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*Suggested Citation:* Hanson, Gordon H. (2001) : The globalization of production, NBER Reporter Online, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. Spring 2001, pp. 12-15

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# The Globalization of Production

Gordon H. Hanson\*

Globalization is transforming the ways in which nations interact. National economies become integrated as the flow of goods and capital across borders expands. In standard theoretical models, a fall in trade barriers or transport cost triggers an increase in trade between producers in one country and consumers in another country. Part of what globalization entails is greater international trade in final goods, but that is by no means the whole story. In the current environment, firms are more able to fragment their operations internationally, locating each stage of production in the country where it can be done at the least cost, and transmitting ideas for new products and new ways of making products around the globe.

My research examines how these new aspects of globalization affect labor markets, industry structure, and industry location in national and regional economies. When U.S. firms fragment production internationally, they typically move less skill-intensive activities abroad and keep more skill-intensive activities at home. Foreign outsourcing of this type can change the demand for skilled and unskilled labor and alter the structure of wages both at home and abroad. In addition, when outsourcing occurs between neighboring countries, such as the United States and Mexico or Hong Kong and China, the globalization of production raises the incentive to produce in regions with relatively low-cost access to for-

eign markets. Thus, it may alter the location of economic activity inside countries.

## International Trade, Foreign Outsourcing, and Wage Inequality

Globalization has attracted a great deal of academic attention in part because it has coincided with dramatic changes in the structure of wages in advanced countries.<sup>1</sup> Since the late 1970s, the real wages of more-skilled workers in the United States have risen steadily, while those of less-skilled workers have stagnated or even fallen.<sup>2</sup> More trade with low-wage countries is one possible factor behind rising wage inequality. What complicates identifying the impact of trade on wages is that other profound shocks to labor markets have occurred at the same time. The advent of information technology, for instance, appears to have increased the demand for skilled labor and allowed firms to eliminate many jobs performed by the less skilled.<sup>3</sup> In the absence of clear evidence linking trade and wages, many have attributed the rise in the skilled wage gap to technological change.

Naturally, we would like to have an empirical framework that allows us to estimate the impact of trade and technology shocks on labor demand and wages at the same time. This is particularly important where international trade takes the form of foreign outsourcing, since moving less-skill intensive production activities abroad makes production at home more skill-intensive. This may be observationally equivalent to changes in technology that are biased in favor of skilled labor. A large fraction of the growth in world

trade since the 1970s has taken the form of trade in intermediate inputs, in general, and foreign outsourcing, in particular.<sup>4</sup> To cite some well-known examples, Nike outsources production of its footwear to firms in Asia, and Dell outsources production of the components and peripheral devices that make up its personal computers to suppliers around the world.

One surprising consequence of foreign outsourcing is that it can increase the demand for skilled labor both at home and abroad. Suppose firms in the skill-abundant United States use firms in non-skill-abundant Mexico to produce intermediate inputs.<sup>5</sup> We imagine that production involves many stages, such as design, parts production, and assembly, each of which differs in terms of how much skilled labor is required. Assuming wages differ between the two nations, we expect the United States to specialize in high-skill tasks and Mexico to specialize in low-skill tasks. If U.S. firms outsource production to Mexico, they will choose to move the least skill-intensive activities that they perform. By moving low-skill activities to Mexico, the average skill intensity of production rises in the United States. The same also happens in Mexico, since Mexico initially specializes in low-skill tasks. Outsourcing from more skill-abundant to less skill-abundant countries then raises the relative demand and the relative earnings of skilled workers in both, contributing to a global increase in wage inequality.

The impact of foreign outsourcing on the relative demand for skilled labor appears to be quantitatively important in both the United States and Mexico. For the 1980s, when wage inequality rose in both coun-

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tries, foreign outsourcing accounts for 15 to 20 percent of the increase in the relative demand for skilled labor in U.S. manufacturing industries and 45 percent of the increase in the relative demand for skilled labor in Mexican manufacturing industries.<sup>6</sup>

The main question of interest is what is the relative contribution of trade and technological change to rising wage inequality in the United States and elsewhere. To answer this question, we need a measure of technological change. One approach is to capture changes in technology by the upgrades that firms apply to their production processes, through investments in computers, communications equipment, and other high-tech capital. For the United States, foreign outsourcing and technological upgrading may affect wages directly by shifting production away from unskilled workers and towards skilled workers, thus raising the relative demand for skilled labor, and indirectly by changing the relative prices of goods that use less-skilled labor intensively, thus changing the relative demand for skilled labor.

By modeling how trade and technological upgrading affect product prices and technology, we can explain their direct and indirect effects on wages. Using this approach, we find that for U.S. manufacturing industries during the 1980s, foreign outsourcing accounts for 15 percent of the observed rise in the skilled-unskilled wage gap and that technological upgrading accounts for 35 percent of this rise.<sup>7</sup> For the United States, then, it appears that both trade and technological change have influenced wages, with the latter having the larger effect.

## **Globalization and the Location of Economic Activity**

Until recently, most research in international economics ignored the

location of economic activity inside countries. In fact, the majority of industrial firms are located in cities and produce goods for urban consumers. In many industrializing countries, such as Argentina, Mexico, and Thailand, most industrial production occurs in a single region or city. Beginning in the early 1990s, theoretical work in international trade began to incorporate geography into trade models.<sup>8</sup> Some of my recent research involves testing these theories empirically.

Understanding the link between trade, industrialization, and geographic concentration is important because globalization and the spread of digital technologies hold the potential to dramatically alter where people live and work. If lower communication costs free individuals from having to work in cities, then advanced countries could de-urbanize. Further, if globalization continues to change national patterns of industrial specialization, it could also reorient the location of economic activity inside countries.

Recent theory is based on the idea that geographic concentration results from a combination of increasing returns to scale in production and transport costs (broadly defined to include all costs of doing business in different locations). Increasing returns to scale imply that larger firms are more efficient than smaller firms, creating an incentive to concentrate production in a few plants. Transport costs imply that firms prefer to locate near large consumer markets. The interaction of these two forces creates an incentive for industrial firms to locate together, which contributes to the formation of cities.

However, empirical work on why industrial firms tend to cluster geographically has been plagued by problems of identifying the underlying causes of industry location: how can we tell whether the existence of New York City is attributable to

increasing returns to scale in production or to the fact that there happens to be a natural port where the Hudson River meets the Atlantic Ocean? Both factors may be at work, which makes it difficult to distinguish the effects of increasing returns on industry location from those of region-specific characteristics, such as climate and access to coastal waterways.<sup>9</sup>

To identify factors that contribute to the geographic concentration of industry, we can use changes in trade policy as a natural experiment. Consider the recent liberalization of trade in Mexico. In 1985, after a 40-year experiment with protectionist trade policies, Mexico suddenly eliminated most trade barriers. According to recent theory, trade reform in Mexico will lead to two changes in the economy. First, positive transport costs imply that firms will relocate towards regions that have good access to world markets. Given its position in North America, the world market for Mexico is mainly the United States. Second, as industry relocates, not all regions with access to foreign markets will benefit. Since firms desire to be near large concentrations of other firms, some low transport-cost regions will grow but others will not.

Following trade reform in Mexico, employment has dramatically relocated from the interior of the country to regions on the Mexico-U.S. border.<sup>10</sup> During Mexico's period as a closed economy, Mexico City was the dominant industrial region in the country. After trade liberalization, Mexico City's position as the country's industrial heartland has diminished, while Mexican states on the U.S. border have experienced rapid economic growth, and new industry centers have formed along the border. Regional industries in Mexico have grown faster where they have access to buyers and suppliers in related industries.<sup>11</sup> This suggests that

as Mexico adjusts to trade reform, it is shifting from an economy based on a single diversified industry center in Mexico City to one based on a number of broadly specialized industry centers in northern Mexico.

Trade reform in Mexico also has implications for the location of economic activity in the United States. During the 1980s and 1990s, employment growth in U.S. border cities was higher where export production in the neighboring Mexican border city was also higher.<sup>12</sup> This suggests that the expansion of export production in Mexico raises the demand for goods made in nearby U.S. locations. In other words, trade between the United States and Mexico contributes to the relocation of industry inside the United States towards the border. The debate surrounding the North American Free Trade Agreement (NAFTA) failed to address the implications of free trade for the intra-national location of economic activity. These results imply that NAFTA will contribute to the expansion of the U.S. Southwest relative to the rest of the nation.

Trade liberalization also affects the organization of industries. Consider the case of apparel production in Mexico. Under the closed economy, the Mexican apparel industry was organized around regional production networks.<sup>13</sup> Firms in Mexico City specialized in high-skill tasks, such as design and marketing, while firms in outlying areas specialized in the low-skill task of assembling apparel items. This specialization pattern reflected regional-wage differences in Mexico. Wages were high in Mexico City, where skilled labor was in abundance and firms had good access to information about the national market, and wages were low in outlying regions, where less-skilled labor was in abundance and firms had relatively poor access to information about market conditions. After trade reform in Mexico,

regional production networks have been recreated on a global scale.<sup>14</sup> The size of the market and the abundance of skilled labor in the United States make U.S. firms relatively efficient in product design and marketing. Apparel assembly firms in outlying regions of Mexico have severed their ties to Mexico City and now rely on U.S. firms for design and marketing services. This shift caused the apparel industry in Mexico City to contract and led to an expansion in apparel assembly in outlying locations, particularly those on the Mexico-U.S. border.

### Future Directions

Global production networks are certainly not confined to North America. While U.S. outsourcing to Mexico began in earnest in the 1980s, foreign outsourcing in Asia has been active for more than three decades. In the 1960s and 1970s, Hong Kong was a major exporter of apparel, footwear, and other labor-intensive items, often producing under subcontract for large buyers in the United States, Europe, and Japan. Since China began to open its economy to foreign trade and investment in the late 1970s, Hong Kong has begun to specialize in business services for mainland China. Hong Kong firms have moved most of their manufacturing operations to the mainland, in particular to the neighboring province of Guangdong, leaving their management offices in Hong Kong where they design and market the goods that China produces. Hong Kong now distributes about one-half of the manufacturing exports that China produces.

Hong Kong's role in intermediating China's exports is linked to information costs in international exchange.<sup>15</sup> Hong Kong traders appear to have an informational advantage in trade with China, which allows them to play the role of middlemen in global exchange. Important questions for

future work include how outsourcing from Hong Kong to China affects labor markets and industry structure in these regions and in the rest of Asia, and how changes in transport costs and information technology affect the nature of global outsourcing networks.

<sup>1</sup> See The Impact of International Trade on Wages, R. C. Feenstra, ed., Chicago: University of Chicago Press, 2000; G. J. Borjas, R. B. Freeman, and L. F. Katz, "How Much Do Immigration and Trade Affect Labor Market Outcomes?" *Brookings Papers on Economic Activity*, 1, (1997), pp. 1-90.

<sup>2</sup> See J. Bound and G. Johnson, "Changes in the Structure of Wages in the 1980s: An Evaluation of Alternative Explanations," *NBER Working Paper No. 2983*, May 1989, and *American Economic Review*, 82 (1992), pp. 371-92; L. F. Katz and K. M. Murphy, "Changes in Relative Wages, 1963-87: Supply and Demand Factors," *NBER Working Paper No. 3927*, December 1991, and *Quarterly Journal of Economics*, 107 (1992), pp. 35-78.

<sup>3</sup> See E. Berman, J. Bound, and Z. Griliches, "Changes in Demand for Skilled Labor Within U.S. Manufacturing Industries," *Quarterly Journal of Economics*, 109 (1994), pp. 367-98; L. F. Katz and D. Autor, "Changes in the Wage Structure and Earnings Inequality," in *Handbook of Labor Economics*, Vol. 3A, O. C. Ashenfelter and D. Card, eds. Amsterdam: Elsevier, 1999; D. Acemoglu, "Technical Change, Inequality, and the Labor Market," *NBER Working Paper No. 7800*, July 2000.

<sup>4</sup> See R. C. Feenstra, "Integration and Disintegration in the Global Economy," *Journal of Economic Perspectives*, 12 (1998), pp. 31-50; D. J. Hummels, J. Ishii, and K. M. Yi, "The Nature and Growth of Vertical Specialization in World Trade," *Journal of International Economics*, 54 (2000), pp. 75-96; and M. J. Slaughter, "Multinational Corporations, Outsourcing, and American Wage Divergence," *NBER Working Paper No. 5253*, September 1995, and "Production Transfer within Multinational Enterprises and American Wages," *Journal of International Economics*, 50 (2000), pp. 449-72.

<sup>5</sup> See R. C. Feenstra and G. H. Hanson, "Foreign Investment, Outsourcing, and Relative Wages," *NBER Working Paper*

No. 5121, May 1995, and in *Political Economy of Trade Policy: Essays in Honor of Jagdish Bhagwati*, R. C. Feenstra, G. M. Grossman, and D. A. Irwin, eds., Cambridge, MA: MIT Press, 1996.

<sup>6</sup> See R. C. Feenstra and G. H. Hanson, "Globalization, Outsourcing, and Wage Inequality," NBER Working Paper No. 5424, January 1996, and *American Economic Review Papers and Proceedings*, 86 (1996), pp. 240–5; and "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras," NBER Working Paper No. 5122, May 1995, and *Journal of International Economics*, 42 (1997), pp. 371–94.

<sup>7</sup> See R. C. Feenstra and G. H. Hanson, "Productivity Measurement and the Impact of Trade and Technology on Wages: Estimates for the United States, 1972–90," NBER Working Paper No. 6052, June 1997, and "The Impact of Outsourcing and High-Technology Capital on Wages: Estimates for the United States, 1979–90," *Quarterly Journal of Economics*, 114 (1999), pp. 907–40.

<sup>8</sup> See P. R. Krugman, "Increasing Returns and Economic Geography," *Journal of Political Economy*, 99 (1991), pp. 483–99; and M. Fujita, P. R. Krugman, and A. J. Venables, *The Spatial Economy: Cities, Regions, and International Trade*, Cambridge, MA: MIT Press, 1999.

<sup>9</sup> See G. H. Hanson "Scale Economies and the Geographic Concentration of Industry," NBER Working Paper No. 8013, November 2000; forthcoming in *the Journal of Economic Geography*.

<sup>10</sup> See G. H. Hanson, "Increasing Returns, Trade, and the Regional Structure of Wages," *Economic Journal*, 107 (1997), pp. 113–33.

<sup>11</sup> See G. H. Hanson, "Regional Adjustment to Trade Liberalization," NBER Working Paper No. 4713, April 1994, and *Regional Science and Urban Economics*, 28 (1998), pp. 419–44.

<sup>12</sup> See G. H. Hanson, "Economic Integration, Intraindustry Trade, and Frontier Regions," *European Economic Review*, 40 (1996), pp. 941–50; "The Effects of Off-Shore Assembly on Industry

Location: Evidence from U.S. Border Cities," NBER Working Paper No. 5400, December 1995, and in *Effects of U.S. Trade Protection and Promotion Policies*, R. C. Feenstra, ed. Chicago: University of Chicago Press, 1997; and "U.S.–Mexico Integration and Regional Economies: Evidence from Border-City Pairs," NBER Working Paper No. 5425, January 1996.

<sup>13</sup> See G. H. Hanson, "Incomplete Contracts, Risk, and Ownership," *International Economic Review*, 36 (1996), pp. 341–63, and "Agglomeration, Dispersion, and the Pioneer Firm," *Journal of Urban Economics*, 39 (1996), pp. 255–81.

<sup>14</sup> See G. H. Hanson, "Localization Economies, Vertical Organization, and Trade," NBER Working Paper No. 4744, May 1994, and *American Economic Review*, 86 (1996), pp. 1266–78.

<sup>15</sup> See R. C. Feenstra and G. H. Hanson, "Intermediaries and Entrepôt Trade: Hong Kong Re-exports of Chinese Goods," NBER Working Paper No. 8088, January 2001.

## Efficiency and Equity in Education

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Education is of interest to many economists because of its perceived importance for a wide variety of economic issues. But like others in society, economists also have a personal interest in education — having been students and perhaps taught themselves, having had children who are students, and often having formed strong opinions about educational policy through their own experiences. This combined professional

and personal interest in education undoubtedly has heightened the interest in school research and led to stronger reactions to the policy implications of that research.

A major strand of my work concerns what determines student achievement — what economists generally would call part of "human capital quality" — and, most importantly, what role schools and governmental policy play in this equation. The results of this research reveal a complicated picture of determining factors that have subsequent implications for other areas of research and policy undertakings.

However, overshadowing all other findings is the fact that measurable attributes of teachers and schools bear little systematic relationship to student performance. This finding is controversial, at least partly because of its policy implications.

## Some Background

The concept of human capital, while part of economics for several centuries, has only recently become central to both theoretical and empirical analyses. In the 1960s and 1970s, Theodore W. Schultz, Gary Becker, and Jacob Mincer laid the foundation of this theory. Their analyses framed the issues of investment in individual skills and provided insights into their empirical relevance. However, most early analysis concentrated on the quantity of individual human capital—not the quality or its determination—and its implications for subsequent wages or health. Specifically, the impact of schools on "quality" was not addressed. In fact, the best early study on the role of schools in skill formation was conducted outside the field of economics in the "Coleman Report."<sup>1</sup> This government

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