

## Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom

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*The experience of East Asia in the 1960s and 1970s supports the theory that greater openness to trade tends to narrow the wage gap between skilled and unskilled workers in developing countries. In Latin America since the mid-1980s, however, increased openness has widened wage differentials. This conflict of evidence is probably not the result of differences between East Asia and Latin America. Instead, the conflict is probably the result of differences between the 1960s and the 1980s, specifically, the entry of China into the world market and, perhaps, the advent of new technology biased against unskilled workers.*

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According to conventional wisdom, greater openness to trade in developing countries not only increases efficiency but also reduces wage inequality. Openness boosts the relative demand for unskilled workers and hence narrows the gap in wages (and in unemployment rates) between unskilled and skilled workers. The experience of Latin America since the mid-1980s, however, has challenged this optimistic view. Greater openness to trade has been accompanied by rising rather than falling wage inequality. In contrast, the debate over trade and inequality in *developed* countries is now over the *magnitude* of the effects, with their *direction*—adverse to unskilled workers—being largely agreed (Wood 1995).

This article attempts to resolve the conflict of evidence in developing countries. Section I outlines the theory underlying the conventional wisdom. Section II provides an overview of the empirical evidence, both in favor of and against the conventional wisdom. Section III considers explanations of the conflict of evidence based on differences between East Asia and Latin America. Section IV

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considers explanations based on differences between the 1960s and the 1980s. Section V sums up.

## I. HECKSCHER-OHLIN THEORY

The belief that increased openness reduces wage inequality in developing countries rests on an apparently indisputable fact—that the supply of unskilled labor, relative to the supply of skilled labor, is larger in developing than in developed countries (Wood 1994: table 3.1)—and on an often-disputed but widely used theory of trade—that of Heckscher and Ohlin.

### *The Simplest Model*

Heckscher-Ohlin theory asserts that countries export goods that use intensively those factors of production that are relatively abundant at home and import goods that use intensively factors that are relatively scarce. Trade thus increases the demand for abundant factors, because of the expansion of export sectors, and reduces the demand for scarce factors, because of the contraction of import-competing sectors, with corresponding effects on factor prices. In developing countries, where unskilled labor is abundant and skilled labor is scarce, trade tends to raise unskilled wages and to lower skilled wages and hence to narrow the gap between them.

To explain the effect on relative wages more precisely, consider a simple model with two countries (developed and developing), two factors (skilled and unskilled labor), and two goods (skill-intensive machinery and labor-intensive clothing). The developing country has a relatively large supply of unskilled labor, giving it a comparative advantage in clothing, while the developed country has a relatively large supply of skilled labor, giving it a comparative advantage in machinery.

Barriers to trade (transport costs and tariffs, for example) drive wedges between the prices of goods in the two countries and may even result in no trade or autarky. In particular, the barriers keep the price of clothing lower in the developing country than in the developed country and have the opposite effect for machinery. A reduction in barriers, and the resulting expansion of trade, would thus raise the price of clothing and lower the price of machinery in the developing country.

Such a change in relative domestic producer prices would raise the wage of unskilled workers relative to that of skilled workers. This link, known as the Stolper-Samuelson theorem, exists because Heckscher-Ohlin theory assumes that technology (that is, the production function for each good) is given. In other words, it assumes a fixed functional relationship between outputs of goods and inputs of factors, which (with no excess profits) implies a similarly fixed relationship between the prices of goods and the wages of factors.

The outcome can be illustrated in a type of supply-and-demand-curve diagram adapted from Leamer (1995). In figure 1, the downward-sloping line, *dd*, is the demand curve for unskilled labor that would prevail in a state of autarky.

Figure 1. *Effects of Openness on Relative Wages: Two Traded Goods*

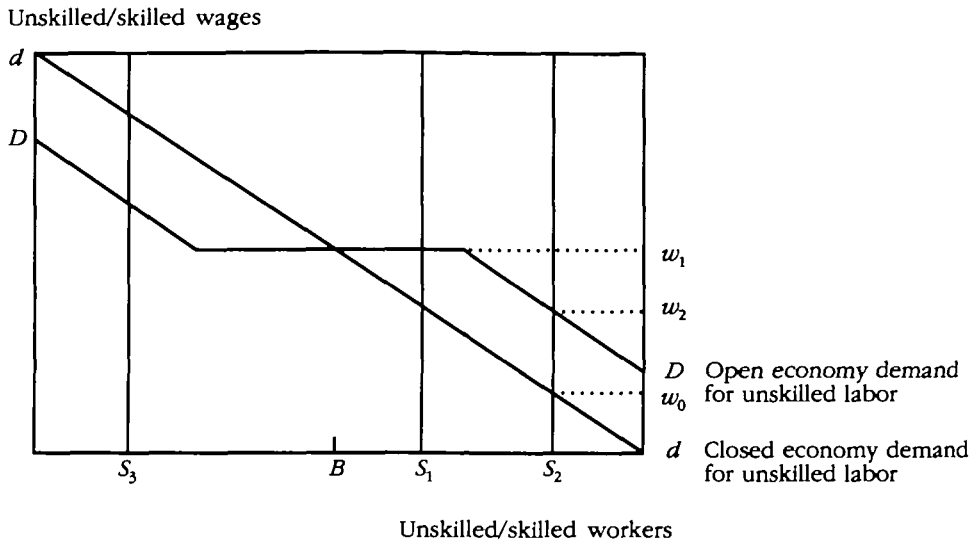
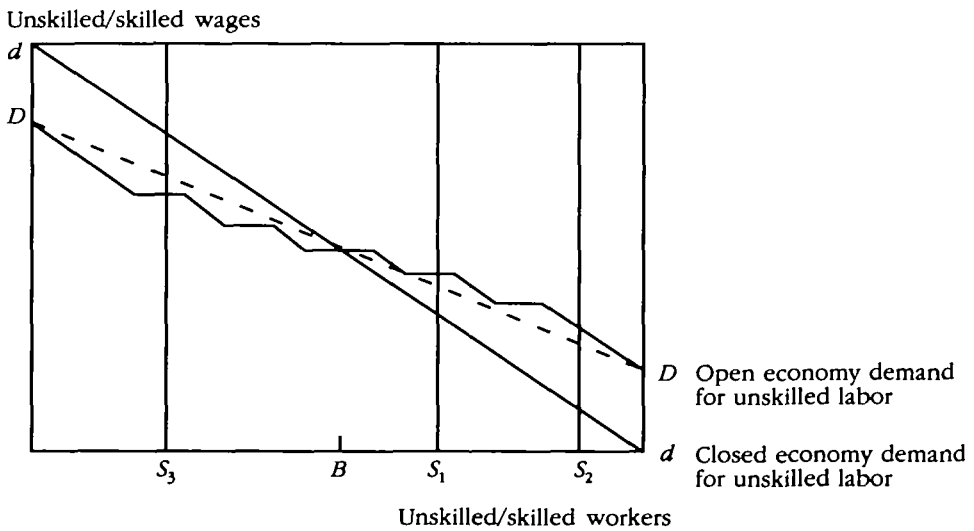


Figure 2. *Effects of Openness on Relative Wages: Many Traded Goods*



In the absence of trade, wages would be determined by the intersection of this demand curve with a supply curve (assumed for simplicity to be completely inelastic), whose position depends on the country's endowment of skilled and unskilled labor. With supply  $S_2$ , say, as in a country with many unskilled workers, the relative wage of unskilled labor would be at the low level,  $w_0$ .

The demand curve in a country open to trade is the line  $DD$ . It crosses  $dd$  at  $B$  on the horizontal axis: if it had this skill supply ratio, even an open country would not trade. The developing country, which has a relatively large supply of unskilled labor and hence is a net exporter of clothing, must lie to the right of  $B$  (and the developed country must lie to the left of  $B$ ). So for a developing country, opening to trade shifts the demand curve in favor of unskilled labor ( $DD$  lies above  $dd$ ) and narrows the gap in wages. With a skill supply ratio  $S_2$ , the relative wage of unskilled labor would rise from  $w_0$  to  $w_2$ .

The open-economy demand curve  $DD$  is an odd shape, with two downward-sloping segments separated by a flat segment in the middle: even to the right of  $B$ , there are two distinct segments in the developing-country range. The flat segment covers the range of skill supplies in which a trading economy would be diversified, in the sense of continuing to produce both clothing and machinery (albeit in different proportions than under autarky), as for example in a developing country with skill supply  $S_1$ . But a country with a high proportion of unskilled workers, as at  $S_2$ , would not produce machinery; rather it would specialize in clothing (a country with very few unskilled workers, as at  $S_3$ , would specialize in machinery). Such specialization puts a country on a segment of the demand curve that slopes downward because increases in the relative supply of unskilled labor have to be absorbed by relative-wage-induced changes in the technique chosen to produce the single good.

Trade raises the relative wage of unskilled workers, whether the outcome is diversified or specialized. But the effects on wages of subsequent changes in the relative domestic supply of labor differ. In a diversified country (as at  $S_1$ ), relative wages are fixed by relative world prices, at the level  $w_1$ . Changes in the domestic labor supply, unless they are big enough to affect world prices, do not change relative wages: they alter only the composition of output and trade. By contrast, in a specialized country on a downward-sloping segment of  $DD$ , as at  $S_2$ , changes in domestic labor supply do affect relative wages. For instance, an increase in the relative number of skilled workers would raise the relative wage of unskilled labor.

### *More Goods, Countries, and Factors*

This model can be extended to include many goods (differentiated by skill intensity) and many countries (differentiated by skill supply) without fundamentally altering the conventional theory that a reduction in trade barriers has a beneficial effect on the relative wages of unskilled workers in developing countries. However, the inclusion of nontraded goods and additional factors can yield contrary results in special cases.

Consider a rise in the number of traded goods. Figure 2 is drawn on the same principles as figure 1, but with six rather than two goods (and at least six countries). The open-economy demand curve,  $DD$ , instead of having one flat segment, has five, which alternate with downward-sloping segments. Countries whose relative skill supplies put them on a flat segment produce two goods, adjacent in skill intensity, while those on a downward-sloping segment produce only one good. All countries are specialized, because none produces all of the goods, but in those that produce two goods, as in a fully diversified country, small changes in labor supplies do not alter relative wages. However, larger changes in labor supplies do alter relative wages by moving the country to a different segment of  $DD$ .

The effects of trade on relative wages remain the same as in figure 1. In developing countries, to the right of  $B$ , a reduction in trade barriers shifts demand in favor of unskilled labor and narrows the skill differential in wages. The impact on wages is bigger for countries with a relatively large supply of unskilled labor (that is, the further the country lies to the right of  $B$ ). For countries with intermediate skill supplies, in the vicinity of  $B$ , trade has a smaller effect on wages and could either increase or decrease them. This is because trade causes the most and the least skill-intensive sectors to contract: such countries export goods of medium skill intensity and import goods of high and low skill intensity from countries with higher and lower relative supplies of skilled labor.

In reality, the number of traded goods of differing skill intensity is very large. It is thus reasonable, as well as convenient, to approximate  $DD$  by a continuous line (shown with dashes in figure 2). Dornbusch, Fischer, and Samuelson (1980) and Feenstra and Hanson (1995) present formal models that assume an infinity or continuum of traded goods. This multiple-goods formulation emphasizes two important points. First, in an open economy, the demand curve is more elastic than in a closed economy, so that changes in factor supplies have *smaller* effects on relative wages. Second, and contrary to the impression conveyed by the two-goods model in figure 1, even in an open economy, changes in factor supplies are generally likely to have *some* effect on relative wages.

Realism also requires the inclusion of nontraded goods in the model. The low ratios of trade to output in many "open" economies indicate that transport costs are often more important barriers to trade than tariffs and quotas. Nontraded goods do not necessarily alter the conventional theory of the effects of greater openness on relative wages, but they do create the possibility of "perverse" outcomes, arising from particular patterns of substitution in consumption between traded and nontraded goods.<sup>1</sup> Robinson and Thierfelder (1996) present a formal model in which the effect of changes in world prices on factor prices can be either normal or perverse, depending on the elasticity of substitution in consumption.

Consider, for example, a country with an abundant supply of unskilled labor in which labor-intensive nontraded goods are close substitutes for the more skill-

1. Edward Leamer suggested this possibility.

intensive of two traded goods. Greater openness reduces the price of the more skill-intensive traded good, inducing consumers to buy more of it and less of the nontraded good. The resulting drop in demand for unskilled labor in the nontraded sector might more than offset the rise in demand for unskilled labor in the traded sector, leading to a fall rather than a rise in the relative wage of unskilled workers.

Perverse outcomes are also possible (though by no means inevitable) when the model is extended to include more factors than skilled and unskilled labor. Consider, for example, infrastructure, a third factor that complements skilled labor in production. In principle a country might have a low ratio of skilled to unskilled labor, but a large supply of infrastructure and hence a comparative advantage in infrastructure-intensive traded goods. In such a country, greater openness to trade would increase the output of infrastructure-intensive goods, which also require a high ratio of skilled to unskilled labor and could thus raise the demand for (and the wages of) skilled relative to unskilled workers.

## II. OVERVIEW OF THE EMPIRICAL EVIDENCE

This section summarizes the factor content of trade and time-series studies that support the conventional wisdom about the effects of greater openness on relative wages in developing countries. Two other types of supporting evidence are neglected here (but are covered in Wood 1994: 220–27): cross-country studies, which are scarce, and simulation studies, which are vulnerable to disagreements about specification. This section also summarizes the recent time-series studies that challenge this conventional wisdom. The conflict of evidence thereby exposed provides the focus for the rest of the article.

### *Factor Content of Trade Studies*

Studies of the factor content of trade calculate the amounts of skilled and unskilled labor used to produce a country's exports and compare these with the amounts of skilled and unskilled labor that would be required to produce domestically the goods that the country imports. If the ratio of skilled to unskilled labor is lower for exports than for imports, then increased openness to trade—more exports, more imports, and less import-competing production—should raise the relative demand for (and so the relative wages of) unskilled workers. Moreover, most calculations of factor content underestimate the impact of trade on the relative demand for skilled and unskilled labor, because they fail to allow for noncompeting imports (Wood 1994: 72–74, 87–91, 121–26).

Table 1 encapsulates some relevant results from the classic study by Krueger and others (1981), which calculated the factor content of trade in broadly defined manufactures in a range of developing countries in the early 1970s. The table shows the ratio of the average skill intensity of exporting sectors to that of import-competing sectors, using two different measures of skill intensity. In every case, the ratio is less than unity, implying that exporting sectors are less skill-intensive than import-competing sectors, usually by a wide margin.

Table 1. *Skill Intensity of Trade in Manufactures in Selected Countries*

Country	Year	Ratio of average skill intensity of exporting sectors to that of import-competing sectors	
		Numbers measure <sup>a</sup>	Wages measure <sup>b</sup>
Brazil	1971-72	—	0.92 <sup>c</sup>
Chile <sup>d</sup>	1966-68	—	0.26 <sup>e</sup>
Colombia	1973	0.53 <sup>c</sup>	0.60 <sup>f</sup>
Côte d'Ivoire <sup>d</sup>	1972	0.62 <sup>c</sup>	—
Hong Kong <sup>d</sup>	1973	0.51 <sup>c</sup>	—
Indonesia	1971	0.55 <sup>c</sup>	0.45 <sup>e</sup>
Tunisia	1972	Less than 1 <sup>c</sup>	0.65 <sup>e</sup>
Uruguay	1968	0.49 <sup>f</sup>	—
Unweighted average		0.54	0.58

— Not available.

a. Based on the ratio of skilled to unskilled employment. Skilled workers are white-collar, unskilled blue-collar, except in Hong Kong (where skilled workers are defined as professional) and Côte d'Ivoire and Tunisia (where some blue-collar workers are in the skilled category). For Tunisia, the source does not give the precise number of skilled workers.

b. Based on the average wage per worker; the precise nature of the calculation varies among the country studies.

c. Trade with all partners.

d. Includes home (nontraded) goods' indirect labor use.

e. Trade with industrial countries only.

f. Exports to industrial countries only, imports from all partners.

Source: Krueger and others (1981), Krueger (1983); for further details, see Wood (1994: table 3.2).

Fischer and Spinanger (1986, retabulated in Wood 1994: table 3.6) find the same result for twenty-one developing countries trading in manufactures with developed countries in 1965, 1973, and 1983: in sixty-one of the sixty-three cases, exports are less skill-intensive than imports. Similar results emerge for Taiwan around 1970 in Lee and Liang (1982: table 10.20), for India in the 1980s in Nambiar and Tadas (1994: table 10), and for several developing countries in Bourguignon and Morrisson (1989: 282). All these studies are limited to manufacturing, but Kim and Vorasopontaviporn (1989) show that, for Thailand, more trade would also increase the demand for low-wage agricultural labor.

Applying a somewhat different approach to three Latin American countries in 1970-85, Londero and Teitel (1996) compare the skill intensity of fast-growing manufactured exports with that of the manufacturing sector as a whole, using sectoral wage levels as their measure of skill intensity. As shown in table 2, all three countries export manufactures of low, medium, and high skill intensity. In Argentina and Colombia, products of medium and low skill intensity account for three-quarters or more of the exports (discounting the value shares for Colombia, which are heavily influenced by two specific products). But in Venezuela, products of high skill intensity account for 40-60 percent of the total.

The fact that almost all calculations of factor content in developing countries show exports to be less skill-intensive than imports is generally seen to support

Table 2. *Skill Intensity of Manufactured Exports in Argentina, Colombia, and Venezuela, 1970–85*

Country and skill intensity	Percentage based on	
	Number of products	Value of exports
<i>Argentina</i>		
High	25.0	18.0
Medium	52.1	53.6
Low	22.9	28.4
<i>Colombia</i>		
High	13.5	38.4
Medium	32.7	27.2
Low	53.8	34.4
<i>Venezuela</i>		
High	39.0	58.6
Medium	39.0	9.9
Low	22.0	31.5

Source: Londero and Teitel (1996: tables 5 and 6).

the conventional view that greater openness benefits unskilled workers in particular. However, analysts devote insufficient attention to variations among developing countries in the skill intensity of exports, which theory implies should be higher in better-educated (or middle-income) countries. And few analysts divide the imports of middle-income countries between those from higher-skilled trading partners and those from lower-skilled partners, which in theory should have different effects on the skill structure of domestic labor demand. The Krueger study is an honorable exception, but the pattern of world trade has changed significantly since the period to which it refers.

Studies that attempt to relate the movement of relative wages over time in particular countries to changes in trade barriers—sometimes casually, sometimes econometrically—provide an entirely different sort of evidence. Most such work has been done on countries in East Asia and Latin America; the results for the two regions are reviewed separately here, following a few remarks on methodology. The few studies of countries in other regions are severely limited by a lack of relevant data, for example, Bourguignon and Morrisson (1989) on Malawi and Morocco and Fontana (1994) on Ghana and Sri Lanka. There are also several studies of the impact of trade liberalization on unemployment (reviewed and extended by Edwards and Edwards 1995), but they rarely distinguish between skilled and unskilled workers and are mainly concerned with transitional dislocation rather than with enduring changes in the labor market.

### *Methodology*

All time-series studies encounter serious problems in the measurement of skill differentials in wages. The common division between white-collar (nonproduction) and blue-collar (production) workers is treacherous, because the skill composition of both groups changes over time (for example, fewer clerks and more engineers in the white-collar category). Data on wages by level of education are



more satisfactory, but not always available. Nor is it easy to obtain accurate measures of changes in openness: information on trade barriers, particularly on the restrictiveness of nontariff barriers, is often inadequate, and changes in the ratio of exports or imports to gross domestic product (GDP) are an unreliable proxy. To measure the impact of changes in openness, it is also necessary to control for changes in domestic influences on relative wages, especially changes in the relative supply of skilled and unskilled labor and changes in labor market institutions that increase or reduce wage flexibility (but also changes in the supply of factors that complement skilled or unskilled labor, in the composition of demand, and in cyclical forces).

CHANGES IN THE RELATIVE SUPPLY OF SKILLED AND UNSKILLED LABOR. As is clear from figures 1 and 2, the impact on relative wages of increased openness (a shift of demand from  $dd$  to  $DD$ ) varies with the level of supply of unskilled labor (the position of the vertical line  $S$ ). The observed change in wages does not accurately measure the impact if increased openness coincides with a shift in supply. This measurement problem would be less serious if  $DD$  were infinitely elastic over the relevant range: the observed change in wages would be an accurate measure of the impact of increased openness at the *initial* level of supply (though not at the *final* level of supply, where the closed-economy wage would have been different). But if  $DD$  is less than infinitely elastic, the change in wages does not accurately measure the impact of increased openness even at the initial level of supply.

Robbins (for example, 1995a) uses two methods to isolate the effects of supply shifts in developing countries. His first method, the inner product test, asks whether relative wages and relative employment in the various skill categories moved in *opposite* directions (implying that supply shifts dominated) or in the *same* direction (implying that demand shifts dominated). In addition, to test the Heckscher-Ohlin prediction that changes in openness affect relative wages by altering the composition of output, Robbins decomposes changes in the skill structure of employment into between-industry and within-industry (between-occupation) components. However, this decomposition is vulnerable to the high level of aggregation of industries in most of his data because changes in product mix can occur *within* statistically defined industries.

Robbins's second method of controlling for changes in supply is to estimate time series of implied shifts in the relative demand for skilled and unskilled labor, using information on relative wages and an equation of the form

$$(1) \quad (\hat{d}_1/\hat{d}_2) = \sigma(\hat{w}_1/\hat{w}_2) + (s_1/\hat{s}_2)$$

where  $d$  and  $s$  are demand and supply, the subscripts 1 and 2 denote skilled and unskilled labor,  $\sigma$  is the elasticity of the relative demand curve, and  $\hat{\phantom{x}}$  over a variable indicates a logarithm. Equation 1 is fundamentally an accounting identity, but, if an assumption is made about the value of  $\sigma$ , it can be used to deduce shifts in demand from observed changes in supply and wages. Attempts to use

this method are complicated by the fact that the absolute value of  $\sigma$  is likely to become larger (and perhaps infinite) as a result of increased openness. Robbins (1995b) thus experiments with different values of  $\sigma$ . He also shows that even in apparently open economies, relative wages are inversely related to relative supply (with the significant exception of Taiwan after 1978), which supports the view that  $DD$  is usually less than infinitely elastic.

CHANGES IN LABOR MARKET INSTITUTIONS THAT INCREASE OR REDUCE WAGE FLEXIBILITY. Changes in government policies might affect relative wages by altering legal minimum wages, the rights and powers of unions, or the extent of employment in the public sector (where wage differentials tend to be narrower than in the private sector). For example, even if demand and supply tend to narrow the wage gap between skilled and unskilled workers, the gap might widen because of a decline in the minimum wage. Thus, changes in wage flexibility affect the accuracy of calculations based on equation 1 and more generally make it harder to measure the impact of changes in openness. In principle, using data on unemployment rates by skill level can solve this problem (because the *combination* of changes in relative wages and relative unemployment rates should indicate the direction of demand and supply shifts), but in practice such data are rarely available.

#### *East Asia*

Most of the time-series evidence from this region refers to the four tigers (Hong Kong, the Republic of Korea, Singapore, and Taiwan). Analysts always cite the experience of the four tigers as confirmation that greater openness raises the relative demand for unskilled workers. In fact, this evidence, reviewed in more detail in Wood (1994: 228–43), is by no means as clear-cut as commonly supposed. The data on relative wages contain gaps and deficiencies. In addition, few analyses have attempted to control for internal influences on the movement of relative wages.

Nonetheless, most of the evidence supports the conventional view that the adoption of more outward-oriented policies increases the demand for workers with only a basic general education relative to the demand for workers with more education and skills. The evidence is also consistent with the theoretical prediction that a switch in trade regime causes a step (or once-and-for-all) change in the composition of demand, whose effects on skill differentials in wages appear to be spread over a period of about ten years. In three of the four tigers, the gap in wages between skilled and unskilled workers narrowed during the decade in question (the 1960s in Korea and Taiwan, the 1970s in Singapore). In Hong Kong in the 1950s (where the change in trade regime was rather different), the wage gap widened, but this was probably the result of a simultaneous, large increase in the relative supply of unskilled labor.

Expansion of post-basic education is another possible explanation for the narrowing of skill differentials in wages. However, in all three of the cases in

which differentials narrowed, the change in trade regime appears to have been at least partly responsible—either because the narrowing was faster than in adjacent decades or because the expansion of higher education was deliberately restrained during the period concerned. After the initial decades of export-oriented industrialization, the expansion of higher education further compressed wage differentials in all four economies (albeit with periods of widening wage differentials, which occurred for a variety of reasons). For more details on the experiences of the four tigers in the 1970s and 1980s, see also Fields (1994) and Robbins and Zveglic (1995).

There is less evidence for other countries in East Asia. Robbins (1994a) finds persistent compression of wage differentials by level of education in Malaysia from 1973 to 1989, particularly between university graduates and less-educated workers. This continued in the early 1990s, with skilled and semiskilled blue-collar workers in manufacturing gaining relative to other groups. Robbins, arguing that this was not a case of increased openness, ascribes this compression mainly to the relative growth in the number of highly educated workers (the inner product test shows that supply shifts dominated demand shifts), perhaps augmented by the policy of discrimination toward indigenous Malays. However, his data show that demand shifted in favor of less-skilled workers within industries, perhaps because of trade-related changes in product mix—the expansion of export-oriented labor-intensive activities within the textiles and machinery sectors. These two sectors account for a big and rising share of all employment—up from 13 percent in 1984 to 16 percent in 1989 (Robbins 1994a: table 22). Moreover, between 1984 and 1989, the share of university-educated workers declined in textiles and was static in machinery, despite growth in the relative supply of such workers (Robbins 1994a: tables 1–3, 15; see also the information on Malaysia in Bourguignon and Morrisson 1989: 116–17).

Robbins (1994b) also analyzes movements in wages by education level in the Philippines between 1978 and 1988, a period of modest trade liberalization accompanied by a severe recession in 1982–86. Skill differentials in wages show no clear trend: they widened during the recession but then narrowed again. The initial, remarkably large relative supply of university graduates increased somewhat, but inner product tests yield conflicting results about the relative importance of demand and supply pressures on relative wages.

#### *Latin America*

Other studies by Robbins cover Argentina, Chile, Colombia, Costa Rica, and Uruguay. Table 3 summarizes the results for seven periods in which efforts were made to increase openness by lowering tariffs, easing quantitative import restrictions, or devaluing the currency (which, in the presence of quantitative restrictions, reduces antiexport bias by lowering the “quota premia” on—or tariff equivalents of—these restrictions). In Argentina in 1989–93, there was little if any net increase in openness, because the reduction of barriers was offset by appreciation of the exchange rate. It also seems unlikely that openness increased

Table 3. *Effects of Increased Openness in Five Latin American Countries*

<i>Country and years</i>	<i>Changes in trade regime</i>	<i>Skill differentials in wages</i>	<i>Predominant influence (inner product test)</i>	<i>Relative demand for skill (time series)</i>
Argentina (Buenos Aires)				
1976–82	Barrier reduction with appreciation	Widened	Demand	Rising
1989–93	Barrier reduction with appreciation	Narrowed	Supply	Falling
Chile (Santiago)				
1974–79	Barrier reduction with devaluation	Widened	Demand	Rising
1984–92	Devaluation	Fluctuated	Demand	Rising
Colombia (seven cities)	Devaluation to 1989, barrier reduction in 1990–92	Widened	Demand	Rising
1985–94				
Costa Rica	Barrier reduction and devaluation	Widened	Supply, except in 1988–90	Rising
1985–93				
Uruguay (Montevideo)	Barrier reduction	Widened	Demand	Rising
1990–95				

*Source:* For Argentina, Robbins, Gonzales, and Menendez (1995); for Chile, Robbins (1995a); for Colombia, Robbins (1996a); for Costa Rica, Robbins and Gindling (1997); for Uruguay and various other countries, Robbins (1995b, 1996b).

in Chile during 1984–92, despite a large devaluation, because by that time almost no quantitative restrictions were placed on imports.

In all the five remaining periods (one in each country) in which openness did increase, skill differentials in wages (by level of education) widened, contrary to the conventional wisdom. The widening occurred from the mid-1970s to the early 1980s in Argentina and Chile and between the mid-1980s and the mid-1990s in Colombia, Costa Rica, and Uruguay. In all five cases, the relative number of skilled workers was rising, and thus the dominant influence on the change in wages was a rise in demand (as indicated by the results of the inner product tests, except for part of the period in Costa Rica). The time-series calculations (based on equation 1) confirm that the relative demand for skilled labor rose in all five of these episodes.

Mexico is another Latin American country where skill differentials in wages widened after the mid-1980s in parallel with radical liberalization of the trade regime. The wage gap between nonproduction and production workers in manufacturing widened between 1984 and 1990 (Feenstra and Hanson 1995; Hanson and Harrison 1995; Revenga and Montenegro 1995). Robbins (1996b) corroborates this finding for wage differentials by level of education over the period 1987–93 and shows, by controlling for changes in relative supply, that the driving force was a shift in relative demand.

In some of these countries, liberalization of labor market institutions might explain the widening of skill differentials, but this possibility is rejected by the

authors of these studies. Robbins (1996b) finds no correlation in Chile, Colombia, or Costa Rica between movements in relative wages (or in his relative demand time series) and changes in the legal minimum wage. (By contrast, Bell 1995 finds that minimum wages do have an effect in Colombia, but her study focuses on average rather than relative wages and ends earlier.) Robbins also argues that reduced union power is unlikely to have been the cause, with the possible exception of Argentina. In Mexico, the widening of skill differentials during 1984–90 coincided with a steep decline in the real minimum wage, but Feenstra and Hanson (1995) and Hanson and Harrison (1995) reject this explanation, citing Bell (1995), who finds that even in 1984 the average production worker was paid more than the minimum in 97 percent of the manufacturing plants in the data set.

These rejections are not entirely convincing. In particular, the widening of wage differentials in Chile in the late 1970s, following the military overthrow of the Allende government, did coincide with a severe curtailment of union activity (Edwards and Edwards 1995) and, moreover, simply restored differentials to the levels prevailing in the late 1960s (Robbins 1995a: figure 5). The widening of wage differentials in Argentina in the late 1970s also occurred after a military coup and in parallel, as Robbins points out, with a decline in the union movement. The counter-evidence for Mexico also needs to be treated with caution: because wages vary among production workers, the legal minimum wage could affect the average wage even if it set only the lowest wage (well below the average). Moreover, Bell (1995) finds that the legal minimum wage did affect the wages of many workers in the informal sector.

#### *Assessment of the Time-Series Evidence*

All the time-series studies—both those that support and those that contradict the conventional wisdom that increased openness reduces wage inequality in developing countries—are open to doubts of one sort or another. But it is hard to avoid the conclusion that there is a genuine conflict of evidence: in some countries and periods, increased openness does appear to have caused a narrowing of skill differentials, but in others the opposite seems to have happened (even allowing for influences other than trade).

The conflict is particularly sharp between, on the one hand, the evidence from East Asia in the 1960s (Korea and Taiwan) and 1970s (Singapore and probably Malaysia) and, on the other hand, the evidence from Latin America in the late 1980s and early 1990s. Increased openness was also associated with widening wage differentials in Argentina and Chile in the late 1970s, but in both these cases labor market liberalization under military rule is a plausible alternative explanation. It is harder to explain away the rise in wage inequality in Colombia, Costa Rica, Mexico, and Uruguay since the mid-1980s.

For the rest of this article, I assume that there was a genuine difference between the effects of greater openness on wage inequality in East Asia in the 1960s and 1970s and its effects in Latin America in the late 1980s and early

1990s. Nonetheless, I acknowledge the various residual doubts and the need for further research on the countries concerned, which might erase the apparent conflict. My assumption not only allows the following pages to focus on possible reasons for the difference but also suggests a convenient framework for the discussion. The conflict involves two regions in two periods: the next section thus asks whether it might be caused by *differences between East Asia and Latin America*, and the following section asks whether it might be caused by *differences between the 1960s–70s and the 1980s–90s*.

### III. DIFFERENCES BETWEEN EAST ASIA AND LATIN AMERICA

Some important differences between the two regions have already been taken into account in the preceding review of evidence: the much faster growth in the supply of skilled labor in East Asia and the more regulated nature of labor markets in most Latin American countries. This section examines two other possibly important areas of differences: the availability of natural resources and the choice of policy instruments for increasing openness.

#### *Natural Resource Endowments*

In some respects, East Asia and Latin America are similarly endowed: both are well educated by comparison with Africa and South Asia, and both have fairly well-developed infrastructure. However, Latin America is far better endowed with natural resources than East Asia and consequently has a comparative advantage in primary products (including processed products, such as canned fish). By contrast, East Asia's comparative advantage lies in narrowly defined manufactures (such as clothing) that require few inputs of local natural resources. The difference in comparative advantage is clear from data on land per worker in the two regions and on the composition of their exports (Owens and Wood 1995: figures 6 and 7). The difference is also clear from the sectoral pattern of the output response to increases in openness. In East Asia, the growth of exports was concentrated in manufacturing. In Latin America, the gains were mainly in primary and processed primary exports, with other (nonprimary processing) manufacturing often shrinking, except in the parts of Mexico adjacent to the United States.

As explained in section I, the introduction of a third factor, such as land, into the Heckscher-Ohlin model could in principle cause greater openness to widen wage differentials even in a country with a relatively low ratio of skilled to unskilled labor. For Latin America, the mechanism would have to be that skill and natural resources were complementary inputs, so that the expansion of primary output raised the relative demand for skilled labor. In practice, however, primary production is not generally skill-intensive, in comparison with import-competing manufacturing. Mining and oil refining do require a highly skilled labor force but account for only a small share of total employment. Agriculture, a far larger employer, has a low ratio of skilled to

unskilled workers.<sup>2</sup> And most primary processing is not skill-intensive. Except for Hong Kong, most of the manufactured exports in Krueger's factor content study (summarized in table 1) were processed primary products (as defined in Owens and Wood 1995). Londero and Teitel (1996: table 5) show that, in Argentina and Colombia, only 13 percent of manufactures intensive in natural resources are of high skill intensity, and in Venezuela, only 30 percent are. The cross-country regressions in Owens and Wood (1995) suggest that primary processing needs a literate labor force but uses a smaller proportion of highly skilled workers than other sorts of manufacturing.

It remains possible that some more complicated process, involving nontraded sectors as well as natural resources, could explain the difference in wage outcomes between the two regions.<sup>3</sup> For instance, it might be the case that all manufactures were import substitutes in Latin America, but only skill-intensive manufactures were import substitutes in East Asia. In that case, nontraded sectors (of a given absolute skill intensity) might be *more* skill-intensive than import-competing sectors in Latin America and *less* skill-intensive than import-competing sectors in East Asia. Hence, if greater openness (through substitution in consumption) caused nontraded as well as export sectors to expand (and import-competing sectors to contract), the net effect might be to increase the relative demand for skilled labor in Latin America, but to decrease it in East Asia.

This specific chain of causation may seem far-fetched, but the correlation between the regional differences in natural resources and in wage outcomes is strong enough to warrant further empirical research. It might also be worth checking whether the wage data for Latin America are hiding increased demand for unskilled workers because of gaps in the coverage of primary sectors and rural areas. The data for Argentina, Chile, Colombia, and Uruguay cover only cities, and most of the data for Mexico are limited to manufacturing. However, the Costa Rican data, which show much the same wage pattern, are nationwide. Moreover, even in the other countries, the data include factory-based primary processing. And if labor markets work properly, changes in relative wages in sectors that are not covered by the surveys should be transmitted into the sectors that are covered.

### *Trade Policy Instruments*

The opening to trade in East Asia, particularly in Korea and Taiwan in the 1960s, was achieved mainly by increasing incentives for exporters, while keeping fairly high levels of protection against imports in most sectors. Most of the opening to trade in Latin America, by contrast, involved large reductions in barriers to imports.

2. However, a referee suggested that in Latin America the least skill-intensive agricultural subsector, staple food, may be an import substitute, so that increased openness may raise the relative demand for skilled labor *within* agriculture.

3. Jeffrey Sachs suggested this.

From a macroeconomic viewpoint, the two approaches are equivalent: it does not matter whether bias against exporting is reduced by giving subsidies to exports or by lowering barriers to imports. However, because neither the subsidies nor the barriers are uniform across sectors, their effects on the sectoral structure of output, and so on the skill composition of the demand for labor, may be different. Labor-intensive manufacturing subsectors such as clothing and footwear were initially highly protected in most Latin American countries (as in developed countries), so that making barriers against manufactured imports lower and more uniform tended to hurt unskilled workers more than skilled workers. For example, in Chile in 1974, textiles and footwear were the second and third most protected manufacturing sectors, with effective rates of protection over 200 percent (Edwards and Edwards 1995: table 2). And in Mexico, Revenga and Montenegro (1995: table 2) show that the nominal tariff on apparel and footwear in 1985 was among the highest in manufacturing, although it stands out less in the calculations of Hanson and Harrison (1995: table 2).

The differences in trade regimes deserve further investigation (and comparison with the liberalization of imports in Korea and Taiwan after the mid-1980s), but this is not a promising explanation of the difference in wage outcomes between the two regions. If Latin America had a comparative advantage in unskilled labor-intensive goods, manufactured or primary, then the effects of import liberalization in sectors such as clothing and footwear should have been more than offset by the growth of exports in (these or other) labor-intensive sectors. And if in fact the outcome of increased openness was a rise in the relative demand for skilled workers because Latin America did *not* have a comparative advantage in unskilled labor-intensive sectors, the explanation must be sought somewhere other than in the details of its trade regime.

#### IV. DIFFERENCES BETWEEN THE 1960s–70s AND THE 1980s–90s

This section examines the possibility that the observed difference in wage outcomes occurred because the world changed in some respect between the 1960s and 1970s, the period covered by the East Asian time-series studies, and the late 1980s and 1990s, the period covered by the most convincing Latin American evidence. One such change was the entry of the largest low-income countries into world markets in the 1980s. Another was perhaps a shift in the skill bias of technology. These two changes seem to be the most promising explanations in this category: others that seem less promising are the debt crisis and greater international mobility of labor and capital. However, Feenstra and Hanson (1995) present a model in which capital flows could explain the widening of wage differentials in Mexico.

##### *Entry of Large Low-Income Exporters*

Half the world's population, and an even higher proportion of the world's unskilled workers, live in five low-income Asian countries: Bangladesh, China,



India, Indonesia, and Pakistan. In the 1960s and 1970s, all five countries were largely closed to trade, and thus their workers did not form part of the effective world labor supply. By the mid-1980s, these countries were all opening to trade, led by Indonesia and China, with the South Asian countries also making some progress. Their manufactured exports grew rapidly: in the six years between 1987 and 1993, developed countries' imports of manufactures from low-income countries rose nearly four times, from \$28 billion to \$110 billion (about one-third of all manufactured imports from developing countries), while imports from middle-income countries rose less than 50 percent.<sup>4</sup>

This opening of the low-income half of the world is likely to have altered the comparative advantage of middle-income countries, whose ratio of skilled to unskilled workers is above the global average, though below that of developed countries. The economic world of the 1960s and 1970s consisted effectively only of developed and middle-income countries, and thus the middle-income countries had a comparative advantage in goods of low skill intensity. In the 1980s, when low-income Asia started to realize its own comparative advantage in goods of low skill intensity, the comparative advantage of middle-income countries shifted to goods of intermediate skill intensity. Rapid accumulation of skills in the East Asian economies that opened in the 1960s also helped to shift their comparative advantage toward goods of intermediate skill intensity.

The effect on relative wages in a middle-income country of opening to trade is thus likely to have changed over time. In the 1960s, increased openness would have raised the relative wage of unskilled workers, because it would have caused sectors of above-average skill intensity to shrink and sectors of below-average skill intensity to expand. In the 1980s, however, greater openness had conflicting effects on relative wages. Greater openness caused the contraction of sectors both of high skill intensity (replaced by imports from developed countries) and of low skill intensity (replaced by imports from low-income countries). The net effect might be in either direction, but greater openness could widen the wage gap between skilled and unskilled workers, as happened in the middle-income countries of Latin America in this period.

In theoretical terms, an increase in the effective relative world supply of unskilled labor lowers the relative world market price of unskilled-labor-intensive goods and thus alters the position of the open-economy demand curve. Figure 3 illustrates this process in the two-goods model introduced in figure 1: the lower relative world price of clothing is shown (with a dashed line) as a downward shift of the horizontal segment of *DD*.

Figure 4, the case of a many-goods model (as in figure 2), approximates the open-economy demand curve by a continuous downward-sloping line. The north-west quadrant depicts the world of the 1960s (with diagonal  $dd_1$ ), consisting of developed countries (with unskilled to skilled labor ratios in the range *OA*) and

4. Data are from World Bank (1989: indicators table 17; 1995: indicators table 16, with Indonesia moved into the low-income group for consistency). The figure for the middle-income group is slightly inflated by the reclassification of countries in Eastern Europe and the former Soviet Union.

Figure 3. *Entry of Low-Income Asia: Two Traded Goods*

Unskilled/skilled wages

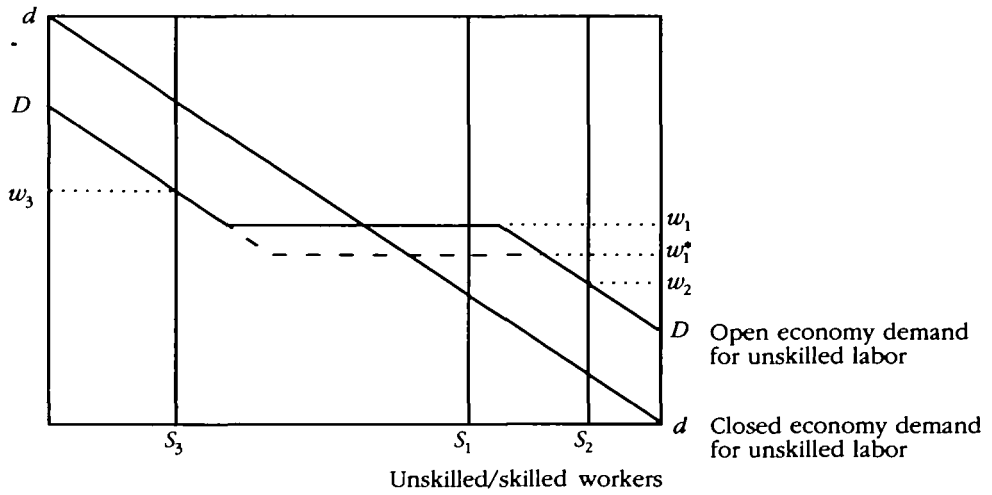


Figure 4. *Entry of Low-Income Asia: Many Traded Goods*

Unskilled/skilled wages

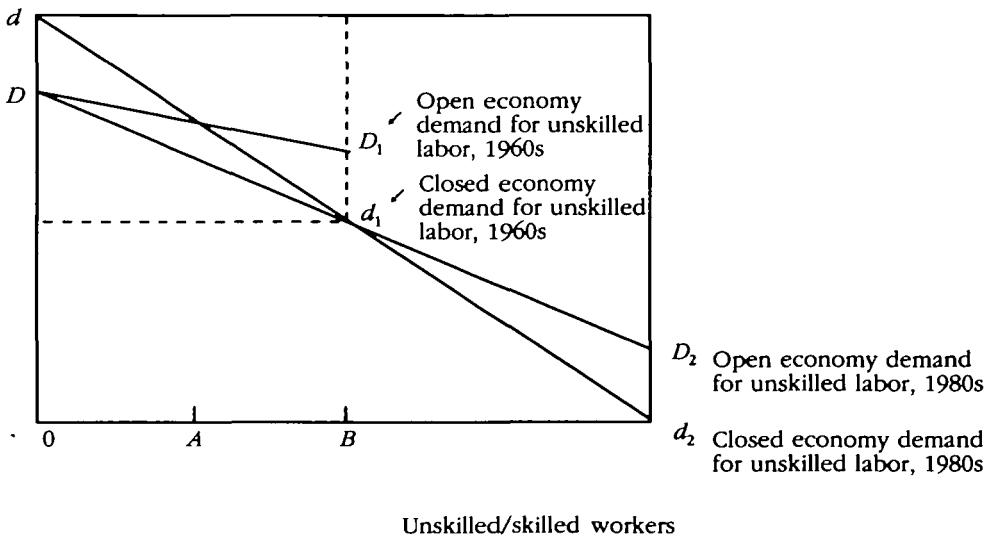
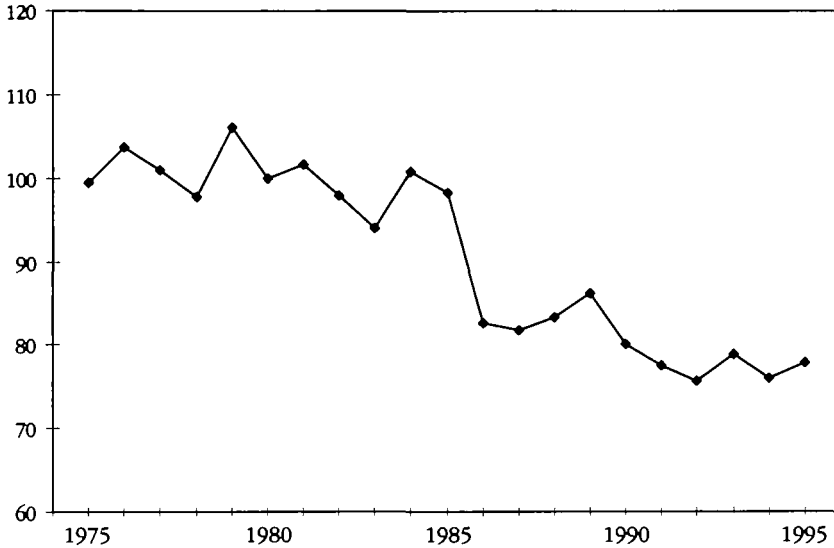


Figure 5. *Price of Developing-Country Manufactured Exports, Relative to Developed-Country Exports of Machinery, Transport Equipment, and Services, 1975-95*

(index: 1980 = 100)

Price of developing-country manufactured exports



*Note:* Manufactured export prices are unit value indexes from U.N. trade data. Service price index refers to the United Kingdom only and has a weight of 0.27 in the combined developed-country index. *Source:* Update of Minford, Riley, and Nowell (1995: figure 6).

middle-income countries (in the range  $AB$ ), but excluding the low-income Asian countries (with unskilled to skilled labor ratios beyond  $B$ ). The open-economy demand curve in the 1960s is the line  $DD_1$ . The whole figure depicts the world of the 1980s. The closed-economy demand curve extends to  $d_2$ , and the open-economy demand curve pivots down to  $DD_2$  (drawn for simplicity to cross  $dd_2$  at  $B$ ). For the middle-income countries, with skill supply ratios between  $A$  and  $B$ ,  $DD_1$  is above  $dd_1$ , but  $DD_2$  is below it, so that opening to trade would have reduced wage inequality in the 1960s but increased it in the 1980s.

The coincidence in the late 1980s of expanding exports from low-income Asia with the opening to trade of Latin American countries provides a plausible explanation for the widening of wage differentials in the latter countries. This expansion of exports did apparently cause a downward shift in the open-economy demand curve from the mid-1980s to the mid-1990s, when, as shown in figure 5, the world price of unskilled-labor-intensive goods dropped relative to that of more skill-intensive goods.<sup>5</sup> There is also anecdotal and case study evidence that labor-intensive Latin American manufacturing sectors suffered as a result of

5. Patrick Minford kindly provided these data. For a discussion of earlier movements of a similar terms-of-trade index, see Sarkar and Singer (1991) and the October 1993 issue of *World Development*.

competition from Asian imports both domestically and in third markets such as the United States (for example, see Kaplinsky 1993).

A downward shift of the open-economy demand curve should also have affected relative wages in other countries that were already open to trade (through the Stolper-Samuelson linkage between product and factor prices), but only in those that produced both labor-intensive and other goods. Figure 3, in the simple two-goods case, thus shows that the downward shift of  $DD$  reduces (from  $w_1$  to  $w_1^*$ ) the relative wage of unskilled workers in the country with skill supply  $S_1$ , which produces clothing and machinery, but does not change relative wages in countries that specialize in one of the goods ( $S_2$  in clothing,  $S_3$  in machinery), since, with only one good produced, there can be no change in domestic relative producer prices. (However, the change in world prices does alter relative *consumer* prices and thus the *real* wages of all workers in the specialized countries, downward in  $S_2$  and upward in  $S_3$ .) The distinction between diversified and specialized countries is blurred in figure 4, but however the diagrams are drawn, open *middle-income* economies—with intermediate unskilled to skilled labor ratios—are the ones most likely to produce both labor-intensive and more skill-intensive goods and so to have experienced external pressure for wider wage differentials.

Thus, an indirect test of the hypothesis that wage differentials widened in Latin American countries that opened to trade because of the simultaneous expansion of exports from low-income Asia would be to see whether wage differentials also widened during the same period in other, already open, middle-income countries. The time-series studies reviewed earlier reveal a mixed picture for such countries: in Hong Kong, wage differentials widened throughout the 1980s; in Taiwan and Singapore, they widened in the early 1980s but narrowed in the late 1980s; in Korea and Malaysia, they narrowed throughout the decade; and in Chile, they fluctuated (Robbins 1995b: figure 3; Wood 1994: 228–43). The estimated relative demand for skilled labor also moved in different directions in the three countries for which data are available—Chile, Malaysia, and Taiwan (Robbins 1995b: figure 6). The test is thus inconclusive on this small set of fairly open middle-income countries.

The hypothesis that the difference between the experience of East Asia in the 1960s and Latin America in the 1980s was caused by the entry of low-income Asian countries into world markets clearly requires further research. Such research should include a larger sample of open middle-income countries and should also examine the opening low-income countries themselves (whose wage differentials should have narrowed). Even more vitally, further research would need to look closely at the consistency of this hypothesis with the experience of the middle-income countries that have opened since the mid-1980s (again with a larger sample). In particular, it should use factor content analysis to check whether the reduction of trade barriers caused sectors of intermediate skill intensity to expand and sectors of low skill intensity to contract.

### *Skill-Biased Technical Progress*

Another possible reason why opening to trade had different effects on wage inequality in the 1980s than in the 1960s is that world technology changed between these periods in a way that raised the relative demand for skilled labor. This explanation is put forward by Robbins (for example, 1995a), who calls it “skill-enhancing trade.” He argues that increased openness in a developing country affects the skill structure of labor demand in two ways: by altering the sectoral composition of production (as in Heckscher-Ohlin theory) and by changing the production technology available—through increased imports of advanced capital goods, for example, or through opportunities for exporters to learn from foreign buyers and be exposed to foreign markets. The net impact depends on the size of these two effects and on the exact nature of the difference between domestic and world technology, but the effect on relative wages could be contrary to the predictions of standard Heckscher-Ohlin theory, which assumes that all countries always have access to the same technology. Moreover, the *real* wage of unskilled workers could rise, even if their *relative* wage falls, whereas under strict Heckscher-Ohlin assumptions, including constant returns to scale, real and relative wages should move in the same direction.

The skill-enhancing trade explanation is depicted in figure 6, in which there are two pairs of closed-economy and open-economy demand curves:  $d_1d_1$  and  $D_1D_1$  are based on the use of 1960s technology,  $d_2d_2$  and  $D_2D_2$  are based on the use of 1980s technology. In the figure, technology is assumed to have changed over time in a biased way, requiring a generally lower ratio of unskilled to skilled labor. Another assumption is that the new technology is available only to open economies, so that a country remaining closed to trade over this period would have continued to use 1960s technology. For most developing countries (to the right of *B*), opening to trade would thus have had different effects on wage inequality in the 1960s (decreasing it, by moving from  $d_1d_1$  to  $D_1D_1$ ) than in the 1980s (increasing it, by moving from  $d_1d_1$  to  $D_2D_2$ ). Even in the 1980s, the Heckscher-Ohlin tendency for openness to reduce inequality remains—reversion to a closed economy, with 1980s technology and demand curve  $d_2d_2$ , would aggravate the increase in wage inequality—but it is dominated by the effect of the change in technology.

The skill-enhancing trade explanation has considerable plausibility. It is likely that increased openness does alter the availability of technology. It is also widely believed that technical progress over the past couple of decades has in fact been biased against unskilled workers and that this is why wage inequality has increased in most *developed* countries. Moreover, Robbins (1996b) provides econometric support for this explanation: pooling the time series for six of the developing countries in his sample, he finds the relative demand for skilled labor to be positively correlated with the rate of growth of GDP and with the ratio of the imported capital stock to GDP, interpreting both variables as proxies for access to new technology.

Figure 6. *Effects of Openness and Technology Transfer*

Note:  $d_1, d_1$  and  $d_2, d_2$  are the closed economy demand curves for unskilled labor based on 1960s and 1980s technology, respectively.  $D_1, D_1$  and  $D_2, D_2$  are the open economy demand curves for unskilled labor based on 1960s and 1980s technology, respectively.

However, there is also considerable room for doubt about this explanation. The opening countries were not completely cut off from new technology. There is little hard evidence of an autonomous skill-using bias in recent technical progress, and there is another plausible explanation—increased openness to trade with developing countries—for the rise in inequality in developed countries (Wood 1995). And, as mentioned earlier, there is no consistent evidence of a rise in wage inequality, or in the relative demand for skilled labor, in open middle-income economies. In addition, Robbins's econometric results are open to alternative interpretations. Again, further research is needed, both to determine whether the open-economy demand curve has shifted down over time—an assumption common to the technological bias and the entry of low-income Asia hypotheses—and to establish which hypothesis provides a better explanation of this shift (including examination of movements in the *real* wages of unskilled workers, concerning which the two hypotheses make different predictions).

## V. SUMMARY AND CONCLUSIONS

A substantial amount of empirical evidence supports the conventional wisdom that increased openness to trade in developing countries tends to raise the demand for unskilled, relative to skilled, labor and thus to reduce wage inequality. However, some recent evidence contradicts the conventional wisdom. In particular, there is a conflict in the time-series evidence between the experience of East Asia in the 1960s and 1970s, which is consistent with the conventional wisdom, and the experience of Latin America in the late 1980s and early 1990s, where increased openness appears to have widened rather than narrowed skill differentials in wages.

Possible explanations fall into two classes: differences between East Asia and Latin America and differences between the 1960s–70s and the 1980s–90s. Preliminary assessment of more specific explanations within these classes suggests that the reason is more likely to be the difference between the two time periods than the difference between the two regions. East Asia and Latin America differ in several respects, not least their endowment of natural resources, but it is difficult to establish a convincing causal link between any of these differences and the difference in the impact of increased openness on wage inequality.

By contrast, there are two plausible reasons why the effects of increased openness on wage inequality might have differed between the earlier and the later periods. First, the entry of China and other large low-income Asian countries into the world market for labor-intensive manufactures in the 1980s shifted the comparative advantage of middle-income countries into goods of medium skill intensity. As a result, increased openness in middle-income countries reduced the relative demand for unskilled workers by causing sectors of low skill intensity to contract. Second, technical progress between the 1960s and the 1980s was biased against unskilled workers.

The available evidence does not permit any strong conclusion as to which of these two period-difference explanations is the right one. More generally, the slender empirical basis of this whole exercise should be emphasized. The sample of developing countries for which there is recent evidence on trade and wage inequality is extremely limited—it not only is small but is also confined to East Asia and Latin America, covers no low-income countries, and covers no countries from Africa or South Asia. Within each country, too, there are gaps and other problems with the data and analysis. More research is needed to confirm whether the impact of increased openness on wage inequality has changed in recent years, as well as to determine how and why such change might have occurred.

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