Capturing NAFTA's Impact With Applied General Equilibrium Models

Patrick J. Kehoe
Adviser
Research Department
Federal Reserve Bank of Minneapolis
and Associate Professor of Economics
University of Minnesota

Timothy J. Kehoe
Adviser
Research Department
Federal Reserve Bank of Minneapolis
and Professor of Economics
University of Minnesota

The recent debate in the United States over ratifying the North American Free Trade Agreement (NAFTA) included frequent references to the economic models used to analyze the agreement's impact on the Canadian, Mexican, and U.S. economies. The type of model used most often for this analysis has been an *applied general equilibrium* (AGE) model. In fact, at a U.S. International Trade Commission conference held in February 1992 and open to all economists studying the economywide impact of NAFTA, 11 of the 12 studies presented used AGE models (U.S. International Trade Commission 1992).

In this article, we discuss the work of four modeling teams who presented their results at that conference and at an earlier conference on North American economic integration, which was held at the Federal Reserve Bank of Minneapolis in March 1991. All of these teams' approaches are good examples of AGE models: Brown, Deardorff, and Stern model NAFTA's impact on all three national economies; Cox and Harris focus on Canada; Sobarzo focuses on Mexico; and Markusen, Rutherford, and Hunter analyze NAFTA's impact on a single industry—the automobile industry—which accounts for a major portion of trade in North America.

All of these researchers use static AGE models of the sort discussed in the other article in this issue. All of their models emphasize increasing returns and imperfect competition. Because all the models make different assumptions and focus on different countries and industries, however, they obtain different results. Nevertheless, where the models overlap, they agree about the impact of NAFTA. Specifically, these studies find that, because Mexico's economy is the smallest, it will enjoy the biggest NAFTA-produced increase in economic welfare, measured as a percentage of gross domestic product (GDP): somewhere in the range of from 2 to 5 percent. The studies predict that the United States will see a very modest NAFTA increase in welfare of around 0.1 percent of GDP, while Canada will notice no increase beyond what it experiences as a result of its Free Trade Agreement (FTA) with the United States, which went into effect in 1989.

Are these results reliable? We think so. The reason is the way static AGE models are constructed. They emphasize the interaction among an economy's different *sectors,* or industries, which makes the models excellent tools for estimating the economic impact of reallocating resources within an economy.

Like all types of economic models, however, static AGE models have their limitations. They stress sectoral detail, but they ignore *dynamic phenomena,* that is, phenomena which involve time and uncertainty. To assess the importance of this omission, we discuss here two examples of dynamic phenomena that NAFTA is likely to affect: labor force adjustment and capital flows. Although static models are not well suited to analyzing such phenomena, the results of the models discussed here indicate their potential importance. For instance, including capital flows modeled in very crude ways boosts Mexico's NAFTA gains from 2–5 percent to 5–11 percent of GDP.

The emphasis on sectoral detail rather than dynamic phenomena in many of the NAFTA analyses can be partially understood in terms of the recent history of AGE modeling. The four models we discuss here are intellectual descendants of models developed by Harris (1984) and Brown and Stern (1989) to analyze the impact of the then-potential U.S.-Canada FTA. In terms of output per work-

er, Canada and the United States are very similar; they have very similar levels of economic development. In terms of population and output, however, the two countries are very different: Canada is much smaller than the United States. (See the data in the box titled "The North American Free Trade Area vs. The European Union.") Consequently, phenomena such as increasing returns and market size are crucial in the analysis of the FTA between these two countries.

Those phenomena are also important in the analysis of NAFTA's impact on Mexico, since this country is also much smaller than the United States. But Mexico has a significantly lower level of output per worker (and wages) than either the United States or Canada. Therefore, NAFTA's impact on phenomena like capital flows is very important for Mexico. Preliminary efforts at analyzing such flows have been made by Kehoe (1994), McCleery (1994), and Young and Romero (1994).

The results presented here indicate the need for continuing efforts to construct satisfactory dynamic models to analyze the potential impact of policies like NAFTA. They also indicate the need for models that incorporate the labor force adjustment process, a phenomenon neglected by existing AGE models.

Modest Gains Predicted

We now begin our examination of the methods and results of the four models' analyses of NAFTA's impact. We find significant areas of agreement among the results. Any disagreement is easily explained by the models' different assumptions.

Some Data Caveats

Before proceeding to the models themselves, however, we must point out a few aspects of the data they use. (Any AGE model is only as good as the data used to calibrate it.)

First, in interpreting the results of these models, note that because of data limitations, all of the models rely on pre-1989 data. Thus their simulations capture the effects of more than just NAFTA. They also capture the effects of the FTA between Canada and the United States and some effects of Mexico's general lowering of trade barriers. (See the box titled "*La Apertura*: The Opening of Mexico.") But combining these developments is natural: NAFTA is appropriately viewed as a small step in furthering the tendency toward greater economic integration in North America.

Second, note that all of the models use different data sources and different commodity classification systems. Consequently, comparing results across models is difficult. At the very least, an AGE modeler has the obligation to provide a concordance of the aggregation in his or her model with a standard classification system. This concordance will be essential for comparing model results with actual outcomes after several years' experience with NAFTA.

Third, and most important for an AGE model that addresses international trade issues, data from one country must be compatible with data from another. One disturbing feature of the Mexican data compared to the U.S. data is the difference between the share of returns to capital in the national income of the two countries. In Mexico, this number is about 70 percent (330 trillion out of total factor income of 460 trillion), whereas in the United States, it is

about 25 percent. (See Table 2 of the other article in this issue.) One approach to handling these data—the one taken in the models discussed here—is to accept the data at face value and to calibrate the production functions accordingly. Another approach is to look for reasons why the two capital shares are so different. Some possibilities are different treatment of the earnings of self-employed workers in the two countries, different composition of national output, higher monopoly rents in Mexico, and more black market labor in Mexico. Whatever the cause or causes, the comparability of data across countries is obviously a serious issue that requires more research.

Three North American Economies
Having made these caveats about the data, we can begin our discussion of the four static AGE models. We start with a model of NAFTA's impact on all three North American economies.

Brown, Deardorff, and Stern (1994) study four fully specified economies: those of Canada, Mexico, and the United States and an aggregate rest-of-the-world economy. The Brown-Deardorff-Stern (BDS) model includes substantial sectoral detail, with 23 tradable goods based on one- and three-digit International Standard Industrial Classification (ISIC) product categories and 6 nontradable goods based on one-digit ISIC product categories. All of the tradable good sectors except agriculture are modeled as producing products differentiated by firm. The firms in these sectors face increasing returns production technologies and are monopolistic competitors as defined by the theory developed by Dixit and Stiglitz (1977) and described by us in the other article in this issue. Agriculture and the nontradable goods are homogeneous within countries and are produced under conditions of constant returns, and firms in these sectors are perfect competitors. Agricultural goods in different countries are imperfect substitutes, which is the Armington specification we also describe in the other article in this issue.

Table 1 summarizes the aggregate results of three different simulations of the BDS model designed to analyze the impact of freer trade in the three North American economies. In the first, Brown, Deardorff, and Stern simulate the reductions of the tariffs and other trade barriers that will occur over 15 years. (These reductions are summarized in the box titled "NAFTA Mechanics.") Since the BDS model, like the others we will discuss, is static, it cannot analyze the impact of gradual reductions of barriers scheduled to take place in some sectors; the full change must be modeled as taking place once and for all. In the second simulation, Brown, Deardorff, and Stern simulate the same reductions in trade barriers, but also increase the capital stock in Mexico by 10 percent, in order to simulate the impact of the reduction in investment barriers; this additional capital is modeled as coming from the rest of the world. In the third simulation, Brown, Deardorff, and Stern simulate only the tariff reductions involved in the U.S.-Canada FTA.

The most striking result of the BDS simulations is that, no matter what scenario is considered, the impact of NAFTA on Mexico, relative to the size of its economy, is much larger than the comparable impacts on Canada or the United States. In fact, NAFTA's impact on the United States, although positive, is barely perceptible as a percentage of GDP. The basic scenario of reducing tariffs and other trade barriers results in a gain in economic welfare

equivalent to 2.2 percent of GDP in Mexico, as opposed to 0.7 percent in Canada and 0.1 percent in the United States.

These results are partly explained by the relative sizes of the different economies: since the United States is much larger than either Canada or Mexico, similar absolute gains in each country would be a much smaller percentage of GDP in the United States than in its two neighbors. Another partial explanation is that the United States, as a large and fairly open country, is not able to realize large gains by exploiting increasing returns due to a larger market size. (Some data on the relative sizes of the three North American countries and the trade between them are presented in the box titled "The North American Free Trade Area vs. The European Union" and in the Appendix.)

Another interesting result produced by the BDS model simulations is that NAFTA has very little impact on Canada above and beyond that generated by the U.S.-Canada FTA. Public discussion of NAFTA in Canada has included concern that the agreement will cause import diversion in the United States, that U.S. importers will switch from Canadian to Mexican suppliers. Empirical evidence presented by Watson (1991), however, suggests much the same conclusion as the BDS model: by and large, Canadian and Mexican exporters do not compete in the same U.S. markets.

Brown, Deardorff, and Stern do show, however, that NAFTA presents a danger of import diversion for the rest of the world. In all but one scenario in their model, NAFTA results in losses for the rest of the world that are significant in absolute terms, although tiny as a percentage of GDP. In the scenario in which the rest of the world gains, it exports capital to Mexico that earns a substantially higher return than the capital would have otherwise. Since Mexico must export more goods to pay the higher return, the rest of the world sees a significant increase in its terms of trade.

The largest impacts found among the different simulations of the BDS model occur in that scenario—when capital is moved from the rest of the world to Mexico. In particular, allowing for capital flows into Mexico increases the net benefits of NAFTA to 5.4 percent of GDP in Mexico. Remember, however, that these capital flows are simply imposed. Nonetheless, the results of the model are useful in illustrating the relative importance of capital flows.

Canada Alone
The second model we examine focuses on the impact of NAFTA on the Canadian economy alone.

Cox (1994) presents the results of a model developed jointly by Cox and Harris to analyze the impact of NAFTA. This model is an extension of an earlier model developed by Cox and Harris (1985) to analyze the impact of the U.S.-Canada FTA on Canada. Like the BDS model, the Cox-Harris model includes considerable sectoral detail: it has 14 tradable goods and 5 nontradable goods based on one- and two-digit Canadian Standard Industrial Classification (SIC) product categories. The Cox-Harris model uses the almost small-country assumption developed by Harris (1984) and described by us in the other article in this issue. This is a fully specified general equilibrium model of Canada, but the economic activity in Mexico, the United States, and the rest of the world is modeled in very rudimentary ways.

Of the 14 tradable goods, the 10 manufacturing goods are produced by firms that face increasing returns production technologies. Unlike the BDS model, which specifies such goods as differentiated by firm, the Cox-Harris model specifies these manufacturing goods as homogeneous within Canada. Firms in the industries that produce these goods set prices that put half the weight on the Cournot (imperfectly competitive) pricing rule and half the weight on the Eastman-Stykolt (collusive) pricing rule. (We discuss both rules in the other article in this issue.) The 4 other tradable goods and the 5 nontradable goods are produced under conditions of constant returns and perfect competition. All of the tradable goods are modeled as Armington substitutes across countries.

Another difference between the Cox-Harris and BDS models lies in their treatment of capital flows. In two of the BDS simulations, capital is modeled as immobile; the third has an exogenously specified transfer of capital from the rest of the world to Mexico. In the Cox-Harris model, in contrast, capital is modeled as perfectly mobile between Canada and the United States.

Cox (1994) reports the results of a simulation of the Cox-Harris model in which the aggregate impact on the Canadian economy of the U.S.-Canada FTA is an increase in economic welfare equivalent to 3.1 percent of GDP, an increase in the real wage of 5.5 percent, and a decrease in the terms of trade of −0.9 percent. The rental rate on capital remains fixed by assumption.

The Cox-Harris model finds a larger impact on Canada of the FTA with the United States than does the BDS model for two reasons. One is a difference in the two models' pricing specifications. The Eastman-Stykolt pricing rule used in the Cox-Harris model causes the tariff reductions in Canada to lead to a greater decrease in Canadian prices and a greater increase in Canadian output than does the Cournot specification used in the BDS model. As we discuss in the other article in this issue, the Eastman-Stykolt specification stresses collusive behavior by Canadian producers while the Cournot specification stresses imperfectly competitive behavior. The FTA allows foreign competition that undermines the collusive behavior in the Eastman-Stykolt case, but merely increases the level of competition in the Cournot case. The other reason for the Cox-Harris model's larger FTA impact is its treatment of Canada's capital stock. The Cox-Harris model allows capital inflows into Canada to keep the rental rate on capital constant. The BDS model assumes a constant Canadian capital stock and shows the Canadian rental rate rising in all three simulations. If capital inflows were allowed in the BDS model, this increase in the rental rate would transform itself into capital inflows.

The Cox-Harris model and the BDS model show some similarity in sectoral results. In both models, for example, Canada's textiles sector, rubber and plastics sector, and chemicals sector experience significant rationalization, with the number of firms falling, prices declining, and output per firm rising. All of these changes are somewhat larger in the Cox-Harris model than in the BDS model. Another parallel in the results generated by the two models is the increase in Canadian output of transportation equipment, 8.5 percent in the BDS model and 8.9 percent in the Cox-Harris model.

Nonetheless, some of the models' sectoral results are very different. For Canadian output of chemicals and textiles, for example, the BDS model shows significant de-creases and the Cox-Harris model significant increases. Whether these differences are due to differences in model specification or data sources is hard to tell.

The two models completely agree on the incremental impact on Canada of NAFTA after the U.S.-Canada FTA has been taken into account. Like the BDS model, the Cox-Harris model finds that this impact is negligible. Furthermore, Cox's (1994) simulations show little difference to Canada if that nation is a member of NAFTA or if the United States has separate FTAs with Canada and Mexico, the *hub and spoke* arrangement often mentioned in the Canadian press. The reason for this indifference is clear: Before NAFTA, Canada and Mexico had little direct trade with each other compared to their trade with the United States. Since the Cox-Harris and BDS models are calibrated to existing trade flows, the calibrated utility functions and Armington aggregators manifest little preference in Canada or Mexico for each other's products.

Mexico Alone

Our third model concentrates on NAFTA's effects on Mexico's economy.

Sobarzo (1994) uses a model of Mexico that is structured similarly to the Cox and Harris (1985) model of Canada. Like the Cox-Harris model, the Sobarzo model adopts the almost small-country assumption, in this case focusing on the Mexican economy. (No such model exists for the United States because of the country's size and relative importance in terms of trade flows.) Like the BDS and Cox-Harris models, the Sobarzo model includes considerable sectoral detail: it has 21 tradable goods and 6 nontradable goods, based on the product classification used in the Mexican national income and product accounts.

Of the 21 tradable goods, the 18 manufactured goods are produced under increasing returns and imperfect competition, just as manufactured goods are in the Cox-Harris model. The other goods are produced under other conditions: 2 of the tradable goods and the 6 nontradable goods, under constant returns and perfect competition; one tradable good, mining, under constant returns and government regulation.

Sobarzo (1994) describes the results of three experiments. In the first, he considers only NAFTA's tariff reductions and assumes that labor is fully employed and the capital stock is fixed. In the second experiment, he keeps the assumption of a fixed capital stock, but fixes the real wage and allows the level of employment to vary with the demand for labor. In the third experiment, he returns to the assumption of full employment, but fixes the rental rate on capital and allows capital flows from Canada, the United States, and the rest of the world. In this third experiment, Sobarzo also fixes the terms of trade and allows the trade balance to vary. The aggregate results of these three experiments are summarized in Table 2.

As do the BDS results, Sobarzo's results illustrate the importance of capital flows. Allowing employment to vary causes only modest changes in the results, but allowing capital inflows greatly increases Mexico's welfare gains due to NAFTA, from 3.7 percent of GDP to 10.9 percent.

That Sobarzo's model finds a larger NAFTA impact on Mexico than does the BDS model is due once again to the Eastman-Stykolt pricing rule. As do Cox and Harris (1985), Sobarzo uses a mixed pricing formula for imperfectly competitive firms that puts a 50 percent weight on the Eastman-Stykolt rule and a 50 percent weight on the

Cournot rule. To illustrate the importance of the Eastman-Stykolt specification, he repeats his third experiment with different weights on the two pricing rules. When he increases the weight on the Eastman-Stykolt rule from 50 to 100 percent, Mexico's welfare gain due to NAFTA rises from 10.9 percent of GDP to 21.2 percent; when he reduces the weight on the Eastman-Stykolt rule from 50 to 0 percent, the welfare gain falls to 1.4 percent.

The significance of the weight placed on the Eastman-Stykolt pricing rule is not just a technicality: it reflects the degree to which Sobarzo thinks that Mexican producers have behaved collusively in setting high prices before NAFTA. The higher the degree of collusive behavior before NAFTA, the lower prices will fall after it. Like Cox and Harris (1985) with Canadian firms, Sobarzo thinks collusive behavior is prevalent enough among Mexican firms to set the weight significantly higher than 0 percent, but not prevalent enough to set it equal to 100 percent. He chooses 50 percent as an intermediate value, but this is obviously a choice that merits further study.

Between the Sobarzo and BDS models, the sectoral results are mixed. Significant areas of agreement exist. Both models, for example, show large increases in Mexico's output in the mining, iron and steel, nonferrous metals, electric and nonelectric machinery, and transportation equipment industries. Areas of disagreement also exist, however. These include the result of the BDS model that by far the largest percentage increase in Mexican output occurs in the nonferrous metals sector; the Sobarzo model shows a much more modest increase for this sector and large gains for several other sectors.

The Auto Industry

The last model we examine differs from the others we have discussed because it focuses on a single but very important sector: automobiles. (For data on the relative importance of this sector in North America, see the Appendix.)

Markusen, Rutherford, and Hunter (1994) study the automobile industry in all three North American countries. Their model, like the BDS model, fully endogenizes economic behavior in each of the three countries and in the rest of the world. Unlike the BDS model, however, the Markusen-Rutherford-Hunter (MRH) model does not differentiate products by firm or by country of origin. Instead the model has two homogeneous products: finished automobiles and an aggregate other good. Automobiles are produced subject to increasing returns and Cournot competition, while the other good is produced subject to constant returns and perfect competition. Firms in North America are multinational; they all can operate plants in all of the three countries.

While calibrating their model, Markusen, Rutherford, and Hunter find that their data on marginal costs, fixed costs, and average output and their assumptions of free entry and zero profits are inconsistent with their calibrated perceived elasticity of demand in the Lerner condition for profit maximization:

$$(1) \qquad p = a/[1 - (1/\varepsilon)].$$

Here p is the price of automobiles, a is the marginal cost, and ε is the perceived elasticity of demand (which depends on the number of firms, the trade barriers, the pa-

rameters of the utility function, and so on). The zero-profit condition is

$$(2) \qquad p\bar{y} - a\bar{y} - f = 0.$$

Here $\bar{y}$ is firm output and f is fixed costs. The problem is that when Markusen, Rutherford, and Hunter plug the price derived from the Lerner condition into the formula for profits, they obtain negative profits.

To get around this problem, they modify the Lerner condition with what they call a *conjecture parameter,* λ:

$$(3) \qquad p = \lambda a/[1 - (1/\varepsilon)].$$

This parameter is interpreted as a measure of the degree of collusive behavior within a country. The larger λ is, the more pervasive is collusive behavior. Markusen, Rutherford, and Hunter calibrate λ to be very close to 1.0 in the United States, indicating that U.S. industry behavior is almost exactly Cournot, while λ is 1.7 in Canada and 2.7 in Mexico, indicating significant collusive behavior. Introducing this conjecture parameter is similar to putting weight on the Eastman-Stykolt pricing rule in the Cox-Harris and Sobarzo models.

Markusen, Rutherford, and Hunter report two types of simulations. One allows free trade for producers only, allowing multinational producers to price-discriminate across countries. The other allows free trade for consumers as well. Markusen, Rutherford, and Hunter find that if multinational automobile producers can price-discriminate after NAFTA, they will do so, charging higher prices for automobiles in Mexico than in the United States or Canada. Allowing consumers to purchase goods across borders, however, eliminates this ability to discriminate and leads to a lower price and a higher level of production of automobiles. Without NAFTA, individual Mexicans could not import an automobile from abroad. Under NAFTA, this restriction, like many other nontariff barriers on trade in automobiles, will be phased out over a 10-year period.

The results generated by the MRH model are consistent with those of the BDS model, at least qualitatively. In the MRH model, NAFTA has a significantly positive impact on Mexico, barely perceptible impacts on Canada and the United States, and negative trade diversion effects on the rest of the world. In the MRH simulation with free trade for producers only, the welfare gain for Mexico is 0.09 percent of GDP; in the simulation with free trade for consumers, this gain is 0.80 percent. Both of these are much smaller than the gains from the BDS model. But that size comparison does not make much sense because, remember, the MRH model considers the impact of trade liberalization for only the automobile sector.

The two models find somewhat different results for auto production. The BDS model finds changes of 8.5 percent in Canada, 14.8 percent in Mexico, and −0.3 percent in the United States; the MRH model finds changes of −0.6 percent, 21.9 percent, and −0.5 percent with free trade for producers only and −2.0 percent, 44.9 percent, and −1.8 percent with free trade for consumers as well. The large increases in Mexico found by the MRH model are partly due to the large conjecture parameter calibrated for that country and partly to the homogeneous products assumption. Automobile prices in Mexico before free trade are high because of high trade barriers and the high level of collusive behavior there. Since automobiles are a ho-

mogeneous good, lowering the Mexican tariff results in an equal decline in the Mexican price of automobiles, at least when consumers enjoy free trade. In contrast, in the BDS model, Mexican automobile producers are not forced to lower their prices by the full amount of the tariff reduction because products from Canada and the United States are differentiated by firm and thus are not perfect substitutes for Mexican products.

The Sobarzo model is similar to the BDS model on this point. Unless the weight on the Eastman-Stykolt pricing rule is 100 percent, declines in Mexican tariffs do not result in equal declines in Mexican prices because imports, since they are differentiated by country of origin, are not perfect substitutes for domestically produced goods.

In explicitly incorporating the plant location decisions of multinational firms, the MRH model is a tool that can be used to investigate other features of industries like the automobile industry and their reactions to policies like NAFTA. An extension of this model by Lopez-de-Silanes, Markusen, and Rutherford (1993), for example, studies the impact of NAFTA on the markets for parts and intermediate inputs. Another extension by Lopez-de-Silanes, Markusen, and Rutherford (1994) carefully models all of the nontariff barriers in the automobile industry before and after NAFTA. One such pre-NAFTA barrier in Mexico was a trade balance restriction that every peso's worth of imports by an automobile producer had to be balanced by two pesos' worth of exports. The most significant nontariff barrier established by NAFTA is a domestic content rule. It requires that at least 62.5 percent of the value of an automobile must be generated within North America for the automobile to be given preferential treatment. This requirement is an increase from 50 percent in a similar requirement in the U.S.-Canada FTA. The content rule is likely to have a great impact on Japanese and European automobile producers with plants in North America. Taking these additional restrictions into account, Lopez-de-Silanes, Markusen, and Rutherford (1994) find that NAFTA will provide an advantage to U.S. producers that results in a 1 percent increase in employment in the U.S. automobile industry.

Greater Gains Possible

The models we have considered thus far capture the changes in prices, output, and welfare from NAFTA that should be generated by resources shifting across sectors in response to the new incentives generated by freer trade. These models assume that labor and capital are costlessly mobile across sectors. In contrast, much of the recent discussion about NAFTA in the United States focused on the costs of shifting workers across sectors and regions and the size of the resulting capital flows into Mexico.

No current economic model of NAFTA incorporates the dynamic process of how workers lose old job-specific skills and gain new ones when they change jobs. Nor does any model provide a precise estimate of what capital flows into Mexico will be. So the best we can do is examine the existing relevant data and studies and speculate on the potential size and significance of the labor force adjustment in the United States and the capital flows into Mexico that could result from NAFTA.

We find that the potential amount of labor force adjustment in the United States due to NAFTA is small relative to both the size of the U.S. labor force and the amount of adjustment that occurs every year for other reasons. We find that NAFTA's potential impact on capital flows is far more significant, especially for Mexico.

Small Labor Adjustment Costs

In a recent study, Stern, Deardorff, and Brown (1992) calculate the employment changes by industry and region in the United States after NAFTA. Using their methodology, we can calculate the impact of NAFTA on employment by region in the United States of the scenario in the BDS model in which tariffs and nontariff trade barriers are eliminated and capital flows into Mexico equal 10 percent of the current Mexican capital stock. The total number of workers who are predicted to change either industry or region is only about 76,000.

To get some feel for the predicted labor force adjustment, we examine how it is distributed across nine regions of the United States. (These are the regions used by Stern, Deardorff, and Brown 1992.) On the accompanying map, the first number displayed for each region indicates the percentage of workers who are predicted to temporarily lose employment within a sector in that region due to NAFTA. (In the model, these workers become employed either in a new sector within the region or in some other region.) The second number in each region indicates the net change of employment within the region. Altogether, these numbers suggest that the job displacement caused by NAFTA will be fairly evenly distributed across regions. In every region, the change in employment is extremely small compared to the area's total employment: no changes are even as large as 0.1 percent. The numbers must be viewed with care, however, since the model that produced them does not take into account geographical advantages due to factors like transportation costs. A model that took those factors into account might generate more job creation in the southern and western states (since they are closest to Mexico).

The BDS model assumes full employment, which means that job creation and job destruction balance. That its results show an increase in real wages due to NAFTA indicates that, had the real wage been held fixed and employment been allowed to vary, job creation would have exceeded job destruction in this model, and employment would have increased. Using an alternative methodology, Hufbauer and Schott (1992) estimate that NAFTA will create 320,000 jobs and eliminate 150,000. Other researchers have made other estimates. Summarizing their results, the U.S. Congressional Budget Office (1993, p. 86) places the high end of estimated job destruction at around 200,000 jobs. (Most studies also indicate even more job creation, but the costs involved in losing old job-specific skills and acquiring new ones impose an asymmetry between job destruction and job creation.)

The overwhelming impression of these numbers is that, relative to the size of the U.S. labor force, they are minuscule. Indeed, Stern, Deardorff, and Brown's (1992) estimated 76,000 affected workers are out of a total civilian labor force of about 116 million. The numbers of NAFTA-affected workers are also tiny relative to the average amount of job-shifting that occurs every year in the United States. Davis and Haltiwanger (1992) calculate net job creation and destruction at the establishment level in U.S. manufacturing. They find that on average from 1973 to 1986 the rates of gross job creation and destruction in U.S. manufacturing were both about 10 percent per year. Since the U.S. manufacturing labor force averaged 19 mil-

lion workers over this period, that translates to almost 2 million jobs destroyed each year in manufacturing alone. Of course, roughly the same number of new jobs were created. Since the manufacturing industries include less than 20 percent of all the jobs in the United States, the total gross job destruction across all sectors must be substantially higher. Clearly, NAFTA's impact on job destruction should be very small.

Still, the models we have discussed so far are static and measure workers in terms of effective labor units. This means that a worker who is paid twice as much as another is assumed to be supplying twice as much effective labor. And when a worker shifts from one sector to another, this effective labor is assumed to be transferred. Actually, of course, workers who shift across sectors lose any job-specific expertise they had built up in their previous jobs. They may eventually gain expertise in their new jobs, but they will not have it immediately. Although no existing model of NAFTA formally models the dynamic impact of losing and gaining job-specific expertise, labor economists have spent a lot of time trying to measure the amount of wages workers lose when they lose this expertise. Topel (1991), for example, uses panel data to attempt to estimate the amount wages increase with years on a job, while holding fixed the total number of years in the labor force. His estimates indicate that the losses for displaced workers are potentially large: a worker with five years' tenure on a job who loses a job and finds a new one, for example, may lose as much as 40 percent of his or her wage in the first year after the displacement.

To put that number into perspective, remember that on average workers change jobs at least six times in a lifetime (Hall 1982). Thus workers are often displaced. The point to be made is qualitative, however: even though the total number of likely job changes due to NAFTA is tiny compared to the entire U.S. labor force, the impact on the small number of workers who are actually displaced may be large. The U.S. Congressional Budget Office (1993) summarizes research on the costs of job displacement (and discusses existing federal programs to help workers who lose their jobs).

Large Capital Inflows
As we have seen, the other potential dynamic impact of NAFTA may not be so small. The models of Brown, Deardorff, and Stern (1994) and Sobarzo (1994) deal with capital flows in simple ways, but they make an important point: if NAFTA leads to large capital flows into Mexico, then the welfare gains for that country will be much larger than otherwise. Here we discuss some factors that should be included in a more satisfactory analysis of the capital flows that could result from NAFTA.

Foreign investment in Mexico has increased dramatically in recent years, and some evidence suggests that this trend will continue under NAFTA. During the period 1988–91, the real interest rate in Mexico—calculated by subtracting inflation, measured by changes in the consumer price index, from the average cost of funds—was 11.6 percent. (See International Monetary Fund 1993.) During the same period, the corresponding real interest rate in the United States—calculated using the prime rate—was 5.0 percent. The difference in interest rates suggests that Mexico is an attractive investment target.

We see two obvious explanations for the higher return on investment in Mexico, and both have a bearing on the capital flows that will result from NAFTA.

One explanation is that the difference in return represents a risk premium in Mexico. Investors fear high rates of Mexican inflation—or even a financial collapse and major devaluation of the peso as occurred in 1982. The key question, of course, is, How much will NAFTA ensure economic stability in Mexico? Insofar as it locks the Mexican government into the trade liberalization that has already occurred over the past seven years and guarantees Mexican exporters continued access to U.S. markets, NAFTA goes a long way toward ensuring stability.

Lucas (1990), however, has argued that inefficient and oligopolistic financial intermediaries may be a more important explanation for the relatively high rates of return and low levels of investment in relatively poor countries. Recent studies have provided clear evidence that financial intermediaries in Mexico are inefficient and oligopolistic. Garber and Weisbrod (1993) point out that the largest three banks in Mexico hold 65 percent of the loans; Gruben, Welch, and Gunther (1993) report that in recent years the spread between the rates lenders charge borrowers and the rates lenders must pay for funds themselves has been much higher in Mexico than in the United States. Under NAFTA, Mexico will open its financial services sector to foreign trade and investment. U.S. exports of financial services to Mexico and investment in financial intermediaries there are likely to be important sources of gains from NAFTA for both Mexico and the United States, gains that are not captured by the models we have discussed.

Regardless of the reason for increased capital flows into Mexico that might result from NAFTA, note that even capital flows several times larger than those currently observed would be very small compared to foreign capital flows into the United States and to the world capital market. Over the period 1984–91, for example, foreign direct investment in Mexico averaged $2.3 billion per year, with a high of $4.8 billion in 1991. Over the same period, foreign direct investment in the United States averaged $40.1 billion per year, with a high of $67.9 billion in 1989. (See International Monetary Fund 1992a.)

Note also that increased investment in Mexico will divert investment away from the United States only insofar as it increases international interest rates or decreases the profitability of investment projects in the United States. The tiny size of Mexico compared to world capital markets suggests that opening that country to more foreign investment should have little effect on interest rates. Over the period 1984–91, only 1.4 percent of world foreign direct investment went to Mexico, with a high of 2.8 percent in 1991. (Again, see International Monetary Fund 1992a.) More important, the results of the models discussed here indicate that NAFTA should make investment projects in the United States more, rather than less, profitable.

Better Models Needed
The models discussed both here and in the other article in this issue provide clear indications of the directions and relative sizes of the impacts of NAFTA on its member countries. Nevertheless, like any economic model, these models are limited. A dynamic AGE model that incorporates the adjustment process of moving from one job to another and investment decisions under uncertainty would do much to inform the public debate over job destruction

and capital flows. At the very least, a dynamic AGE model could explicitly take into account the phase-in period of 15 years for all the provisions of NAFTA. The timing of this phase-in is necessarily ignored by static models of NAFTA.

A dynamic AGE model with overlapping generations of workers could also address some interesting generational issues involved in NAFTA. For example, its labor force adjustment costs are likely to fall more on older workers, who may have more job-specific skills than younger workers. Any diversion of investment from the United States to Mexico, however, is likely to hurt young workers more; older workers are likely to benefit as the returns on their retirement funds increase. Although these costs and benefits are likely to be extremely small in the United States, they are likely to be much bigger in Mexico.

An overlapping generations model of the North American economies would need to take into account a significant difference between Mexico and its North American partners that does not play a major role in static models. Until recently, population has grown much faster in Mexico than in Canada or the United States. This has resulted in a substantially younger population in Mexico than in the other two countries. For example, 1990 census data indicate that in Mexico, half the population is aged 19 years or younger, while in the United States, half is aged 34 years or younger.

As well as helping better address the issues discussed here, a dynamic AGE model could be used to analyze the impact of NAFTA on productivity growth rates. Recent work on growth theory suggests that this impact may be substantial, particularly in Mexico. Using a single framework drawn from this theory and some tentative empirical work based on cross-country growth experiences from 1970 to 1985, Kehoe (1994) suggests that increased openness could lead to a 1 or 2 percent per year increase in productivity growth in Mexican manufacturing. Compounded over 20 or 30 years, such an increase would have a substantial impact on Mexico. By providing a growing market for U.S. exports, it would also yield significant benefits for the United States.

In Sum

Using a formal model, such as a static AGE model, forces an economic analyst to make all assumptions explicitly and consistently. The models discussed here (and in the other article in this issue) have their limitations, but their explicitness and consistency let us evaluate their predictions.

These models find that NAFTA is likely to have a significantly positive impact on the Mexican economy; a positive, but very small, impact on the U.S. economy; and almost no impact on the Canadian economy beyond that generated by the U.S.-Canada FTA. Mexico's impact looks much larger when other likely effects are taken into account: an inflow of foreign capital and an increase in productivity. Prosperity and growth in Mexico would also have positive effects on its North American neighbors, especially the United States.

Appendix

North American Trade Data

Examining data on the current levels and composition of trade among the three North American countries can help us understand and interpret the results produced by the models discussed in the preceding article.

The accompanying chart displays the exports and imports among Canada, Mexico, and the United States in 1991. Notice that, although Canada is the number one trading partner of the United States and Mexico is number three after Japan, the United States conducts only about one-quarter of its trade with its two North American neighbors. In contrast, more than two-thirds of foreign trade in both Canada and Mexico is with the United States. Canada and Mexico have little direct trade with each other. Put bluntly, and somewhat simplistically, in Canada and Mexico, foreign trade means trade with the United States.

The accompanying table reports the composition of that trade by sector in 1991. The data have some interesting patterns. Although all three countries are large agricultural producers, agriculture is not a major trading industry for any of them. Canada exports significant amounts of wood, paper products, and non-ferrous metals to the United States, revealing a comparative advantage in raw materials over the United States, which itself exports a large amount of these sorts of goods to the rest of the world. Both Canada and Mexico export a large amount of petroleum to the United States.

Perhaps the most significant patterns in the data, however, are the concentration of trade in machinery and transportation equipment and the large amount of *cross-hauling*, the simultaneous exporting and importing of goods in the same category. The largest category of Canadian exports to the United States, at the two-digit Standard International Trade Classification level, is road vehicles and parts; this is also the largest category of exports from the United States to Canada. The largest two categories of United States exports to Mexico are electrical machinery and road vehicles and parts; these are the largest and third-largest categories of exports from Mexico to the United States, the second-largest being petroleum and petrochemicals.

References

Brown, Drusilla K.; Deardorff, Alan V.; and Stern, Robert M. 1994. Estimates of a North American Free Trade Agreement. Manuscript. Federal Reserve Bank of Minneapolis.

Brown, Drusilla K., and Stern, Robert M. 1989. U.S.-Canada bilateral tariff elimination: The role of product differentiation and market structure. In *Trade policies for international competitiveness,* ed. Robert C. Feenstra, pp. 217–45. Chicago: University of Chicago Press.

Cox, David J. 1994. An applied general equilibrium analysis of the impact of a North American Free Trade Agreement on Canada. Manuscript. Federal Reserve Bank of Minneapolis.

Cox, David, and Harris, Richard. 1985. Trade liberalization and industrial organization: Some estimates for Canada. *Journal of Political Economy* 93 (February): 115–45.

Davis, Steven J., and Haltiwanger, John C. 1992. Gross job creation, gross job destruction, and employment reallocation. *Quarterly Journal of Economics* 107 (August): 819–63.

Dixit, Avinash K., and Stiglitz, Joseph E. 1977. Monopolistic competition and optimum product diversity. *American Economic Review* 67 (June): 297–308.

Garber, Peter M., and Weisbrod, Steven R. 1993. Opening the financial services market in Mexico. In *The Mexico-U.S. Free Trade Agreement,* ed. Peter M. Garber, pp. 279–310. Cambridge, Mass.: MIT Press.

Gruben, William C.; Welch, John H.; and Gunther, Jeffrey W. 1993. U.S. banks, competition, and the Mexican banking system: How much will NAFTA matter? *Financial Industry Studies* (October): 11–25. Federal Reserve Bank of Dallas.

Hall, Robert E. 1982. The importance of lifetime jobs in the U.S. economy. *American Economic Review* 72 (September): 716–24.

Harris, Richard. 1984. Applied general equilibrium analysis of small open economies with scale economies and imperfect competition. *American Economic Review* 74 (December): 1016–32.

Hufbauer, Gary Clyde, and Schott, Jeffrey J. 1992. *North American free trade: Issues and recommendations.* Washington, D.C.: Institute for International Economics.

International Monetary Fund. 1992a. *Balance of payments statistics yearbook.* Washington, D.C.: International Monetary Fund.

_____. 1992b. *Direction of trade statistics 1992 yearbook.* Washington, D.C.: International Monetary Fund.

_____. 1993. *International financial statistics yearbook.* Washington, D.C.: International Monetary Fund.

Kehoe, Timothy J. 1994. Towards a dynamic general equilibrium model of North American trade. In *Modeling trade policy: Applied general equilibrium assessments of NAFTA,* ed. Joseph F. Francois and Clinton R. Shiells. Cambridge, U.K.: Cambridge University Press.

Lopez-de-Silanes, Florencio; Markusen, James R.; and Rutherford, Thomas F. 1993. Anti-competitive and rent-shifting aspects of domestic-content provisions in regional trade blocks. Manuscript. University of Colorado.

_____. 1994. The automobile industry and the North American Free Trade Agreement: Employment, production, and welfare effects. In *Modeling trade policy: Applied general equilibrium assessments of NAFTA,* ed. Joseph F. Francois and Clinton R. Shiells. Cambridge, U.K.: Cambridge University Press.

Lucas, Robert E., Jr. 1990. Why doesn't capital flow from rich to poor countries? *American Economic Review* 80 (May): 92–96.

Markusen, James R.; Rutherford, Thomas F.; and Hunter, Linda. 1994. North American free trade and the production of finished automobiles. Manuscript. Federal Reserve Bank of Minneapolis.

McCleery, Robert K. 1994. An intertemporal, linked, macroeconomic CGE model of the United States and Mexico focussing on demographic change and factor flows. In *Modeling trade policy: Applied general equilibrium assessments of NAFTA,* ed. Joseph F. Francois and Clinton R. Shiells. Cambridge, U.K.: Cambridge University Press.

Sobarzo, Horacio E. 1994. A general equilibrium analysis of the gains from trade for the Mexican economy of a North American Free Trade Agreement. Manuscript. Federal Reserve Bank of Minneapolis.

Stern, Robert M.; Deardorff, Alan V.; and Brown, Drusilla K. 1992. A U.S.-Mexico-Canada Free Trade Agreement: Sectoral employment effects and regional/occupational employment realignments in the United States. In *The employment effects of the North American Free Trade Agreement: Recommendations and background studies,* Appendix A. Special Report 33. Washington, D.C.: National Commission for Employment Policy.

Summers, Robert, and Heston, Alan. 1991. The Penn World Table (Mark 5): An expanded set of international comparisons, 1950–1988. *Quarterly Journal of Economics* 106 (May): 327–68.

_____. 1993. Penn World Table Mark 5.5. Computer diskette. University of Pennsylvania.

Ten Kate, Adriaan. 1992. Trade liberalization and economic stabilization in Mexico: Lessons of experience. *World Development* 20 (May): 659–72.

Topel, Robert H. 1991. Specific capital, mobility, and wages: Wages rise with job seniority. *Journal of Political Economy* 99 (February): 145–76.

U.S. Congressional Budget Office. 1993. *A budgetary and economic analysis of the North American Free Trade Agreement.* Washington, D.C.: U.S. Government Printing Office.

U. S. International Trade Commission. 1992. *Economy-wide modeling of the economic implications of a FTA with Mexico and a NAFTA with Canada and Mexico.* Publication 2508. Washington, D.C.: U.S. International Trade Commission.

Watson, William G. 1991. Canada's trade with and against Mexico. Manuscript. McGill University.

World Bank. 1992. *World development report 1992.* New York: Oxford University Press.

Young, Leslie, and Romero, Jose. 1994. Steady growth and transition in a dynamic dual model of the North American Free Trade Agreement. In *Modeling trade policy: Applied general equilibrium assessments of NAFTA,* ed. Joseph F. Francois and Clinton R. Shiells. Cambridge, U.K.: Cambridge University Press.

BOX 1
La Apertura: The Opening of Mexico

The North American Free Trade Agreement (NAFTA) is not the beginning of free trade policy in Mexico; rather, it is the culmination of a decade-long policy of openness, or *la apertura,* which has substantially dismantled trade barriers.

Until 1982, Mexico pursued an economic development strategy based heavily on government intervention and protectionism—with some success. Much of the investment in Mexico, especially in the late 1970s and early 1980s, was financed by government borrowing from abroad and by oil sales.

In 1982, after international interest rates rose and oil prices fell, Mexico was unable to meet its debt service obligations, which resulted in a financial collapse. Thus the Mexican government sharply cut expenditures and raised taxes. It also increased its protection of Mexican firms against foreign competition, making the Mexican economy one of the most closed in the world. In 1985, Mexico had tariffs as high as 100 percent, licenses required for 92 percent of goods imported, and a general restriction of 49 percent on foreign ownership of Mexican companies. (For details, see ten Kate 1992.)

In 1985, however, the Mexican government changed course. It joined the General Agreement on Tariffs and Trade (GATT) in 1986 and started the process of opening the Mexican economy to foreign trade and investment.

Since then, Mexico's trade barriers have fallen rapidly, with the maximum tariff dropping to 20 percent, most import licensing requirements being eliminated, and foreign investment laws being liberalized. Chart 1 depicts the substantial impact of *la apertura* on Mexican trade with the United States. Notice the sharp growth in trade, especially U.S. exports to Mexico, starting in 1987. Chart 2 depicts the corresponding impact on foreign investment in Mexico. Notice, in particular, the significant effect of opening the Mexican stock market to foreign private portfolio investment in 1988.

Charts 1 and 2

Some Effects of *la Apertura*

Annually, 1980–92, Billions of U.S. Dollars

Chart 1 Trade Between Mexico and the United States

$ Bil.

Mexican Exports
to the U.S.

Mexican Imports
From the U.S.
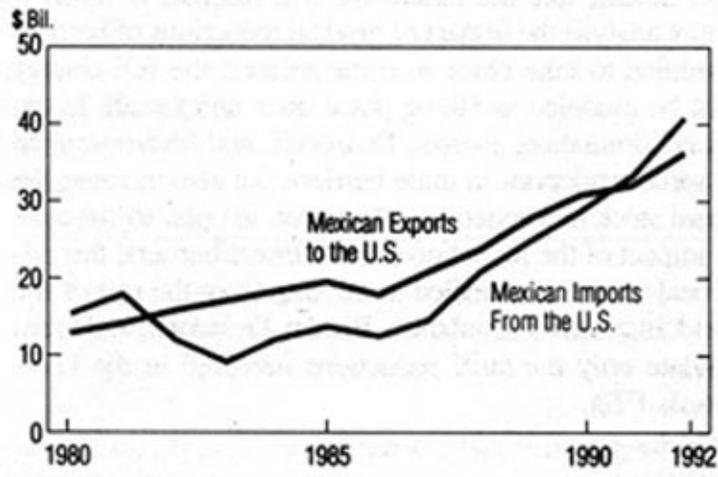
Source: International Monetary Fund

Chart 2 Foreign Investment in Mexico

$ Bil.

Direct +
Private
Portfolio
Investment

Direct
Investment
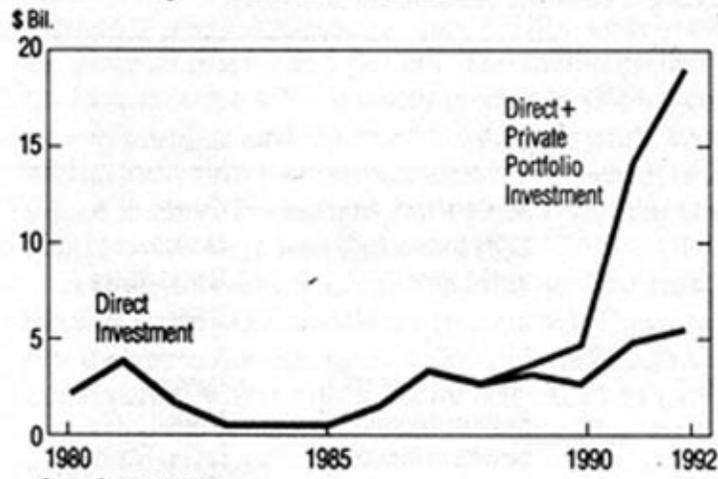
Source: Banco de México

BOX 2

NAFTA Mechanics

In August 1992, representatives of Canada, Mexico, and the United States concluded their negotiations of the North American Free Trade Agreement (NAFTA). This agreement has since been signed by the heads of the governments of all three countries and ratified by their legislatures. As of January 1, 1994, NAFTA created a free trade area with more than 360 million people and a combined gross domestic product of roughly $6.5 trillion (in U.S. dollars).

NAFTA lifts trade barriers primarily between Mexico and its North American neighbors. In 1992, Mexican tariffs on imports from the United States averaged about 10 percent when weighted by the value imported; at the same time, U.S. tariffs on imports from Mexico averaged about 4 percent. Canada and the United States had no tariffs on most of their trade; they had made a separate free trade agreement, which took effect in January 1989. NAFTA substantially reduces nontariff trade barriers, such as import quotas, sanitary regulations, and licensing requirements, although these are not eliminated. Recently, North American countries have had few restrictions on capital flows. The obvious exceptions are in Mexico and are laws prohibiting private ownership, foreign or domestic, in the petroleum industry and parts of the petrochemical industry, laws restricting foreign investment in the financial and insurance sectors, and laws institutionalizing communal ownership of much agricultural lands, the *ejido* system.

NAFTA eliminates tariffs on trade among the three countries over a period of 15 years, it substantially reduces nontariff barriers over the same period, and it immediately ensures the free flow of capital throughout the region.

Here are some specifics by sector:

- *Automobiles.* NAFTA immediately decreases Mexican tariffs on automobiles from 20 percent to 10 percent and over the next 10 years decreases them to zero. It decreases tariffs on most auto parts to zero within 5 years. It includes rules of origin specifying that to qualify for preferential tariff treatment, vehicles must contain 62.5 percent North American content, an increase over the 50 percent provision in the U.S.-Canada Free Trade Agreement. NAFTA eliminates over 10 years requirements that automakers supplying the Mexican market produce the cars in Mexico and buy Mexican parts. It eliminates mandatory export quotas on foreign-owned auto manufacturing facilities in Mexico, and within 5 years it eliminates Mexican restrictions on imports of buses and trucks.

- *Textiles and Apparel.* NAFTA immediately eliminates barriers to trade on over 20 percent of trade in textiles and apparel between Mexico and the United States. Over six years it eliminates barriers on another 60 percent. It provides rules of origin which require that, to receive NAFTA tariff preferences, apparel be manufactured in North America from the yarn-spinning stage forward.

- *Agriculture.* NAFTA immediately reduces tariffs from between 10 and 20 percent to zero for one-half of U.S. agricultural exports to Mexico; those for the other half it eliminates within 15 years. It immediately eliminates Mexico's licensing requirements for grains, dairy, and poultry. (As part of an agricultural reform program, Mexico is also eliminating most of the restrictions on buying and selling agricultural land.)

- *Energy and Petrochemicals.* NAFTA immediately lifts trade and investment restrictions on most petrochemicals. It allows foreign private ownership of electric power plants and allows foreigners to sell to state-owned Mexican energy companies under competitive bidding rules.

- *Financial Services.* NAFTA eliminates over six years Mexico's restrictions on Canadian and U.S. ownership and provision of commercial banking, insurance, securities trading, and other financial services. Under NAFTA, Canadian and U.S. financial firms are allowed to establish wholly owned subsidiaries in Mexico and to engage in the same range of activities as similar Mexican firms.

BOX 3

The North American Free Trade Area vs. The European Union

To appreciate the size and potential significance of the free trade area created by the North American Free Trade Agreement (NAFTA), compare the area to the European Union.

The accompanying table provides some data for this comparison. The NAFTA area obviously includes fewer countries than the European Union: only 3 vs. 16. (The European Union recently approved an expansion from 12 to 16 countries.) But note that the NAFTA area is larger in terms of both population and production. Note also that Mexico has a larger population and is poorer than the four poorest members of the European Union: Greece, Ireland, Portugal, and Spain. And note that output per worker, or labor productivity, in Mexico is less than half of that in the United States. This ratio is similar to the ratio between Portugal and some of the richer countries of the European Union.

Finally, note one great difference between countries in the NAFTA area. Output per person is about one-third of output per worker in Mexico, but about one-half in the United States. Most of this difference arises because Mexico has had a much higher population growth rate than has the United States; thus a larger fraction of Mexico's population is very young and not in the labor force.

In making these comparisons of economic size, standard of living, and labor productivity across countries, we have used output adjusted for purchasing power parity. Such output measures, constructed by Summers and Heston (1991, 1993), value output at a common set of international prices. Summers and Heston argue that such measures are more useful in cross-country comparisons than measures that simply use exchange rates to convert domestic measures of real output from different currency units.

NAFTA and the agreements that bind the members of the European Union are in some ways significantly different. NAFTA eliminates trade tariffs for 15 years, substantially reduces nontariff trade barriers, and ensures free capital flows throughout the region. Unlike the European Union agreements, NAFTA does not erect trade barriers against the rest of the world or promote the free flow of labor throughout the region. (The lack of common trade barriers in NAFTA makes crucial its rules of origin, which determine whether a product has enough North American content to qualify for preferential treatment.) Unlike the European Union agreements, NAFTA does not include plans for significant direct redistribution to poorer regions within its area. Although NAFTA does establish dispute resolution mechanisms, public discussion has not included plans for a central North American government like the European Parliament and the European Union bureaucracy. Neither has it included serious talk about a common currency system for North America, as has been proposed for Europe, although both Canadian and Mexican monetary authorities carefully manage their currencies' exchange rates against the U.S. dollar.

BOX 3 table

An International Economic Comparison

In 1990

Area	Country	Population (Million)	Output (Bil. U.S. $)	Output (Thou. U.S. $)	
				Per Person	Per Worker
North	Canada	26.5	548.8	20.7	41.4
American	Mexico	86.2	544.4	6.3	18.4
Free Trade	United States	250.0	5,392.2	21.6	43.9
Area					
	North America	**362.7**	**6,485.4**	**17.9**	**39.2**
European	Belgium	10.0	166.6	16.7	40.1
Union	Denmark	5.1	85.7	16.7	29.9
	France	56.4	941.5	16.7	36.4
	Germany (FRG)	62.1	1,125.2	18.1	37.3
	Greece	10.1	79.4	7.9	20.7
	Ireland	3.5	38.1	10.9	28.2
	Italy	57.7	868.5	15.1	37.1
	Luxembourg	.4	7.3	19.2	44.7
	Netherlands	14.9	232.3	15.5	37.3
	Portugal	10.4	80.7	7.8	17.3
	Spain	39.0	454.0	11.7	32.1
	United Kingdom	57.4	882.4	15.4	31.1
	12 Countries	**327.0**	**4,961.7**	**15.2**	**33.9**
	Austria	7.7	99.2	12.9	27.0
	Finland	5.0	70.9	14.2	27.7
	Norway	4.2	63.2	14.9	29.2
	Sweden	8.6	124.1	14.5	27.9
	16 Countries	**352.5**	**5,319.0**	**15.1**	**33.4**

Sources: World Bank 1992, Summers and Heston 1993

Table 1

NAFTA's Potential Effects

According to the Brown, Deardorff, and Stern Model

Experiment	Country	Predicted % Change in Each Country's			
		Welfare (GDP)	Wage Rage	Rental Rate	Terms of Trade
1. Remove North American tariffs and nontariff trade barriers.*	Canada	.7	.5	.6	−.7
	Mexico	2.2	.4	.8	−1.1
	United States	.1	.2	.2	.3
	Other	.0	−.1	−.1	.0
2. Same as (1) *PLUS* Reduce investment barriers in Mexico.**	Canada	.7	.6	.7	−.7
	Mexico	5.4	7.2	3.0	−4.8
	United States	.1	.2	.2	.1
	Other	.0	.0	.2	.2
3. Remove tariffs between Canada and the United States.	Canada	.7	.6	.6	−.7
	Mexico	.0	−.1	.0	.0
	United States	.0	.1	.1	.2
	Other	.0	−.1	−.1	.0

*The nontariff barrier change is a 25% expansion of U.S. import quotas on Mexican exports of food, textiles, and clothing.

**The investment barrier change is a relaxation of Mexico's capital import controls that results in a 10% increase in the capital stock there.

Source: Brown, Deardorff, and Stern 1994, Table 1

Table 2

NAFTA's Potential Effects on Mexico

According to the Sobarzo Model

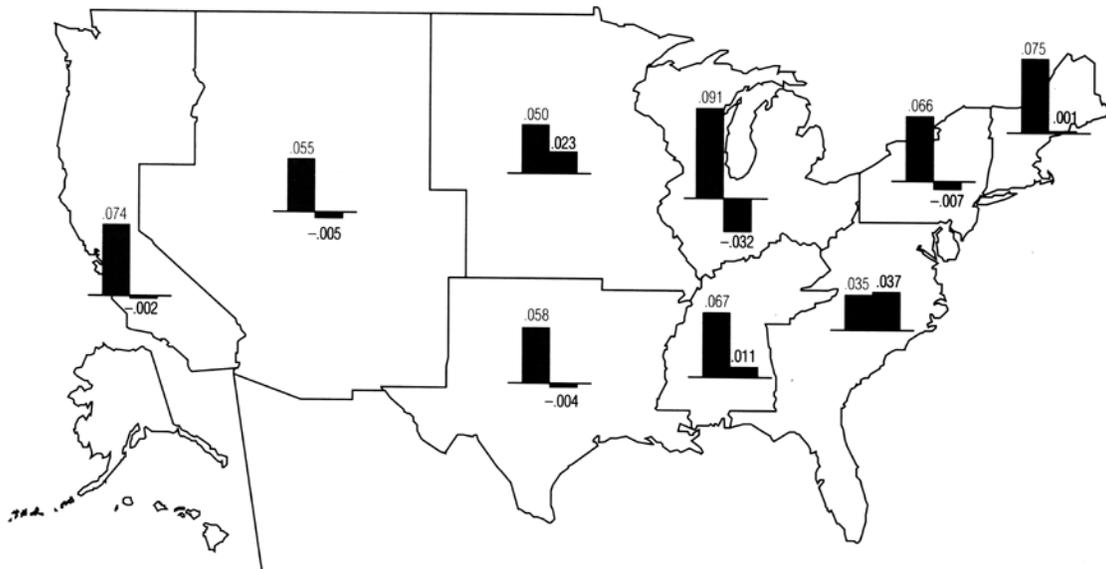|	Predicted % Change in Mexico's				
Experiment	Welfare (GDP)	Wage Rate	Employment	Rental Rate	Terms of Trade
1. Fix Mexico's capital stock and employment.	3.7	4.3	.0	4.6	1.5
2. Fix Mexico's capital stock and real wage; let its employment vary.	4.9	.0	5.1	6.2	3.1
3. Fix Mexico's rental rate, terms of trade, and employment; let its capital stock and trade balance vary.	10.9	16.2	.0	.0	.0

Source: Sobarzo 1994, Table 3

Predicted U.S. Employment Changes Due to NAFTA

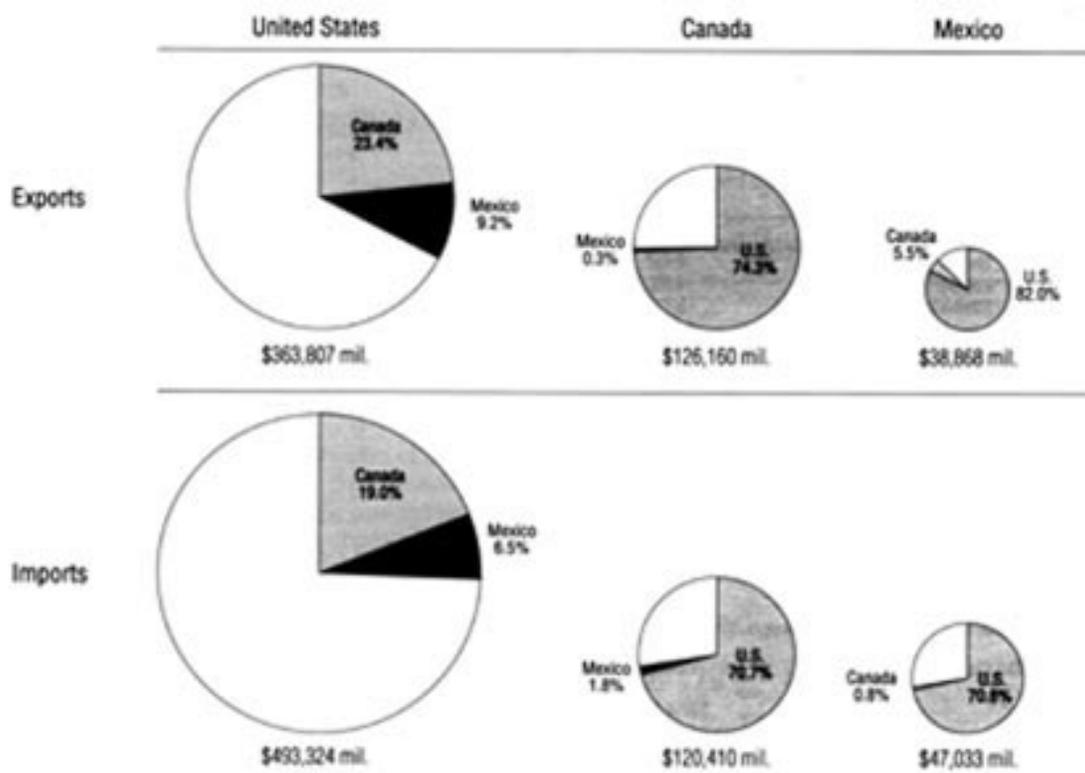According to the Brown-Deardorff-Stern Model

% of Workers in Each Region

■ Who Change Industry or Region

■ Who Are Added to or Subtracted From the Region

.074
−.002

.055
−.005

.050 .023

.091
−.032

.066
−.007

.075
.001

.058
−.004

.067
.011

.035 .037

Foreign Trade in North America
In 1991

	United States	Canada	Mexico

Exports

Canada
23.4%

Mexico
9.2%

$363,807 mil.

Mexico
0.3%

U.S.
74.3%

Canada
5.5%

U.S.
82.0%

$126,160 mil.

$38,868 mil.

Imports

Canada
19.0%

Mexico
6.5%

$493,324 mil.

Mexico
1.8%

U.S.
76.7%

Canada
0.8%

U.S.
70.8%

$120,410 mil.

$47,033 mil.

U.S. Merchandise Trade by Commodity

In 1991 (Millions of 1991 U.S. Dollars)

Selected Commodities*	U.S. Exports to			U.S. Imports From		
	Entire World	Canada	Mexico	Entire World	Canada	Mexico
0 Food and Live Animals	**29,555**	**4,204**	**2,086**	**23,924**	**4,023**	**2,666**
03 Fish, Related Products	3,056	329	17	5,951	1,248	297
04 Cereals	10,916	362	686	1,092	423	40
05 Vegetables and Fruit	5,329	1,727	153	6,244	287	1,509
1 Beverages and Tobacco	**6,750**	**141**	**44**	**5,132**	**746**	**267**
2 Crude Materials Except Fuels	**25,462**	**2,748**	**1,626**	**14,317**	**6,888**	**782**
22 Oil Seeds	4,324	97	391	150	83	27
24 Cork and Wood	5,103	665	227	3,342	2,970	145
25 Pulp and Waste Paper	3,604	227	285	2,301	1,983	2
28 Metal Ores and Scrap	3,989	929	178	3,881	994	213
3 Mineral Fuels, Related Products	**12,033**	**1,240**	**865**	**58,557**	**10,992**	**4,876**
33 Petroleum, Related Products	6,586	644	706	54,150	7,308	4,751
4 Animal and Vegetable Fats, Oils	**1,147**	**64**	**143**	**927**	**138**	**31**
5 Chemicals, Related Products	**42,965**	**6,554**	**2,624**	**25,289**	**4,603**	**748**
51 Organic Chemicals	10,928	1,088	705	8,450	797	257
52 Inorganic Chemicals	4,102	489	259	3,533	1,078	193
6 Manufacturing, by Material	**35,566**	**10,266**	**4,419**	**60,362**	**15,762**	**2,364**
64 Paper, Related Products	5,961	1,536	775	8,435	6,352	124
65 Textiles, Related Products	5,457	1,350	541	7,339	506	330
67 Iron and Steel	4,365	1,393	873	10,073	1,579	314
68 Nonferrous Metals	5,713	1,210	425	8,621	3,687	356
7 Machinery, Transportation Equipment	**187,360**	**42,289**	**15,059**	**215,950**	**41,030**	**15,040**
71 Power Generating Machinery	16,968	4,097	1,070	14,487	2,344	1,140
72 Specialized Machinery	16,565	2,658	1,222	11,244	1,122	142
74 General Industrial Machinery	17,107	4,654	1,548	14,891	1,812	837
75 Office Machines, Computers	25,954	3,680	1,002	30,703	2,324	729
76 Telecommunications	9,966	1,486	1,506	23,915	1,013	2,965
77 Electrical Machinery	29,935	6,175	4,211	35,822	3,686	4,875
78 Road Vehicles and Parts	31,805	17,396	3,590	72,732	25,945	4,312
79 Other Transportation Equipment	36,355	1,739	671	8,414	2,550	33
8 Miscellaneous Manufacturing	**43,162**	**8,122**	**3,694**	**87,375**	**3,689**	**3,658**
82 Furniture	2,113	895	638	5,286	1,081	751
84 Apparel, Clothing	3,212	244	533	27,699	319	921
87 Scientific Instruments	13,488	1,883	999	6,908	585	648
9 Not Classified Elsewhere	**13,447**	**2,654**	**1,612**	**15,423**	**4,635**	**1,401**
Total**	**397,448**	**78,282**	**32,172**	**507,255**	**92,505**	**31,834**

Notes for Appendix table:

*The commodities are coded by the Standard International Trade Classification (revision 3), one-digit and selected two-digit codes.

**Since all the data have been rounded somewhat, the one-digit subtotals do not sum to the totals. Also, the totals on this table do not match export/import totals elsewhere in the article because these data are from different sources.

Source: OECD