losses that are attributable to fluctuations subject to the con-

straint that interest rates be no more variable than under current policy would cause inflation to be stabilized considerably more and output to be stabilized considerably less than under the authors' estimates of current policy.

Using evidence on the variation in, and the returns to, schooling and experience across countries, **Klenow** and **Rodriguez** find that productivity differences are the dominant source of the large international dispersion in levels and growth rates of output per worker. Thus, although models that focus on physical and human capital accumulation are clearly important, research needs to be refocused toward explaining the causes of productivity differentials.

**Gavin** and **Perotti** study a dataset they constructed on fiscal policy in Latin America. They show that the movements in fiscal policy in the region differ significantly from those in industrialized countries. In partic-



ular, both government expenditure and taxes are significantly more procyclical — so that they rise together with the level of output — in Latin America. They also study the connection between fiscal policy and exchange rate regimes. They find no evidence that fixed exchange rate regimes impose more fiscal discipline, and some evidence that the reverse is true. Moreover, fiscal expansions in Latin America have been associated with subsequent exchange rate collapses.

**Feldstein and Samwick** study the economics of prefunding Social Security and Medicare benefits by increased savings in individual accounts. Because of the aging population, maintaining the existing relation of benefits to past earnings would require raising the current 12 percent payroll tax to 19 percent by

the year 2030 if the current pay-as-you-go (PAYGO) system continues. In contrast, a funded system can deliver the same benefits with mandatory saving of less than 3 percent of payroll. The transition to this fully funded system could begin with a 2-percent-of-payroll rise in the combined value of the PAYGO tax and the mandatory saving that subsequently declines gradually, reaching the existing tax rate in 19 years and then falling sharply to less than 3 percent. The study examines the favorable impact on the capital stock and real disposable wage income, and discusses issues of risk and income distribution.

**Carroll and Dunn** attempt to make sense of the relationship between household balance sheets and consumer purchases. They find that the level of uncertainty about labor

income, as measured by consumer's unemployment expectations, is correlated with all measures of consumer spending. Finally, they show that a runup in debt similar to that experienced in the late 1980s can make consumption more sensitive to the uncertainty of labor income. This provides a formal underpinning for the view that the buildup of debt in the 1980s may have played an important role in explaining the weakness of consumption in the last recession.

As in previous years, the papers and discussions presented at this conference will be published in a volume of the same title by the MIT Press. It is typically available in the fall; publication information will appear in a future issue of the *NBER Reporter*.

## The Economics of Aging

The NBER's Program on Aging held its biannual conference, organized by Program Director David A. Wise of Harvard University, in late April this year. As in previous years, the papers and discussions referred to in this article will be published by the University of Chicago Press in an NBER conference volume. Its availability will be announced in a later issue of the *NBER Reporter*. The program for this conference was:

**James M. Poterba**, NBER and MIT; **Steven D. Venti**, NBER and Dartmouth College; and **David A. Wise**, "Implications of Using Personal Retirement Saving

**Ronald Lee**, University of California, Berkeley; and **Shripad Tuljapourkar**, Mountain View Research, "Stochastic Forecasts for Social Security

Discussant for both papers: **Sylvester Schieber**, Watson Wyatt & Company

**John B. Shoven**, NBER and Stanford University; and **David A. Wise**, "The Taxation of Pensions: A Shelter Can Become a Trap," (NBER Working Paper No. 5815)

Discussant: **Alan J. Auerbach**, NBER and University of California, Berkeley

Background Paper: **Poterba, Venti**, and **Wise**, "Personal Retirement Saving Programs and Asset Accumulation: Reconciling the Evidence" (NBER Working Paper No. 5599)

Discussion of behavioral notions of saving: **David Laibson**, NBER and Harvard University

**Angus S. Deaton** and **Christina Paxson**, NBER and Princeton University, "Health, Income, and

Inequality over the Life Cycle

**David M. Cutler**, NBER and Harvard University; and **Ellen McEura**, Harvard University, "The Medical Cost of the Young and Old: a Forty-Year Perspective"

Discussant for both papers: **David Meltzer**, NBER and University of Chicago

**Alan Garber**, **Mark B. McClellan**, and **Thomas Macurdy**, NBER and Stanford University, "Medicare Expenditures at the End of Life"

Discussant: **David M. Cutler**; **Matthew J. Eichner**, MIT, "The Impact of Interfamily Correlations on the Viability of Catastrophic Insurance"

Discussant: **Thomas Kane**, NBER and Harvard University

(Continued on next page)

**Michael D. Hurd**, NBER and Rand Corporation; **Daniel L. McFadden**, NBER and University of California, Berkeley; and **Hanish Chand, Eli Gan, Angela Merrill, and Michael Roberts**, all of University of California, Berkeley. "Consumption and Savings Balances of the Elderly: Experimental Evidence

on Survey Response Bias." Discussant: **James Smith**, Rand Corporation.

**Kathleen M. McGarry**, NBER and University of California, Los Angeles; and **Andrew Davenport**, University of California, Los Angeles. "Pensions and the Distribution of Wealth."

Discussant: **Robert Willis**, University of Michigan.

**Mark B. McClellan**, "Health Events, Health Insurance, and Labor Supply: Evidence from the Health and Retirement Survey." Discussant: **Michael D. Hurd**.

Retirement saving accounts, particularly employer-provided 401(k) plans, have expanded rapidly in the last decade. More than 50 percent of workers are currently eligible for these plans, and over 70 percent of eligibles participate in these plans. The substantial and ongoing accumulation of assets in these plans has the potential to significantly alter the financial preparations for retirement by future retirees. **Poterba, Venti, and Wise** use data on current age-specific patterns of 401(k) participation, in conjunction with Social Security earnings records that provide detailed information on age-earnings profiles over the lifetime, to project the 401(k) balances of future retirees. The results, which are illustrated by reference to individuals who were 27 and 37 in 1996, demonstrate the growing importance of 401(k) saving. The projected mean 401(k) balance at retirement for a current 37-year old is \$91,600 (in 1992 dollars), assuming that the 401(k) plan assets are invested half in stocks and half in bonds. For a current 27-year old, the projected balance is \$125,500. These results support the growing importance of personal saving through retirement saving accounts in contributing to financial well-being in old age.

**Lee and Tuljapourkar** develop forecasts of the Social Security reserve fund, payroll tax rates, and other quantities of interest. They also model the real rate of interest on government securities, and a mea-

sure of the rate of labor productivity growth, purged of demographic effects. They compare their results to Social Security projections, assess the level and relative importance of various sources of error, present probability distributions for balanced budget payroll tax rates up to the year 2070, and provide distributions of the actuarial balance. (This was a work in progress, and all results were preliminary at the time of the conference.)

**Shoven and Wise** show that pension distributions can face marginal tax rates as high as 61.5 percent; pension assets passing through an estate can face virtually confiscatory marginal tax rates between 92 and 99 percent. This is not limited to the rich; in fact, people of modest incomes who participate in a pension plan over a long career may face such rates.

The background paper by **Poterba, Venti, and Wise** summarizes their research on the effect of IRA and 401(k) contributions on net personal saving. They conclude that contributions to both IRA and 401(k) plans largely represent new saving.

**Deaton and Paxson** use the National Health Interview Survey from 1983 to 1994 to examine patterns of inequality over the life cycle for two health-related indicators: self-reported health status (SRHS) and body-mass index (BMI). As with economic measures, these health measures become more widely dispersed with age. The rate of dispersion with age of BMI,

but not SRHS, is more rapid for women than for men. BMI and SRHS are more variable among young women than among young men, possibly reflecting pregnancy. Health status rises with income: the correlation is lowest for the young, increases until age 50 to 60, and then diminishes. BMI is not correlated with income for men, but is negatively correlated with income among women; the correlation is highest in middle age. Blacks consistently report lower health status than do whites; some fraction of this difference can be attributed to the lower incomes of blacks. Less of the difference is explained by income among women than among men, an effect that is even more pronounced for BMI.

Why has medical care become so expensive over time, and what has been its value to society? **Cutler and Meara** use surveys of individual annual spending on all medical services to begin to address these questions. They show that from 1953 to 1987, medical spending increased disproportionately for infants (those under a year old) and the elderly (those 65 and older). Much of the spending growth for these groups was related to treatment of premature infants and of elderly with circulatory disorders or cancer. Based on aggregate data, the gains in "health outcomes" are greatest where spending growth has been most concentrated, Cutler and Meara find.

**Garber** and his coauthors analyze claims for a random sample of all

elderly Medicare beneficiaries who died during 1986–90. They find that the “excess” Medicare costs for decedents tend to diminish with advancing age. A very small number of decedents have no Medicare claims in the year before death. For the most part, the conditions diagnosed in Medicare decedents are common and not necessarily fatal.

Major risk insurance, like any other coverage, is supposed to protect against large losses. But if expenditures are correlated within families, then the consequences of having large deductibles might be more serious than an analysis of individuals’ expenditures would suggest. **Eichner** evaluates the consequences of such correlations under a major risk insurance scheme. He shows that in the ranges relevant to a consideration of catastrophic health coverage, interfamily correlation in expenditures has relatively minor consequences.

“Anchoring” is a psychological response to information disclosed in the course of a subject’s being asked about some quantity. In a wide variety of situations, the information (or “anchor”) changes the subjects’ responses systematically, shifting them toward the anchor. The magnitude of this effect depends on the amount of uncertainty that respondents have about the topic. **Hurd** and his coauthors study the effects of anchoring on reports of consumption and savings accounts. They find the effects to be about what psychologists

would predict: the distributions shift toward the anchor; anchoring is quantitatively important; and the magnitude seems to vary with expectations about respondent uncertainty. The elasticity of the estimated median of the distribution of consumption is about 20 percent, and about 10 percent for savings accounts, with respect to the anchor. The authors conclude that anchoring may be a quantitative estimate of the amount of uncertainty in a population.

**McGarry** and **Davenport** focus on one source of financial support for the elderly, pensions. Using data from the Health and Retirement Survey, they analyze the distribution of pension wealth paying particular attention to differences in pension wealth by sex and race. They find that men are approximately 50 percent more likely to have pensions than are women. More surprisingly, even conditional on having a pension, men have twice as much average pension wealth as women: married men have average pension wealth of \$140,300 and married women just \$72,000. Differences by race are less strong than differences by sex, but still large. Finally, the financial inequality between single men and single women is increased with the addition to net worth (non-Social Security, non-pension wealth) of pension wealth, while the difference between whites and nonwhite is lessened.

**McClellan** considers the consequences of various illnesses and acci-

dents for labor supply and health insurance coverage of three groups of older Americans: males and females within couples, and single females. He finds that these health problems are more prevalent in individuals with lower education, incomes, and wealth, and in individuals with other prior health conditions. These relationships persist after **McClellan** adjusts his sample for age. Major “health events” have particularly large effects on retirement decisions, and these effects go well beyond the consequences of the events for functional status. The occurrence of chronic health problems has a milder, although significant, effect on rates of exit of the labor force beyond the association with declining function alone. In contrast, accidents are not associated with additional departures from the labor force. Health events also have substantial effects on health insurance coverage, especially for males. They are associated with small increases in the probability of having health insurance, despite the fact that they tend to lead to reductions in private insurance coverage, particularly for males and for individuals without retiree insurance coverage. These reductions in private insurance coverage are offset by increased coverage through government insurance programs, primarily Medicare, as a result of qualification through the Disability Insurance system.

