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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."¹ 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,² have tended to doubt the validity of this approach, Paul R. Krugman recently has argued that it is valid under some circumstances.³ 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.⁴

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.⁵ 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.⁶

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.⁷ 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.⁸

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.⁹ 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.¹⁰ 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.¹¹

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.¹² An alternative view of outsourcing focuses on just the activities of multinational firms, as Matthew Slaughter, and Lael Brainard and David Riker do.¹³ 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.¹⁴ 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.¹⁵ Kiminori Matsuyama demonstrates a similar pattern of agglomeration and uneven incomes across countries.¹⁶ 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.¹⁷ 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.¹⁸ 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.¹⁹ 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.²⁰ 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.²¹ 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.²² 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.²³ 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.²⁴ At a theoretical level, Joshua Aizenman and Nancy Marion have further examined the impact on a country's investment of uncertainty due to openness.²⁵

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.²⁶ 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.²⁷

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.²⁸ 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.²⁹ Barbara Spencer examines a model where the government allocates quota licenses in a non-uniform fashion to firms that are otherwise identical.³⁰ 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.³¹ Rauch explores how social capital — measured by networks of individuals — can influence trade patterns.³² 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.³³ 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 Wei³⁴ has found that an OECD country purchases about two and one-half times as much from itself as from an otherwise identical foreign country; Helliwell³⁵ 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 Rogers³⁶ 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.³⁷ 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.³⁸

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,³⁹ 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.⁴⁰ 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.⁴¹ 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.⁴² Krishna and Jiandong Ju further investigate the effects of a free trade area that does not use rules of origin.⁴³

Alessandra Casella also examines regional trade blocs, and argues that the gains from enlarging the bloc are received disproportionately by the small countries.⁴⁴ 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.⁴⁵ Magnus Blomstrom and Ari Kokko consider the impact of regional integration on direct investment flows.⁴⁶

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.⁴⁷ Their models allows 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.⁴⁸ 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.⁴⁹ 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.⁵⁰ 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.⁵¹ 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 1930.⁵² 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.⁵³

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.⁵⁴ 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.⁵⁵ 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.⁵⁶ 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.⁵⁷ 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.⁵⁸ 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.⁵⁹ 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,⁶⁰ Atish Ghosh, and Holger Wolf.⁶¹ 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.⁶² 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.⁶³ 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.⁶⁴ 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 Hansen⁶⁵ 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.⁶⁶ 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.⁶⁷

The possibility of losses for one country also arises in the model of trade and the environment that Brian Copeland and Scott Taylor consider.⁶⁸ 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.⁶⁹ Markusen also has examined the impact of locational choice on pollution levels.⁷⁰ 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 1996.⁷¹

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.

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

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

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

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

⁶ 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.

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

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

⁹ 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.

¹⁰ 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.

¹¹ 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.

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

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Research Summaries

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.¹

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.² 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.³ 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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