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ABSTRACT

Does regional economic integration affect the location of economic activity inside countries? In this paper, I discuss recent academic literature on whether the movement towards free trade in North America has influenced the spatial organization of production in Canada, Mexico, or the United States. In Mexico, closer economic ties with the United States appear to have contributed to a contraction of employment in the Mexico City manufacturing belt, a rapid expansion of manufacturing employment in northern Mexico, and an increase in the wage premia paid to skilled workers. The effects of economic integration on industry location in Canada and the United States seem to have been much weaker. On exception to this finding is U.S. cities on the Mexican border, whose employment growth is strongly positively correlated with export production in neighboring Mexican regions. I also discuss implications of a possible hemispheric free trade agreement.

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I. INTRODUCTION

In the United States, the popular press portrayed the debate over the North American Free Trade Agreement (NAFTA) as a conflict of capital versus labor. The logic was that U.S. corporations favored NAFTA, since it would lower their costs of serving the North American market relative to competitors in Japan and Europe, and that labor opposed the agreement, since it would bid down U.S. wages by putting U.S. workers in competition with low-wage Mexican labor. While business groups did favor NAFTA and labor unions opposed it, the politics of free trade are more complex than its characterization in the media implies.

Geography also played a role in the politics of NAFTA, which suggests that voters expected the effects of freeing trade in North America to vary across regions within the United States. NAFTA was perceived to be mainly about increasing trade with Mexico, since the United States had completed a free trade agreement with Canada in 1989. U.S. congressional representatives from districts on the border with Mexico voted overwhelmingly to support NAFTA, while those from districts on the border with Canada voted overwhelmingly against it. More generally, politicians from southern and western states were much more likely to support the agreement than were their counterparts in the northeast and midwest. U.S. politicians seemed to feel that NAFTA would benefit regions close to Mexico and harm regions distant from Mexico.[1]

Why should support for free trade agreements have a geographic component? Recent theoretical work in international trade provides a conceptual framework to understand how trade reform alters relative regional economic fortunes within a country's borders. In Fujita

[1] Scheve and Slaughter (1997) provide further evidence on how locational factors influence voter preferences about trade policy.

(1988) and Krugman (1991), the interaction of increasing returns to scale and transport costs creates a self-reinforcing process of industry agglomeration. Firms desire to concentrate production near large consumer markets since this allows them to economize both on transports costs and fixed production costs. As more firms locate in an industry center, the center becomes more attractive as a production site. Immobile factors of production, land rents, or other sources of congestion costs work against agglomeration. As long as agglomerative forces are sufficiently strong, firms will geographically concentrate in one or more industry centers. Where industry centers happen to form may only be partially determined by the exogenous features of regions, such as climate, access to waterways, or supplies of natural resources. Thus, historical factors or policy decisions, intentioned or not, may influence which regions develop an industrial base.[2]

Free trade agreements influence the location of economic activity by expanding the set of markets that firms serve. As a country lowers its trade barriers, there is an increase in foreign demand for domestically-produced goods. All else equal, free trade gives domestic firms an incentive to move production to regions with relatively good access to foreign markets, such as border areas or port cities. The incentive to relocate is likely to be stronger in small economies, such as Canada and Mexico, where exports are a large fraction of sales, and weaker in large economies, such as the United States, where exports are a small fraction

[2] Extending this line of work, Venables (1996) and Krugman and Venables (1995) allow production within each industry to contain several intermediate stages, each of which exhibits scale economies. Given transport costs, firms prefer to locate near upstream suppliers or downstream buyers. Complimentarity between the location decisions of upstream and downstream firms causes entire industries to agglomerate. Puga (1998) generalizes these results and examines the impact of alternative sets of assumptions about labor mobility, input-output linkages, and transport costs. See Fujita and Thisse (1996) and Ottaviano and Puga (1998) for surveys.

of sales.[3] As firms begin to move towards specific regions, a self-reinforcing process is created, which may cause entire industry centers to relocate. A fall in trade barriers may thus cause some regions to expand and other regions to contract.

To examine the relationship between trade policy and industry location, I begin by reviewing patterns of regional development in North America. I then discuss evidence on how North American economic integration has influenced the location of economic activity in the three countries and conclude by considering the impact of future initiatives towards hemispheric integration on regional economies. I make no attempt at a comprehensive survey of the literature and instead choose papers to illustrate conceptual issues.

II. INDUSTRIALIZATION AND SPATIAL CONCENTRATION

For most countries, industrialization and urbanization are concurrent events. Industrial development in Canada, Mexico, and the United States brought with it the geographic concentration of economic activity. In each country, industry initially concentrated in a relatively confined geographic area. While industry in North America has moved out of traditional manufacturing regions over the last several decades, economic activity is still highly unevenly distributed across space.

Over the past half century, the regional pattern of economic activity in the United States has altered considerably. Table 1 shows the regional distribution of manufacturing

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[3] To be more precise, what matters is not size per se but exposure to world markets. For instance, in China, which is by any measure a large economy, the reduction of trade barriers has lead to a dramatic shift in regional production towards southern coastal cities, which have good access to foreign markets relative to interior cities (Cheng and Kwan, 1998). One of many ways in which China is distinct from the United States is that foreign trade is a bigger part of its economy. See Henderson (1988) for a theoretical discussion of how initial patterns of settlement influence regional industrial structure.

employment in the United States for the period 1850-1990. Industry in the United States was concentrated initially in a manufacturing belt that included New England, the mid Atlantic states, and the Great Lakes region. In 1870, this region accounted for 80.5% of U.S. manufacturing employment and 56.4% of the U.S. population. A century later, the region still had 57.9% of U.S. manufacturing employment and 49.8% of the population.

Recent economic growth in the United States has shifted the locus of economic activity to the south and west. Since 1950 employment growth relative to the nation as a whole has been strongly negative in northeastern and midwestern states, such as Massachusetts, Michigan, New York, and Pennsylvania, and strongly positive in southern and western states, such as California, Florida, Georgia, and Texas (Blanchard and Katz, 1992). The shift in U.S. production from manufacturing to services has reinforced these movements and contributed to a lessening of regional specialization (Kim, 1995).

Despite the ongoing delocalization of industry, economic activity in the United States remains highly geographically concentrated. In 1990, the 100 most economically-active U.S. counties accounted for 41.2% of U.S. manufacturing employment but only 1.5% of total U.S. land area.[4] With the relocation of industry, traditional manufacturing centers, such as Cleveland, Detroit, and Pittsburgh, have declined, but new manufacturing centers, such as Atlanta, Los Angeles, and San Jose, have been created. Thus, while industry has become more evenly distributed across regions over time, within each region production remains

[4] Figures for earlier years are similar. In 1970, the 100 most economically-active U.S. counties accounted for 44.9% of U.S. manufacturing employment and 1.5% of U.S. land area.

highly concentrated in and around a few major cities.[5]

In Canada, industrial activity has historically also been spatially agglomerated. The country's manufacturing belt appears to be largely an extension of the U.S. manufacturing belt. Table 2 shows the regional distribution of manufacturing employment in Canada for the period 1926-1995. Ontario, which adjoins the major manufacturing regions of the U.S. northern midwest, has had just under half of Canada's manufacturing employment for most of this century. In contrast to the United States, the spatial distribution of manufacturing activity in Canada has been quite stable over time. The lack of dynamism in industrial location in Canada when compared to the United States is an interesting point of contrast between the two countries, which has received relatively little attention in the academic literature.

It is perhaps less well known that regional industrial development in Mexico has followed a pattern broadly similar to that in the United States. The Mexican economy begin to industrialize in the 1930's. What was initially a de facto process of import-substitution industrialization (ISI), due to rising trade barriers and the Great Depression in the United States, became de jure in the 1940's, as the government raised import tariffs, adopted a system of import licenses, and imposed export controls as means to promote domestic industry. Given the narrow goal of ISI, the policy was largely successful. Between 1930 and 1970, the share of manufacturing in Mexican GDP increased from 12.9% to 23.3%, as Mexico expanded and diversified its manufacturing base.

The industrialization of Mexico was centered in Mexico City, which until recently was

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[5] The dynamics of agglomeration for individual industries differ from that for manufacturing activity overall. Kim (1995) finds that individual manufacturing industries became more geographically concentrated over the period 1878-1926 and then less concentrated over the period 1926-1986. Dumais, Ellison, and Glaeser (1997) find that industry agglomeration declined slightly over the period 1972 to 1992.

the country's principal manufacturing center. Table 3 shows the regional distribution of manufacturing employment in Mexico for the period 1930 to 1993. Mexico City's share of the national manufacturing labor force rose from 19.0% in 1930 to 46.0% in 1960. Over that 30-year period manufacturing employment in Mexico City grew at an average annual rate of 6.7%, compared to 2.4% in the rest of the country (Garza, 1985).

Since 1980, industrial activity in Mexico has shifted to states on the U.S.-Mexico border, diminishing Mexico City's role in the national economy. These developments have coincided with the opening of the Mexican economy to foreign trade and investment. Between 1980 and 1993, the share of national manufacturing employment in border states rose from 21.0% to 29.8%. Recent foreign direct investment in Mexico is concentrated almost entirely in the border region. The decline of the Mexico City manufacturing belt has been as dramatic as its rise. Between 1980 and 1993 the region's share of national manufacturing employment fell from 44.4% to 28.7%, as employment in the region actually declined by 1.9%. Mexico's new industrial centers are located in northern cities such as Ciudad Juarez, Monterrey, and Tijuana, which are physically close to the United States.

III. TRADE, INCREASING RETURNS, AND REGIONAL ECONOMIES

Could trade policy be responsible for regional employment shifts in Canada, Mexico, and the United States? The sheer size of the U.S. economy makes it unlikely that foreign trade could have a substantial impact on industry location. From Table 1 it is evident that the regional reallocation of employment towards the west and southeast has been ongoing for nearly a century, during which the U.S. economy's exposure to world markets has oscillated.

Factors such as the development of the interstate highway system and the advent of air conditioning likely have more to do with regional population changes in the United States than does trade with the rest of the world.

For Canada and Mexico, however, the relationship between international trade and industry location appears to be much stronger. Canada's industry centers developed alongside those in the United States, forming an extension of U.S. industry agglomerations. Until recently, for instance, auto production in the two countries was geographically concentrated in the Michigan-Ontario industrial corridor. In Mexico, the demise of the Mexico City manufacturing belt and the rapid expansion of industry in northern Mexico followed the formation of closer economic ties with the rest of the world, and with the United States in particular. At first glance, at least, access to foreign markets seems to have played an important role in these countries' regional economic development.

A correlation between proximity to the United States and regional economic development in Canada and Mexico in no way implies causality. The Canadian-U.S. border is the site of important waterways that link markets in interior Canada to markets in Europe and elsewhere. Similarly, northern Mexico has stocks of natural resources, including timber and iron ore, which supply Mexican industry. How do we know that it is international trade, and not these other factors, that is driving regional economic development in Canada and Mexico? A related question has been at the heart of much recent empirical literature on industry location and regional economic growth: how do we know that industry agglomeration, such as that which occurred in the U.S. manufacturing belt, is due to scale economies and not to exogenous factors, such as supplies of natural resources?

To understand the relationship between international trade and industry location, we must first identify the underlying forces that shape the spatial distribution of economic activity. In this section, I briefly review empirical research on the relationship between increasing returns to scale and industry location and then examine the particular question of how trade shapes the location and organization of production in North America.

A. Is Geographic Concentration Evidence of Increasing Returns?

The geographic concentration of economic activity is often cited as evidence of increasing returns to scale. With capital and labor mobile in the long run, there would need to be an implausible concentration of immobile resources to produce cities the size of Chicago, Los Angeles, or New York. Yet, the time-invariant characteristics of regions, such as the supply of water, the existence of natural harbors, and weather, surely influence the formation of cities and the spatial distribution of resources.

One strategy to empirically distinguish the effects of increasing returns on industry location from those of site-specific factors is to examine the variation in industry growth rates across regions. While the concentration of natural resources in a particular location may contribute to industry agglomeration in that region, it will not, except under specific forms of technological change, contribute to the industry's expansion over time. Using data on long-run changes in industry employment in U.S. cities, Glaeser et al. (1992) find that employment growth in a regional industry is positively correlated with the initial diversity of industrial activity in the region. Henderson, Kuncoro, and Turner (1995), using annual data for individual manufacturing industries in U.S. cities, discover that regional industries with larger

initial employment levels tend to grow faster, but only over short horizons. Both studies interpret the positive correlation between regional industry employment growth and the initial concentration of economic activity as evidence of dynamic agglomeration economies. In a related branch of literature, Wheeler and Mody (1992) and Head, Ries, and Swenson (1995) find that, controlling for international differences in factor prices, multinational firms are more likely to locate in a region the larger is the local concentration of existing multinationals. These findings are also interpreted as evidence of agglomeration economies.

A second strategy to identify the effects of increasing returns on industry location is to use the spatial covariation in wages, employment, and income to estimate the magnitude of scale economies directly. Ciccone and Hall (1996) find that the correlation between labor productivity and the spatial density of employment across U.S. states is consistent with small but significant aggregate increasing returns to scale. To control for the potential endogeneity of spatial employment densities, they use historical data on population levels and transportation infrastructure as instrumental variables. In a similar vein, Rauch (1993) finds that wages for workers are positively correlated with the local concentration of economic activity. In Hanson (1998a), I use data on U.S. counties to estimate the structural equations of the Krugman (1991) model. Using a time-differenced specification to control for the unobserved site-specific characteristics, I find evidence of large transport costs and moderate scale economies. The magnitude of increasing returns that I estimate are sufficiently strong to support the spatial agglomeration of industry.

A growing body of empirical work suggests that increasing returns to scale contribute to the geographic concentration of economic activity. The literature helps answer questions

such as why industrial firms tend to concentrate near large cities or, at the level of individual industries, why microelectronics firms tend to concentrate in a place like Silicon Valley. An important question for trade policy is how specific shocks, such as the formation of free trade areas, influence the spatial distribution of economic activity. Recent literature extends empirical work on increasing returns to address this question.

B. Mexico-U.S. Economic Integration

The long history of Canada-U.S. trade makes its impact on industry location in Canada difficult to identify. Though the Canada-U.S. free trade agreement was passed in 1989, the United States has exerted a strong pull on Canadian industry for more than a century. Perhaps for this reason, there has been little empirical work on how changes in Canadian trade policy have influenced industry location in the country.

Mexico, in contrast, offers a relatively clean case for study. The country has made the transition from a closed economy to an open economy in a remarkably short period of time. In 1985, Mexico ended its experiment with ISI and announced that it was joining the General Agreement on Trade and Tariffs. At that time, import licenses covered 92.2% of national production, the average tariff was 23.5%, and there were export controls on 85.0% of non-petroleum exports (Hanson, 1997a). By the end of 1987, the Mexican government had abolished export controls, reduced import-license coverage to 25.4% of production, and cut average tariffs to 11.8%. Given Mexico's proximity to the United States and relatively low U.S. trade barriers, trade liberalization for Mexico is tantamount to economic integration with its northern neighbor. Mexico-U.S. integration thus begins with Mexico's 1985 trade reform

-- NAFTA merely finalizes a process that had been underway for nearly a decade.

In several recent papers, I use trade reform in Mexico as a natural experiment to examine the impact of changes in trade policy on the spatial and industrial organization of economic activity. Four questions are especially pertinent to this research. First, can we attribute the pre-trade reform agglomeration of industry in Mexico City to high trade barriers? If the combination of trade protection and increasing returns to scale helped create the Mexico City manufacturing belt, then trade reform may substantially alter industry location in the country. Second, how has the pattern of regional economic growth in Mexico changed following the opening to trade? By comparing economic growth across regions before and after trade reform, I can identify the factors that influence industry location, including agglomeration economies and the importance of access to the U.S. market. Third, how has increased Mexico-U.S. trade affected labor earnings in Mexico? Expanded foreign trade in Mexico has coincided with large inflows of U.S. investment, which are concentrated along the Mexico-U.S. border, and a shift to more specialized industrial production. These events may have changed factor intensities in production, which could alter the rewards to different types of factors. Fourth, has Mexico-U.S. integration influenced regional employment in the United States? Given the relative size of the two economies, it may not be surprising to find that increased Mexico-U.S. trade influences industry location in Mexico. To also find that Mexico-U.S. trade matters for industry location in the United States would suggest that changes in trade policy can have strong effects on regional economies.

B.1 Trade Policy and the Mexico City Manufacturing Belt

Prior to trade liberalization in Mexico, Mexico City was the country's principal industrial center. In Hanson (1996a, 1997a), I exploit the information contained in the regional structure of wages to assess whether increasing returns to scale contributed to the geographic concentration of economic activity in the country.

An important implication of increasing-returns-based theories of industry agglomeration, such as Rauch (1991), Krugman and Livas (1996), and Thomas (1997), is that regional wages decrease with transport costs to industry centers. This result is due to a combination of congestion in agglomerated regions, which drives up local housing prices relative to housing prices in outlying locations, and labor migration between regions, which, given housing-price differentials, requires that nominal wages in industry centers be sufficiently high that real wages are equalized across locations.

Under ISI in Mexico, industry concentrated in Mexico City. Though trade barriers were high, they were not prohibitive. There was still some production for foreign markets, mainly in the United States. Given trade barriers that are sufficiently large, Krugman and Livas (1996) show that two types industry centers may emerge: a principal center (in Mexico City), in which firms produce for the domestic market, and a smaller center (in northern Mexico), in which firms produce partly for the foreign (U.S.) market. Table 3 shows that in 1980, five years before trade liberalization began, 69.3% of the Mexico's manufacturing labor force was located in Mexico City and the surrounding central states, and 21.0% of the manufacturing labor force was located in Mexican states on the U.S. border. Northern and southern states, which account for 40.5% of Mexico's land area, contained only 11.3% of

national manufacturing employment.

Theory has two important predictions for the regional wage structure. First, nominal wages will be relatively low in regions that have relatively high transport costs to either Mexico City or the United States. Second, trade reform, by increasing U.S. demand for Mexican goods, will weaken the pull of the closed-economy industry center in Mexico City and strengthen the pull of the U.S. market. To examine these predictions, Table 4 shows regional average nominal manufacturing wages relative to national average nominal manufacturing wages from 1965 to 1988. Consistent with the theory, Mexico City has the highest wages, followed by the border states and central states, with northern and southern states lagging far behind.

To more formally examine the relationship between wages and proximity to industry centers, in Hanson (1997a) I estimate state manufacturing wages relative to national manufacturing wages as a function of distance to Mexico City and distance to the United States. Regional relative wages are strongly negatively correlated with distance to Mexico City and distance to the Mexico-U.S. border. A 10% increase in distance from Mexico City is associated with a 1.9% decrease in the relative state nominal wage, and a 10% increase in distance from the Mexico-U.S. border is associated with a 1.3% decrease in the relative state nominal wage. The results suggest that differential access to industry centers helps create regional wage differentials. Also consistent with the theory, in Hanson (1996a), I find that the effect of distance from Mexico City on state manufacturing wages has weakened following the liberalization of trade.

The strong correlation between regional wage differentials and proximity to industry

centers suggests that trade policy plays an important role in regional economic development. However unintended it may have been, import substitution appears to have contributed in an important way to industry agglomeration in Mexico City. In a perhaps equally unintended manner, the opening of the economy to foreign trade and investment appears to undermine the economic rationale of such megacities.

B.2 Regional Economic Growth in Mexico Before and After Trade Reform

We expect trade liberalization to induce greater specialization in production and, as a consequence, a sectoral reallocation of resources. There are several reasons why falling trade barriers might also contribute to a spatial reallocation of resources. First, if individual industries are geographically concentrated, then regions that specialize in import-competing goods are likely to contract and regions that specialize in export industries are likely to expand. Second, the existence of transport costs gives firms that export a substantial fraction of their output or that use imported intermediate inputs intensively an incentive to locate their activities in regions with low-cost access to foreign markets. The existence of spatial agglomeration effects may compound these factors, as the size or mix of industries in a region also affects how it adjusts to trade. Venables (1996), for instance, shows that in the presence of scale economies vertical linkages between industries help make the location decisions of buyers and suppliers interdependent. Expansion in one industry may contribute to the expansion of upstream and downstream industries.

In Hanson (1998b), I examine regional industry employment growth in Mexico before and after trade reform in an attempt to disentangle the various effects that falling trade

barriers have on industry location. I estimate state-level employment growth in individual manufacturing industries for two time periods, 1980-1985, the period immediately preceding trade reform, and 1985-1993, the period immediately succeeding trade reform, as a function of the following factors: (1) distance to the Mexico-U.S. border, which proxies for transport costs to foreign markets, (2) the initial regional concentration of upstream and downstream industries, which captures the effects of backward-forward linkages, and (3) the initial regional concentration of activity in the same industry, which captures the effects of within-industry agglomeration economies.[6]

The findings suggest that access to foreign markets influences industry location. Prior to trade reform, there is zero correlation between regional industry employment growth and distance to the United States. But after trade reform, the correlation is strongly negative. As Table 3 suggests, the locus of manufacturing activity in Mexico is shifting towards the U.S. border. In both time periods, there is a strong positive correlation between regional employment growth and the initial concentration of activity in upstream and downstream industries, which is consistent with the presence of backward-forward linkages in economic growth. An industry is likely to grow more rapidly when it is located near its buyers and suppliers. Finally, consistent with Glaeser et al. (1992) (but not with Henderson, Kuncoro, and Turner, 1995), I find no evidence of within-industry agglomeration economies. There is a negative correlation between employment growth and within-industry agglomeration before trade reform and a zero correlation after trade reform.

The empirical results help put in context the overall spatial shift in manufacturing

[6] To control for the sectoral effects of trade reform, I measure state industry employment growth relative to national industry employment growth.

activity that is occurring in Mexico. Since trade reform, the closed-economy manufacturing belt around Mexico City has begun to break apart. New industrial centers are forming in northern Mexico, where firms have low-cost access to the U.S. market. Accompanying the relocation of industry is a shift in the composition of Mexico's industry centers. The importance of backward-forward linkages and the lack of within-industry agglomeration economies suggests that broadly specialized regional industrial centers are replacing the dense concentrations of industries around Mexico City that dominated the Mexican economic landscape under ISI. The shift involves both a spatial decentralization of employment, as industry moves from Mexico City to one of several Mexican states on the U.S. border, and a reduction in regional specialization, as multiple manufacturing activities expand in the new industrial sites. NAFTA, by further lowering trade barriers between Mexico and the United States, is likely to reinforce these movements.

B.3 Mexico-U.S. Integration and the Structure of Wages in Mexico

Trade reform in Mexico has lead to a dramatic increase in Mexico-U.S. trade, which has further expanded following the passage of NAFTA in 1994. Table 5 shows U.S. trade with Mexico from 1980 to 1995. A large fraction of U.S.-Mexico trade in manufactured products is the result of U.S. multinational firms establishing export assembly plants, known as *maquiladoras*, in Mexico. These plants import most parts and components from the United States and export most output back to the United States. In 1995, exports by maquiladoras accounted for 40.2% of all Mexican exports to the United States. Most maquiladoras assemble one of three types of goods, apparel, electronics, or auto parts. In 1995, these three

industries accounted for 72.6% of total maquiladora employment in Mexico and 80.5% of total exports by maquiladoras to the United States.

Maquiladoras account for a major portion of recent manufacturing employment growth in Mexico. Table 6 shows employment in all manufacturing plants and employment in maquiladoras for all Mexico and for Mexican states on the U.S. border from 1980 to 1997. The share of Mexican manufacturing employment accounted for by maquiladoras rose from 5.6% in 1980 to 25.1% in 1997. These plants are overwhelmingly concentrated in Mexican states on the U.S. border. It appears that the shift in production to northern Mexico has occurred mainly through the exit of domestic firms located in the center of the country and the entry of maquiladoras located in the border region. Thus, in Mexico expanding trade with the United States has coincided with large inflows of foreign investment, a shift in production towards the Mexico-U.S. border region, increased specialization in a narrow range of goods, and, within industries, greater specialization in assembly-type activities.[7]

An important question is how Mexico-U.S. trade, in general, and the growth of maquiladoras, in particular, will affect the relative demand for different factors of production in the two countries. In the United States, the impact of trade with low-wage countries on the earnings of U.S. workers has received considerable attention. Over the last two decades, the earnings of more-skilled workers have risen dramatically relative to the earnings of less-

[7] It is often asserted that the growth of maquiladoras is the result of special trade advantages afforded to goods produced by these plants on their entry into the United States. Tariffs are levied only on the value added abroad (i.e., in Mexico) and not on the value of the U.S. inputs used in the assembly of the goods. Mexican firms that use domestically-produced inputs enjoy no such advantage. An alternative view, which I stress in this paper, is that maquiladoras have expanded in part because Mexico, given its relative abundance of low-wage labor, has a comparative advantage in assembly-type activities (rather than in entire industries). Since NAFTA was implemented in 1994, maquiladoras have lost their special trade advantages in most industries. Yet, maquiladoras continue to grow faster than any other sector in the economy, which suggest that their initial trade advantages relative to other firms in Mexico cannot fully account for their growth.

skilled workers, which many observers attribute at least partially to expanded U.S. trade with the developing world (Freeman, 1995). Interestingly, during the 1980's Mexico also experienced a large increase in the relative earnings of more-skilled workers. Over the period 1986-1990, the wages of manufacturing workers in the 90th wage percentile increased by 16 percent relative to those in the 10th wage percentile (Feliciano, 1993). This rise in wage inequality coincided with the opening of the Mexican economy to trade and large inflows of foreign direct investment from the United States.

To examine the relationship between globalized production, as exemplified by the growth of U.S.-owned maquiladoras in Mexico, and wage inequality, Feenstra and Hanson (1996) develop a model of foreign outsourcing, in which firms in the skill-abundant North (the United States) use firms in the nonskill-abundant South (Mexico) to produce intermediate inputs. We imagine a situation where production involves many different stages, such as design, parts production, and assembly, each of which differ in the intensity with which they require skilled labor. If wages differ between nations, the North specializes in high-skill tasks, such as research and design, and the South specializes in low-skill tasks, such as the product assembly performed by maquiladoras. If we allow Northern firms to outsource production to the South, they will choose to move the least skill-intensive activities that they perform. By moving low-skill activities to the South, the average skill intensity of production rises in the North. Interestingly, the same happens in the South, since the South initially specializes in very low-skill tasks. Outsourcing from the North to the South thus raises the relative demand and the relative earnings of high-skilled workers in both countries,

contributing to a global increase in wage inequality.[8]

In Feenstra and Hanson (1997a), we use data on regional manufacturing activity in Mexico to examine whether the relative earnings of skilled workers have risen more in regions where foreign investment has been more concentrated, as would be consistent with our model. We use regional data on maquiladoras to measure the spatial distribution of foreign direct investment in Mexico. Consistent with the theory, we find that the relative demand for high-skilled workers is higher in regions where maquiladoras have expanded most rapidly. In regions where maquiladoras are concentrated, growth in maquiladora activity can account for over 50 percent of the increase in the skilled labor wage share that occurred in Mexico during the late 1980's. These results suggest that foreign outsourcing, in the form of maquiladoras, has contributed to a rise in wage inequality in Mexico. While we believe that foreign outsourcing has also contributed to the U.S. rise wage inequality (see Feenstra and Hanson, 1997b), trade with Mexico alone is surely too small to have had a large impact on the relative demand for labor in the United States.

B.4 Mexico-U.S. Trade and the U.S. Border Economy

What are the implications of Mexico-U.S. economic integration for regional economies in the United States? The expansion of maquiladora-based trade represents expanding vertical supply linkages between U.S. and Mexican firms. It seems clear that these linkages have helped pull economic activity northward in Mexico. In principle, Mexico-U.S. trade could

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[8] This story resembles the model in Krugman and Venables (1995), in which expanded international trade deindustrializes some countries and leads to a rise in income inequality between nations. Though they focus on the interaction of increasing returns to scale and transport costs, and not differences in relative factor abundance, the two models should be seen as complimentary.

also pull U.S. production southward.

In Hanson (1996b, 1997b), I examine the impact that the growth in Mexico-U.S. trade has had on the location of production in the United States. There are several ways in which the economic integration of the two countries could contribute to a relocation of economic activity in the United States. First, an increase in U.S.-Mexico trade could raise demand for transportation and warehousing services on both sides of the border, in which case border cities function as land ports. Second, the existence of transport costs may give U.S. firms that export to Mexico or that supply maquiladoras with inputs, an incentive to locate their production facilities in U.S. border cities. In this outcome, the border is the center of a binational regional production network for the North American market.

To assess the impact of Mexico-U.S. trade on industry location in the United States, I examine the correlation between economic activity in pairs of U.S. and Mexican border cities. I use annual data on the ten major border-city pairs for the period 1975-1994 to estimate employment growth in U.S. border cities as a function of a series of control variables and the growth in export production in nearby Mexican border cities. Nearly all production for export in Mexican border cities occurs in maquiladoras. A positive correlation between export production in a Mexican border city and employment in the neighboring U.S. border city would be consistent with the hypothesis that production in border-city pairs is linked through vertical supply relationships. But it could also be simply a byproduct of secular shifts in U.S. employment towards southwestern states, which are evident in Table 1. To control for this possibility, I also examine the correlation between export production in Mexican border cities and employment in interior cities located in U.S. border states.

The empirical findings suggest that economic integration between countries is associated with the expansion of production in border regions. A 10.0% increase in export manufacturing in a Mexican border city is associated with a 1.5% to 2.0% increase in employment in the neighboring U.S. border city. This effect is substantial when one considers that export manufacturing in maquiladoras has been growing at an annual average rate of 12.1% since 1980. The impact of economic integration on U.S. border cities appears to vary with the size of the border city. For small U.S. border cities, the employment effects are strongest for the transportation and wholesale trade industries, which is consistent with the land-port hypothesis; for large U.S. border cities, the employment effects are strongest for the manufacturing industry, which is consistent with the binational-regional-production-network hypothesis. Further, there is no statistically significant correlation between Mexican export production and employment in interior cities located in U.S. border states, which suggests that employment growth in U.S. border cities is not a byproduct of generalized employment growth in U.S. border states.

As NAFTA consolidates the process of U.S.-Mexico economic integration, it is likely to contribute to further relocation of U.S. production towards U.S. cities on the Mexican border. That free-trade agreements contribute to a spatial reorganization of economic activity may account for the geographic pattern of political support for NAFTA in the United States. Politicians from states on the Mexico-U.S. border may have expected that NAFTA would shift production towards their districts, raising incomes for local home owners and other constituents that own location-specific factors of production. Politicians from states that are distant from Mexico may have feared that NAFTA would lead to a relative economic

contraction in their districts. Additionally, labor unions may have been concerned that a relocation of production would move jobs from northern union-friendly states, such as Michigan, Ohio, and Pennsylvania, to southern right-to-work states, such as Texas.

IV. HEMISPHERIC INTEGRATION AND INDUSTRY LOCATION

What does the prospect of future hemispheric economic integration hold for industry location in North America? In considering this question, it is worthwhile to summarize the factors that have contributed to recent regional employment changes in the region. The most dramatic spatial movements in production have occurred in Mexico, with the breakup of the Mexico City manufacturing belt and the shift in economic activity to northern Mexico. The empirical literature I review suggests that increasing returns to scale and transport costs have contributed to these events.

Several idiosyncratic factors have also shaped the emerging geography of production in North America. First, Mexico and the United States share a land border, and, as a result, over 80 percent of merchandise trade between the two countries is transported by truck or rail. This makes the Mexico-U.S. border an obvious production site for Mexican firms wishing to export to the U.S. market and U.S. firms wishing to export to the Mexican market. The recent formation of regional production networks on the Mexico-U.S. border mirrors the Canadian-U.S. production networks that formed earlier in the century.

Second, the U.S. economy is substantially larger than the Canadian or Mexican economies. As a result, the United States exerts a strong pull on industry location in the economies of its neighbors, but the effects in the reverse direction are relatively weak. In

other words, Ross Perot got it wrong. The "giant sucking sound" he heard is the United States pulling Mexican industry north to the Mexico-U.S. border, more than Mexico pulling U.S. industry south. While employment in U.S. cities on the border with Mexico is growing much faster than in the United States as a whole, the U.S. border economy is still quite small relative to the rest of the United States. Mexico isn't big enough *yet* to have a substantial impact on the spatial organization of production in the United States.

Third, a large fraction of Mexico-U.S. trade is in intermediate inputs for manufacturing. In the move to free trade, Mexico is specializing in specific manufacturing processes, such as the product assembly done by maquiladoras, within specific manufacturing industries. The expansion of Mexico-U.S. trade has brought with it the creation of vertical supply relationships between U.S. and Mexican firms. These relationships are transport intensive. The flow of intermediate inputs produced in the United States and exported to Mexico and the return flow of final goods, which are assembled from the imported inputs, exported from Mexico to the United States has greatly increased the importance of the Mexico-U.S. border region as a production site. The growth in Mexico-U.S. trade, the relocation of industrial activity to northern Mexico, and the shift in Mexican production towards assembly activities are all different aspects of the same transition process.

The expansion of NAFTA to include Chile, Central America and the Caribbean, the MERCOSUR countries, or the Andean countries would certainly increase international trade within the hemisphere. There is little reason, however, to expect that the effects of hemispheric integration on industry location elsewhere in Latin America would be nearly as dramatic as they have been in Mexico. The main reason is that transport costs to the U.S.

market, or to other markets in the hemisphere, do not favor relatively less industrialized regions in these countries as they have in the case of Mexico. Most trade between the United States and the countries of Central and South America is shipped by sea or air. An increase in trade with the United States would favor cities with access to a major airport or sea port. Outside of Mexico, most industrial activity in Latin America is already located in such cities -- Buenos Aires in Argentina, Sao Paulo in Brazil, Santiago in Chile, Lima in Peru, and Caracas in Venezuela. Hence, there would be no need for firms in these countries to relocate in order to improve access to the U.S. market. Further, with the possible exception of Brazil, no country in the hemisphere besides the United States has a market which is sufficiently large to influence industry location inside countries.

Other aspects of adjustment to hemispheric free trade would likely resemble the transition process in Mexico. The reduction of trade barriers in Central American and Caribbean countries, which occurred during the 1980's, has been followed by an expansion of maquiladora-type plants and specialization in the assembly of imported intermediate inputs for export, mainly in apparel and electronics. Most Latin American countries, like Mexico, appear to have a comparative advantage in nonskill intensive manufacturing activities, such as product assembly. Hemispheric integration would likely promote the expansion of international vertical supply relationships similar to those that have developed between Mexico and the United States. This may lead to similar increases in wage inequality as has occurred in the Mexican regions where maquiladoras have been most active.

Hemispheric integration may have other effects on economies in the region, which may be most evident at the national level. Following the logic of the increasing-returns-based

models discussed in the introduction, integration might cause some countries to partially deindustrialize. Puga and Venables (1997) show that the formation of a free trade area may lead industry to agglomerate in just one of the member countries. The key to their model is the combination of increasing returns at the firm level, input-output linkages between industries, and transport costs between countries. The country in which industry agglomerates serves as a hub, purchasing intermediate inputs from other member countries, which trade mainly with the hub country and relatively little with each other. In some respects, the United States operates as a hub for the North American economy. The U.S. auto industry is supported by auto-parts production in Canada and Mexico, and the U.S. apparel and electronics industries are supported by maquiladora operations in Mexico.

An important question is whether the expansion of NAFTA to include other countries in the hemisphere would create a sufficiently large economy, or an economy with sufficiently high transport costs, to support multiple hubs. One could imagine Argentina and Brazil serving as hub economies for the southern cone and competing with the United States in certain industries, such as automobiles, where Argentina-Brazil trade through MERCOSUR has been particularly active. The expansion of an Argentina-Brazil hub might entail a decline in industrial production in small neighboring economies, such as Chile or some of the Andean countries. One could alternatively imagine the addition of MERCOSUR to NAFTA causing the collapse of auto and other industries in Argentina and Brazil, as the United States, supported by production Canada and Mexico, become the hemispheric industrial center. Which path the hemisphere takes will depend on the strength of scale economies and transport costs, the magnitudes of which can only be uncovered through further empirical work.

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Table 1: U.S. Regional Shares (%) of Manufacturing Employment, 1850-1990

Region	1850	1870	1890	1910	1930	1950	1970	1990
New England	32.64	21.65	17.38	13.42	10.48	9.59	7.48	6.36
Mid Atlantic	43.90	38.35	35.84	33.55	30.31	29.11	23.24	15.81
Great Lakes	9.70	20.36	21.23	22.61	25.59	28.94	27.11	24.17
Southeast	11.36	9.94	10.42	12.69	14.38	15.43	20.19	24.38
Plains	1.83	6.52	8.88	8.35	7.11	5.68	8.93	10.26
Southwest	0.12	0.72	1.31	2.74	4.13	3.28	1.27	2.12
Mountain	0.01	0.35	1.44	1.64	1.34	0.87	1.27	2.09
Far West	0.44	2.11	3.50	5.00	6.66	7.10	10.31	14.59

Sources: Perloff et al. (1960), U.S. BEA Regional Economic Information System.

Notes. The following region definitions apply. New England: Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, Vermont; Mid Atlantic: Delaware, Maryland, New Jersey, New York, Pennsylvania, Washington, D.C.; Great Lakes: Illinois, Indiana, Ohio, Michigan, Wisconsin; Southeast: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia; Plains: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota; Southwest: Arizona, New Mexico, Oklahoma, Texas; Mountain: Colorado, Idaho, Montana, Utah, Wyoming; Far West: California, Nevada, Oregon, Washington.

Table 2: Canada Regional Shares (%) of Manufacturing Employment, 1926-1995

Province	1926	1936	1945	1955	1965	1975	1995
Ontario	48.4	48.6	46.3	47.3	49.3	48.8	47.7
Quebec	31.3	32.8	34.3	33.1	31.8	30.6	27.7
Atlantic	6.4	5.2	5.2	5.0	4.5	4.7	5.0
Prairie	5.9	6.7	6.4	6.8	6.8	8.0	10.2
British Columbia	8.0	6.7	7.9	7.9	7.6	7.9	9.5
Yukon and Northwest Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Leacy (1983). Canada Yearbook (1997).

Notes. The Atlantic provinces are New Brunswick, Newfoundland, Nova Scotia, and Prince Edward Island; the Prairie provinces are Alberta, Manitoba, and Saskatchewan.

Table 3: Mexico Regional Shares (%) of Manufacturing Employment, 1930-1993

Region	1930	1940	1950	1960	1970	1980	1985	1993
Border	--	--	--	--	18.6	21.0	23.5	29.8
North	--	--	--	--	5.5	5.1	5.4	6.0
Center	--	--	--	--	21.8	22.9	27.6	27.4
Mexico City	19.0	24.7	25.0	46.0	47.3	46.4	37.4	28.7
South	--	--	--	--	6.8	6.2	6.1	8.1

Source: Hanson (1997a, 1998b).

Notes. The border region contains states on the Mexico-U.S. border; the north region contains the next tier of northern states; the center region contains the states that surround Mexico City; the Mexico City region contains the two states that the city's metropolitan expanse occupies; and the south region contains states south of Mexico City.

Table 4: Mexico Regional Manufacturing Wage/National Manufacturing Wage, 1965-1988

Region	1965	1970	1975	1980	1985	1988
Border	1.05	1.06	1.02	1.04	0.97	1.00
North	0.60	0.58	0.63	0.70	0.72	0.71
Center	0.84	0.85	0.93	0.92	0.94	0.99
Mexico City	1.19	1.17	1.13	1.10	1.16	1.12
South	0.45	0.45	0.51	0.63	0.68	0.69

Source: Hanson (1997a).

See notes to Table 2.

Table 5: Mexico-U.S. Trade, 1980-1995
(billions of 1987 US dollars)

	Total U.S. Trade		U.S. Trade with Maquiladoras	
Year	Imports from Mexico	Exports to Mexico	Imports from Mexico	Exports to Mexico
1980	17.82	21.12	3.27	1.61
1985	20.54	14.44	5.90	2.77
1990	27.18	24.96	11.47	5.71
1995	48.33	36.02	19.43	9.99

Source: Hanson (1997b), USITC (1997).

Table 6: Mexico Manufacturing Employment (000s), 1980-1993

	Total Manufacturing Employment		Employment in Maquiladoras	
	Nation	Border States	Nation	Border States
1980	2,139.1	448.1	119.6	114.1
1985	2,488.0	585.4	212.0	199.2
1988	2,629.0	727.7	369.5	349.7
1993	3,246.0	969.6	542.1	468.0
1995	3,221.6	--	681.3	570.0
1997*	3,737.0	--	939.5	757.0

Source: Hanson (1997b); Instituto Nacional de Estadistica, Geografia e Informatica, unpublished data.

* Figures for 1997 are for the month of September.