
Developing-Country Trade and US Wages: Theoretical Perspectives

In a column written in 2007, Paul Krugman argued that “growing US trade with third world countries reduces the real wages of many and perhaps most workers in this country.”¹ If Krugman is correct and most American workers are actually hurt, the rationale for free US trade could indeed be undermined.² This brief review of Krugman’s theory argues that his case is based on a framework that requires extremely strong assumptions about US patterns of trade specialization and how the US labor market works. While more realistic alternative frameworks also demonstrate that trade could affect wages, their implications for economywide relative wage inequality and the real wages of unskilled workers are nowhere near as sweeping.

To make his case, Krugman implicitly invokes the model of trade introduced by Eli Heckscher and Bertil Ohlin, which emphasizes the role of factor endowments in determining trade specialization.³ The model predicts that countries will specialize in products that are intensive in their relatively abundant factors of production. Assuming two factors of production, skilled and unskilled labor, the model implies that developing countries with relatively abundant supplies of unskilled labor will export unskilled-labor-intensive

1. Paul R. Krugman, “The Trouble with Trade; Keep Our Markets Open but Protect Those Who Get Hurt,” *Pittsburgh Post-Gazette*, December 29, 2007, B-7.

2. Dani Rodrik (2011, 60) writes, “A deserving argument against free trade must overcome at least one of two hurdles. . . . [T]he economic gains from freer trade must remain small compared to the distributional costs; and trade must entail practices that violate prevailing norms and social contracts at home.”

3. See Krugman and Obstfeld (2003, chapter 4) for a discussion of the Heckscher-Ohlin model.

products (e.g., clothing). Developed countries, on the other hand, with relatively abundant supplies of skilled labor, will export products that are skilled-labor-intensive (e.g., aircraft). If developing countries liberalize, they will increase their imports of skill-intensive products. To pay for these products they will have to export additional quantities of unskilled-labor-intensive products. This will reduce the world relative price of these products. Conversely, import liberalization in developed countries would reduce the domestic relative price of unskilled-labor-intensive products. In both cases, therefore, as trade barriers are reduced we would expect unskilled-labor-intensive products to become cheaper in developed countries.⁴

A related theory, developed by Wolfgang Stolper and Paul Samuelson (1941), provides a link between product prices and the returns to factors of production. It shows in the case of two goods and two factors that a decline in the relative price of a product will reduce both the relative and absolute earnings of the factor used relatively intensively in its production.⁵ Thus, by helping skilled workers and hurting the unskilled, a reduction in the relative price of unskilled-labor-intensive products will increase wage inequality. A key insight in the Stolper-Samuelson theory is the “magnification effect.” Under conditions of nonspecialization—i.e., the country continues to produce both products—the returns to the factor used relatively intensively in the import industry—i.e., wages of unskilled workers in developed countries—will fall by more than import prices. This means that the price changes due to removing trade barriers will not only increase wage inequality but also make unskilled workers absolutely worse off.⁶

This then is the basis for Krugman’s statement. If trade with developing countries reduces the real wages of unskilled workers, and all US workers without college degrees are defined as “unskilled,” then a large majority—about 70 percent—of the US labor force could be hurt by trade.⁷

The Stolper-Samuelson result does not pertain only to price changes caused by trade—product price changes from any source will mandate these changes in factor prices—but if a country is a price taker and traded goods

4. In developing countries, on the other hand, the relative price of unskilled-labor-intensive products will increase.

5. Factor intensity is defined by the factor shares in total costs. If there are two factors, skilled (s) and unskilled labor (u), and two goods, a skilled-labor-intensive good x and an unskilled-labor-intensive good y , there is a one-to-one relationship between the relative prices of the goods and the relative wages of skilled workers, W_s , and unskilled workers, W_u . Using an $*$ to indicate proportional rates of change, and S_x and S_y as the shares of skilled labor in the production cost of x and y , respectively, then: $P_x^* - P_y^* = (S_x - S_y) (W_s^* - W_u^*)$.

6. If there are more than two factors, as Ronald Jones and José Scheinkman (1977) show, at least one factor will be made worse off by any relative price decline and at least one factor will be made better off. Thus, every good, according to their terminology, is a friend to some factor and an enemy to some other factor.

7. Using the alternative classification of workers as production and nonproduction workers leads to a similar conclusion, since almost 70 percent of workers meet this definition as well.

prices are determined in international markets, the Heckscher-Ohlin and Stolper-Samuelson theories can be merged to connect increased trade with developing countries and factor incomes in a causal relationship we refer to as HOSS (borrowing the first letter of the last names of the four authors). Taken together these theories imply that trade liberalization (or anything else that increases the world relative supply of unskilled-labor-intensive products) increases wage inequality in developed countries and causes real wage reductions for unskilled workers.

Since Stolper-Samuelson assumes that factors are homogeneous, factor markets competitive, and skilled and unskilled labor fully mobile throughout the economy, its predictions are extremely powerful. The potential for mobility implies that all workers with similar skill levels receive the same wages no matter where they work. Workers in each skill category are perfect substitutes. We produced evidence in chapter 3 that only a relatively small share of the US workforce is employed in industries that produce tradable goods and services. But in the Stolper-Samuelson model this does not matter. The forces that affect the workers who produce tradable goods and services have similar effects on workers who produce nontraded goods and services. If the wages of unskilled workers producing clothing fall, for example, workers with similar skill levels in nontraded activities such as food servers in restaurants experience similar wage declines. Richard Freeman (1995) memorably captured the power of this process in the title of his survey paper on the links between trade and wages when he asked “Are Your Wages Set in Beijing?”

Moreover, if specialization is incomplete, and technologies are unchanged, internationally traded goods prices are the only determinant of domestic factor prices.⁸ This means that the demand for these factors is perfectly elastic (horizontal) and changes in relative factor supplies at home affect factor prices only if they alter global prices.⁹ In the case of countries too small to affect world prices, changes in domestic factor supplies simply shift the composition of output. If a country experiences an increase in the supply of unskilled labor, for example, these workers are absorbed into the labor force not by a change in wages but by an increase in the output of the unskilled-labor-intensive industry and a reduction of output in the skill-intensive sector.¹⁰

The Stolper-Samuelson framework can also explain the impact of productivity changes on factor prices. In a small economy in which the prices of traded goods are determined on world markets, an increase in productivity in an industry acts just like a price increase. It raises the real return to the factor used relatively intensively in the industry experiencing productivity growth

8. Trade economists refer to the insensitivity of factor prices to factor supplies as the factor price equalization theorem.

9. For a figure illustrating demand when there is complete and incomplete specialization, see Wood (1995, 60). For the case with more goods than factors, see Haskel and Slaughter (2001).

10. This is known as the Rybczynski effect.

and lowers the real return to the other factor.¹¹ A similar response occurs if the prices of imported inputs used by the industry change. As shown by Gene Grossman and Esteban Rossi-Hansberg (2008), cheaper imported inputs—due to offshoring, for example—operate exactly like sector-biased productivity growth. They raise the return to the factor used relatively intensively in the production of the industry that uses the inputs and reduce the return to the other factor.¹²

The Heckscher-Ohlin theory is alluring because of its simplicity as a teaching tool and these strong implications. The assumption of costless mobility provides it breathtaking explanatory power because, assuming given technology, it can account for economywide developments in factor returns by looking only at trade. The framework also allows for an exploration of the relative roles of trade, offshoring, and sector-biased technological change as sources of relative wage changes. It is no surprise that it has been the centerpiece of many empirical studies on the impact of trade on income inequality—some of which we review in the next chapter—as well as studies explaining class-related political positions on open trade.¹³

Restrictive Assumptions: Nonspecialization and Perfect Labor Mobility

Although appealing in their simplicity and ease of application, the assumptions required for the HOSS theory are extremely restrictive.¹⁴ Indeed, they are so severe that the original Stolper-Samuelson paper was first rejected for publication as a theory by the editors of the *American Economic Review*. They acknowledged that it was a “beautiful theoretical performance” but felt that it “does not have anything to say about any real life situations with which the theory of international trade has to concern itself” (Cline 1997, 43). Given the profound influence of the theory, this appraisal has often been used to show

11. As Edward Leamer (1994, 1998) has emphasized, given product prices, it is the sectoral location of technological improvement rather than whether the improvement is neutral or biased toward a particular factor that matters. However, this strong result is dependent on the assumption that prices are unchanged. If prices fall, they offset this effect. As Krugman (2000) shows, sector bias might not matter at all if the technological change is global and the technological improvement is passed through into product prices. For a discussion of this issue, see Robert C. Feenstra, *Offshoring in the Global Economy: Lecture 1: Microeconomic Structure; Lecture 2: Macroeconomic Implications, Ohlin Lecture* presented at the Stockholm School of Economics, September 17–18, 2008.

12. Thus, paradoxically, given final product prices, as Grossman and Rossi-Hansberg (2008) show, offshoring some of the assembly operations of an unskilled-labor-intensive industry would actually raise the economywide relative wages of unskilled workers.

13. For an application of Stolper-Samuelson to international public opinion, see Mayda and Rodrik (2002). For a description of its use in the politics of trade, see Alt and Gilligan (1999).

14. See Davis and Mishra (2007) for a trenchant analysis of the HOSS theory.

how out of touch such editors may have been, but in fact, there may well have been some merit in their reactions.

One important assumption is incomplete specialization. Domestic factor prices will depend only on the prices of goods and services that are actually produced domestically, and if an imported product is not produced locally, its price will not directly affect factor prices. Thus the key to tightly connecting all traded goods prices and domestic factor prices is the assumption that specialization is incomplete and similar versions of the goods and services that are imported are all produced at home.

As we have noted, the Stolper-Samuelson theorem shows that the scarce-factor group—consider this group to be unskilled labor in developed countries, for example—must lose from trade because its wages will fall by more than the decline in price of the importable good they produce. But if there is specialization, the strong relationship between import prices and real factor returns breaks down. If the imported product is not produced at home and its price falls, all domestic producers could gain. In this case, therefore, Krugman’s claim that a majority of workers would be hurt by trade would not hold.

Noncompeting Goods

Complete specialization can occur if all products are homogeneous but some imported products are not produced domestically, and/or if imports and domestic goods are imperfect substitutes. In conventional Heckscher-Ohlin models, products are assumed to be homogeneous and goods produced at home are identical to imports. But specialization can arise when countries have very different factor endowments (Dornbusch, Fischer, and Samuelson 1980) and move out of what is called the “cone of diversification.” This is not simply a theoretical possibility. Peter Schott (2003) has emphasized the empirical problems of applying the “single cone” version of Heckscher-Ohlin theory, which requires that all countries produce all types of goods. On the other hand, he finds empirical support for a “multicone” equilibrium in which countries specialize in the subset of goods that are most suited to their endowments.¹⁵

Imperfect Substitutes

If imports and the goods produced at home are imperfect substitutes, as is the case with differentiated products, import prices will affect domestic product and factor prices only indirectly—if they change the prices of domestic goods via substitution effects on demand.¹⁶ John Whalley and Lisandro Abrego

15. Peter Debaere and Ufuk Demiroglu (2003) similarly find that while OECD countries have sufficiently similar factor endowments to produce the same set of goods, this is not the case for countries generally.

16. More generally, domestic factor supplies matter for factor prices, if there are more factors than goods.

(2000) show that if, rather than infinite (i.e., perfect substitutes), the elasticity of substitution between imports and domestic products is unity, so that consumers, for example, allocate constant shares of their spending to imported and domestic varieties, changes in import prices will not influence domestic product or factor prices at all.¹⁷ Again the possibility that products differ systematically because of their production location is not simply a theoretical possibility. Many trade models adopt the so-called Armington assumption that products have distinctive national attributes.

Changes in Specialization¹⁸

For a given array of imported products, specialization might limit the effects of trade on domestic factor prices, but under some circumstances changes in specialization might still have effects. One example is where countries move from incomplete to complete specialization; a second is where countries are initially fully specialized, but patterns of specialization change and goods that were originally produced at home are later produced abroad.

In the debate in the 1990s, Adrian Wood (1994) was a noteworthy dissenter from the view that trade with developing countries had not been a serious source of wage inequality. He argued that the developed countries had made a transition from incomplete to complete specialization. At first, as trade with developing countries was initiated, it had adverse effects on the wages of unskilled workers in the United States and other developed countries via traditional Stolper-Samuelson effects, since imports were becoming cheaper and imports and domestic products were close substitutes. Over time, however, imports drove out domestic production and the economy thus became fully specialized. Technically, the economy moved out of the cone of diversification, in which labor demand was flat and dependent only on traded prices, to specialization, in which domestic factors such as relative supplies also affected wages.

Imagine, for example, two types of TVs, black and white and color, which are imperfect substitutes. Originally, the United States produces both using skilled and unskilled labor. But over time, production of the most unskilled-labor-intensive products—black and white TVs—moves abroad, and the US economy becomes fully specialized in color TVs. The producers of black and white TVs are displaced and need to be reemployed. In this case, there is now just one US product, color TVs, and two factors of production, skilled and

17. If the elasticity of substitution is less than unity, the sign of the effect actually changes: Lower import prices of unskilled-labor-intensive products would increase domestic prices of domestic substitutes. The effects *would* be present with the expected signs if the elasticity were greater than unity, but would be far more muted than assumed in the case of perfect substitutes.

18. In small countries, as long as the number of traded products produced domestically exceeds the number of factors, replacing some domestic production with imports will not change relative factor prices. But if there are more factors than produced goods, changes in domestic factor supplies affect factor prices.

unskilled labor. This means relative factor supplies do affect factor prices and there could be a one-time adjustment in which the relative wages of unskilled workers decline to induce other employers to hire them.¹⁹ Estimating the impact of that adjustment requires knowing the factor content of black and white TVs. We should obviously not use the skill intensity of employment in color TVs to estimate this relative wage impact. Wood complained, however, that most studies used developed-country input-output coefficients to estimate the net factor content of trade. This biased the studies to severely underestimate the relative wage impact of the displaced unskilled worker.

Once specialization is complete, however, the strong link between the prices of black and white TVs and US factor prices is broken. If there are additional declines in the prices of black and white TVs, but no impact on the prices of color and high-definition TVs, US consumers gain, but US relative factor prices are unaffected. Indeed, the same reasoning that led Wood (1995) to argue that the initial effects of trade had been underestimated also led him to reject the forecasts of those who argued that the impact of trade on the relative wages of unskilled workers in developed countries would become increasingly pronounced over time (e.g., Sachs and Shatz 1994).²⁰ Instead, Wood argued—presciently, we believe—that these pressures would diminish because additional downward movements in the prices of most unskilled-labor-intensive products would not put pressures on the wages of unskilled workers in developed countries once they no longer produced such goods.

If there are many products, even if countries are fully specialized, technically they occupy different cones of diversification—changes in specialization could impact relative wages. Assume, for example, that there are two countries, North and South, and many products that can be arranged in descending order according to their skill intensity, as in Dornbusch, Fischer, and Samuelson (1980). Initially there is a particular cutoff point such that the more skill-intensive products are produced in the North and the more unskilled-labor-intensive in the South. Then assume there is a shock such that the cutoff shifts and the production of what were previously the most unskilled-labor-intensive goods in the North shifts to the South.²¹ In this case, production in both the North and the South becomes more skill-intensive.²² Relatively more unskilled workers will be displaced compared with the overall

19. A similar process is modeled by Feenstra and Hanson (1996). See also Feenstra (2004, 106–18).

20. Wood (1995, 77) wrote, “I do not expect unskilled workers in developed countries to be much hurt by even major new entry into the world market for low-skill-intensive manufacturers, simply because these goods are no longer produced in developed countries. The entry of China and India, pushing down the world prices of these goods, will benefit developed-country workers, skilled and unskilled alike.”

21. Such a shock might be increased productivity in the South, as in Zhu and Trefler (2005), or capital inflows into the South, as in Feenstra and Hanson (1996).

22. There is an old joke told differently by members of Harvard and MIT that from a Harvard perspective states, “When the worst Harvard professor moves to MIT it raises the average caliber of professors in both places.”

share of unskilled workers in the Northern economy. As a result, in order to reemploy these workers, the relative wages of unskilled workers would have to fall in the North. In the South, the introduction of the most skill-intensive industry will raise the relative demand for skilled workers. Thus the relative wages of skilled workers increase in both the North and the South. It should be noted, however, that in this framework, while such changes in specialization do increase wage inequality, unlike the typical Stolper-Samuelson case they do not necessarily reduce the absolute wages of unskilled workers in each country.

Intermediate Inputs

Declines in the prices of noncompeting goods might raise the real incomes of all who consume them, but some noncompeting goods could also be used as intermediate inputs to produce domestic products. In this case, again, these price changes could affect domestic factor prices not through the conventional demand channel but by changing the profitability of the assembly operations in which they are used. Cheaper imported auto parts, for example, could increase the profitability of auto assembly. This might increase the returns to the factor used intensively in assembly. Given final goods prices, this effect operates exactly like sector-biased productivity growth and raises the return to the factor used relatively intensively in assembly.²³

Grossman and Rossi-Hansberg (2008) provide a comprehensive treatment of the effects of offshoring intermediate inputs and identify this “productivity effect” as one of three channels through which imported intermediate inputs could affect domestic factor prices.²⁴ In a price-taking nonspecialized economy with fixed prices for final goods, this effect will dominate. Thus, cheaper inputs in unskilled-labor-intensive industries due to offshoring will raise relative wages of unskilled workers. However, this productivity effect could be offset partially or more than completely by two other impacts if prices change. These are already familiar. The first is the relative price or Stolper-Samuelson effect. If the country is large enough to influence prices, and its output expands because of outsourcing, world prices of the unskilled-labor-intensive product could fall and thus reduce the returns to the factor used intensively in the outsourcing industry. The second, which Stolper and Samuelson call the labor supply effect, is the case even in a small economy in which relative factor supplies can affect relative factor prices. This occurs if there are more factors of production than products, or if countries are fully specialized and

23. This effect has also been recognized by Robert Feenstra and Gordon Hanson (1999), who note that offshoring will show up in the industry aggregate production function as a change in total factor productivity.

24. See also Robert C. Feenstra, *Offshoring in the Global Economy: Lecture 1: Microeconomic Structure; Lecture 2: Macroeconomic Implications*, Ohlin Lecture presented at the Stockholm School of Economics, September 17–18, 2008.

specialization patterns change.²⁵ Under conditions where relative factor supplies matter for factor prices, if unskilled-labor-intensive tasks were once undertaken at home and these move offshore, the unskilled-labor factors previously engaged need to be reemployed. This could lead to an expansion in unskilled-labor activities, resulting in reduced unskilled-labor-intensive product and factor prices.

Acknowledging specialization and the presence of noncompeting goods therefore presents challenges for applying the HOSS theory empirically. Simulation models that assume that all imported products are still produced domestically and ignore the possibility of specialization could give inaccurate results. Price studies should only include changes in the prices of tradable products that are actually produced domestically, and while these prices might be influenced by trade, the effects need to be explicitly modeled. In addition, as Wood (1994) pointed out, if there is specialization the net factor content approach cannot be applied in a straightforward manner using domestic input coefficients.²⁶ Instead the factor contents of the products that are no longer produced in the country need to be taken into account. Moreover, the propositions based on Stolper-Samuelson that one factor will necessarily lose as a result of trade are not necessarily true.

Other Theories

In addition to nonspecialization, applying the HOSS theory also requires assuming that factor markets are competitive and factors homogeneous and mobile. For competitive labor markets, for example, workers with particular skill levels—for example, college education—all need to earn the same wage regardless of where they work. In reality, however, many labor markets are imperfect, and the same worker could be paid differently in different jobs. Unions, for example, can obtain premiums for workers who would earn lower wages in other activities. Also, in reality, some factors might be immobile. In the short run, there are costs to renegotiating wages and changing jobs, and thus similar workers could earn different wages. But even in the long run, while some worker attributes such as the ability to read and calculate may be mobile and useful in many jobs, other attributes might be highly specific to a particular occupation or job and thus immobile. For example, occupational skills (such as those of plumbers versus carpenters) are highly specific and not necessarily interchangeable. Similarly, some attributes may only be valuable in

25. In the case they consider, the country produces only one product with two factors of production, and some unskilled-labor-intensive tasks are offshored. This creates an excess supply of unskilled workers and thus reduces their relative wages. In this case, as with the full specialization we discussed above, however, while wage inequality might rise, real wages of skilled workers could still improve.

26. Alan Deardorff (1997) points out that if there are noncompeting imports, the effect of trade is the same as a Hicks-neutral increase in productivity growth that would allow the noncompeting imports to be produced in the home country.

one job or task. For example, a nurse might be highly paid because of relationships with patients in a particular doctor's office that were built up over many years, but far less valuable if she were able to find another nursing job.

Specific Factors

Since trade changes product prices, it can affect the returns-to-worker attributes that are specific. If factors are immobile, for example, theory indicates that opening up to trade raises the returns to specific factors in export industries (since trade raises export prices and lowers them in import-competing industries) (Jones 1971, Mussa 1974, Neary 1978). In this way, trade could induce greater inequality, but these specific effects would be confined to just a few industries. These specific effects can be combined with those operating through mobile factors. If a mobile factor is introduced into a model with two immobile factors, the theory suggests that the impact of trade on the mobile factor is ambiguous. If labor markets are imperfect, trade can also impact industry-specific factor rents such as union wage premiums. As emphasized by Rodrik (1997), unions could be forced to accept lower wages if trade makes the derived demand for their services more elastic.²⁷

Wages could also be firm-specific when firms are heterogeneous, as in Melitz (2003). In the Melitz model, lower trade costs boost profitability in the most productive (exporting) firms. However, profits are squeezed in less-productive firms. Thus, within industries, profit inequality increases in the short run. In his original version, Melitz assumes that workers all earn similar wages, but by linking firm wages to firm profitability theorists have found new channels by which trade affects firm wages when there are labor market imperfections that allow similar workers to earn different wages depending on which firms they work for. These include “notions of fairness” (Egger and Kriekemeier 2009), rent sharing between owners and workers (Amiti and Davis 2008), changes to incentives to search for good workers (Helpman, Itzhoki, and Redding 2010), reduced worker shirking (Davis and Harrigan 2007), implicit contracts between firms and workers (Bertrand 2004), and upgraded skills (Verhoogen 2008).

Heterogeneous Workers

The HOSS framework generally assumes a limited number of factors, such as skilled and unskilled labor. But new theories also consider implications if workers are more heterogeneous in their skills (Yeaple 2005). The virtue of such frameworks is that they can produce more complex outcomes in the wage distribution. In these models, opening to trade can affect the process by which workers sort into firms and, through this, earnings related to skill. Arnaud

27. For an argument that international competition could raise wages in a union setting, see Lawrence and Lawrence (1985).

Costinot and Jonathan Vogel (2010) explore a framework in which workers have different skills and can be arrayed along a continuous distribution. They show that if comparative advantage is driven by differences in endowments of skilled workers, and developed countries have more skilled workers at every rank in their distribution, opening up North-South trade could lead to increased wage inequality that resembles the Stolper-Samuelson effect in the two-factor setting. However, they also show that if developed countries have technologies that are biased toward using more skilled workers, opening up to trade could lead to more equal wages in the developed countries. Thus if both effects are operating, increased North-South trade need not cause more inequality. Matching models can also produce more complex outcomes in which trade results in wages of medium-skilled workers lagging behind those at the top and bottom of the distribution (Costinot and Vogel 2010, Blanchard and Willmann 2008). They could also explain how trade could especially raise wages at the very highest (superstar) levels (Manasse and Turrini 2001).

These alternative perspectives change how we think about the links between trade and wage inequality and are more likely to account for the wide variety of relative wage outcomes that have occurred in developing countries that have undergone trade liberalization.²⁸ They allow explanations of inequality that reflect more than the returns to broad skill categories and yield more complex predictions about the effects on the wage distribution. In some cases, the theories imply that the effects of trade on wages will not be economywide. In some specific-factor models, only the workers directly involved in trade, or who work in particular firms, have their wages affected. In these cases, trade can increase wage inequality, but it is quite limited in scope. In other theories, there are both specific and general equilibrium effects, but the general equilibrium effects could be more attenuated than assumed in Stolper-Samuelson, since factors are not all affected in the same way.²⁹

In sum, the HOSS framework is powerful and offers a straightforward way to test the effects of trade on relative wages throughout the economy. But it rests on extremely strong assumptions—in particular, that the economy is nonspecialized, factors are homogeneous, factor markets competitive, and factors fully mobile. If these assumptions are not valid, the implications of increased trade with developing countries for wage inequality may be very dif-

28. See the excellent survey by Pinelopi Goldberg and Nina Pavcnik (2007).

29. The approaches that emphasize worker heterogeneity can be blended with Stolper-Samuelson theory to capture more complex and more realistic outcomes. For example, Jonathan Haskel, Robert Lawrence, Edward Leamer, and Matthew Slaughter (2012) develop a model in which some workers' skills are complementary with capital, while others' skills are not. In this case, the unskilled workers earn the same wage no matter where they work, but the skilled workers earn more in capital-intensive industries. The authors show how a rise in the price of capital-intensive goods can increase profits and the premiums earned by highly skilled workers while lowering the return to unskilled labor. They also show how some types of human capital, e.g., movie making or investment banking, could have their returns raised by increased globalization or technologies such as the internet. For a discussion of globalization and the returns to superstars, see Lawrence (2008).

ferent, and other frameworks and empirical methods must be used for testing them. The HOSS framework is also relatively limited, since it is concerned only with the dimension of wage inequality that is associated with returns to homogeneous and mobile factors. Recognizing that factors are immobile leads to consideration of returns that reflect industry- and region-specific factors. Recognizing that firms are heterogeneous leads to consideration of returns to firm-specific wages. Recognizing that wages may also reflect returns to skills that are heterogeneous leads even to the consideration of the effects on individual wages.

Stolper-Samuelson is a general equilibrium theory. Remarkably, and not always appreciated, it implies there will be no relationship between the wages of a worker and the trade (or lack of trade) in the industry where the worker is employed. In a two-factor model, for example, what matters only is how trade affects the relative price of the traded industry that uses the worker's services relatively intensively. By contrast, the specific-factors theories can be tested by linking wages to particular firm, industry, and regional characteristics.³⁰

We have already described in chapter 2 the empirical studies on the United States that explore the effects of imports from and offshoring to developing countries such as Mexico, China, and India on the wages of workers in particular industries, occupations, and regions, as well as on the earnings of workers who have been displaced and forced to find new jobs, sometimes in sectors that are different from those in which they were originally employed. For the most part, these studies can be considered applications of the specific-factors models that we have just described. While their findings are not always consistent, these studies do suggest that trade with developing countries has caused displacement and depressed wages in some industries, locations, and occupations. The effects on displaced workers who experience loss in specific human capital when forced to take jobs at lower wages are also clear. Stolper-Samuelson, however, is about the returns to factors throughout the economy, and in the next chapter, we explore how well it explains recent US outcomes.

30. An early version of this approach was Revenga (1992).