LIBERALIZATION AND INCENTIVES FOR LABOR MIGRATION: THEORY WITH APPLICATIONS TO NAFTA

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ABSTRACT

One of the motivations for NAFTA from the US point of view was to reduce the incentives

for Mexican migration into the US. Unskilled rural males are a primary source of illegal

immigration and also Mexico's relatively abundant factor. This group should therefore be made

better off by trade and investment liberalization according to the traditional Heckscher-Ohlin

model. Existing evidence, along with best guesses of many experts in the area, suggest that

NAFTA is unlikely to have a significant positive impact on this group, at least not within the time

frame of several decades. We draw on a number of recent theoretical contributions in order to

offer reasons why NAFTA may not raise the wages of unskilled Mexican workers.

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1. Introduction

Regionalism has been an important phenomenon in the world of international trade in the recent decade. Groups of countries, typically geographically concentrated, are banding together to liberalize trade and investment among themselves. The European Union is surely the furthest along, with relatively liberal provisions for labour migration added to trade and investment liberalization.

One interesting and relatively novel feature of some of the new regional trade agreements is that they combine partners of very different levels of development. Typically this was not the case during previous decades, when such agreements tended to be among countries of similar per capita income levels. The North American Free Trade Agreement (NAFTA) was pioneering in this respect and may be expanded to include other Latin American countries in the next several decades. Similarly, the European Union will surely consider substantial liberalizations in the future with countries from Eastern Europe and the former Soviet Union.

Factors which motivate and encourage these new "North-South" or "East-West" agreements may also differ from the older agreements among highly developed countries. The latter were in large part motivated by the objective of creating large internal markets in order to capture scale economies and other production efficiencies. But the newer agreements have a somewhat different focus. First, the developed partner(s) may be seeking a low-wage partner that can provide low-cost labour for labour-intensive tasks of the developed country's firms. The less developed partner(s) may be seeking access to inward investment and newer technologies. A somewhat more subtle motive for the less developed

country is to obtain "insurance" against capricious policy changes by the developed countries.

Lastly, the developed partner(s) may be seeking to reduce the pressures of immigration and migration from the developing partner(s).[1] Some observers believe that influxes of workers from less-developed countries cause various social and economic problems in the developed countries, and the underlying strategy is to help create jobs in the less-developed countries in order to keep these persons and their families at home. Both the United States and the European Union have experienced this type of inward movement of labour. Between 1986 and 1995, the United States admitted over 2.8 million legal immigrants from Mexico (see Table 1). This number includes some two million individuals who entered the United States illegally but were granted amnesty under the terms of the Immigration Reform and Control Act of 1986 (IRCA). Barring any dramatic reform of U.S. immigration law and any substantial long-term improvement in the Mexican economy, it is not unreasonable to expect that the United States will continue to admit sizable numbers of additional legal immigrants from Mexico each year for some time to come, especially as persons originally admitted under IRCA become entitled to seek the entrance of their relatives.

Undocumented migration from Mexico to the United States also continues to be substantial. No one knows with any great precision just how many Mexicans reside illegally in the United States, but widely circulated "guess-timates" range between four and ten million. What is certain is that undocumented Mexican migration now extends to virtually every region of the United States and that this phenomenon often outmatches the resources

allocated by the U.S. government to control it. Of course, not everyone sees undocumented migration from Mexico to the United States as a problem because illegal migrants are a source of considerable profits for many U.S. firms and farmers.

The purpose of this paper is to consider the links between trade and investment liberalization on the one hand and the incentives for the migration of less skilled labour on the other. The analysis will be mostly theoretical, using models firmly rooted in the stylized facts of NAFTA. Our discussion focuses largely on Mexico and the United States but not Canada, which hopefully is a forgiveable transgression since undocumented migration from Mexico is a more prominent concern in the United States than in Canada. The principal question at hand is whether we should expect that trade and investment liberalization between a developed and a less-developed partner will lead to convergence in the wages of unskilled workers between the two countries and hence reduce the incentives of workers to migrate from the less-developed to the developed country. In other words, will trade and investment liberalization substitute for migration?

Section 2 of the paper presents a few background facts about NAFTA and the Mexican economy, especially with respect to the Mexican labour market and the country's agricultural sector. Although it is far too early to judge the effects of NAFTA, especially in the wake of a major macroeconomic downturn in Mexico in late 1994 and 1995, we echo the widely-held view that NAFTA will do little to achieve wage convergence in the next decade or two. We then outline the basic mechanism of the Heckscher-Ohlin (HO) model which argues in the other direction, in favor of wage convergence. The HO model suggests that the wage of unskilled labour in Mexico should rise and that of unskilled labour in the

United States should fall following trade and/or investment liberalization.

The next several sections of the paper outline some of the reasons why the gap between the wages in the United States and Mexico may not fall, and indeed why the gap between skilled and unskilled wages may actually rise in both countries, as some evidence seems to suggest. Section 3 considers a model and associated evidence presented in two papers by Feenstra and Hanson (1995a,b). Section 4 examines a mechanism proposed by Markusen and Venables (1995, 1997a,b) and Markusen (1997). Both of these models focus on a crucial role played by investment liberalization, and both suggest the possibility of a rising skilled-unskilled wage gap in *both* the developed and less-developed countries.

Section 5 considers three other mechanisms, all of which operate in traditional competitive, constant-returns models and all of which seem empirically relevant to NAFTA. The first is a model based on multiple techniques of production in agriculture, maize in particular, motivated by the observation that maize production is very capital intensive in the United States (relative to other U.S. sectors) and very labour intensive in Mexico (relative to other Mexican sectors). The argument is similar to but not quite the same as one suggested by Schiff (1996), which relates tangentially to Burfisher, Robinson, and Thierfelder (1994) as well. The second is a simple specific-factors model developed by Neary (1995) and Markusen (1983) in which trade in goods and and trade in factors are complements. An alternative version of the specific-factors argument is presented by Schiff (1996). The final model is drawn from a suggestion by Martin (1996) that Mexican agriculture requires public infrastructure more than some other sectors, such as maquiladora assembly plants. Hence maize is a disadvantaged sector in Mexico despite being intensive

in the use of the abundant factor, namely unskilled labour. Section 6 concludes the paper.

2. NAFTA

The North American Free Trade Agreement took effect on January 1, 1994, following the Canadian-American Free Trade Agreement of the late 1980s and early 1990s. In the simplest terms, NAFTA lowered trade and investment barriers within North America but contained only minor provisions regarding labour migration. Mexico undertook substantial unilateral liberalizations during the period following 1985, so the actual reforms introduced by NAFTA were not profound in some overall sense. Most estimates put U.S. tariffs against Mexico prior to NAFTA at about four percent and Mexican protection levels at something over ten percent, with a variety of non-tariff barriers also in place.

The leaders of the three signatories to NAFTA stated that the agreement aimed to increase the growth and income levels of all three countries. Trade and investment liberalization were predicted to lead to higher incomes, investment, growth, employment, and all things bright and beautiful. But it is widely believed that there was a sub-agenda guiding the agreement that was rarely stated in public, in particular regarding the United States and Mexico.

Four things may have been important from the U.S. point of view. First, there was the hope that NAFTA would improve wages in Mexico, thereby reducing the tendency of unskilled Mexican workers to migrate to the United States. But others wonder how confident the U.S. government really was about this, and perhaps it was privately skeptical that NAFTA would have much of an impact over one or two decades on illegal migration.

Second, U.S. firms argued fairly persuasively that they needed a low-wage partner for routine, less-skilled operations such as assembly in order to compete with suppliers or branches of Japanese multinationals in less-developed countries. They argued, perhaps genuinely in many cases, that jobs going to Mexico would displace jobs in Asia, not in the United States. Third, some believe that the United States was greatly frustrated with the slow pace of traditional multilateral negotiations and wanted to create something of an example in order to get things moving again. A fourth explanation, and one that we favor, is that a foreign policy objective dominated the economic ones. The United States had witnessed substantial liberalization in Mexico in both the economic and political arenas and wanted to do something to help lock in these reforms. Under this explanation, it is quite possible that U.S. policymakers had little confidence in their own statements about growth, jobs, and reduced inward migration. Those issues were irrelevant.

The Mexican government did make clear statements about its desire to reduce undocumented migration to the United States ("we want to export goods, not people"), but these may have been issued largely to cultivate support for NAFTA in the United States. Many analysts believe that the Mexican government also saw NAFTA as a way to lock in reforms that it had brought into effect. NAFTA thus was "insurance" against domestic backsliding. But it is at least as likely that the Mexican government viewed NAFTA as insurance against U.S. backsliding. The fact that late in the game Mexico seemed to give in on many bargaining points (in the face of a scare that NAFTA might not pass in the U.S. Congress) reinforces this view in the opinion of many. In any case, our point is that it is not necessarily true that either government really believed that NAFTA would reduce migration

in the span of one or even two decades.

Some statistics may help set the context for this paper. Table 2 gives the distribution of civilian employment within the Canadian, Mexican, and U.S. economies. Mexico's labour force is far more concentrated in agriculture than either that of Canada or the United States. In 1994, 25.8 percent of the Mexican workforce was occupied in agriculture, as compared to 4.1 and 2.9 percent for Canada and the United States respectively. In fact, the number of persons working in agriculture in Mexico is more than double that of Canada and the United States combined (8,361,000 versus 4,131,000). Moreover, agriculture's share of the Mexican workforce has held steady between 1991 and 1994.[2] In contrast, the U.S. and Canadian labour forces are distinguished by relatively high proportions employed in two categories: (1) finance, insurance, real estate, and business services; and (2) community, social, and professional services. Using 1988 data, Burfisher, Robinson, and Thierfelder (1994) further identify that Mexico's urban labour force is much less skilled than that of the United States (see Table 3). When one considers both urban and rural workers, it is clear that Mexico is abundant in unskilled labour relative to the United States and Canada.

Although agriculture employs roughly one-quarter of Mexico's workforce, it only accounts for about six percent of the country's gross domestic product (INEGI, 1997). Depending on the region, much of rural production is concentrated in one crop: maize (referred to as corn in the United States). Most Mexican farmers grow maize in some amount, perhaps for their private consumption if nothing else. But production is inefficient and yields are low, averaging about 2.4 metric tons per hectare (see Table 4). Mexican yields begin to approach U.S. and Canadian levels of roughly seven tons per hectare for

producers during the Spring-Summer growing season and when farmers have access to irrigation.

Maize is also a highly protected sector in Mexico. Mexico's bilateral import barrier on U.S. food corn is 45.0 percent, while the corresponding U.S. barrier on Mexican food corn is nil (Burfisher, Robinson, and Thierfelder, 1994). Thus we have an odd situation where the crop that uses Mexico's abundant factor intensively is an import-competing sector. The United States lobbied hard for reform to the various forms of maize protection and basically got its way, phased in over a number of years (initially 15, but Mexico has apparently speeded this up). Mexico also has high protection levels on what are sometimes called "program crops" in the United States because they are subject to special agricultural programs. These include feed corn, food grains, soybeans, and cotton. Mexico's bilateral barrier on such crops from the United States is 12.9 percent, while the corresponding U.S. barrier is again zero.

This characterization of a major part of Mexican agriculture as highly protected yet intensive in unskilled labour is both tremendously important for discussing the possible effects of NAFTA on migration to the United States and also somewhat a puzzle for economic theory. Most trade economists' quick intuition about trade policy is derived from the Heckscher-Ohlin model. In that simple, two-sector, two-good, two-country model, each country exports the good whose production intensively uses its abundant factor. This *apparently* contradicts the Mexican situation if we think of two goods, maize and a "composite" good, and two factors, unskilled labour and a composite factor. Trade liberalization should raise the return to each country's abundant factor, and hence unskilled

labour in Mexico should benefit.

Few analysts seem to believe that the HO story is the right one. There is the problem with maize and several other crops as we just noted. We will attempt to model this more in section 5 of this paper. But there are also doubts regarding the prospects for workers in Mexican manufacturing. Some believe that liberalization will tend to favor more skilled Mexican workers rather than the less skilled in manufacturing. These ideas will be discussed in sections 3 and 4 of the paper.

Three additional aspects of the Mexican economy further complicate the evaluation of NAFTA. First, the Mexican population is much younger that that of its two NAFTA partners and is growing at a faster albeit deaccelerating rate (see Table 5). In 1995, the median age in Mexico was 21.7 years, in contrast to 34.7 in Canada and 34.2 in the United States. Mexico implemented family planning policies a decade or two later than other middle-income countries such as Taiwan and South Korea, and this delay is reflected in the high growth rate of its population. Mexico has made tremendous strides in this area, and recent figures indicate that the country's population growth rate has slowed to 1.8 percent (Associated Press, 1996). Nevertheless, the large number of young Mexicans who enter the workforce each year both expands the pool of prospective migrants and is likely to exert a downward pressure on Mexican wages.

Second, high rates of unemployment and underemployment are enduring features of the Mexican economy. During the last 10 years, Mexico's combined rate of unemployment and underemployment has never dipped below 20 percent, and often the rate has exceeded 25 percent (see Table 6). In the face of such phenomena, along with the demographic

characteristics described above, less-skilled Mexican workers may not experience dramatic increases in their wages or employment levels, even if post-NAFTA changes in the relative demand for their labour conform to those found in the HO model.

Third, Mexico suffered a devastating macroeconomic disruption in late 1994 and 1995, less than a year after NAFTA's implementation.[3] We do not believe that NAFTA was the primary cause of this crisis, but we do view the agreement as one of a multitude of factors that entered into play. Also, it is important to note that the crisis abruptly terminated a six-year period during which real per capita income in Mexico rose modestly. Between 1988 and 1994, real income climbed from 17,327 to 18,491 new pesos per capita, as expressed in 1995 prices (see Table 6). This period of rising incomes falls neatly within the broader period of Mexican liberalization that we outlined above. However, even at the end of this six-year period, real per capita income still had not returned to its 1980 level.

We end this section on a note of caution. Unfortunately, it is much too early to assess the effects of NAFTA. After all, even given the various complexities of the Mexican economy, the agreement is still only three years old. However, there is some hope for prompt empirical work on the subject of Mexican liberalization, insofar as many Mexican reforms predated NAFTA by as much as ten years. In any case, we expect that most experts would concur that NAFTA is unlikely to have much of an effect in reducing Mexico-to-U.S. migration over at least the next decade.

3. <u>Investment Liberalization and Income Distribution I: The Feenstra-Hanson Model</u>

In this section and the next, we focus largely on manufacturing. We consider some

evidence and associated theory that suggests that NAFTA may do little to help less skilled workers in Mexico and hence have little effect on the tendency for these workers to seek jobs in the United States over the short to medium term. Evidence is present in a number of studies, including Feenstra and Hanson (1995a,b) and Aitken, Hanson, and Harrison (1994), Aitken, Harrison, and Lipsey (1995), Hanson and Harrison (1995), and the OECD (1996a), that foreign firms pay higher wages, with a higher share of wages going to more skilled workers, and that wages gaps in manufacturing between skilled and unskilled workers have increased since Mexican liberalization began in the mid-1980s.[4]

Table 7 reproduces data from Feenstra and Hanson (1995b). They use production and non-production workers as proxies for skilled and unskilled workers which is subject to limitations of which they are surely aware. The table shows the ratio of non-production to production wages and the share of non-production wages in total wages. The years 1970-1985 were years of high protection in Mexico, with substantial liberalizations beginning about 1984. The data indicate that the "wage gap" (the ratio of non-production to production wages) fell in all regions between 1975 and 1985, and that the share of non-production wages rose modestly. The big change occurred after 1985, with the wage gap rising significantly in all regions and the non-production share rising in all regions except the North. The largest increases in both measures is in the Mexico-U.S. border region, where liberalization in both trade and investment barriers had by far the largest impact.

Tables 8 and 9 present more recent data on changing compensation levels in the Mexican economy. Between 1985 and 1993, the overall pattern is one of shrinking levels of real compensation per employee from 1985 to 1988 and recovering levels thereafter (see

Table 8). The net increase in the average annual compensation per salaried employee over this eight-year period was a mere 1.8 percent. Workers in agriculture fared extremely poorly. The average level of real annual compensation in the sector dropped by 35.8 percent between 1985 and 1993, to a meager 2,776 new pesos per salaried employee. Workers in construction and commerce also experienced a net decline in their average compensation, while manufacturing employees received a net increase.

More detailed evidence pertaining to the manufacturing sector is found in Table 9. These data indicate that the average real compensation level in Mexican manufacturing climbed 45.0 percent between 1987 and 1994, from 3,180 to 4,610 new pesos per month, as measured in June 1995 prices. The three manufacturing sectors that provided the highest levels of compensation in 1994 are also ones that require workers with particular technical skills: chemicals, petroleum derivatives, and rubber and plastic products (V); non-metallic mineral products (VI); and basic metal industries (VII).

Table 9 also contains separate measures of compensation for production and non-production workers. For manufacturing as a whole, the compensation gap between the two groups widened between 1987 and 1994, from 1,830 to 3,820 new pesos per month. In the three manufacturing sectors mentioned above, as well as in metal products, machinery, and equipment (VIII), the difference in compensation between production and non-production workers exceeded 4,000 new pesos per month in 1994, with a breach of 5,430 new pesos existing in the non-metallic mineral products sector.

Two broad patterns in wage movements are thus apparent during the first decade of Mexican liberalization (1985-1994). First, wages diverged across different sectors of the

Mexican economy. Compensation levels in agriculture, construction, and commerce actually shrank during the 1985-1993 period, and these sectors have high concentrations of less-skilled workers. A similar pattern of divergence existed among various sectors within manufacturing. Second, the compensation gap for production and non-production workers within manufacturing widened, particularly in sectors where overall compensation levels increased the most. Finally, we note that there was a large jump in foreign investment following liberalization after 1985 (Table 10), coincident with the wage movements just discussed.

Econometric analysis by Feenstra and Hanson provides strong support for the hypothesis that foreign investment leads to an increase in the wage gap and the non-production wage share in Mexican manufacturing. But this is again apparently at odds with the Heckscher-Ohlin model, insofar as less skilled labour would seem to be Mexico's abundant factor. Furthermore, it has been widely observed that the wage gap is rising in the United States [reviews of the literature and evidence are found in Freeman (1995), Richardson (1995), and Wood (1994, 1995)]. According to Heckscher-Ohlin theory, the factor-price ratios should move in opposite directions in the two countries, as the return to the abundant factor rises in each country.

Feenstra and Hanson provide an intriguing model and indeed a model that is very much in the tradition of Heckscher-Ohlin to explain this phenomenon. The model has three factors: capital, skilled labour, and unskilled labour. There is a single composite consumption commodity that is "assembled" from a continuum of intermediate inputs. All these intermediate inputs have the same capital intensity but may be ranked according to

skilled-labour intensity. The authors assume that initially Mexico has a higher return to capital than the United States. There is a dividing point in the continuum of intermediates, with less-skilled-labour-intensive goods produced in Mexico and more-skilled-labour-intensive goods produced in the United States.

The effect of investment liberalization is to move capital from the United States to Mexico. This lowers the cost of producing all intermediates in Mexico and raises it in the United States. In equilibrium, it shifts the dividing line in the continuum toward Mexico. More goods are produced in Mexico. The situation is illustrated in Figure 1, where the horizontal axis indexes the commodities, with the least-skilled-labour-intensive goods on the left. There is some initial (pre-liberalization) dividing line in the continuum as shown. Liberalization shifts this dividing line to the right. But now we have the crucial insight. The goods shifted are relatively skilled-labour intensive from Mexico's point of view (they are to the right of the goods that Mexico was producing), but they are unskilled-labour-intensive from the U.S. point of view (they are to the left of the goods that the United States continues to produce). The effect is thus to raise the relative demand for skilled labour in both Mexico and the United States. The relative wage of skilled labour will rise in both countries in equilibrium.

Empirical results in the paper provide support for the simple, ingenious model. However, they do not provide support for the notion that NAFTA will mitigate the problem of unskilled-labour migration to the United States.

4.   Investment Liberalization and Income Distribution II: The Markusen-Venables
     Model

A second approach to the wage-gap issue explicitly considers the role and structure

of multinationals (Markusen and Venables, 1995, 1997a,b, Markusen, 1997). Some features

of the basic model, expanded in the latter paper to include vertical multinationals, are as

follows.

1.   Two Homogeneous Goods, X and Y;
     Two Countries, h and f.
     Two Factors, unskilled labour: L   skilled labour: S.

2.   Y - competitive, constant returns to scale, L intensive

3.   X - imperfectly competitive, increasing returns to scale, S intensive overall.
     "Headquarters" and "plant" may be geographically separated.
     A firms may have plants in one or both countries

4.   There are six firm types, with free entry and exit into and out of firm types. Regime
     denotes a set of firm types active in equilibrium.

Type m_h -   horizontal multinationals which maintain plants in both countries,
               headquarters is located in country h.

Type m_f -   horizontal multinationals which maintain plants in both countries,
               headquarters is located in country f.

Type n_h -   national firms that maintain a single plant and headquarters in country h.
               Type-n_h firms may or may not export to country f.

Type n_f -   national firms that maintain a single plant and headquarters in country f.
               Type-n_f firms may or may not export to country h.

Type v_h -   vertical multinationals that maintain a single plant in country f, headquarters
               in country h. Type-v_h firms may or may not export to country h.

Type v_f -   vertical multinationals that maintain a single plant in country h, headquarters
               in country h. Type-v_f firms may or may not export to country f.

Crucial to the story are assumptions concerning the factor intensities of various

activities. In this we draw indirect inferences from a number of empirical sources, including

Feenstra and Hanson (1995a,b), Blomstrom and Wolff (1994), and Slaughter (1995). First,

assume that X sector production is skilled-labour intensive overall relative to the Y sector.

The second crucial assumption is that branch plants (e.g., plants of U.S. firms in Mexico)

are more skilled-labour intensive than the Y sector but less skilled-labour intensive than

local integrated X producers. The branch plants need local managers, engineers,

technicians, and so forth, and these requirements make them more skilled-labour intensive

than composite Y production. But much of the branch plants' skilled-labour requirements

are nevertheless supplied from the home firm (e.g., the U.S. parent). There is a transfer of

"producer services" from the home firm to the subsidiary in the form of research and

development and other assets. The third assumption is that two-plant multinational firms

require more skilled labour in their headquarters than the one-plant firms. These represent

the "technology transfer" costs of doing business abroad. Fourth, headquarters activities

are more skilled-labour intensive than a production plant (indeed, headquarters use only

skilled labour in the model). The full set of factor-intensity assumptions are as follows.

Factor-intensity assumptions: ranked from most skilled-labour-intensive to least skilled-
labour-intensive

<div align="center">

Activities

[headquarters] > [integrated X] > [branch plant] > [Y]

Firm Types

[type-m firms] > [type-v and type-n firms]

</div>

Operations within a Country

[local type-v firm] > [local type-m firm] > [local type-n firm] >
[plant of foreign type-m or type-v firm] > [Y]

The consequences of trade and investment liberalization in this model depend very much on the initial parameters. If trade costs are high, investment liberalization involves the creation of type-m firm if the two countries are not extremely different, with headquarters concentrated in the skilled-labour abundant country. If trade costs are low, investment liberalization results in the entry of type-v firms if countries differ significantly in relative endowments, with their headquarters in the country abundant in skilled labour and their single plant in the country abundant in unskilled labour.

Consider a parameterization of the model which resembles the U.S.-Mexico situation, with the countries referred to as the north and the south. The north is skilled-labour abundant and large, and the south is unskilled-labour abundant and small. Figure 2 presents a general outline of the effects of investment liberalization given such an initial situation. These results are qualitatively independent of whether or not trade is also liberalized or restricted. The horizontal axis of Figure 2 ranks three activities according to their skilled-labour intensity, Y production being the least skilled-labour intensive, then final X production and then headquarters' services.

In the initial protected situation in which multinationals cannot exist, the south produces little or no X, since it is severely short of skilled labour for headquarters activities. Investment liberalization leads to branch plants of type-m (higher trade costs) or type-v firms (lower trade costs) headquartered in the north. But since the south was not producing much or any X initially, resources for the branch plants are drawn from the Y sector. But

the branch plants are more skilled-labour intensive than Y, since the plants require managers, engineers, technicians and so forth as we noted above. Thus investment liberalization increases the demands for skilled labour in the south. Under the assumptions noted, local skilled labour is a complement, not a substitute, for the imported producer services produced with northern skilled labour. The relative wage of skilled labour can rise in the south in equilibrium.

The situation in the north is perhaps more intuitive. It is the skilled-labour-abundant region, and initially it has a relatively low price for skilled labour. Investment liberalization leads to a shift of headquarters toward the north and a shift of X production toward the south. Even if all headquarters are initially in the north (no southern X production), liberalization is analogous to a cost reduction or positive technical change, so the sector expands with more headquarters activities in the north in the new equilibrium. This of course increases the relative demand for skilled labour in the north, with some of the unskilled labour released from the X production being "soaked up" by the Y sector.

Figure 3 presents for the sake of completeness the "world" factor box, with country h measured from the southwest corner and the country f from the northeast corner. This is a rough composite of the results of investment liberalization for different levels of trade costs. We see substantial regions in which the wage of skilled labour rises in both countries. This is particularly likely to occur when one country is both larger and skilled-labout abundant. If we are near the top and to the right of centre of the box, for example, country h is the north (e.g., the United States) and country f is the south (e.g., Mexico).

One final point should be noted. In this type of model, it is quite possible for the

efficiency gains associated with liberalization to lead to an increase in the prices of both factors. Still, the overall message of this model is not to assume that the HO mechanism will operate in favor of unskilled labour in the south and decreased incentives for migration.

5.   Technology and the Maize Sector

In this section, we focus on some aspects of the maize sector in Mexico, since the reforms in that sector plus trade liberalization through NAFTA are possibly the greatest force operating to send more, not less, unskilled Mexicans northward. The first feature about this sector is that is it very labou intensive in Mexico and very capital intensive in the United States. While we do not have precise statistics on this point, we believe that is true not just in the cross-country comparison, but also within in each country. That is, cereal grain production in the United States is relatively capital intensive relative to many other U.S. tradeable sectors, and maize production is labour intensive in Mexico relative to other tradeable sectors there.

This suggests a model based on multiple techniques of production in the maize sector. A very capital intensive technique exists (and is clearly available to Mexican farmers) and a labour intensive technique exists. The technique adopted in a country depends on factor prices, which in turn depend on relative endowments. The situation is shown in Figure 4, for an initial equilibrium with positive protection. There is the agricultural sector and a composite Y sector. The unit value isoquant for Y lies between the unit value isoquants for the more capital-intensive technique and the labour-intensive technique. There exist two "cones of diversification" in the diagram, one producing Y and

agriculture with the capital-intensive technique and one producing Y and agriculture with the labour-intensive technique. We assume in the initial equilibrium that the north's factor endowment lies in the former (upper) cone and that the south's factor endowment lies in the latter (lower) cone.

The initial factor-price ratios are as shown in Figure 4, with the north having a relatively high wage-rental ratio and the south having a low wage-rental ratio. Note that from each country's point of view, the unused technique is not profitable at equilibrium factor prices. We assume that in the initial protected equilibrium, the north exports agriculture and imports the composite (in fact, Mexican protection was so high that there was virtually no trade in maize).

Now consider tariff reduction for one or both countries, using Y as numeraire for expositional convenience. The results are shown in Figure 5. The price of agriculture (maize) rises in the north, shifting its unit-value isoquant inward. The price of maize falls in the south shifting its unit value isoquant outward. The effect of these changes on the relative prices of factors moves in the same direction in the two countries. The wage-rental ratio falls in both the north and the south because, from each of their points of view, the price of the capital-intensive good has risen. Mexican labour may of course still gain somewhat relative to U.S. unskilled labour, but the effect is not going to be dramatic and could go the other way.

In order to verify that such an outcome is indeed possible, we constructed a simple numerical example using Rutherford's (1994, 1995) non-linear complementarity solver. Complementarity is necessary for the problem, because we need to verify that each country

does not choose to use the other available technique and more generally that the proposed solution is indeed the equilibrium. The model was benchmarked initially with 20 percent import tariffs in both directions.

Results for the simulations are shown in Table 11, where the first row for tariff 0.20 is the benchmark replication. Factor prices are reported in real terms, the nominal price divided by the consumer price index (the unit expenditure function). At all levels of protection, neither country shifts to the alternative maize technique. Results of the simulations are as suggested in Figure 5. Tariff reduction reduces the real wage of labour in both countries, but raises the real return to capital. The real wage is reduced somewhat proportionately less in the south, but there is little wage convergence. Specialization is reached at a tariff rates of about 0.08. Note that for further reductions in the tariff, the relative factor prices in the two countries remain unchanged, but the real prices of all factors rise somewhat reflecting the capture of further gains from trade (eliminating the consumption distortions even though production ceases to change). The countries are sufficiently different in this example that there is no factor-price equalization at free trade.

This example is suggestive, but obviously needs some empirical work. But as in the case of the Feenstra-Hanson model, it is firmly rooted in traditional Heckscher-Ohlin theory, if differing from the very narrow HO model. The latter has been used by several authors to argue that factor-proportions trade theory is false, because it is inconsistent with the stylized facts.

A second way of thinking about the maize sector uses the specific-factors model, drawing on ideas in Markusen (1983) and Neary (1995). Suppose that we once again view

the Mexican economy as having a maize sector and a composite sector. Maize uses a specific factor, R, and the composite sector usesa specific factor, K. Labor is homogeneous, and can be used in maize (M), the composite sector (C), or it can migrate to the US. Assume that initially, trade protection raises the price of maize and that investment restrictions limit foreign investment in C.

Figure 6 gives the familiar cross diagram, with the value-of-marginal-product curves for maize and the composite, with the labor input to maize measured from the left-hand axis and the labor input to C measured from the right-hand axis. The heavy lines give the initial marginal product curves in the protected equilibrium. The twist on the standard story is that there is an "outside option", indicated by the US wage, drawn as a horizontal line in Figure 6. The initial equilibrium allocation of Mexican labor between M, C, and migration is given by the intersection of the M and C value-of-marginal-product curves with the US wage line.

There are some complicated issues here about price indices in determining real wages, such as whether or not migrant workers use US prices or Mexican prices to evaluate their wages. Indeed, one should probably use different urban and rural price indices within Mexico. In order to get the idea across, we will ignore this important difficulty here and assume that the same price index is used regardless of whether one is a C worker, an M worker, or a migrant. This assumption in turn allow us to ignore the price index altogether: the price index affects real income, but not the allocation of labor among the three activities. Adopt the price of C as numeraire. Trade liberalization drops the price of the protected good, in this case maize. This is shown as a downward shift in the value-of-marginal-product curve (the price of maize times the physical marginal product) for maize

in Figure 6. Under the assumption that the US wage does not change, the new equilibrium must involve a shift in Mexican labor from the rural maize sector to the US, with no change in the labor allocated to C. Trade liberalization worsens the migration problem.

Investment liberalization, on the other hand, shifts up the value-of-marginal-product curve for C in Figure 6 by bringing sector-specific capital into the C sector. The C sector expands and all of the expansion is in the form of reduced labor migration, rural employment is held constant. Investment liberalization can in this way relieve some of the migration pressure.

Many variations on this theme can be presented. Obviously, many factors are ignored, including the price index issue and the issue of the multiple types of labor which formed the focus of the previous section. Our purpose here is not to suggest what the exact effects of NAFTA might be, but rather to suggest some empirically-relevant possibilities as we noted earlier. Figure 6 also serves the function of emphasizing that trade and investment liberalization might have quite different effects, contrary to the symmetry between the two in the Heckscher-Ohlin model.

A final suggestion about the agriculture-migration dilemma is drawn from Martin (1993, 1996). He notes the importance of public-sector infrastructure in agriculture, particularly roads and other transportation inputs. It a bit unclear to us what the general proposition is, but it seems to be that these are more important in agriculture than in maquiladora-type manufacturing plants in the U.S.-Mexico border region, and that is clearly plausible. The second point is that this infrastructure is far better developed in the United States than in Mexico. The lack of infrastructure in Mexico is analogous to having a poorer

technology in that sector relative to the United States. Figure 7 illustrates the ideal with two production frontiers, one with a high level of public transport-sector capital and one with a low level. Maize (or agriculture more generally) is assumed to be more sensitive to this capital stock, and that turns into a source of comparative advantage and disadvantage.

Markusen (1983) notes that in such a situation in which one country has a superior technology in one sector with all other things being equal, the real return to the factor used intensively in that sector will be higher in the advanced country. In the present situation, the real wage to unskilled rural Mexican workers will be less than the corresponding real wage in the United States. This difference may not be eliminated by free trade, even if Mexico is abundant in unskilled labour (specialization is now a necessary condition for factor-price equalization). It is only by moving Mexican workers to the United States to work with U.S. "technology" (infrastructure) that wages can begin to equalize. Martin presents evidence that this productivity difference is relevant, with Mexican workers being significantly more productive in the United States on the same crops.

6.   Summary and Conclusions

The purpose of this paper is to consider the migration of unskilled, rural Mexican workers to the United States and how migration incentives may be altered by NAFTA. We have not yet done any formal empirical work, and it is far too early to infer such effects from an agreement that has just turned three years of age, even though Mexican liberalization began in the mid-1980s as we noted. This task is further compounded by a major macroeconomic disruption in Mexico in late 1994 and 1995. Yet what evidence does

exist plus the opinions of many experts suggest that NAFTA is not likely to have much of an effect on the incentives to migrate.

The paper therefore more or less accepts this conclusion and inquires into the reasons why it might be true. After all, it apparently contradicts our most cherished trade model, the Heckscher-Ohlin model, despite the considerable broadening of the theory. Several models are presented, all of which imply that NAFTA may not raise the wages of unskilled Mexican workers very much relative to their potential wages as legal or illegal immigrants to the United States. While there are potentially an unlimited number of such models, we believe that the ones we present are all empirical plausible and relevant.

The first one present is due to Feenstra and Hanson and involves a continuum of goods ranked by their intensity in skilled labour. The effect of investment liberalization is to move to the south production of goods which are skilled-labour intensive from the south's point of view, but unskilled-labour intensive from the north's point of view, therefore raising the relative demand for skilled labour in both countries. The second one is by Markusen and Venables, where the "unbundling" of activities permitted by investment liberalization raises the relative demand for skilled labour in both countries (but may increase the real incomes of all factors as well). The final three models focus on the maize sector and consider the role of production technologies, specific factors, and public infrastructure.

We might note again that, with the exception of the Markusen-Venables model, all of these explanations are solidly within the tradition of Heckscher-Ohlin if differing from the very specific model of that name. This is of some importance insofar as some

economists have used the inconsistency of certain stylized facts within the HO model to dismiss all of factor-proportions trade theory. More exotic explanations are then sought in terms of industrial-organization features and/or "technical change." The latter is almost never estimated, an unexplained residual is just *defined* to be technical change. At this point, all models remain candidates for explaining the wage-gap phenomenon, and of course all of them could plausibly be contributing to the observed data.

Endnotes

1. We distinguish between legal immigration, in which persons obtain legal residency and even citizenship from their new country of residence, and undocumented or illegal migration, in which persons enter a country without its government's expressed permission and reside there for an indefinite period of time.

2. The available statistics measuring civilian employment in Mexico do not allow an easy comparison with years prior to 1991. Specifically, some sort of methodological change appears to have occurred between the generation of the 1990 and the 1991 statistics, perhaps in conjunction with the 1991 Mexican census. In fact, the data for years prior to 1991 probably underestimate agricultural employment in Mexico, as OECD (1996b) indicates that civilian employment in agriculture was 5,300,000 in 1990 and 7,532,000 in 1991. The Mexican data for five of the other economic activities listed in Table 2 also experience a profound shift between 1990 and 1991.

3. Although the crisis manifested itself in full force in December 1994, when the Mexican government sharply devalued the peso, various statistics presented in this paper indicate that the Mexican economy was slowing down during the course of 1994.

4. For related labor-market issues, see Hinojosa-Ojeda and McCleery (1992), Hinojosa-Ojeda and Robinson (1992), Leamer (1993), Tan and Batra (1995), Brainard and Riker (1995), and Riker and Brainard (1996).

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Table 1: Legal Immigration to the United States by Persons Born in Mexico and Deportions of Mexicans by the U.S. Border Patrol, Fiscal Years 1981-1995

Fiscal Year	Total Legal Immigration	Total Minus IRCA Legalizations	Number of Mexicans Apprehended and Deported by the U.S. Border Patrol
1981	101,268	101,268	797,923
1982	56,106	56,106	795,362
1983	59,106	59,106	1,076,345
1984	57,557	57,557	1,104,429
1985	61,290	61,290	1,218,695
1986	66,533	66,533	1,635,702
1987	72,351	72,351	1,123,725
1988	95,039	95,039	928,278
1989	405,172	66,445	830,985
1990	679,068	56,549	1,054,849
1991	946,167	52,866	1,045,122
1992	213,802	91,332	1,168,946
1993	126,561	109,027	1,230,124
1994	111,398	106,995	965,144
1995	89,932	86,960	1,381,465

Sources: Immigration and Naturalization Service (INS), *Statistical Yearbook of the Immigration and Naturalization Service*, various issues; and INS (1996).

Table 2: Canadian, Mexican, and U.S. Civilian Employment by Economic Activity, 1994
(in thousands of persons, except percent)

Economic Activity	Canada		Mexico		United States	
	Number	Percent	Number	Percent	Number	Percent
Agriculture, hunting, forestry, and fishing	545	4.1%	8,361	25.8%	3,586	2.9%
Mining and quarrying	157	1.2%	152	0.5%	669	0.5%
Manufacturing	1,949	14.7%	5,127	15.8%	20,157	16.4%
Electricity, gas, and water	144	1.1%	80	0.2%	1,216	1.0%
Construction	750	5.6%	1,828	5.6%	7,493	6.1%
Wholesale and retail trade, restaurants, and hotels	3,151	23.7%	6,962	21.5%	27,163	22.1%
Transport, storage, and communication	835	6.3%	1,467	4.5%	6,750	5.5%
Financing, insurance, real estate, and business services	1,611	12.1%	1,111	3.4%	13,566	11.0%
Community, social, and personal services	4,149	31.2%	7,337	22.6%	42,460	34.5%
Activities not adequately defined	--		14	0.0%	--	
Total	13,292		32,439		123,060	

Source: OECD (1996b).

Table 3: Comparison of U.S. and Mexican Employment Structures, 1988

Sector of Workforce	Mexico	United States
Rural labor	23.8%	1.1%
Urban unskilled labor	14.1%	17.7%
Urban skilled labor	37.1%	48.5%
White-collar workers	25.0%	32.7%
Total	100.0%	100.0%

Source: Burfisher, Robinson, and Thierfelder (1988)

Table 4: Canadian, Mexican, and U.S. Maize Production

Country	Year/ Growing Season	Area Harvested (thousands of hectares)	Production (thousands of metric tons)	Yield (metric tons tons per hectare)
Canada	1994	955	7,043	7.4
	1993	985	6,501	6.6
	1992	858	4,883	5.7
Mexico	1996	5,921	14,000	2.4
	1996 Spring/Summer	5,059	10,840	2.1
	1995/1996 Fall/Winter	862	3,160	3.7
	1995	5,855	13,421	2.3
	1995 Spring/Summer	4,748	9,678	2.0
	1994/1995 Fall/Winter	1,107	3,744	3.4
	1994	7,853	19,193	2.4
	1993	7,536	18,648	2.5
	1992	7,249	16,929	2.3
United States	1994	29,508	256,629	8.7
	1993	25,464	160,954	6.3
	1992	29,169	240,719	8.3

Note: Mexican data for 1995 and 1996 may not be strictly comparable with 1992-1994 data.

Sources: For 1992-1994, Food and Agriculture Organization (1995);
for 1995-1996, Secretaria de Agricultura, Ganadería, y Desarrollo Rural (1997).

Table 5: Population, Median Age, and Population Growth in the Three NAFTA Countries, Estimates and Projections (1970-2025)

Year	Total Population (thousands)			Median Age (years)			Period	Population Growth Rate (percent)		
	Canada	Mexico	U.S.	Canada	Mexico	U.S.		Canada	Mexico	U.S.
Estimates										
1970	24,324	50,328	205,051	26.0	16.6	27.9	1965-1970	1.61	3.21	1.08
1975	22,727	58,876	215,972	27.5	16.6	28.7	1970-1975	1.27	3.14	1.04
1980	24,070	67,046	227,757	29.3	17.5	30.0	1975-1980	1.15	2.60	1.06
1985	25,181	75,594	238,466	31.4	18.6	31.5	1980-1985	0.90	2.40	0.92
1990	26,639	84,486	249,975	33.1	20.0	32.9	1985-1990	1.13	2.22	0.94
Projections										
1995	28,537	93,670	261,138	34.7	21.7	34.2	1990-1995	1.38	2.06	1.03
2000	30,425	102,555	275,324	36.2	23.2	35.5	1995-2000	1.28	1.81	0.90
2005	32,293	110,810	285,931	37.2	24.8	36.6	2000-2005	1.19	1.55	0.76
2010	34,070	118,455	296,089	37.9	26.5	37.4	2005-2010	1.07	1.33	0.70
2015	35,674	125,484	305,622	38.6	28.3	38.1	2010-2015	0.92	1.15	0.63
2020	37,125	131,885	314,541	39.2	30.1	38.8	2015-2020	0.80	0.99	0.57
2025	38,356	137,783	322,007	39.9	32.0	39.5	2020-2025	0.65	0.83	0.47

Projections are the medium-variant projections.

Source: United Nations (1993).

Table 6: Selected Economic Statistics for Mexico, 1980-1995

Year	GDP (in millions of new pesos, 1995 prices)	Population (midyear estimate, in millions)	Real GDP per capita (new pesos, 1995 prices)	Underemployment and unemploy- ment rate (in percent)
1980	1,323,964	69.66	19,006	--
1981	1,429,169	71.35	20,030	--
1982	1,420,066	73.02	19,448	--
1983	1,360,750	74.67	18,224	--
1984	1,408,615	76.31	18,459	--
1985	1,444,146	77.94	18,529	--
1986	1,391,585	79.57	17,489	--
1987	1,416,837	81.20	17,449	25.6
1988	1,435,337	82.84	17,327	24.1
1989	1,482,613	84.27	17,594	21.8
1990	1,549,565	86.15	17,987	22.1
1991	1,605,943	87.84	18,283	21.2
1992	1,650,285	89.54	18,431	23.6
1993	1,661,738	91.21	18,219	23.5
1994	1,719,879	93.01	18,491	27.8
1995	1,600,953	94.78	16,891	27.2

Underemployment and unemployment rate indicates proportion of economically active population that was either unemployed or employed for less than 35 hours per week in sampled urban areas. The figures displayed are for the second quarter of the given calendar year.

Sources: For GDP and population figures, IMF (1997); for underemployment and unemployment rate, INEGI, *Encuesta Nacional de Empleo*, as cited in INEGI (1997).

Table 8: Average Annual Compensation by Sector, 1980-1993 (New Pesos Per Salaried Employee, 1995 Prices)

Year	Total	Agriculture, Poultry, and Fishing	Mining	Manu-facturing	Construction	Electricity, Gas, and Water	Commerce, Restaurants, and Hotels	Transportation, Warehouses, and Commu-nication	Financial Services, Insurance, and Real Estate	Community Social, and Personal Services
1980	22,290	4,658	40,562	37,332	26,912	82,998	23,031	31,023	51,635	26,662
1981	29,892	6,376	52,917	49,076	34,744	108,897	29,836	41,712	68,672	36,246
1982	25,753	5,391	43,118	43,192	27,929	101,189	24,225	34,634	58,987	31,850
1983	20,783	4,563	34,775	35,055	23,705	79,547	20,826	30,409	47,145	25,149
1984	18,010	3,957	29,579	30,012	20,249	61,940	17,711	26,233	41,097	22,063
1985	19,571	4,321	35,545	32,782	21,958	64,072	19,040	28,756	45,385	23,832
1986	17,633	4,315	30,383	30,028	19,508	55,706	17,093	26,290	42,301	20,715
1987	17,352	4,030	30,074	29,883	18,911	61,516	16,197	25,921	44,097	20,575
1988	15,810	3,433	28,248	29,709	16,587	51,473	14,323	25,629	40,066	18,438
1989	16,606	3,281	27,897	31,681	15,838	51,435	14,756	25,592	42,518	19,995
1990	17,076	3,143	27,056	32,820	15,743	51,401	14,696	24,496	46,280	20,523
1991	17,643	2,911	27,091	34,562	16,036	53,582	15,017	24,965	50,685	21,700
1992 (P)	19,009	2,831	29,129	37,502	16,709	59,532	15,306	26,171	56,879	24,097
1993 (P)	19,922	2,776	27,044	38,952	17,219	64,894	16,057	26,531	63,396	26,030

Source: INEGI, Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios; and Dirección de Contabilidad Nacional, *Sistema de Cuentas Nacionales de Mexico* (various years); both as cited in Cuadro 4.5 of INEGI (1996).

Table 7: Relative Wage and Wage Shares by Mexican Region, 1975-1988

Region	Year	Non-Production Wage/ Production Wage		Non-Production Share of Total Wages	
		Level	Change	Level	Change
Border	1975	2.104		0.342	
	1980	2.048	-0.537%	0.365	0.477%
	1985	2.073	0.245%	0.373	0.154%
	1988	2.517	6.464%	0.415	1.398%
North	1975	1.963		0.304	
	1980	1.964	0.011%	0.335	0.632%
	1985	1.813	-1.599%	0.358	0.453%
	1988	2.085	4.659%	0.353	-0.178%
Center	1975	1.838		0.313	
	1980	1.824	-0.156%	0.330	0.329%
	1985	1.719	-1.181%	0.341	0.230%
	1988	2.085	3.048%	0.363	0.733%
Mexico City	1975	2.145		0.416	
	1980	2.022	-1.185%	0.410	-0.117%
	1985	1.772	-2.634%	0.435	0.482%
	1988	2.137	6.237%	0.466	1.055%
South	1975	2.090		0.288	
	1980	1.518	-6.400%	0.292	0.075%
	1985	1.530	0.159%	0.313	0.425%
	1988	1.699	3.490%	0.330	0.568%

Source: Reproduction of Table 2 in Feenstra and Hanson (1995b)

Table 9: Monthly Compensation Per Worker in Mexican Manufacturing, 129 Classes of Activity, 1987-1995
(in thousands of 1995 new pesos)

	All Manufacturing			Food Products, Beverages, and Tobacco (I)			Textiles, Clothing, and Leather Industry (II)			Wood Industries and Wood Products (III)		
Year	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers
1987	3.18	1.71	3.54	2.76	1.46	2.74	2.14	1.49	2.48	2.05	1.35	2.53
1988	3.26	1.70	3.71	2.47	1.51	2.76	2.21	1.49	2.51	1.97	1.21	2.41
1989	3.53	1.76	4.10	2.80	1.59	3.21	2.41	1.57	2.78	2.05	1.22	2.77
1990	3.64	1.79	4.41	2.85	1.60	3.45	2.35	1.45	2.92	2.17	1.31	2.89
1991	3.96	1.79	4.87	3.08	1.62	3.71	2.49	1.43	3.18	2.27	1.33	3.20
1992	4.21	1.91	5.32	3.34	1.68	4.04	2.60	1.49	3.55	2.35	1.34	3.26
1993	4.43	1.97	5.64	3.75	1.80	4.42	2.66	1.49	3.63	2.49	1.34	3.45
1994	4.61	2.05	5.87	3.90	1.83	4.66	2.82	1.56	3.79	2.47	1.24	3.74
1995 (P)	3.99	1.66	5.08	3.26	1.52	3.72	2.16	1.18	2.88	1.89	0.95	2.77

	Paper, Paper Products, Printed Matter, and Editorial Material (IV)			Chemicals, Petroleum Derivatives, and Rubber and Plastic Products (V)			Non-Metallic Mineral Products, Except Those Derived From Petroleum or Carbon (VI)		
Year	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers
1987	3.27	1.94	3.51	4.03	2.01	4.11	3.93	2.01	4.63
1988	3.51	1.81	3.97	4.21	2.05	4.36	4.14	2.00	4.92
1989	3.66	1.93	4.10	4.53	2.16	4.84	4.21	1.91	5.24
1990	3.61	1.81	4.39	4.68	2.11	5.02	4.52	1.93	5.85
1991	5.21	1.85	4.76	4.97	2.19	5.45	4.92	1.96	6.43
1992	4.18	1.98	5.41	5.60	2.39	6.08	5.36	2.12	7.28
1993	4.15	1.97	5.42	5.65	2.30	6.55	5.59	2.24	7.87
1994	4.16	1.90	5.53	6.05	2.44	6.85	5.78	2.36	7.79
1995 (P)	3.45	1.60	4.65	5.47	2.08	6.13	5.16	2.02	7.35

	Basic Metal Industries (VII)			Metal Products, Machinery, and Equipment (VIII)			Other Manufacturing Industries (IX)		
Year	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers	Total	Production Workers	Non-production Workers
1987	4.19	2.11	3.99	3.22	1.63	3.63	2.47	1.26	3.44
1988	4.14	2.14	4.49	3.23	1.57	3.71	2.40	1.22	3.40
1989	4.55	2.08	4.57	3.52	1.63	4.17	2.64	1.29	3.78
1990	4.74	2.04	5.02	3.69	1.84	4.60	2.58	1.27	3.96
1991	5.27	2.01	5.99	3.91	1.80	5.19	2.81	1.32	4.27
1992	5.78	2.23	6.31	4.18	1.93	5.59	3.09	1.53	4.72
1993	6.26	2.30	6.67	4.46	2.05	5.94	3.41	1.68	5.06
1994	6.05	2.41	6.78	4.58	2.13	6.24	3.56	1.65	5.20
1995 (P)	5.22	2.08	5.66	3.97	1.62	5.53	3.22	1.29	4.39

Observations are for the month of June of each calendar year. Figures for total compensation per worker include benefits, while those for production and non-production workers do not.

Source: INEGI, Encuesta Industrial Mensual, as cited in INEGI (1997).

Table 10: Foreign Investment in Mexico, 1980-1995 (in millions of U.S. dollars)

	Direct Foreign Investment (Flows)			Net Foreign Investment (Stock)		
Year	Total	U.S.	Canada	Total	U.S.	Canada
1980	1,622.8	1,078.6	17.5	8,458.8	5,836.6	126.9
1981	1,701.1	1,072.1	5.2	10,159.9	6,908.7	132.1
1982	626.5	426.1	8.1	10,786.4	7,334.8	140.2
1983	683.7	266.6	22.1	11,470.1	7,601.4	162.3
1984	1,429.8	912.0	32.5	12,899.9	8,513.4	194.8
1985	1,729.0	1,326.8	34.9	14,628.9	9,840.2	229.7
1986	2,424.2	1,206.4	40.6	17,053.1	11,046.6	270.3
1987	3,877.2	2,669.6	19.3	20,930.3	13,716.2	289.6
1988	3,157.1	1,241.6	33.9	24,087.4	14,957.8	323.5
1989	2,499.7	1,813.9	37.4	26,587.1	16,771.7	360.9
1990	3,722.4	2,308.0	56.1	30,309.5	19,079.7	417.0
1991	3,565.0	2,386.1	74.2	33,874.5	21,465.8	491.2
1992	3,599.6	1,651.7	88.4	37,474.1	23,117.5	579.6
1993	4,900.1	3,503.6	74.2	42,374.2	26,621.1	653.8
1994	8,026.2	4,004.5	163.5	50,400.4	30,625.6	817.3
1995	6,534.4	4,176.3	77.9	--	--	--

Notes: Net foreign investment does not include investments in the stock market nor foreign capital derived from authorizations granted by the Comisión Nacional de Inversiones to firms that "cotizan" in the stock market.

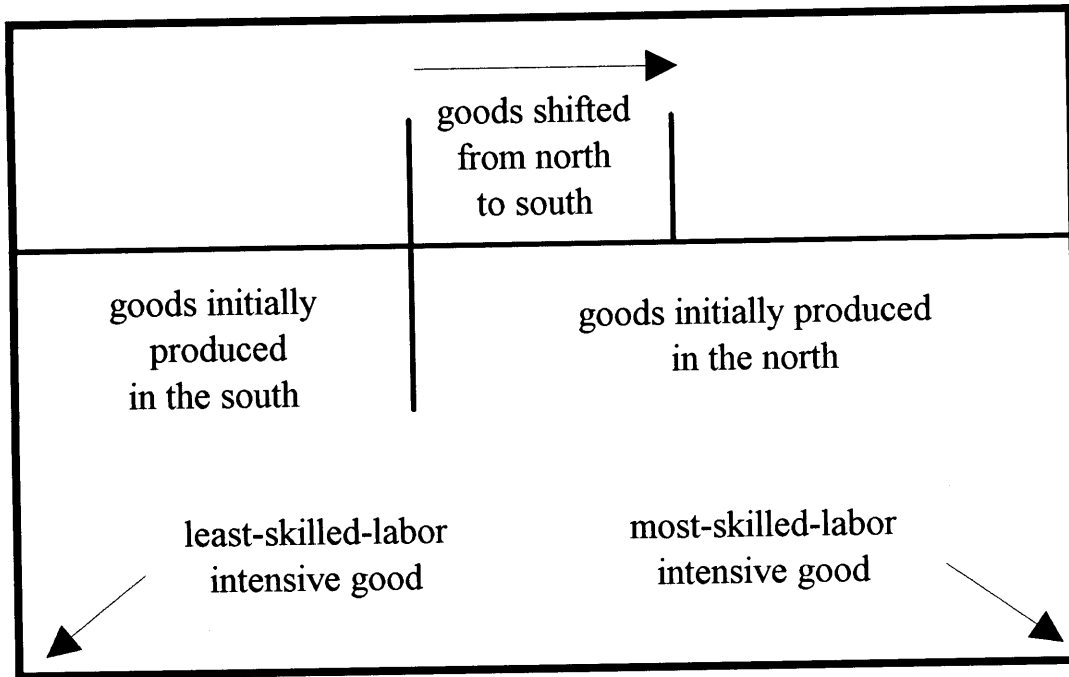1995 figures for direct foreign investment include certain maquiladora imports.

Source: SECOFI, Dirección General de Inversión Extranjera, as cited in INEGI (1997).

Table 11: Simulation Results for the Alternative-Technologies Model

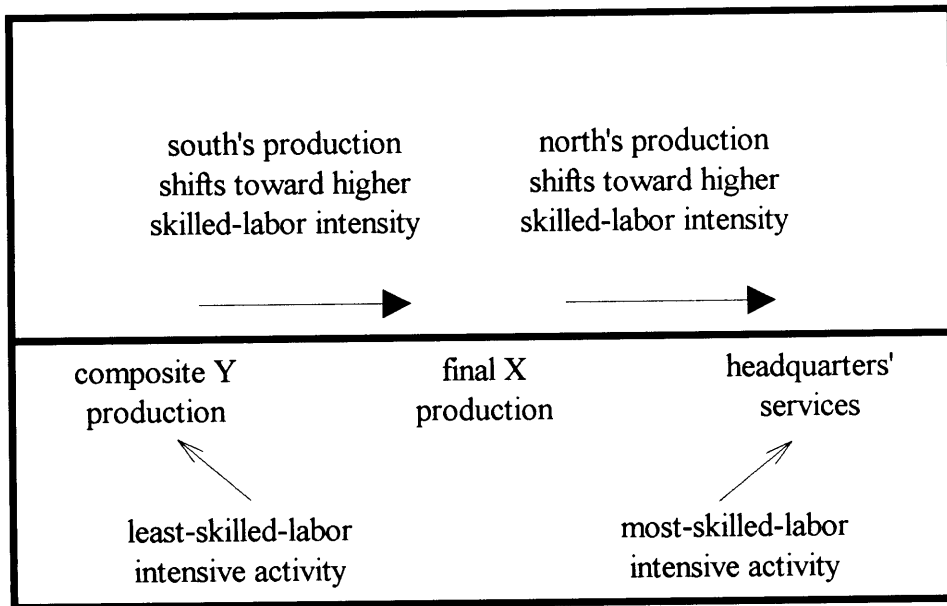| Tariff	w_h	w_f	r_h	r_f	w_h/r_h	w_f/r_f
0.20	2.00	1.00	1.00	2.00	2.00	0.50
0.18	1.91	0.98	1.03	2.08	1.86	0.47
0.16	1.83	0.95	1.06	2.17	1.73	0.44
0.14	1.74	0.93	1.09	2.25	1.61	0.41
0.12	1.66	0.91	1.12	2.35	1.47	0.39
0.10	1.58	0.89	1.15	2.44	1.37	0.36
0.08	1.56	0.89	1.17	2.49	1.33	0.36
0.06	1.57	0.90	1.18	2.52	1.33	0.36
0.04	1.59	0.91	1.19	2.54	1.33	0.36
0.02	1.60	0.92	1.20	2.56	1.33	0.36
0.00	1.62	0.93	1.21	2.59	1.33	0.36

Notes: (1) factor prices are in real units: price divided by the consumer price index
(2) specialization is reached at a tariff near 0.08. After that point, trade
liberalization does not affect relative factor prices in the two countries.

Figure 1: Investment Liberalization and Wage Gaps: The Feenstra-Hanson Model

goods shifted
from north
to south

goods initially
produced
in the south

goods initially produced
in the north

least-skilled-labor
intensive good

most-skilled-labor
intensive good

Goods Ranked by Skilled-Labor Intensity

Figure 2: Investment Liberalization and Wage Gaps:
The Markusen-Venables Model (Activity Shifts)

south's production
shifts toward higher
skilled-labor intensity

north's production
shifts toward higher
skilled-labor intensity

composite Y
production

final X
production

headquarters'
services

least-skilled-labor
intensive activity

most-skilled-labor
intensive activity

Goods Ranked by Skilled-Labor Intensity

Figure 3: Investment Liberaliztaion and Wage Gaps:
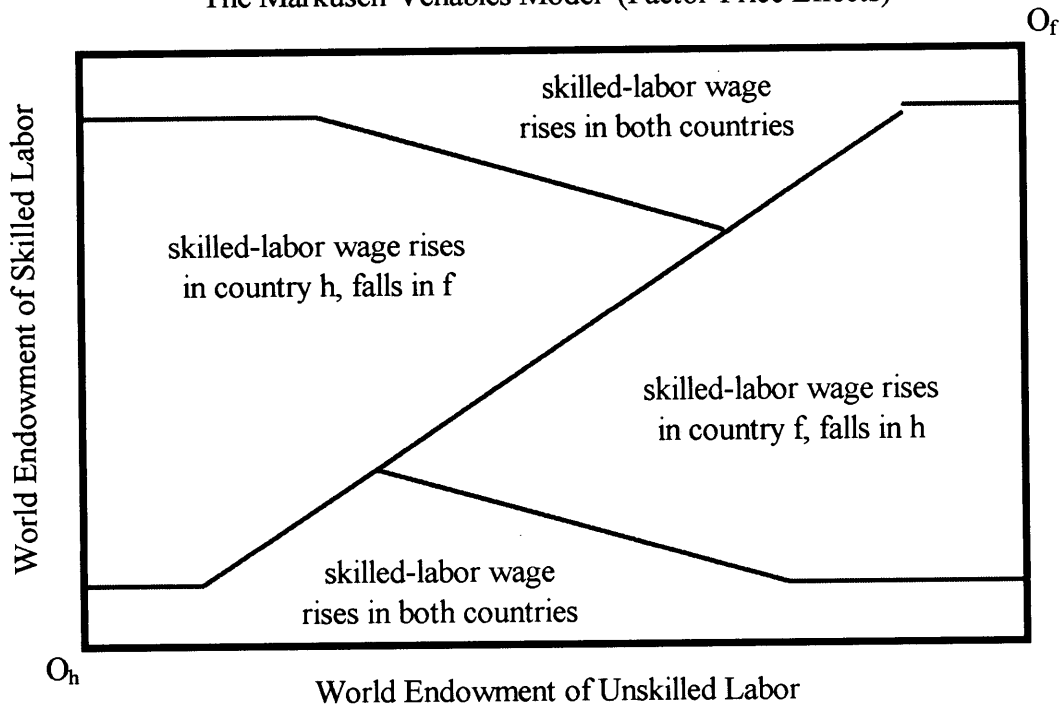The Markusen-Venables Model (Factor-Price Effects)

O_f

skilled-labor wage
rises in both countries

skilled-labor wage rises
in country h, falls in f

skilled-labor wage rises
in country f, falls in h

skilled-labor wage
rises in both countries

O_h

World Endowment of Skilled Labor

World Endowment of Unskilled Labor

Figure 4: Competitive Model with Multiple Techniques of Agricultural Production

northern agriculture
technique

$(w/r)_n$

composite Y-sector
technology

southern agriculture
technique

$(w/r)_s$

K

L
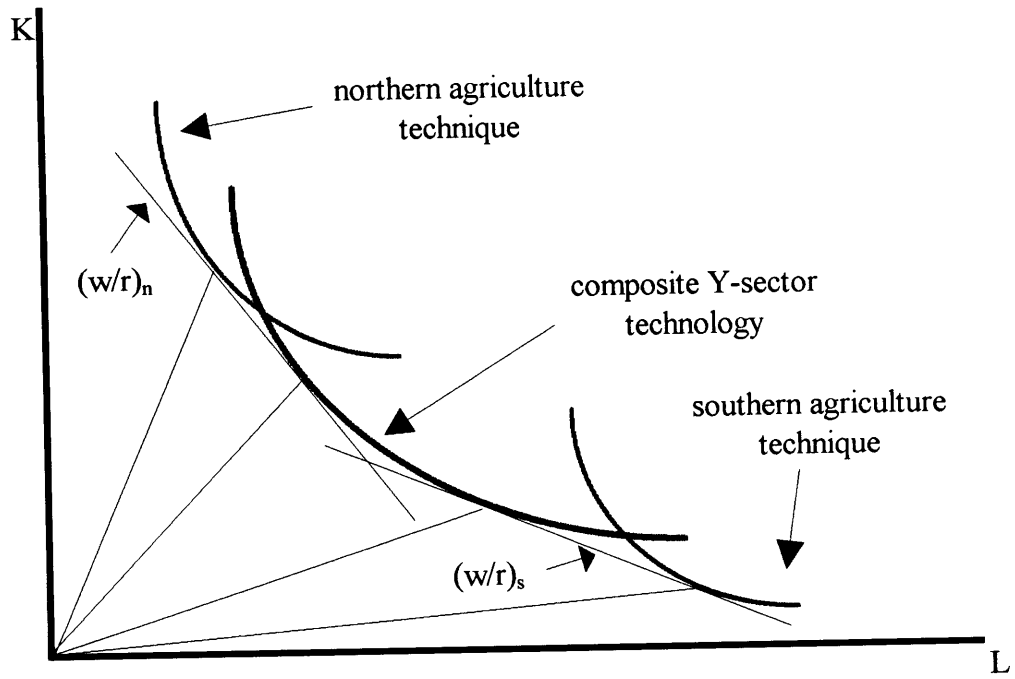
Figure 5: Competitive Model with Multiple Techniques of Agricultural Production, Trade Liberalization

northern agriculture
technique

Y

$(w/r)_n$

$(w/r)_s$

southern agriculture
technique

K

L
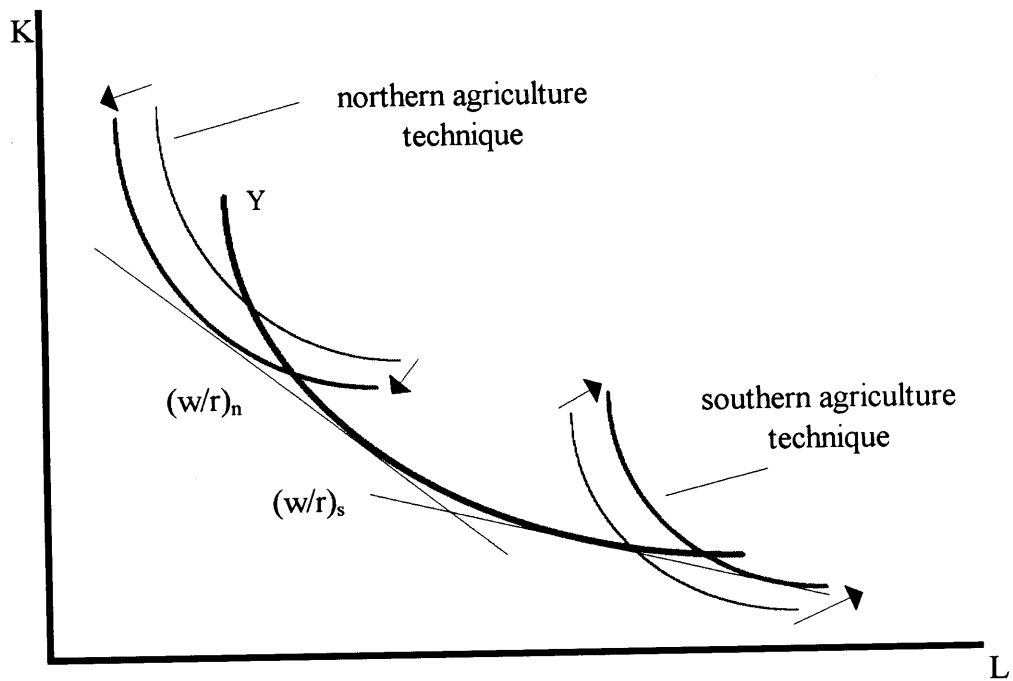
Figure 6: Specific-Factors Model with an Outside Opportunity

marginal product of labor in maize

marginal product of labor in composite

marginal product
of labor in the
maize sector

investment
liberalization

US wage for
a migrant

trade liberalization

marginal product
of labor in the
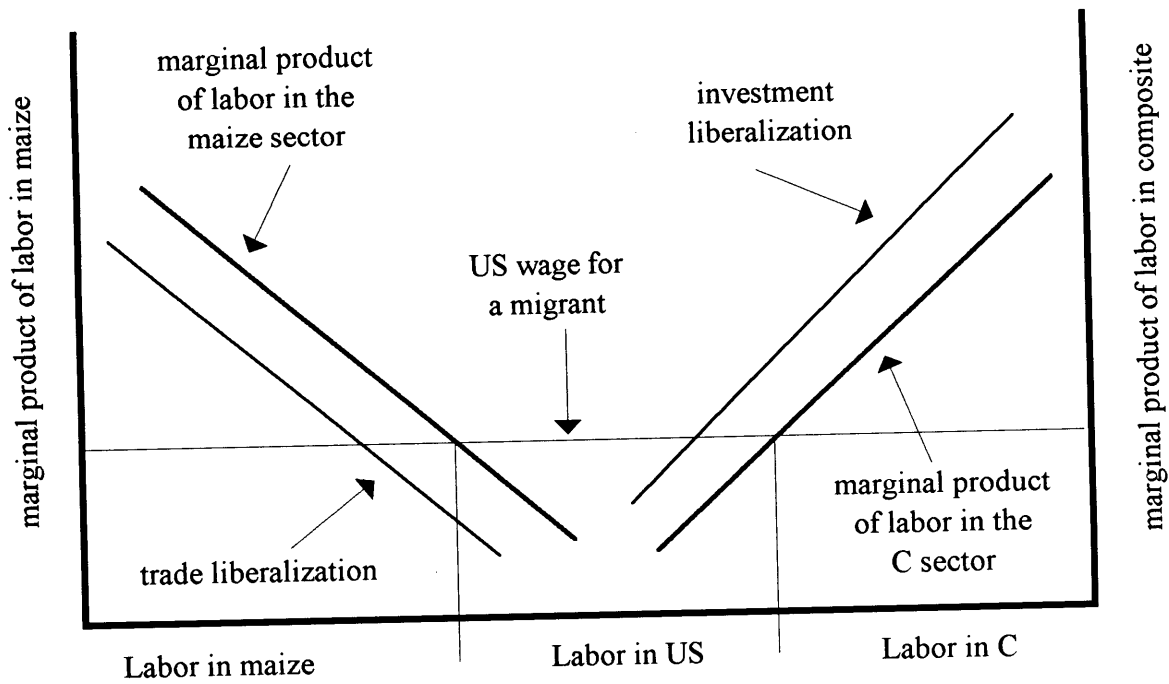C sector

Labor in maize

Labor in US

Labor in C

Figure 7: Model with a Public Intermediate Good:
Public Infrastructure

C

low level of infrastructure

high level of infrastructure

Maize