BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY

Task 14:
Methodologies for Developing Estimates of Costs and Benefits for Assessing Transportation Impacts of U.S.-Mexican Trade

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La Empresa

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FINAL REPORT

Preface

U.S./Mexico Binational Border Transportation Planning and Programming Study implements a significant binational policy making document entitled “Memorandum of Understanding on the Planning Process for Land Transport on Each Side of the Border” signed by the federal governments of Mexico and the United States at the first “NAFTA Transportation Summit” held in Washington, D.C., April 29, 1994.

The purpose of this study is to provide policymakers with information needed to establish a continuous, joint, binational, transportation planning and programming process. A goal of this study is to improve the efficiency of the existing binational policy making planning procedures and funding criteria affecting our Border Land Transportation Systems (BLTS). The BLTS should be seen as a binational transportation system made of international bridges and border crossings and land connections to major urban and/or economic centers, principal seaports, airports and multimodal/transfer stations, and ultimately, to national transportation facilities.

Disclaimer

The purposes of the Binational Planning and Programming Study and all of its reports were: to investigate current state and national transportation planning processes in both the United States and Mexico, to review available data on border transportation infrastructure and goods movement, and to recommend an ongoing, binational planning and programming process. The information contained in these reports was not developed to serve as the basis for making funding allocation or distribution decisions at either the federal or state level in the United States.

BINATIONAL BORDER TRANSPORTATION PLANNING AND PROGRAMMING STUDY TASK 14 REPORT: METHODOLOGIES FOR DEVELOPING ESTIMATES OF COSTS AND BENEFITS FOR ASSESSIING TRANSPORTATION IMPACTS OF U.S.-MEXICAN TRADE

This report is a companion to the Task 10, “Economic Impacts of U.S.-Mexican Binational Trade” document. The objective of this report is to provide additional detail regarding the calculation of benefits and costs; and to update the analysis procedures or findings of Task 10 with more current information if available. As the Task 10 report contained substantial discussion of methodological assumptions, techniques and sources of data used to undertake the analysis, this documentation is not repeated in Task 14, except where needed to clarify the presentation of methodologies. Where appropriate, this report suggests some shortcuts to the methodologies followed in Task 10, based on the ultimate perceived utility of the resultant findings. By the same token, areas needing additional research are also identified, given the importance of their findings.

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Key Words: methodologies, impacts, employment, costs, tonnage, trucks, border, logistics, congestion, noise, air, accidents

TABLE OF CONTENTS

14.1 Introduction 1
14.2 Review of Task 10 Findings 2
U.S. Benefits of Binational Commerce 3
U.S. Costs of Binational Trade 4
Mexico's Benefits of Binational Commerce 4
Mexico's Costs of Binational Commerce 5
14.3 Data Sources–United States 7
14.3.1 U.S. National Benefits of U.S.-Mexico Trade 7
14.3.2 U.S. State Level Benefits of U.S.-Mexico Trade 8
14.3.3 U.S. Border State Costs of U.S.-Mexico Binational Trade 8
14.3.4 Unit Costs for Roadway Consumption and Social/Environmental Impacts 9
14.3.5 Calculating Pass-Through Trade 10
14.3.6 Border Trade Economies 10
14.4 Methodologies for Estimating U.S. Employment Supported by Trade With Mexico 11
14.4.1 U.S. National Employment Supported by Trade 11
U.S. Employment 14
14.4.2 Border State Employment Supported by Trade 15
14.4.3 Border County Employment Supported by Trade 23
14.5 Methodologies for Estimating Road Consumption, Bridge Damage, and Marginal Social Costs of Binational Trade 25
14.5.1 Estimating Freight Weight 25
14.5.2 Estimating Freight Weight Passing Through Customs Districts and Ports of Entry 37
14.5.3 Estimating Freight Volumes (Conveyances) Passing Through Customs Districts and Ports of Entry 38
14.5.4 Cost of Flow Through Trade 44
14.5.5 External Social Costs 50
14.6 General Methodology—Mexico 51
14.6.1 Sources of Information 51
a) National Industrial Census Reports 51
b) System of National Accounts 51
c) Maquiladora Industry Statistics 52
d) State Level Statistics 53
e) Municipal Statistical Notebooks 53
f) Colegio de la Frontera Norte Research 53
14.7 Detailed Methodology Used in the Study—Mexico 55
14.7.1 Maquiladora Industry 55
Step 1: Determining Imports and Exports by Product 56
Step 2: Quantifying Foreign Trade by Activity Sector 56
14.7.2 Traditional Manufacturing Industry 56
14.7.3 COLEF's Methodology for Estimating Employment 57

14.7.4 Method of the Propensity to Export (Employment) 59
14.7.6 Technical Coefficient Matrix for Indirect Employment 61
14.8 Method to Assess Logistical Operation Costs at the Border 63
14.8.1 Unit Costs for Logistical Services at the Border 63
14.8.2 Unit Costs for Delays in Customs and Border Crossings 64
14.9 Findings and Conclusions 68
14.9.1 Findings 68
14.9.2 Conclusions 69

List of Tables

Table 14.1	Initial Estimates of United States Export-Related Employment to Mexico, 1993-1995 (in thousands)	12
Table 14.2	Revised Estimates of United States Export-Related Employment to Mexico, 1993-1995 (in thousands)	13
Table 14.3	U.S. Jobs Supported by Trade With Mexico	15
Table 14.4	Manufacturing Industries-Shipments and Employment Related to Manufactured Exports for States: 1991	17
Table 14.5	Employment Related to Manufactured Exports by Major Economic Sector for States: 1991	18
Table 14.6	California Employment Related to Manufactured Exports	19
Table 14.7	Arizona Employment Related to Manufactured Exports	20
Table 14.8	New Mexico Employment Related to Manufactured Exports	21
Table 14.9	Texas Employment Related to Manufactured Exports	22
Table 14.10	Shortcut Estimate of California Jobs Supported by Exports to Mexico	23
Table 14.11	1995 Trans-Surface Data—U.S. Imports from Mexico	26
Table 14.12	1995 Trans-Surface Data—U.S. Exports to Mexico	28
Table 14.13	1996 Trans-Surface Data—U.S. Imports from Mexico	30
Table 14.14	1996 Trans-Surface Data—U.S. Exports to Mexico	32
Table 14.15	Transborder Trade Trends	34
Table 14.16	1996 Trans-Surface Data—U.S. Imports from Mexico	35
Table 14.17	1996 Trans-Surface Date—U.S. Exports to Mexico	36
Table 14.18	Northbound Commercial Truck Traffic at U.S.-Mexican Border Ports, Fiscal Year 1994-Fiscal Year 1996	39
Table 14.19	Northbound Commercial Vehicle (Truck) Volumes By Gateway	40
Table 14.20	Mexico Imports: Number of Rail Cars (Southbound)	40
Table 14.21	Mexico Imports: Rail Tons (Southbound)	41
Table 14.22	Mexico Exports: Number of Rail Cars (Northbound)	41
Table 14.23	Mexico Exports: Rail Tons (Northbound)	41
Table 14.24	Train Units Driven Across the Border (January through March 1996)	42
Table 14.25	Northbound Commercial Rail Traffic (Cars) at U.S.-Mexican Border Ports Fiscal Year 1994-Fiscal Year 1996	42
Table 14.26	Unit Costs of Border Services for Imports (Southbound)	64
Table 14.27	Unit Costs for Export Border Services (Northbound)	65
Table 14.28	Unit Costs for Motor Transport Delays at the Customs Complexes	66
Table 14.29	Unit Costs for Motor Transport Delays at Border Crossings	66
Table 14.30	Total Unit Costs for Motor Transport Delays at the Border (in 1995 U.S $)	67
Table 14.31	Total Unit Costs for Railroad Delays at Border Crossings	67

List of Figures

Figure 14.1	Employment Related to Manufactured Exports for States: 1991	16
Figure 14.2	Northbound Freight Through the U.S.-Mexican Border by Mexican Customs District	38
Figure 14.3	Equipment/Payload Matrix-Truck	45
Figure 14.4	Worksheet 1 Estimating Costs/ESAL-Mile from the Texas HCA Study	46
Figure 14.5	1994 Dominant U.S.—Mexico Highway Trade Corridors	49

14.1 Introduction

The purpose of this task is to report methodologies used to estimate the cost and benefit impacts of binational trade on the border area and beyond. Costs include border transaction costs, delays, roadway consumption, and environmental impacts. The methodologies define assumptions, required input data and computations. This report also suggests how this information can be used in the planning and programming process and how agencies can acquire and maintain needed data.

This report begins with a review of the Task 10 findings and its analyses of benefits and costs. As part of this overview, methods available for estimating employment benefits and costs (transaction, road consumption, environmental) are also addressed.

Next, the sources of data and unit cost assumptions employed in the benefit/cost calculations are discussed. Updated information is provided when available and sources of information for future updates are suggested.

The actual methodology for estimating employment related to binational trade is presented next. The methodology addresses the question of how to estimate future employment impacts associated with different levels of binational trade.

A similar presentation is then made of the actual methodologies used for estimating cost impacts of binational trade. Border transaction costs, delays, roadway consumption costs and environmental/social costs are each, individually discussed. These methodologies account for trade volumes and different efficiency levels at border crossings when appropriate.

The last section of this report provides suggestions as to how this benefit and cost information can be used to assist with transportation system planning and programming processes. Needs for additional research are identified where the findings of this study indicate shortcomings.

As much of the aforementioned methodologies, assumptions and data sources are previously documented in the Task 10 report, this effort attempts to avoid repetitive information wherever possible. New data, details, and assumptions not previously disclosed are the primary subject of this reporting.

14.2 Review of Task 10 Findings

The findings of Task 10 were reported in a single document with the first five chapters covering U.S. economic benefits and costs and the second five chapters covering Mexico's economic benefits and costs associated with binational trade. Appendices to this report provided additional details. The benefits discussion for both countries was related to employment supported by binational trade at the national, border state, and case study municipal level. The costs analysis for the two countries was different. The Mexican analysis addressed the cost of border transactions (delay, drayage, customs brokers, etc.) while the U.S. analysis addressed roadway consumption costs and various social and environmental costs associated with binational trade.

The Task 10 report identified the generation of jobs supported by export trade as a frequently used indicator of benefits. This measurement was recently used in a U.S. Presidential report to Congress for identifying the economic effects of NAFTA.[1] It is routinely measured by/for the U.S. Department of Commerce for the U.S. economy as a whole and for trade with countries of interest which include Mexico. There is no attempt or mission requirement on the part of the Department of Commerce to split out its countrywide estimates to individuals states or regions.

In Mexico, there is no ongoing, routine effort to quantify the economic impacts of border trade with the U.S. The estimates and processes used in this Binational Study are thus unique and may represent a stepping off point for follow-on work.

The U.S. Department of Commerce estimates of jobs supported by foreign trade, while routinely performed, are published on an irregular basis, every one to three years. Also, the publication dates lag the estimates by almost two years. The report published in November 1996, for example, covered the period through 1994. No “off-the-shelf” estimates are furnished attributable to individual states, thus there exists a lag of current national data.

In Mexico, the reverse situation is true. INEGI routinely reports counts of employment attributable to maquiladora trade—which constitutes the bulk of both foreign export trade and industrial activity in at least four of the northern border states and all six of the case study municipalities. Thus foreign trade-related employment by border state and border municipality is easily acquired.

As these situations exist, the Mexican portion of the report dealing with economic benefits expends the majority of its investigative effort and reporting on producing countrywide estimates of jobs supported by foreign trade. Very little research or effort was needed to estimate border state and border municipality job impacts. In contrast, the U.S. portion of the report on economic benefits expends the majority of its investigative and reporting effort on producing border state and border municipality estimates of jobs supported by trade with Mexico. Only a small degree of effort was needed to produce more recent estimates of countrywide jobs supported by trade with Mexico.

On the costs side, again two very different sets of needs for information existed, and therefore two sets of costs impacts were produced by the study team. In the United States, the border state Departments of Transportation were interested in ascertaining the impact of trade flowing through and over their transportation network to other parts of the nation. During most of the investigation period, the subject of national allocation of transportation funding resources was being discussed in Congress, as part of the ISTEA reauthorization process. Naturally, the U.S. border states

[1] *Study on the Operations and Effects of the North American Free Trade Agreement,* Office of The President, July 1997.

desired fair and equitable treatment in this funding allocation process, and increased trade resulting from NAFTA was a topic of much discussion.

In Mexico, the federal government manages the operation, maintenance, and improvement of the interstate transportation network, hence there is much less state led competition for funding resources. As a result, the focus of the investigation relative to Mexico's interest was on the border crossing itself, long renowned as the major bottleneck to freer, faster trade between the two nations. Here the major impediments to trade were quickly isolated to be avoidable time and money. This includes unnecessary or wasteful time spent by trucks and rail conveyances waiting to cross the border (in both directions), and unnecessary or wasteful money spent for "border transactions" such as draying truck trailers across the border and customs broker services. Again, these expenditures of perhaps avoidable time and money were viewed as restricting the opportunity for freer trade, and thus a constraint to economic prosperity.

In light of these divergent priorities and sets of available data, the study team has made no attempt to impose a common, single, binational methodology or analysis for each cost or benefit item of interest. Rather, the methodologies and available data sets employed in Task 10 are elaborated here to be used, refined or discarded as follow-on investigators may wish.

The major findings of the Task 10 investigation are highlighted below, organized by country of impact.

U.S. Benefits of Binational Commerce

1. The most important benefit of international trade is its contribution to the U.S. economy in terms of increased industrial efficiency and an improved standard of living for U.S. citizens.
2. Worldwide U.S. exports of goods supported over 7.2 million jobs in 1995. About 34 percent of these export-supported jobs were directly required to produce the products while the remaining 66 percent were indirectly required upstream in the production process.
3. In 1994, before the devaluation of the peso, goods exports to Mexico supported 729,000 jobs according to the U.S. Department of Commerce. In 1995, after the devaluation, goods exports to Mexico supported 617,000 jobs, the same level as experienced in 1993, prior to NAFTA.
4. California's exports to the world supported an estimated 902,000 jobs in 1995. Of these, between 67,000 and 75,000 resulted from trade with Mexico, depending on the data source used for estimation purposes.
5. Texas' exports of goods supported 514,000 jobs statewide in 1995. Between 52,000 and 176,000 of these jobs (32 percent of the total) are attributable to export of goods to Mexico.
6. Arizona and New Mexico have smaller work forces supported by worldwide exports, compared to California and Texas. About 81,000 jobs in Arizona are supported by trade, of which 12,000 to 17,000 are attributable to commerce with Mexico. The state of New Mexico experiences the benefits of about 18,000 workers supported by goods related exports. Two to three thousands of these jobs result from exports of goods to Mexico.
7. At the local level, El Paso was the greatest beneficiary of export related jobs of the six case study border cities that were studied. Some 20,000 El Paso jobs, with an annual payroll of $331 million, were supported by export trade in 1995. San Diego had the next largest number of export supported jobs, almost 7,000, generating an annual payroll of $178 million. Laredo, the border city accommodating the largest volume of binational trade, benefited by some 4,700 jobs which generated an annual payroll of $93 million for the local economy. Each of the three other case study cities (Nogales, Brownsville and Eagle Pass) had between one and two thousand jobs supported by trade, according to our estimates.

8. Growth of exports allows U.S. industries to produce those goods and services for which they are best suited to produce and to import inputs to their production process best produced by foreign industries. Thus while U.S. economy remains robust, further increases in foreign trade will result in diminishing increases in national employment.
9. Overall, the 617,000 jobs supported by trade with Mexico yielded an annual payroll of $16 billion in 1995. Income and sales taxes on this payroll was in turn available to offset costs associated with binational trade.

U.S. Costs of Binational Trade

1. In 1995, the U.S. imported nearly $54 billion of goods (weighing some 20.7 million tons) across its land border with Mexico. Approximately 77% of this freight moved overland by truck, when measured on the basis of weight.
2. From an export (southbound) perspective, the U.S. exported goods (weighing 29.3 million tons) with a value of $42 billion across its land border with Mexico in 1995,. Of this volume of freight, two-thirds (19.5 million tons), traveled overland by truck. Rail transported most of the rest (9.5 million tons).
3. Most of the two-way trade flowed across the State of Texas border with Mexico. Seventy-four percent (74%) of the truck transported freight (26.5 million tons) moved through the Laredo and El Paso customs districts in 1995.
4. Wear and tear on the border state highway systems, resulting from U.S.-Mexico trade, amounted to $113 million in 1995. Of this amount, $53 million was attributed to trucks flowing through the border states on their way to or from states inland from the border.
5. Wear and tear on the non border state highway systems, associated with binational trade, was estimated at $62 million for 1995, bringing the total roadway consumption cost to $175 million annually for the U.S. as a nation.
6. The marginal, social costs of binational trade were also computed. These costs addressed the impacts of congestion, accidents, air pollution, noise, and energy security attributable to binational trade. For the border states, these amounted to $68 million for 1995. Of this amount, $32 million was caused by trucks flowing through the border states with the rest staying within the border state.
7. Social cost for the non border states, attributable to binational trade, were estimated at $37 million annually; bringing the total national cost of congestion, accidents, air pollution, noise and energy security to $105 million annually.
8. These collective costs of $280 million annually were in turn offset by the employment benefits identified above.

Mexico's Benefits of Binational Commerce

1. The major benefit of U.S.-Mexico binational trade is the generation of jobs in the maquiladora export industry in border states.
2. 86 percent of the total direct and indirect jobs generated by the maquiladora industry (638,000 jobs in 1995) are concentrated in the six border states. In turn, these jobs account for 74 percent of total jobs generated by foreign trade in Mexican border states.
3. Maquiladora jobs are growing by more than 10 percent per year, being heavily concentrated in the states of Baja California and Chihuahua, although recent increases are reported in the remaining border states.
4. Consequently, the local impact of this industry is significant, since in the six POE case studies the maquiladora export industry accounts for an average 40 percent of municipal jobs.

5. However, faced with a long-lasting downturn of its domestic market, the traditional industry has seen a high increase in its exports to North America ($US 26.4 billion of a total $US 35.4 billion exported in 1995).
6. Hence, exports are seen as playing an increasingly significant role in job creation and preservation in this industry (665,000 jobs related to binational commerce in 1995). Contrary to the general perception, the job balance in mainstream industry is currently slightly higher than that of the maquiladora industry.
7. Additionally, the mainstream industry jobs are better distributed throughout the national territory. For this reason, only 26 percent of total direct and indirect jobs generated by the traditional industry exports are concentrated in the six border states, mostly in the border states where industry is historically stronger (Nuevo Leon and Coahuila).
8. Overall, including the agricultural and mining sectors, binational trade led to the creation and preservation of 1,565,000 direct and indirect jobs in 1995, i.e., 6.8 percent of the economically active population and more than 45 percent of Mexico's overall industry-generated jobs. There is a high concentration of foreign trade-related employment in the industrial production and a relatively low proportion of related services, as compared to the United States.
9. Nevertheless, the overall impact in Mexico from binational-trade-generated jobs is almost three times that of the United States (617,000 jobs in 1995) and is related to the relocation to Mexico of industrial activities and some high job-generating logistics services (cartage, customs brokers, and maneuvering charges).
10. In fact, the Mexican transportation and communications sector is one of the most benefited by binational trade, given that it maintains approximately 163,000 jobs (36 percent of total jobs generated by the cargo transportation sector).

Mexico's Costs of Binational Commerce

1. Border transaction costs for services at the border plus additional costs resulting mainly from delays and cargo breakage.
2. Border transaction costs paid or defrayed by Mexican exporters and importers ranged from $US 1.345 to 1.673 billion in 1995.
3. These costs represent 45 percent to 56 percent of foreign trade freight charges collected in Mexico that same year.
4. It is estimated that 50 percent of these costs could be avoided by:
   - gradually decreasing customs brokers' rates for imports;
   - renegotiating commercial conditions for bringing in American cars to Mexico;
   - reducing delays at crossing points and customs compounds at some POEs.
5. For railroads, avoidable costs amount to 37 percent of border costs (up to $U.S. 60 million in 1995). These costs mainly result from fees levied on individual cars on a daily basis.
6. The persistence of unbalanced flows tipping heavily toward the import side together with high customs rates negatively affect railroad imports.
7. In the case of cargo motor transport, a gradual standardization of border service costs is taking place between Mexico and the United States for both imports and exports.
8. Almost 50 percent of total border transaction costs emerge from delays affecting both imports and exports by truck.
9. Southbound, most delays can be traced to Mexican customs compounds (when infrastructure is inadequate). Northbound, major delays occur at border crossings due to major flow fluctuations (at least in Nuevo Laredo and Ciudad Juarez) due to a mismatch

between the staffing of American inspection booths and overall demand, rather than to inadequate infrastructure.

10. Analysis of the six border crossings studied show a concentration of 36 percent of border transaction costs and almost 40 percent of potentially avoidable surcharges at Laredo/Nuevo Laredo, while San Diego/Tijuana and El Paso/Juarez account for 15 percent and 12 percent of total costs, respectively.

14.3 Data Sources–United States

The Task 10 report lists the general sources of information used to compute economic benefits and costs of U.S.-Mexico binational trade. Additional details are furnished here to expedite the retrieval or use of data sources. Additionally, the Internet version of this report includes linkages to many of the data sources listed, although these worldwide web addresses and contents change over time.

Organizationally, the presentation of information contained in this section follows the presentation of benefits and costs embodied in the Task 10 reports. For ease of application, each Task 10 chapter is followed separately, from beginning to end rather than mixing and matching U.S. and Mexican data by topic.

14.3.1 U.S. National Benefits of U.S.-Mexico Trade

The primary data source for this analysis is a U.S. Department of Commerce publication entitled *U.S. Jobs Supported by Goods and Services Exports, 1983-1994.* This may be acquired via the Internet following a couple of paths:

direct: http://www.stat-usa.gov/BEN/esadocs/esadocs.html

or

http//www.doc.gov

go to Economics and Statistics Administration, then

go to STAT-USA, and then go to Selected Publications of Interest

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As these national estimates generally involve a publication time lag of 18 to 24 months, the Binational Study team needed to update the Department of Commerce estimate from 1993 and 1994 to 1995. We did this based on the relational dollar value of exports by SIC code grouping as available from the Massachusetts Institute for Social and Economic Research (MISER). MISER data is available for purchase from the following source:

MISER
128 Thompson Hall Box 37515
University of Massachusetts at Amherst
Amherst, MA 01003
Telephone (413) 545-4360
Fax (413) 545-3686
E-Mail MISER@MISERUMASS.EDU
Internet http://www.umass.edu/miser/

The National Trade Data Bank [http://www.stat-usa.gov/BEN/subject/trade] may also be queried; or an alternate, simplified approach can be followed as described in Section 14.4.1.

14.3.2 U.S. State Level Benefits of U.S.-Mexico Trade

In the United States, there is no consistent, routinely published source of state-by-state estimates of jobs supported by export trade to the world or to an individual country. To develop the estimates reported in the Task 10 report, we relied on the U.S. Bureau of the Census Annual Survey of manufacturers which publishes a report series entitled *Exports from Manufacturing Establishments.*

The report containing the data we utilized was: *Exports from Manufacturing Establishments: 1990 and 1991,* issued December 1994, by the U.S. Department of Commerce, Economics and Statistics Administration.

Information regarding this publication can be obtained by an Internet search of the following address:

http://www.census.gov/ftp/pub/econ/www/ma0300.html

or by contacting:

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Fax (202) 482-3968

Mr. Kolarik is not the manager of this Bureau of Census program, however, he is most knowledgeable of its application strengths and weaknesses with regard to trade analyses.

Alternative, simplified methods and other estimates of state-related export employment are described in Section 14.4.2.

14.3.3 U.S. Border State Costs of U.S.-Mexico Binational Trade

The essential element of calculating U.S. border state costs, according to the methodology reported in Task 10, is the estimation of freight weight, by mode and geographic area. As of April 1995, shipment weights for imports are detailed in the U.S. Department of Transportation, Bureau of Transportation Statistics (BTS) *Transborder Surface Freight Database.* This data base may be accessed via the Internet at:

http://www.bts.gov/ntda/tbsCd./

The period of January 1996 through December 1996 is the most recent calendar year of data available; and this data set can be added to the 1995 data (January through March, estimated based on value, and April through December, actual) reported by the Binational Study for comparison and trends.

Additional insights insofar as commodity trends and the implication of NAFTA are reported in a U.S. International Trade Commission document entitled *Investigation No. 332-381: The Impact of the North America Free Trade Agreement on the U.S. Economy and Industries: A Three-Year*

Review. This June 1997 document, while lengthy, can be downloaded from the following Internet site: http:/www.usitc.gov/

Commodity by weight, value, and mode of travel is only reported for the border as a whole, not individual border crossings nor customs districts. We utilized the U.S. Merchandise Imports and the U.S. Merchandise Exports data files to geographically distribute the commodity tonnages by mode based on proportional dollar values. These Merchandise Import and Export files are available for purchase from the U.S. Census Bureau by visiting:

http://www.census.gov/foreign-trade/www/frd.order.html

or by ordering data on compact disk from the

Bureau of Census
Foreign Trade Division
Washington, D.C. 20233

The BTS data set cannot be used for the distribution of weight to customs districts as commodity level of detail is not reported geographically—for individual POEs or customs districts. This appears to be a shortcoming in need of correction.

14.3.4 Unit Costs for Roadway Consumption and Social/Environmental Impacts

Among the U.S. border states, Texas has been most active in supporting a research program to investigate the transportation impacts of trade with Mexico. As the largest U.S. state trading partner with Mexico and the confluence point of several interstate trade corridors leading to and from Mexico, this interest on the part of Texas is understandable and warranted.

Amongst the various research institutions undertaking work for the Texas Department of Transportation, we found the Center for Transportation Research, Bureau of Engineering Research at the University of Texas at Austin to be the most active insofar as publishing its research findings. A recent document, *Transportation Issues and the U.S.-Mexico Free Trade Agreement,* February 1997, provides an excellent summary of CTR's research relative to benefits and costs. Mr. Robert Harrison can be contacted via e-mail at: harrison@mail.utexas.edu for copies of this summary report.

We also addressed bridge damage costs, and the marginal social costs of congestion, accidents, air pollution, energy security and noise as part of the Task 10 estimate of binational trade economic impacts. All of the unit cost information for this analysis was derived from the Transportation Research Board's *Special Report 246, Paying our Way: Estimating Marginal Social Costs of Freight Transportation,* dated 1996. This publication (TRB Number 96-21831, Library of Congress ISBN 0-309-06217-9) may be ordered on-line from the TRB Book Store by visiting site: http://www.nas.edu/trb

or by mail by writing:

Transportation Research Board
Box 289
Washington, D.C. 2055
Telephone (202) 334-3214
Fax (202) 334-2519

14.3.5 Calculating Pass-Through Trade

The Task 10 report contained calculations of the amount of U.S.-Mexico trade that originated in or was destined to U.S. border states as well as the amount of trade that passed through the border states on its way to or from Mexico. This data was summarized from the transborder Surface Freight Database which may be accessed via the Bureau of Transportation Statistics website at: http://www.bts.gov/ntda/tbsCd./

Import data files are arranged by: mode, commodity, Mexico as the country of origin, U.S. state of destination, value, and shipping weight.

Export data files are arranged by: mode, commodity, U.S. state of origin, Mexico state of destination, and value. No weight data is provided.

As discussed further in Chapter 14.5, pass-through traffic was not assigned to a transportation network to compute its magnitude. Rather, the border state trade, to and from California, Arizona, New Mexico, and Texas was subtracted from the overall U.S. trade volumes passing through the corresponding border customs districts (see Section 14.3.3).

14.3.6 Border Trade Economies

Chapter 10.5 of the *Economic Impacts of U.S.-Mexico Binational Trade* report summarizes the number of jobs and payroll supported by trade in each of the six case study border cities or metropolitan areas. An Appendix to the Task 10 report provides details regarding the methodologies used to calculate these employment benefits as well as thorough assessment of the underlying elements supporting these economies.

The approach taken to estimating the importance of international trade in local communities draws upon work by Paul Krugman (*Geography and Trade,* MIT Press, Cambridge, 1991), Michael Porter (*The Competitive Advantage of Nations,* The Free Press, New York, 1990) and the U.S. Bureau of labor Statistics (see Robert Shelburne and Robert Bednarzik, “Geographic Concentration of Trade-Sensitive Employment” *Monthly Labor Review,* U.S. Bureau of Labor Statistics, June 1993). These reports and publications are available at most university business school libraries for independent study.

The underlying employment data used in the analysis is gathered and reported by the U.S. Census Bureau in its annual publication, *County Business Patterns.* These reports are available in print form, organized by state, or can be accessed electronically. Please visit the following web site for additional information on how to obtain the specified reports or electronic files of interest:

http://www.census.gov/cgi-bin/searchweb

14.4 Methodologies for Estimating U.S. Employment Supported by Trade With Mexico

This chapter addresses the methods by which U.S. national, state, and border city employment supported by trade with Mexico may be estimated. Please also see Report 10 for examples of the application of these methodologies and section 14.3 of this report for the location of data sources.

14.4.1 U.S. National Employment Supported by Trade

As noted earlier, the U.S. Department of Commerce is the official source for U.S. employment supported by trade estimates. Its reporting lags year end by 18 to 24 months, so it is necessary to project one to two years to estimate recent year increases or decreases.

We used relational export value data for the nation as a whole to ratio 1994 jobs supported by trade with our 1995 forecast year. We did this by two-digit SIC code grouping for manufacturing industries based on measured export supported employment for 1991 derived from the survey of manufacturing establishments. This base year employment attributable to exports was adjusted downward to reflect subsequent (1996) estimates of employment that were developed by the U.S. Department of Commerce. For nonmanufacturing employment sectors, we derived the ratio of 1995 total manufacturing jobs (estimated) to 1994 total manufacturing jobs (from the Department of Commerce) and applied this ratio to the 1994 total of nonmanufacturing jobs. We then used MISER trade data to relate 1994 agriculture and mining export values with 1994 jobs so that the resulting jobs per export values could be applied to on-hand MISER totals of 1995 exports, for these some SIC product divisions. The remaining nonmanufacturing job categories were manipulated in a quasi-scientific attempt to match U.S. Department of Commerce job estimates with survey results from the Bureau of Census.

Having gained some comfort with this process, we then applied it to the question of U.S. jobs supported by exports to Mexico. Here the challenge was somewhat different. At the time of our initial estimation process (August 1996), we had a Preliminary Release of *Data on U.S. Jobs Supported by Exports,* dated June 21, 1996 on hand. This report updated an earlier 1992 report and covered the country as a whole through 1994. No estimates of jobs supported by trade with individual countries or geographic markets was provided in this preliminary release, however. Based on this report's control totals for 1993 and 1994, for trade with all countries, we created Table 14.1, using our quasi-scientific process for three years of employment estimates attributable to trade with Mexico (1993 through 1995). Later in December 1996, the Department of Commerce issued its official estimates of jobs supported by trade with Mexico for 1993 and 1994, the totals of which are shown in Table 14.2 (617,000 and 729,000 jobs, respectively). It is noteworthy that our estimates for 1993 and 1994 were within one to three percent of those produced for the Department of Commerce.

Table 14.1
Initial Estimates of United States Export-Related Employment to Mexico, 1993-1995 (in thousands)

	Export-Related Jobs		
2-Digit SIC Code Grouping	**1993**	**1994**	**1995**
Manufacturing			
20. Food and kindred products	9.5	9.3	6.9
21. Tobacco products	0.1	0.1	0.0
22. Textile mill products	11.8	12.4	13.9
23. Apparel and other fabrics	13.1	13.2	14.7
24. Lumber and wood products, except furniture	7.4	5.8	4.2
25. Furniture and fixtures	5.9	4.9	4.7
26. Paper and allied products	13.4	13.2	12.3
27. Printing, publishing, and allied industries	8.9	10.5	9.0
28. Chemicals and allied products	16.8	17.2	17.1
29. Petroleum refining and related industries	1.6	1.6	2.0
30. Rubber and miscellaneous plastics products	31.6	34.3	35.1
31. Leather and leather products	1.8	1.7	2.1
32. Stone, clay, glass, and concrete products	5.0	5.4	5.1
33. Primary metal industries	21.5	25.9	25.4
34. Fabricated metal products	38.1	44.9	42.4
35. Industrial machinery and computer equipment	36.8	38.2	33.2
36. Electronic and other electrical equipment	69.0	63.3	64.8
37. Transportation equipment	24.7	26.5	24.4
38. Measuring, analyzing, and controlling instruments	14.3	13.2	11.1
39. Miscellaneous manufacturing industries	3.9	3.9	3.0
Auxiliary industries	25.4	25.6	24.9
Total Manufacturing Jobs	360.5	371.1	356.2
Non-Manufacturing			
Trade	91.1	106.1	94.5
Business Services	18.7	35.5	19.4
Transportation	28.8	35.2	29.9
Agriculture	44.3	56.7	54.5
Mining	2.7	4.5	3.9
Other	71.0	120.0	58.9
Total Non-Manufacturing Jobs	256.6	358.0	261.0
Total Goods Export-Related Jobs	617.1	729.1	617.2

Source: Barton-Aschman estimates based on U.S. Commerce and MISER data.

Table 14.2
Revised Estimates of United States Export-Related Employment to Mexico, 1993-1995 (in thousands)

	Export-Related Jobs		
2-Digit SIC Code Grouping	**1993**	**1994**	**1995**
Manufacturing			
20. Food and kindred products	8.6	9.5	6.2
21. Tobacco products	0.1	0.1	0.0
22. Textile mill products	10.6	12.6	12.5
23. Apparel and other fabrics	11.8	13.4	13.2
24. Lumber and wood products, except furniture	6.7	5.9	3.7
25. Furniture and fixtures	5.3	5.0	4.2
26. Paper and allied products	12.0	13.5	11.1
27. Printing, publishing, and allied industries	8.0	10.7	8.1
28. Chemicals and allied products	15.1	17.5	15.3
29. Petroleum refining and related industries	1.4	1.6	1.8
30. Rubber and miscellaneous plastics products	28.4	34.9	31.5
31. Leather and leather products	1.6	1.7	1.9
32. Stone, clay, glass, and concrete products	4.5	5.5	4.6
33. Primary metal industries	19.4	26.3	22.8
34. Fabricated metal products	34.3	45.7	38.1
35. Industrial machinery and computer equipment	33.1	38.9	29.9
36. Electronic and other electrical equipment	62.0	64.4	58.2
37. Transportation equipment	22.2	26.9	21.9
38. Measuring, analyzing, and controlling instruments	12.9	13.4	10.0
39. Miscellaneous manufacturing industries	3.5	3.9	2.7
Auxiliary industries	22.8	26.2	22.3
Total Manufacturing Jobs	324.1	377.5	320.2
Non-Manufacturing			
Trade	106.0	133.7	109.9
Business Services	22.4	28.3	23.3
Transportation	35.1	44.3	36.4
Agriculture	24.0	37.5	29.5
Mining	3.3	3.6	4.8
Other	86.5	94.8	71.7
Total Non-Manufacturing Jobs	277.3	342.1	275.6
Total Export-Related Jobs	601.4	719.6	595.8

Source: Barton-Aschman estimates based on U.S. Commerce and MISER data.

The U.S. Administration faced a similar problem in preparing its *Study on the Operation and Effects of the North American Free Trade Agreement.* The following is extracted from that recent document.

> *"U.S. Employment*
>
> The most direct measurement of this impact of trade agreements such as NAFTA on employment is the number of jobs supported by exports. Extrapolation from the Department of Commerce measurement of the number of jobs supported by exports to Canada and Mexico from 1983 to 1994 shows that jobs supported by U.S. goods exports to the NAFTA countries totaled 2.3 million in 1996. Jobs supported by U.S. goods exports to Canada were nearly 1.6 million in 1996, and jobs supported by U.S. goods exports to Mexico were nearly 750,0000 in 1996. These job estimates are based on total goods exports to Canada and Mexico in 1995 and 1996 and the actual number of jobs supported by U.S. exports for the years prior to 1995.[1]
>
> [1]The Commerce Department periodically publishes estimates on the number of U.S. jobs supported by exports. These figures include both workers employed in exporting sectors as well as U.S. workers employed producing inputs or components for export production, or whose employment is otherwise required to produce exports and move them to market. Commerce's estimate of jobs supported by exports are based on the examination of U.S. sectoral input/output relations and U.S. employment data. These estimates take into account actual annual changes in the volume of output for exports an domestic demand, composition of that output, productivity, and technology change, among other factors effecting the labor requirements for the production of U.S. exports. Because of the lag in Commerce's reporting of its formally derived estimates, this Study uses an extrapolation for recent years, currently for 1995 and 1996, which reflects the fact that productivity gains and price inflation reduce the average number of U.S. jobs supported each year for a given dollar value of U.S. exports. (*Study on the Operation and Effects of the North America Free Trade Agreement,* p.18)"

Elsewhere in this report, the actual estimate of 1996 jobs supported by trade with Mexico was cited as 749,000.[2]

We mention the above to illustrate the opportunity for using a shortcut method to estimate the control total of jobs supported by trade with Mexico. Table 14.3 records the estimated number of Mexico trade supported jobs along with the source of the estimate, the total value of U.S. export trade with Mexico and a derived "jobs per billion dollars of exports" value. While we should note that the Commerce Department specifically warns against using jobs per billion dollar ratios and has stated that this approach is categorically unsupportable, given the work required to be more scientific, and the adjustments to its earlier estimates which are routinely made by Commerce; a shortcut method may be good enough for establishing a control total which individual states may then subdivide. Taking note that the jobs per billion dollars of trade is a continually declining factor, due to increases in job productivity and inflation, one could quickly estimate jobs supported by trade given a total value for exports to Mexico. If for example, 1997 exports to Mexico increase to $67.0 billion, as forecast in Task 11, and one was to assume a 1,000 jobs per billion ratio of 12.65, (deflated from 1996 based on straight-line trend) it could be quickly estimated that nearly 850,000 jobs would be supported by trade with Mexico in 1997.

[2] Ibid, p2.

Table 14.3
U.S. Jobs Supported by Trade With Mexico

Year	Job Estimate	Exports ($billions)	1,000 jobs/$billion	Source of Jobs Estimate
1993	617,000	41.6	14.83	Dept. of Commerce
1994	729,000	50.8	14.35	Dept. of Commerce
1995	617,000	45.4	13.59	Barton-Aschman
1996	749,000	56.8	13.18	U.S. Presidential Administration

14.4.2 Border State Employment Supported by Trade

The Task 10 report described the detailed approach the study team followed to estimate U.S. border state employment supported by export trade with the world and with Mexico. This approach was consistent with that used to estimate total U.S. employment supported by trade with Mexico; and relied on the same basic data sources: MISER for origin of movement trade values by SIC group, and the U.S. Census Survey of Manufacturing Establishments.

Figure 14.1 illustrates the U.S. Department of Commerce, Bureau of the Census estimate of total state-by-state employment related to the manufacturing of exports for 1991, the most recent published survey results. Tables 14.4 and 14.5 present more detailed information for the 50 states relative to manufacturing and non manufacturing employment, respectively. This information is further detailed in the census report for each individual state. For ease of retrieval, the four U.S. border state tabulations of employment supported by manufactured exports are reproduced in the Appendix.

These tables represent worldwide export-supported employment for 1991, as surveyed and tabulated by the Census Bureau for publication in December 1995. These numbers do not match those published by the Office of the Chief Economist,[3] however, and therefore need to be adjusted to match the official, updated estimates. We estimated these adjustments based on U.S. 50-state total employment supported by trade, and applied the resulting adjustment factors across the board for the four U.S. border states.

The resulting computational tables are reported as Tables 14.6 through 14.9. These tables present Barton-Aschman's estimates of employment supported by exports to the world and by exports to Mexico based on MISER origin of movement trade volume data.

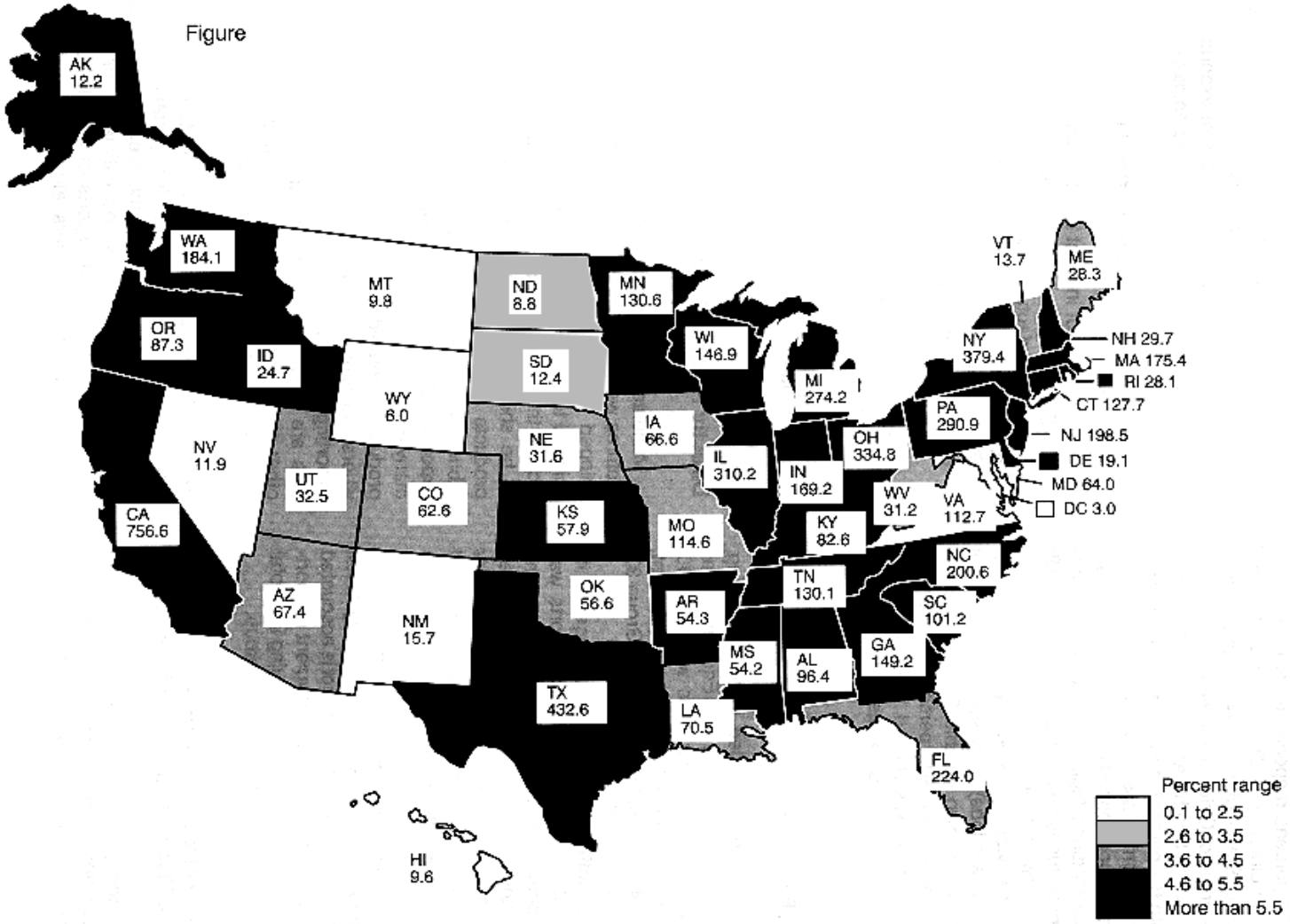
Recent evidence suggests that state agencies may be using more simplified approaches to estimate jobs supported by trade with Mexico. The California Trade and Commerce Agency, for example, recently issued an article on its web page discussing the benefits to California resulting from trade with Mexico and Canada.[4]

This article states that "California exports to Mexico directly and indirectly support approximately 126,000 jobs in the Golden State, with 23,800 of these jobs resulting from export growth in 1996 alone."

[3] U.S. Jobs Supported by Goods and Services Exports, 1983-1994, U.S. Department of Commerce, November 1996.

[4] Going Global: Experienced Benefits to California, circa May 1997 [http://commerce.ca.gov]

Figure 14.1 Employment Related to Manufactured Exports for States: 1991



Source: Exports from Manufacturing Establishments: 1990 and 1991, U.S. Department of Commerce, 1994.

Table 14.4
Manufacturing Industries-Shipments and Employment Related to Manufactured Exports for States: 1991

Geographic Area	Value of Manufacturers' Shipments					Manufacturing Employment				
	Total (million dollars)	Direct exports (million dollars)	Supporting Exports (million dollars)	Total export related (million dollars)	Total export related as percent of total shipments	Total (1,000)	Direct export related (1,000)	Supporting Exports (1,000)	Total export related (1,000)	Total export related as percent of total employment
	A	B	C	D	E	F	G	H	I	J
United States	**2,826,207.3**	**314,135.9**	**232,809.8**	**546,945.7**	**19.4**	**18,061.7**	**1,697.2**	**1,665.3**	**3,362.5**	**18.6**
Alabama	48,448.9	4,077.3	5,191.3	9,268.6	19.1	363.3	24.1	32.4	56.5	15.6
Alaska	3,638.9	1,612.3	195.6	1,807.8	49.7	14.4	6.3	0.8	7.1	49.3
Arizona	22,983.3	3,071.9	2,217.6	5,289.5	23.0	173.5	17.7	18.4	36.1	20.8
Arkansas	31,084.4	2,407.5	2,558.7	4,966.2	16.0	220.2	15.2	17.1	32.3	14.7
California	289,612.5	39,299.3	22,258.2	61,557.2	21.3	1,961.8	230.7	171.3	402.0	20.5
Colorado	26,824.9	2,581.3	1,938.8	4,520.1	16.9	176.3	17.3	14.7	32.0	18.2
Connecticut	40,010.4	7,015.8	3,340.7	10,356.5	25.9	338.6	47.0	35.1	82.1	24.2
Delaware	11,934.4	1,152.0	889.4	2,041.4	17.1	62.4	3.3	9.1	12.4	19.9
District of Columbia	2,056.6	78.4	135.4	213.8	10.4	13.3	0.2	1.0	1.2	9.0
Florida	59,275.0	7,747.8	4,113.0	11,860.8	20.0	473.1	48.7	36.1	84.8	17.9
Georgia	82,764.7	6,776.5	6,218.6	12,995.1	15.7	545.1	37.7	43.2	80.9	14.8
Hawaii	3,805.3	442.1	178.5	620.6	16.3	19.3	1.8	0.9	2.7	14.0
Idaho	9,810.1	2,008.7	812.3	2,821.0	28.8	60.5	7.7	5.6	13.3	22.0
Illinois	151,925.1	14,441.7	12,934.2	27,375.9	18.0	976.1	80.9	101.0	181.9	18.6
Indiana	97,281.9	8,875.7	8,720.2	17,595.9	18.1	594.1	47.9	58.0	105.9	17.8
Iowa	44,996.3	3,620.0	2,953.9	6,573.9	14.6	224.0	16.6	16.7	33.3	14.9
Kansas	36,695.4	2,930.6	2,312.2	5,242.8	14.3	187.0	14.5	14.8	29.3	15.7
Kentucky	53,500.0	5,029.2	4,257.0	9,286.2	17.4	272.9	22.0	23.2	45.2	16.6
Louisiana	63,381.7	5,524.3	6,647.2	12,171.5	19.2	174.8	13.7	16.1	29.8	17.0
Maine	11,642.2	1,262.9	1,173.6	2,436.5	20.9	98.8	9.7	8.2	17.9	18.1
Maryland	29,582.7	2,824.4	2,114.1	4,938.5	16.7	200.6	14.4	16.9	31.3	15.6
Massachusetts	61,859.2	9,518.7	4,930.4	14,449.1	23.4	487.7	63.9	47.1	111.0	22.7
Michigan	143,102.6	16,509.9	10,830.3	27,340.2	19.1	858.2	81.9	93.5	175.4	20.4
Minnesota	53,302.5	4,868.0	3,899.1	8,767.1	16.4	384.5	32.9	36.5	69.4	18.0
Mississippi	31,196.5	2,766.8	2,400.1	5,166.9	16.6	237.2	15.3	15.2	30.5	12.9
Missouri	66,414.8	5,468.8	4,556.3	10,025.1	15.1	401.4	27.5	34.1	61.6	15.3
Montana	3,766.8	142.8	427.0	569.8	15.1	19.8	0.6	2.2	2.8	14.1
Nebraska	21,009.5	1,587.9	1,155.7	2,743.6	13.1	100.5	6.6	7.2	13.8	13.7
Nevada	2,820.6	208.9	232.5	441.4	15.6	25.6	1.8	2.1	3.9	15.2
New Hampshire	9,770.5	1,296.5	863.2	2,159.7	22.1	85.8	9.0	9.2	18.2	21.2
New jersey	85,692.1	6,447.4	6,549.6	12,997.0	15.2	590.9	39.0	63.0	102.0	17.3
New Mexico	8,037.0	614.6	1,045.8	1,660.4	20.7	40.7	2.5	3.4	5.9	14.5
New York	148,402.8	16,516.5	11,067.1	27,583.6	18.6	1,054.0	98.8	90.7	189.5	18.0
North Carolina	118,206.4	10,625.3	10,065.9	20,691.2	17.5	801.9	54.9	67.3	122.2	15.2
North Dakota	3,056.3	282.9	158.3	441.2	14.4	17.2	1.1	1.0	2.1	12.2
Ohio	174,927.6	20,408.1	15,461.5	35,869.6	20.5	1,045.4	96.4	113.1	209.5	20.0
Oklahoma	28,418.4	1,965.6	2,267.5	4,233.1	14.9	168.6	12.3	14.6	26.9	16.0
Oregon	30,691.5	4,127.7	2,975.1	7,102.8	23.1	208.4	24.0	19.6	43.6	20.9
Pennsylvania	134,022.2	10,886.9	11,663.1	22,550.0	16.8	962.0	73.6	96.2	169.8	17.7
Rhode Island	9,576.9	975.0	885.3	1,860.3	19.4	94.6	8.2	8.8	17.0	18.0
South Carolina	47,515.0	5,247.4	4,929.8	10,177.2	21.4	352.6	27.8	35.6	63.4	18.0
South Dakota	4,508.4	329.2	289.7	618.9	13.7	30.3	2.6	2.4	5.0	16.5
Tennessee	69,549.4	6,138.5	5,838.2	11,976.7	17.2	493.0	37.2	40.3	77.5	15.7
Texas	204,001.5	22,764.6	20,373.2	43,137.8	21.1	922.7	133.9	86.9	220.8	23.9
Utah	14,491.5	1,303.3	1,187.9	2,491.2	17.2	101.8	9.4	8.6	18.0	17.7
Vermont	5,785.8	533.5	656.4	1,189.9	20.6	42.8	3.7	4.2	7.9	18.5
Virginia	61,642.0	6,121.1	4,464.7	10,585.8	17.2	408.4	26.3	30.9	57.2	14.0
Washington	67,978.3	25,311.9	4,302.6	29,614.5	43.6	353.8	81.2	29.2	110.4	31.2
West Virginia	12,473.8	1,406.0	1,862.8	3,268.8	26.2	78.1	5.5	10.3	15.8	20.3
Wisconsin	79,999.4	6,917.0	6,012.2	12,929.2	16.2	533.0	41.6	50.5	92.1	17.3
Wyoming	2,733.4	65.3	298.2	363.5	13.3	9.8	0.4	1.0	1.4	14.3

Source: Exports From Manufacturing Establishments: 1990 and 1991, U.S. Department of Commerce, December 1994.

Table 14.5
Employment Related to Manufactured Exports by Major Economic Sector for States: 1991

			Employment Related to Manufactured Exports						
				Nonmanufacturing Industries					
Geographic Area	Civilian employment (1,000)	Private sector employment (1,000)	Manufacturing industries (1,000)	Trade (1,000)	Business services (1,000)	Transportation, communication, and utilities (1,000)	Other, including mining and agriculture (1,000)	Total (1,000)	Total (col. C + col. H) (1,000)
	A	B	C	D	E	F	G	H	I
United States	**120,039.9**	**92,203.7**	**3,362.5**	**1,426.8**	**268.1**	**397.4**	**637.2**	**2,729.5**	**6,092.0**
Alabama	1,790.3	1,346.3	56.5	18.6	4.5	6.7	10.1	39.9	96.4
Alaska	259.4	168.4	7.1	1.8	0.6	0.8	2.0	5.1	12.2
Arizona	1,654.5	1,243.5	36.1x	16.1	2.9	4.3	8.0	31.3	67.4
Arkansas	1,080.2	826.2	32.3	8.8	2.6	3.8	6.8	22.0	54.3
California	14,097.8	10,670.8	402.0	201.0	32.1	47.5	74.0	354.6	756.6
Colorado	1,691.2	1,262.2	32.0	16.4	2.6	308	7.9	30.6	62.6
Connecticut	1,746.6	1,419.6	82.1	18.2	6.5	9.7	11.2	45.6	127.7
Delaware	345.4	283.4	12.4	2.4	1.0	1.5	1.8	6.7	19.1
District of Columbia	279.3	178.3	1.2	1.4	0.1	0.1	0.2	1.8	3.0
Florida	6,149.1	4,729.1	84.8	103.1	6.8	10.0	19.2	139.2	224.0
Georgia	3,074.1	2,369.1	80.9	38.3	6.5	9.6	14.0	68.3	149.2
Hawaii	555.3	395.3	2.7	5.3	0.2	0.3	1.1	6.9	9.6
Idaho	487.5	352.5	13.3	5.3	1.1	1.6	3.4	11.4	24.7
Illinois	5,743.1	4,600.1	181.9	63.0	14.5	21.5	29.3	128.3	310.2
Indiana	2,659.1	2,163.1	105.9	25.3	8.4	12.5	17.0	63.3	169.2
Iowa	1,473.0	1,128.0	33.3	17.6	2.7	3.9	9.1	33.3	66.6
Kansas	1,258.0	949.0	29.3	15.3	2.3	3.5	7.6	28.6	57.9
Kentucky	1,677.9	1,301.9	45.2	16.2	3.6	5.3	12.2	37.4	82.6
Louisiana	1,836.8	1,351.8	29.8	23.2	2.4	3.5	11.6	40.7	70.5
Maine	623.8	453.8	17.9	4.1	1.4	2.1	2.7	10.4	28.3
Maryland	2,488.6	1,757.6	31.3	20.7	2.5	3.7	5.7	32.7	64.0
Massachusetts	3,027.7	2,424.7	111.0	27.3	8.9	13.1	15.1	64.4	175.4
Michigan	4,206.2	3,339.2	175.4	38.2	14.0	20.7	25.9	98.8	274.2
Minnesota	2,408.5	1,907.5	69.4	32.0	5.5	8.2	15.5	61.2	130.6
Mississippi	1,135.2	865.2	30.5	10.2	2.4	3.6	7.4	23.7	54.2
Missouri	2,596.4	2,082.4	61.6	29.0	4.9	7.3	11.8	53.0	114.6
Montana	392.8	267.8	2.8	4.2	0.2	0.3	2.2	7.0	9.8
Nebraska	844.5	637.5	13.8	10.2	1.1	1.6	4.9	17.8	31.6
Nevada	642.6	508.6	3.9	5.1	0.3	0.5	2.1	8.0	11.9
New Hampshire	570.8	436.8	18.2	5.3	1.5	2.2	2.6	11.5	29.7
New jersey	3,862.9	3,067.9	102.0	61.7	8.1	12.1	14.6	96.5	198.5
New Mexico	696.7	433.7	5.9	4.6	0.5	0.7	4.0	9.8	15.7
New York	8,313.0	6,240.0	189.5	123.9	15.1	22.4	28.5	189.9	379.4
North Carolina	3,265.9	2,579.9	122.2	34.7	9.7	14.4	19.5	78.4	200.6
North Dakota	310.2	223.2	2.1	4.2	0.2	0.2	2.1	6.7	8.8
Ohio	5,170.4	4,135.4	209.5	51.4	16.7	24.8	32.5	125.3	334.8
Oklahoma	1,463.6	1,043.6	26.9	12.9	2.1	3.2	11.5	29.7	56.6
Oregon	1,458.4	1,095.4	43.6	27.0	3.5	5.2	8.1	43.7	87.3
Pennsylvania	5,701.0	4,564.0	169.8	59.0	13.5	20.1	28.5	121.1	290.9
Rhode Island	490.6	385.6	17.0	5.4	1.4	2.0	2.3	11.1	28.1
South Carolina	1,615.6	1,230.6	63.4	15.4	5.1	7.5	9.9	37.8	101.2
South Dakota	351.3	259.3	5.0	3.6	0.4	0.6	2.8	7.4	12.4
Tennessee	2,301.0	1,803.0	77.5	24.3	6.2	9.2	12.9	52.6	130.1
Texas	8,124.7	6,187.7	220.8	111.1	17.6	26.1	57.0	211.8	432.6
Utah	776.8	557.8	18.0	7.0	1.4	2.1	3.9	14.5	32.5
Vermont	303.8	224.8	7.9	2.7	0.6	0.9	1.5	5.8	13.7
Virginia	3,175.4	2,313.4	57.2	31.6	4.6	6.8	12.6	55.5	112.7
Washington	2,428.8	1,782.8	110.4	35.2	8.8	13.0	16.6	73.7	184.1
West Virginia	732.1	560.1	15.8	5.6	1.3	1.9	6.7	15.4	31.2
Wisconsin	2,465.0	1,932.0	92.1	20.2	7.3	10.9	16.3	54.8	146.9
Wyoming	236.8	163.8	1.4	1.4	0.1	0.2	2.9	4.6	6.0

Source: Exports From Manufacturing Establishments: 1990 and 1991, U.S. Department of Commerce, December 1994.

Table 14.6
California Employment Related to Manufactured Exports

	To the World					To Mexico					
Mfg. SIC	1991 Raw	1991 Adj	1993 Adj	1994 Adj	1995 Adj	1993 % of SIC	1993 emp	1994 % of SIC	1994 emp	1995 % of SIC	1995 emp
f	1.0	0.953	0.994	1.037	1.099						
20	13.2	12.6	12.5	13.1	13.8	0.0879	1.1	0.0849	1.1	0.0624	0.9
21	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0006	0.0	0.1067	0.0
22	1.2	1.1	1.1	1.2	1.3	0.2708	0.3	0.2995	0.4	0.3097	0.4
23	5.6	5.3	5.3	5.5	5.9	0.2077	1.1	0.2108	1.2	0.156	0.9
24	7.1	6.8	6.7	7.0	7.4	0.4329	2.9	0.374	2.6	0.2933	2.2
25	2.3	2.2	2.2	2.3	2.4	0.25	0.5	0.2563	0.6	0.1371	0.3
26	3.8	3.6	3.6	3.8	4.0	0.3931	1.4	0.3469	1.3	0.2924	1.2
27	12.6	12.0	11.9	12.5	13.2	0.1179	1.4	0.1013	1.3	0.1009	1.3
28	12.3	11.7	11.7	12.2	12.9	0.1159	1.4	0.124	1.5	0.1001	1.3
29	1.9	1.8	1.8	1.9	2.0	0.1243	0.2	0.1613	0.3	0.1333	0.3
30	15.3	14.6	14.5	15.1	16.0	0.3436	5.0	0.3807	5.8	0.3415	5.5
31	1.3	1.2	1.2	1.3	1.4	0.1283	0.2	0.1172	0.2	0.0646	0.1
32	4.0	3.8	3.8	4.0	4.2	0.2017	0.8	0.1912	0.8	0.1252	0.5
33	9.8	9.3	9.3	9.7	10.3	0.222	2.1	0.1631	1.6	0.1801	1.8
34	24.1	23.0	22.8	23.8	25.2	0.2013	4.6	0.2181	5.2	0.2008	5.1
35	68.4	65.2	64.8	67.6	71.6	0.0628	4.1	0.0707	4.8	0.0477	3.4
36	89.0	84.8	84.3	88.0	93.2	0.0889	7.5	0.0967	8.5	0.085	7.9
37	62.3	59.4	59.0	61.6	65.2	0.034	2.0	0.0283	1.7	0.0243	1.6
38	37.3	35.5	35.3	36.9	39.1	0.0525	1.9	0.0456	1.7	0.0313	1.2
39	8.2	7.8	7.8	8.1	8.6	0.1967	1.5	0.1986	1.6	0.1347	1.2
Aux	22.3	21.3	21.1	22.0	23.3	0.0963	2.0	0.0978	2.2	0.0788	1.8
Sub	402.0	383.1	381.0	397.5	420.9		41.9		44.1		38.9
Non-Mfg.											
Trade	201.0	191.6	190.5	198.7	210.4	0.0963	18.3	0.0978	19.4	0.0788	16.6
Bus. Svcs	32.1	30.6	30.4	31.7	33.6	0.0963	2.9	0.0978	3.1	0.0788	2.6
Transp.	47.5	45.3	45.0	47.0	49.7	0.0963	4.3	0.0978	4.6	0.0788	3.9
Ag	15.6	14.9	14.8	15.4	16.3	0.0394	0.6	0.0475	0.7	0.0309	0.5
Mining	7.6	7.2	7.2	7.5	8.0	0.0725	0.5	0.09	0.7	0.1683	1.3
Other	50.8	48.4	48.1	50.2	53.2	0.0963	4.6	0.0978	4.9	0.0788	4.2
Sub	354.6	337.9	336.0	350.6	371.3		31.3		33.5		29.2
Supplement											
AG Other	29.3	28.2	28.0	29.3	31.0	0.0394	1.1	0.0475	1.4	0.0394	1.2
Other Other	65.3	62.9	62.6	65.3	69.1	0.0963	6.0	0.0978	6.4	0.0788	5.4
Sub	94.6	91.1	90.6	94.6	100.1		7.1		7.8		6.7
Total	851.2	812.2	807.6	842.6	892.3		80.4		85.4		74.7

f = Factor used to reconcile Bureau of Census estimates with Department of Commerce estimates.

Source: Barton-Aschman estimates based on MISER Origin of Movement Export data and Bureau of Census Survey of Manufacturing Establishments.

Table 14.7
Arizona Employment Related to Manufactured Exports

	To the World					To Mexico					
						1993	1993	1994	1994	1995	1995
Mfg. SIC	1991 Raw	1991 Adj	1993 Adj	1994 Adj	1995 Adj	% of SIC	emp	% of SIC	emp	% of SIC	emp
f	1.0	0.953	0.994	1.037	1.099						
20	0.4	0.4	0.4	0.4	0.4	0.6438	0.2	0.6152	0.2	0.3328	0.1
21	0.1	0.1	0.1	0.1	0.1	1	0.1	1	0.1	1	0.1
22	0.3	0.3	0.3	0.3	0.3	0.9456	0.3	0.9514	0.3	0.9573	0.3
23	0.2	0.2	0.2	0.2	0.2	0.9127	0.2	0.87	0.2	0.6925	0.1
24	0.4	0.4	0.4	0.4	0.4	0.867	0.3	0.834	0.3	0.613	0.3
25	0.1	0.1	0.1	0.1	0.1	0.8559	0.1	0.7618	0.1	0.764	0.1
26	0.2	0.2	0.2	0.2	0.2	0.9405	0.2	0.9484	0.2	0.9538	0.2
27	1.2	1.1	1.1	1.2	1.3	0.1999	0.2	0.2718	0.3	0.2377	0.3
28	0.5	0.5	0.5	0.5	0.5	0.3331	0.2	0.3371	0.2	0.2032	0.1
29	0.1	0.0	0.0	0.0	0.1	0.5025	0.0	0.6393	0.0	0.6998	0.0
30	0.7	0.7	0.7	0.7	0.7	0.8226	0.5	0.786	0.5	0.8073	0.6
31	0.1	0.1	0.1	0.1	0.1	0.2649	0.0	0.52	0.1	0.4201	0.0
32	0.3	0.3	0.3	0.3	0.3	0.8416	0.2	0.7977	0.2	0.7017	0.2
33	2.2	2.1	2.1	2.2	2.3	0.2065	0.4	0.2801	0.6	0.191	0.4
34	1.7	1.6	1.6	1.7	1.8	0.7761	1.3	0.7752	1.3	0.6181	1.1
35	2.8	2.7	2.7	2.8	2.9	0.2899	0.8	0.3038	0.8	0.333	1.0
36	11.5	11.0	10.9	11.4	12.0	0.102	1.1	0.1083	1.2	0.1171	1.4
37	6.8	6.5	6.4	6.7	7.1	0.3268	2.1	0.4266	2.9	0.1854	1.3
38	3.3	3.1	3.1	3.3	3.5	0.0624	0.2	0.0868	0.3	0.059	0.2
39	0.8	0.8	0.8	0.8	0.8	0.1696	0.1	0.1928	0.2	0.3008	0.3
Aux	2.4	2.3	2.3	2.4	2.5	0.2586	0.6	0.2723	0.6	0.2165	0.5
Sub	36.1	34.4	34.2	35.6	37.7		9.2		10.7		8.8
	0.1										
Non-Mfg.											
Trade	16.1	15.3	15.3	15.9	16.9	0.2586	3.9	0.2723	4.3	0.2165	3.6
Bus. Svcs	2.9	2.8	2.7	2.9	3.0	0.2586	0.7	0.2723	0.8	0.2165	0.7
Transp.	4.3	4.1	4.1	4.3	4.5	0.2586	1.1	0.2723	1.2	0.2165	1.0
Ag	1.8	1.7	1.7	1.8	1.9	0.2893	0.5	0.2378	0.4	0.0695	0.1
Mining	0.8	0.8	0.8	0.8	0.8	0.0059	0.0	0.0604	0.0	0.0646	0.1
Other	5.4	5.1	5.1	5.3	5.7	0.2586	1.3	0.2723	1.5	0.2165	1.2
Sub	31.3	29.8	29.7	30.9	32.8		7.5		8.2		6.7
Supplement											
AG Other	2.6	2.5	2.5	2.6	2.8	0.2893	0.7	0.2378	0.6	0.0695	0.2
Other Other	5.9	5.6	5.6	5.9	6.2	0.2586	1.5	0.2723	1.6	0.2165	1.3
Sub	8.5	8.2	8.1	8.5	9.0		2.2		2.2		1.5
Total	75.8	72.4	72.0	75.1	79.5		18.9		21.1		17.0

f = Factor used to reconcile Bureau of Census estimates with Department of Commerce estimates.

Source: Barton-Aschman estimates based on MISER Origin of Movement Export data and Bureau of Census Survey of Manufacturing Establishments.

Table 14.8
New Mexico Employment Related to Manufactured Exports

	To the World					To Mexico					
						1993	1993	1994	1994	1995	1995
Mfg. SIC	1991 Raw	1991 Adj	1993 Adj	1994 Adj	1995 Adj	% of SIC	emp	% of SIC	emp	% of SIC	emp
f	1.0	0.953	0.994	1.037	1.099						
20	0.1	0.1	0.1	0.1	0.1	0.5101	0.0	0.5665	0.1	0.2124	0.0
21	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.3813	0.0	0.5608	0.0	0.7676	0.0
23	0.3	0.3	0.3	0.3	0.3	0.0087	0.0	0.9066	0.3	0.5734	0.2
24	0.5	0.5	0.5	0.5	0.5	0.2815	0.1	0.4879	0.2	0.1161	0.1
25	0.0	0.0	0.0	0.0	0.0	0.0444	0.0	0.0983	0.0	0.1921	0.0
26	0.1	0.1	0.1	0.1	0.1	0.7033	0.1	0.7115	0.1	0.6428	0.1
27	0.3	0.3	0.3	0.3	0.3	0.0407	0.0	0.022	0.0	0.0741	0.0
28	0.4	0.4	0.4	0.4	0.4	0.1856	0.1	0.1947	0.1	0.1933	0.1
29	0.0	0.0	0.0	0.0	0.0	0	0.0	1	0.0	1	0.0
30	0.2	0.2	0.2	0.2	0.2	0.2383	0.0	0.1992	0.0	0.2209	0.0
31	0.0	0.0	0.0	0.0	0.0	0	0.0	0	0.0	0	0.0
32	0.1	0.1	0.1	0.1	0.1	0.0057	0.0	0.0139	0.0	0.0099	0.0
33	0.3	0.3	0.3	0.3	0.3	0.2074	0.1	0.1764	0.1	0.1842	0.1
34	0.2	0.2	0.2	0.2	0.2	0.3044	0.1	0.3274	0.1	0.039	0.0
35	0.3	0.3	0.3	0.3	0.3	0.1188	0.0	0.2192	0.1	0.0603	0.0
36	1.5	1.4	1.4	1.5	1.6	0.2063	0.3	0.0761	0.1	0.0028	0.0
37	0.3	0.3	0.3	0.3	0.3	0.0268	0.0	0.0078	0.0	0.0077	0.0
38	0.3	0.3	0.3	0.3	0.3	0.0182	0.0	0.0417	0.0	0.0145	0.0
39	1.0	1.0	0.9	1.0	1.0	0.0358	0.0	0.016	0.0	0.0445	0.0
Aux	0.0	0.0	0.0	0.0	0.0	0.1432	0.0	0.1461	0.0	0.0703	0.0
Sub	5.9	5.6	5.6	5.8	6.2		0.9		1.1		0.6
	0.0										
Non-Mfg.											
Trade	4.6	4.4	4.4	4.5	4.8	0.1432	0.6	0.1461	0.7	0.0703	0.3
Bus. Svcs	0.5	0.5	0.5	0.5	0.5	0.1432	0.1	0.1461	0.1	0.0703	0.0
Transp.	0.7	0.7	0.7	0.7	0.7	0.1432	0.1	0.1461	0.1	0.0703	0.1
Ag	0.7	0.7	0.7	0.7	0.7	0.2205	0.1	0.3286	0.2	0.151	0.1
Mining	1.0	1.0	0.9	1.0	1.0	0.7763	0.7	0.8545	0.8	0.8567	0.9
Other	2.3	2.2	2.2	2.3	2.4	0.1432	0.3	0.1461	0.3	0.0703	0.2
Sub	9.8	9.3	9.3	9.7	10.3		2.0		2.2		1.6
Supplement											
AG Other	0.4	0.4	0.4	0.4	0.5	0.2205	0.1	0.3286	0.1	0.151	0.1
Other Other	1.0	0.9	0.9	1.0	1.0	0.1432	0.1	0.1461	0.1	0.0703	0.1
Sub	1.4	1.3	1.3	1.4	1.5		0.2		0.3		0.1
Total	17.1	16.3	16.2	16.9	17.9		3.1		3.6		2.4

f = Factor used to reconcile Bureau of Census estimates with Department of Commerce estimates.

Source: Barton-Aschman estimates based on MISER Origin of Movement Export data and Bureau of Census Survey of Manufacturing Establishments.

Table 14.9
Texas Employment Related to Manufactured Exports

	To the World					To Mexico					
						1993	1993	1994	1994	1995	1995
Mfg. SIC	1991 Raw	1991 Adj	1993 Adj	1994 Adj	1995 Adj	% of SIC	emp	% of SIC	emp	% of SIC	emp
f	1.0	0.953	0.994	1.037	1.099						
20	5.0	4.8	4.7	4.9	5.2	0.4373	2.1	0.4627	2.3	0.2717	1.4
21	0.3	0.3	0.3	0.3	0.3	0.9781	0.3	0.9954	0.3	0.5598	0.2
22	1.4	1.3	1.3	1.4	1.5	0.8674	1.2	0.8827	1.2	0.8673	1.3
23	2.1	2.0	2.0	2.1	2.2	0.7151	1.4	0.7259	1.5	0.7143	1.6
24	3.1	3.0	2.9	3.1	3.2	0.52	1.5	0.5133	1.6	0.2935	1.0
25	0.8	0.8	0.8	0.8	0.8	0.8584	0.7	0.7364	0.6	0.6954	0.6
26	2.8	2.7	2.7	2.8	2.9	0.7303	1.9	0.7198	2.0	0.6354	1.9
27	4.7	4.5	4.5	4.6	4.9	0.515	2.3	0.6079	2.8	0.5826	2.9
28	24.5	23.3	23.2	24.2	25.7	0.1241	2.9	0.1341	3.2	0.1066	2.7
29	2.3	2.2	2.2	2.3	2.4	0.2391	0.5	0.2572	0.6	0.2688	0.6
30	8.1	7.7	7.7	8.0	8.5	0.7235	5.6	0.763	6.1	0.73	6.2
31	1.4	1.3	1.3	1.4	1.5	0.6997	0.9	0.6336	0.9	0.6292	0.9
32	2.8	2.7	2.7	2.8	2.9	0.3798	1.0	0.4392	1.2	0.3809	1.1
33	8.9	8.5	8.4	8.8	9.3	0.5599	4.7	0.586	5.2	0.5302	4.9
34	14.0	13.3	13.3	13.8	14.7	0.5936	7.9	0.6373	8.8	0.5176	7.6
35	34.7	33.1	32.9	34.3	36.3	0.1978	6.5	0.2166	7.4	0.1569	5.7
36	59.7	56.9	56.6	59.0	62.5	0.5441	30.8	0.5136	30.3	0.4551	28.4
37	21.1	20.1	20.0	20.9	22.1	0.5594	11.2	0.5677	11.8	0.4532	10.0
38	8.9	8.5	8.4	8.8	9.3	0.4252	3.6	0.4192	3.7	0.3285	3.1
39	1.4	1.3	1.3	1.4	1.5	0.5405	0.7	0.516	0.7	0.3396	0.5
Aux	12.8	12.2	12.1	12.7	13.4	0.3925	4.8	0.4019	5.1	0.3212	4.3
Sub	220.8	210.4	209.2	218.3	231.2		92.4		97.4		86.9
	0.0										
Non-Mfg.											
Trade	111.1	105.9	105.3	109.8	116.3	0.3925	41.3	0.4019	44.1	0.3212	37.4
Bus. Svcs	17.6	16.8	16.7	17.4	18.4	0.3925	6.5	0.4019	7.0	0.3212	5.9
Transp.	26.1	24.9	24.7	25.8	27.3	0.3925	9.7	0.4019	10.4	0.3212	8.8
Ag	12.1	11.5	11.5	12.0	12.7	0.324	3.7	0.3112	3.7	0.2114	2.7
Mining	6.1	5.8	5.8	6.0	6.4	0.6201	3.6	0.5704	3.4	0.6734	4.3
Other	38.8	37.0	36.8	38.4	40.6	0.3925	14.4	0.4019	15.4	0.3212	13.0
Sub	211.8	201.8	200.7	209.4	221.8		79.3		84.1		72.1
Supplement											
AG Other	16.1	15.5	15.4	16.1	17.0	0.324	5.0	0.3112	5.0	0.2114	3.6
Other Other	35.9	34.6	34.4	35.9	38.0	0.3925	13.5	0.40199	14.4	0.3212	12.2
Sub	51.9	50.1	49.8	51.9	55.0		18.5		19.4		15.8
Total	484.5	462.3	459.7	479.7	507.9		190.2		200.9		174.7

f = Factor used to reconcile Bureau of Census estimates with Department of Commerce estimates.

Source: Barton-Aschman estimates based on MISER Origin of Movement Export data and Bureau of Census Survey of Manufacturing Establishments.

The higher estimates may be a result of using a "shortcut method" of jobs per billion dollars of trade as described earlier. A comparison of the estimates derived from this shortcut method versus those of the California Trade and Commerce Agency is presented in Table 14.10.

These estimates are remarkably close and the differences are most likely explained by the unavailability of the U.S. total jobs supported by trade with Mexico at the time the California Trade and Commerce Agency made its estimate.

Nevertheless, the shortcut method is probably inappropriate for California given the high proportion of high technology, high value exports included in California's exports to Mexico[5].

Researchers desiring more information on other methods or results are directed to two reports which present state employment estimates attributable to export trade with Mexico.

M.J. Bolle, NAFTA: *Estimated U.S. Job "Gains" and "Losses" by State* (Washington, D.C.: U.S. Library of Congress, Congressional Research Service, September 1996)

Dean International, Inc., *NAFTA Trade: Past, Present and Future* (Dallas, Texas, 1996)

14.4.3 Border County Employment Supported by Trade

Section 10.5.6 of the Task 10 Appendix presents a detailed explanation, along with supporting tables in electronic format of the methodology used to estimate border county employment supported by trade with Mexico. The methodology is summarized here to avoid duplication.

Using data available from the U.S. Census, Bureau of Economic Analysis, the basic structure of the border county employment base was examined and compared to state and national work force breakdowns. Particular attention was paid to the manufacturing and transportation sectors to ascertain if higher than average concentrations of employment existed in these areas.

The next step involved a review of U.S. Export History data for the appropriate customs district in which the border county was located. Here, the intent was to identify high dollar value commodities traded through the subject and nearby ports of entry—as a possible clue of borderland manufacturing concentration by Schedule B Commodity codes.

The third step involved using data from the U.S. Census Bureau's *County Business Patterns,* and comparing county employment shares to state employment shares for the top traded commodities. Industry types having employment shares exceeding the statewide average were deemed to have a concentration coefficient greater than 1.0, and therefore possible evidence of a relationship to export trade.

Table 14.10
Shortcut Estimate of California Jobs Supported by Exports to Mexico

	U.S.-Mexico Export Trade	CA-Mexico Export Trade	%CA	U.S. Jobs	CA Jobs BA Shortcut	CA Trade and Commerce Agency
1995	45.4B	7.36B	16.2%	617,000	100,000	102,000
1996	56.8B	9.10B	16.0%	749,000	120,000	126,000

Sources: Compiled by Barton-Aschman, 1997

[5] In 1995, 54 percent of California exports to Mexico, by value, were high technology or high value (SIC codes 35-38).

Similarly employment shares in wholesale trade, transportation, and warehousing services and freight arrangement were each examined and compared to statewide averages. Concentration coefficients were computed for the number of employees, payroll and number of establishments in an effort to uncover higher than average concentrations of activity. Growth rates were also observed and compared to statewide trends.

Employment attributable to trade with Mexico was then computed for industries exhibiting concentration coefficients in excess of 1.0. This “extra” employment was computed as the difference between the expected value (at a coefficient of 1.0) and the actual, higher value.

The number of extra jobs, extra payroll and extra number of firms were all recorded as the demonstrated benefits of binational trade.

14.5 Methodologies for Estimating Road Consumption, Bridge Damage, and Marginal Social Costs of Binational Trade

This section provides additional detail with respect to the calculation of various costs that were reported in Chapter 10.4, “Border State Costs of U.S.-Mexico Binational Trade” of the Task 10 document. Please refer to this prior chapter for the bulk of the discussion addressing the research and rational for methodologies utilized.

14.5.1 Estimating Freight Weight

The Task 10 report includes a tally of U.S. Imports Freight Weight flows based on declared shipment weights as summarized by the U.S. Bureau of the Census for the Bureau of Transportation Statistics. As discussed earlier in this document, the shipment weights were reported by BTS beginning with their monthly summaries for April 1995, and continuing through December 1995 and thereafter. The nine months of available data for 1995 was expanded by Barton-Aschman to a full calendar year of coverage by calculating value to weight ratios for each of the 98 Schedule B commodities by mode of transportation. The resulting value to weight ratios were then applied to the commodity by mode of transportation trade values reported for January through March 1995 to estimate a full year of data. The results of that effort are repeated in this section as Table 14.11.

In the future, there will be little to no value in repeating this exercise as a full year of data (12 months) is now available for 1996, accessible via the Internet.

BTS, through the Bureau of Census does not maintain a data file of southbound, export shipment weights. U.S. state of origin, Mexico state of destination, commodity, and declared shipment values are maintained however. To estimate export weights, we used the value to weight ratios that we computed for imports by commodity and mode, to estimate export tonnages. The results of that effort are repeated here as Table 14.12.

It should be noted that for U.S. imports from Mexico, the value tabulations reported by BTS do not include freight charges, insurance, or any miscellaneous costs. For U.S. exports to Mexico, the value tabulations explicitly include freight charges from the point where the goods enter the international pipeline to the U.S.-Mexico border. These freight charges for U.S. exports to Mexico cannot be isolated. Therefore use of the import value to weight ratios, which do not include freight charges, for the purpose of calculating export tonnages, whose value does include freight charges, may overstate U.S. export tonnage to Mexico.

As of November 1997, BTS monthly data, including import shipment weights is now available through January 1997. In the interest of binational transportation planning, we downloaded and tabulated the 12 months of data available for 1996 and prepared U.S. Import and Export summaries, by commodity, mode, value, and tonnage. These data summaries are reported in Tables 14.13 and 14.14.

Table 14.11
1995 Trans-Surface Data—U.S. Imports from Mexico

Comm Code	Total Value	Total Tonnage	Truck Value	Truck Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
1	$547,041,191	402,181	$536,440,689	395,281	$0	0	0	0	$10,600,502	6,901
2	6,371,433	2,375	6,371,433	2,375	0	0	0	0	0	0
3	401,156,440	60,675	401,040,287	60,630	51,546	37	0	0	64,607	8
4	3,556,686	2,871	3,556,686	2,871	0	0	0	0	0	0
5	12,647,107	7,790	12,622,907	7,776	0	0	0	0	24,200	14
6	16,151,039	12,650	16,122,195	12,622	28,844	28	0	0	0	0
7	1,193,827,508	2,617,002	1,188,580,371	2,609,065	5,218,173	7,883	0	0	28,964	54
8	518,986,355	1,121,041	518,956,815	1,121,002	9,045	16	0	0	20,495	23
9	494,806,248	210,044	453,861,891	195,033	40,944,357	15,012	0	0	0	0
10	1,101,007	3,372	1,101,007	3,372	0	0	0	0	0	0
11	4,726,332	16,895	3,702,672	13,447	1,023,660	3,448	0	0	0	0
12	24,917,583	37,314	24,807,673	36,442	109,910	872	0	0	0	0
13	10,525,979	2,970	10,232,488	2,925	293,491	45	0	0	0	0
14	34,825,338	33,644	34,825,338	33,644	0	0	0	0	0	0
15	52,436,613	73,559	17,572,327	12,927	17,274,572	25,243	0	0	17,589,714	35,388
16	19,055,611	4,692	19,055,611	4,692	0	0	0	0	0	0
17	66,329,834	62,649	60,987,247	54,284	5,342,587	8,365	0	0	0	0
18	20,047,613	11,428	19,955,038	11,356	81,720	67	0	0	10,855	5
19	92,177,713	91,602	91,704,524	91,042	234,522	344	0	0	238,667	216
20	201,471,388	262,623	193,934,857	251,642	7,505,056	10,956	0	0	31,475	26
21	60,817,054	38,683	60,295,346	38,293	335,353	251	0	0	186,355	140
22	382,249,967	737,604	190,954,286	271,159	189,191,795	465,538	6577	11	2,097,309	896
23	3,964,368	9,969	981,983	2,202	2,982,385	7,767	0	0	0	0
24	2,914,511	1,902	1,452,709	717	1,448,549	1,177	0	0	13,253	8
25	44,131,702	1,017,287	10,281,297	211,141	33,850,405	806,146	0	0	0	0
26	198,426,518	96,625	115,854,632	46,321	82,571,886	50,304	0	0	0	0
27	86,758,246	791,377	25,543,374	279,759	18,617,961	73,679	25,209,361	278,077	17,387,550	159,861
28	183,175,662	482,803	65,601,464	156,210	115,381,083	263,607	2,123,021	62,893	70,094	93
29	125,724,863	115,066	89,561,646	80,682	35,763,961	34,238	0	0	399,256	146
30	6,678,018	1,416	6,678,018	1,416	0	0	0	0	0	0
31	3,021,041	10,453	2,888,224	8,921	132,817	1,532	0	0	0	0
32	31,613,665	16,751	31,420,729	16,566	192,936	184	0	0	0	0
33	42,504,938	10,356	42,299,306	10,313	105,199	22	0	0	100,433	22
34	88,322,159	83,435	85,718,688	80,310	2,603,471	3,125	0	0	0	0
35	12,748,208	6,953	12,500,115	6,828	248,093	125	0	0	0	0
36	7,553,786	1,760	7,553,786	1,760	0	0	0	0	0	0
37	64,233,271	3,868	63,674,923	3,866	0	0	0	0	558,348	2
38	67,773,069	65,431	44,157,866	38,951	23,615,203	26,480	0	0	0	0
39	647,015,019	411,351	596,049,757	364,680	50,830,795	46,590	0	0	134,467	81
40	245,899,752	133,521	244,332,847	132,588	1,530,963	927	0	0	35,942	6
41	69,184,240	13,795	68,064,786	13,685	1,119,454	110	0	0	0	0
42	143,947,748	27,454	143,190,804	27,354	150,186	25	0	0	606,758	75
43	1,489,963	204	1,489,963	204	0	0	0	0	0	0
44	300,595,297	528,465	286,822,023	490,278	13,657,415	38,168	1936	16	113,923	2
45	76,901	47	71,199	27	0	0	0	0	5,702	20
46	2,575,285	1,294	2,188,047	1,157	387,238	137	0	0	0	0
47	5,392,814	23,578	5,009,956	21,452	382,858	2,126	0	0	0	0
48	344,407,923	415,880	274,093,226	284,473	70,298,068	131,403	0	0	16,629	4
49	95,391,077	26,738	95,361,751	26,735	21,486	2	0	0	7,840	1
50	407,202	13	407,202	13	0	0	0	0	0	0
51	7,009,860	1,471	6,784,987	1,463	0	0	0	0	224,873	8
52	114,875,560	34,553	114,863,977	34,548	11,583	5	0	0	0	0

Table 14.11
1995 Trans-Surface Data—U.S. Imports from Mexico

Comm Code	Total Value	Total Tonnage	Truck Value	Truck Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
53	$586,250	2,472	$286,001	659	$300,249	1,813	0	0	$0	0
54	97,260,615	40,074	96,120,982	39,953	194,701	69	0	0	944,932	52
55	131,673,165	99,460	131,192,766	99,145	480,399	316	0	0	0	0
56	25,517,083	8,154	25,377,722	7,950	139,361	204	0	0	0	0
57	9,400,376	3,315	9,316,840	3,293	77,448	22	0	0	6,088	0
58	16,178,299	2,291	16,178,299	2,291	0	0	0	0	0	0
59	25,399,066	5,668	25,389,817	5,668	9,249	1	0	0	0	0
60	9,451,918	1,699	9,450,678	1,699	1,240	0	0	0	0	0
61	925,725,021	104,632	925,154,499	104,553	552,130	78	0	0	18,392	1
62	1,714,988,097	155,453	1,708,187,671	154,873	2,748,173	349	0	0	4,052,253	231
63	344,470,529	82,892	343,605,090	82,723	841,710	169	0	0	23,729	0
64	205,056,368	22,071	203,993,437	21,975	843,973	72	0	0	218,958	25
65	48,490,935	6,928	48,415,122	6,910	61,521	17	0	0	14,292	1
66	662,778	187	662,778	187	0	0	0	0	0	0
67	2,607,749	854	2,607,749	854	0	0	0	0	0	0
68	119,323,326	262,015	117,899,284	255,976	1,424,042	6,038	0	0	0	0
69	227,707,706	538,608	223,205,331	527,206	4,424,223	11,304	0	0	78,152	98
70	400,637,540	470,012	378,684,408	457,403	21,818,704	12,609	0	0	134,428	0
71	293,151,281	4,020	263,092,251	2,530	156,690	0	0	0	29,902,340	1,490
72	487,860,344	1,101,447	417,494,680	875,131	70,352,292	226,289	0	0	13,372	27
73	694,871,335	615,741	614,534,827	565,829	76,334,461	45,711	0	0	4,002,047	4,201
74	623,230,818	249,065	448,211,019	201,321	174,651,820	47,674	0	0	367,979	71
75	213,521	167	213,521	167	0	0	0	0	0	0
76	273,619,266	166,497	269,545,729	162,763	4,027,337	3,698	0	0	46,200	36
78	33,502,148	59,785	6,478,404	10,732	27,019,473	49,051	0	0	4,271	1
79	109,723,634	120,486	10,684,520	13,375	99,039,114	107,111	0	0	0	0
80	900,798	586	847,703	586	53,095	0	0	0	0	0
81	9,167,066	4,514	9,167,066	4,514	0	0	0	0	0	0
82	87,429,622	14,693	87,176,482	14,499	253,140	194	0	0	0	0
83	272,915,258	55,288	267,619,622	54,799	2,996,190	166	0	0	2,299,446	323
84	6,067,719,221	1,238,918	5,087,048,413	874,901	672,595,026	203,203	0	0	308,075,782	160,814
85	16,875,884,140	2,036,610	16,278,243,087	1,993,522	140,589,285	32,688	0	0	457,051,768	10,400
86	66,290,661	70,787	64,652,163	68,885	1,613,898	1,888	9000	4	15,600	10
87	9,510,223,857	1,925,646	2,388,462,142	632,982	7,091,251,282	1,272,440	31734	17	30,478,699	20,206
88	144,778,744	994	21,437,555	897	0	0	0	0	123,341,189	97
89	727,239	149	727,239	149	0	0	0	0	0	0
90	2,068,703,425	135,771	1,802,913,246	114,618	3,161,015	119	0	0	262,629,164	21,034
91	19,139,852	1,559	18,717,904	1,527	419,074	31	0	0	2,874	0
92	65,449,389	6,184	65,276,363	6,168	173,026	15	0	0	0	0
93	10,834,454	760	10,776,980	757	57,474	3	0	0	0	0
94	1,380,259,402	332,611	1,379,000,191	332,444	483,284	97	0	0	775,927	71
95	610,463,167	109,413	606,958,012	107,428	3,503,171	1,985	0	0	1,984	0
96	164,266,059	22,840	164,010,969	22,810	216,000	28	0	0	39,090	2
97	2,929,247	341	1,336,378	178	0	0	0	0	1,592,869	162
98	2,356,157,831	541,067	1,753,044,440	527,661	11,834,182	6,618	12853	107	591,266,356	6,681
Totals	53,648,587,302	20,770,207	42,614,980,350	15,940,993	9,138,246,078	4,058,055	27,394,482	341,126	1,867,966,392	430,033

Source: Barton-Aschman estimates based on 1995 BTS data.

Table 14.12
1995 Trans-Surface Data—U.S. Exports to Mexico

Comm Code	Total Value	Total Tonnage	Truck Value	Truck Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
1	$30,031,188	20,377	$29,948,871	20,321	$82,317	56	$0	0	$0	0
2	350,291,571	119,069	345,194,510	117,337	4,734,310	1,609	0	0	362,751	123
3	31,150,816	4,659	30,593,799	4,258	557,017	401	0	0	0	0
4	110,310,992	81,995	58,859,710	43,751	51,412,395	38,215	0	0	38,887	29
5	30,379,270	17,280	29,983,174	17,055	396,096	225	0	0	0	0
6	22,004,399	15,864	21,985,059	15,848	7,910	8	0	0	11,430	8
7	40,835,388	79,421	34,858,463	70,371	5,918,922	8,941	0	0	58,003	108
8	95,963,876	190,565	94,927,091	188,764	953,058	1,705	0	0	83,727	96
9	6,895,314	2,723	6,726,539	2,659	108,058	40	0	0	60,717	24
10	553,038,932	1,564,310	209,546,505	592,717	341,573,034	966,164	0	0	1,919,393	5,429
11	45,476,201	152,570	25,190,243	84,244	20,273,689	68,285	0	0	12,269	41
12	425,145,786	2,199,656	171,906,604	224,842	247,971,841	1,967,735	0	0	5,267,341	7,078
13	24,999,790	5,127	11,701,682	3,081	13,218,458	2,026	0	0	79,650	21
14	7,953,115	7,077	3,909,604	3,479	4,043,511	3,598	0	0	0	0
15	276,432,498	327,189	100,108,337	67,816	173,215,058	253,118	0	0	3,109,103	6,255
16	39,013,856	8,847	38,832,533	8,806	145,703	33	0	0	35,620	8
17	61,942,011	74,477	30,165,971	24,732	31,769,589	49,740	0	0	6,451	6
18	40,341,925	21,215	40,088,325	21,006	253,600	208	0	0	0	0
19	42,209,979	38,917	41,515,203	37,951	600,568	880	0	0	94,208	85
20	30,666,464	37,053	28,728,695	34,240	1,913,360	2,793	0	0	24,409	20
21	109,134,889	63,924	108,415,806	63,386	502,170	375	0	0	216,913	163
22	62,718,177	79,803	52,306,606	68,372	3,715,128	9,142	0	0	6,696,443	2,289
23	201,671,950	486,406	71,794,378	148,251	129,283,535	336,688	0	0	594,037	1,467
24	23,073,265	11,024	19,119,081	8,687	76,588	62	0	0	3,877,596	2,275
25	73,373,740	1,517,565	46,384,117	877,755	24,462,878	582,593	0	0	2,526,745	57,217
26	54,126,729	21,021	49,434,584	18,201	4,430,738	2,699	0	0	261,407	121
27	655,257,903	5,740,223	504,537,965	5,088,471	140,501,141	556,024	966,988	10,667	9,251,809	85,061
28	331,363,563	741,053	222,602,542	488,329	94,250,748	215,331	0	0	14,510,273	37,393
29	575,692,903	490,087	473,830,778	393,063	92,645,971	89,039	49111	43	9,167,043	7,942
30	59,284,414	11,578	58,860,812	11,495	423,602	83	0	0	0	0
31	46,485,680	347,091	21,659,097	61,602	24,708,567	285,098	0	0	118,016	392
32	193,738,822	95,822	189,397,532	91,905	3,855,437	3,681	0	0	485,853	237
33	138,470,110	31,114	125,157,012	28,263	384,616	80	0	0	12,928,482	2,771
34	91,367,179	81,265	83,934,105	72,403	7,250,243	8,703	0	0	182,831	159
35	80,121,264	40,298	78,433,789	39,455	1,248,160	628	0	0	439,315	215
36	4,500,605	965	4,460,412	957	3,063	1	0	0	37,130	8
37	133,700,880	7,478	133,160,330	7,465	212,014	12	0	0	328,536	1
38	351,365,776	299,286	301,262,967	244,673	42,539,531	47,700	0	0	7,563,278	6,913
39	2,771,016,358	1,585,065	2,685,354,537	1,510,377	73,821,289	67,663	0	0	11,840,532	7,025
40	531,133,424	270,271	476,305,350	238,033	52,667,336	31,906	0	0	2,160,738	331
41	173,807,144	32,172	172,959,073	32,089	848,071	84	0	0	0	0
42	50,708,291	8,938	50,630,120	8,926	42,751	7	0	0	35,420	4
43	1,371,956	173	1,371,956	173	0	0	0	0	0	0
44	235,182,956	375,567	225,511,785	352,383	8,288,143	23,158	0	0	1,383,028	27
45	9,246,426	7,306	983,676	347	8,262,750	6,959	0	0	0	0
46	387,131	185	381,303	182	0	0	0	0	5,828	3
47	599,389,912	3,061,650	164,209,001	646,779	434,008,805	2,410,096	0	0	1,172,106	4,775
48	1,270,694,353	1,313,185	1,152,231,421	1,101,816	112,214,134	209,753	0	0	6,248,798	1,616
49	182,190,561	46,745	180,023,558	46,526	1,857,174	180	0	0	309,829	39
50	7,304,186	218	7,220,469	215	83,717	2	0	0	0	0
51	10,018,928	1,943	9,539,033	1,894	202,119	39	0	0	277,776	10
52	310,798,964	108,042	184,032,016	50,963	126,675,299	57,054	0	0	91,649	25
53	799,808	1,734	790,236	1,676	9,572	58	0	0	0	0
54	196,554,358	75,152	194,526,821	74,455	1,955,054	693	0	0	72,483	4
55	78,071,877	54,294	76,969,873	53,563	938,543	617	0	0	163,461	114
56	189,274,936	54,962	188,820,772	54,429	339,871	499	0	0	114,293	34
57	49,285,018	15,906	46,538,048	15,141	2,731,642	764	0	0	15,328	1
58	123,235,400	16,071	122,714,376	16,003	204,527	27	0	0	316,497	41
59	76,332,152	15,678	76,138,647	15,659	174,153	15	0	0	19,352	4
60	31,873,563	5,253	31,647,346	5,239	226,217	15	0	0	0	0
61	522,034,544	54,561	518,920,346	54,168	2,339,600	352	0	0	774,598	41
62	766,932,226	64,129	761,945,565	63,596	3,548,862	451	0	0	1,437,799	82
63	89,765,237	19,875	89,551,398	19,851	114,199	23	0	0	99,640	1
64	67,077,047	6,658	66,235,993	6,575	398,038	34	0	0	443,016	50
65	7,182,151	944	7,179,334	944	0	0	0	0	2,817	0
66	872,184	227	867,384	226	0	0	0	0	4,800	1
67	3,080,735	929	3,046,237	919	21,764	7	0	0	12,734	4
68	49,148,459	97,932	48,748,520	96,609	232,273	985	0	0	167,666	338

Table 14.12
1995 Trans-Surface Data—U.S. Exports to Mexico

Comm Code	Total Value	Total Tonnage	Truck Value	Truck Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
69	56,629,979	124,072	52,327,499	113,929	3,650,060	9,326	0	0	652,420	816
70	239,383,327	254,000	218,542,668	243,102	18,856,773	10,898	0	0	1,983,886	0
71	52,507,465	465	52,411,776	464	40,325	0	0	0	55,364	0
72	668,543,510	1,515,721	484,743,036	933,267	177,533,893	569,580	0	0	6,266,581	12,873
73	1,124,235,283	936,887	1,054,496,202	894,452	68,070,626	40,684	0	0	1,668,455	1,751
74	246,538,156	101,596	244,287,267	101,010	1,895,073	517	0	0	355,816	69
75	8,197,775	5,908	8,190,862	5,903	6,913	5	0	0	0	0
76	638,005,812	392,037	531,079,588	295,121	103,415,485	94,948	0	0	3,510,739	1,969
78	6,648,586	10,058	6,419,104	9,792	132,941	241	0	0	96,541	25
79	11,701,862	13,468	11,377,012	13,116	285,876	309	0	0	38,974	42
80	20,068,505	12,778	19,729,358	12,562	232,792	148	0	0	106,355	68
81	9,212,319	4,177	8,855,612	4,015	96,617	44	0	0	260,090	118
82	144,328,203	22,396	142,925,540	21,892	468,854	360	0	0	933,809	144
83	511,043,324	90,838	471,566,982	88,590	38,808,723	2,154	0	0	667,619	94
84	5,470,462,999	895,427	5,114,730,554	809,617	320,327,948	67,280	0	0	35,404,497	18,530
85	10,410,832,308	1,182,233	10,310,145,806	1,162,633	82,151,709	19,177	0	0	18,534,793	423
86	70,613,512	76,571	31,651,418	31,069	38,808,499	45,401	0	0	153,595	101
87	4,296,100,547	951,620	2,776,053,368	676,207	1,512,080,893	270,131	0	0	7,966,286	5,281
88	240,787,752	2,322	55,587,247	2,174	555,614	3	0	0	184,644,891	145
89	9,941,643	1,871	7,734,336	1,455	3,000	1	0	0	2,204,307	415
90	1,198,060,159	69,861	1,181,754,495	69,209	15,429,323	582	0	0	876,341	70
91	31,137,836	1,915	24,849,447	1,867	36,715	3	0	0	6,251,674	46
92	24,780,238	2,156	24,761,862	2,155	0	0	0	0	18,376	2
93	4,556,614	294	4,511,974	292	44,640	2	0	0	0	0
94	677,700,002	150,321	675,893,971	149,977	1,586,430	324	0	0	219,601	20
95	205,456,284	34,246	203,046,012	33,098	1,866,510	1,058	0	0	543,762	90
96	102,776,035	12,728	96,256,136	12,318	523,590	67	0	0	5,996,309	343
97	1,843,390	227	1,831,315	225	8,307	1	0	0	3,768	0
98	1,886,883,831	88,688	242,385,097	68,545	5,673,313	2,652	0	0	1,638,825,421	17,490
Totals	42,224,278,761	29,285,037	35,503,062,569	19,523,826	4,694,439,969	9,451,052	1,016,099	10,709	2,025,760,124	299,450

Source: Barton-Aschman estimates based on 1995 BTS data.

Table 14.13
1996 Trans-Surface Data—U.S. Imports from Mexico

Comm Code	Total Value	Total Tonnage	Road Value	Road Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Unknown Value	Unknown Tonnage
01	104,684,344	85,583	104,684,344	85,583	0	0	0	0	0	0
02	8,712,198	3,869	8,712,198	3,869	0	0	0	0	0	0
03	362,573,604	53,479	362,570,969	53,478	0	0	0	0	2,635	1
04	6,314,553	4,454	6,018,773	4,208	165,655	108	0	0	130,125	138
05	12,954,563	7,282	12,928,172	7,277	2,391	5	0	0	24,000	0
06	16,177,256	11,340	16,177,256	11,340	0	0	0	0	0	0
07	1,291,696,782	2,332,084	1,287,630,387	2,324,783	4,059,224	7,276	0	0	7,171	25
08	522,385,069	1,176,169	522,247,685	1,175,987	49,690	49	0	0	87,694	133
09	433,703,173	210,844	377,464,466	184,626	56,238,707	26,218	0	0	0	0
10	1,524,825	3,125	1,524,825	3,125	0	0	0	0	0	0
11	4,247,513	13,192	4,243,551	13,191	3,962	1	0	0	0	0
12	34,582,006	37,744	34,469,247	37,633	112,759	111	0	0	0	0
13	13,380,580	8,487	13,224,634	8,465	155,946	22	0	0	0	0
14	33,603,780	28,614	33,586,049	28,577	17,731	37	0	0	0	0
15	59,903,412	102,948	19,287,513	16,667	9,203,398	13,371	0	0	31,412,501	72,910
16	27,205,290	9,222	27,169,197	9,215	0	0	0	0	36,093	6
17	86,804,480	124,511	73,801,696	65,831	11,271,154	51,834	0	0	1,731,630	6,847
18	22,524,508	12,162	22,337,787	11,997	170,788	160	0	0	15,933	6
19	117,291,194	128,130	116,674,164	127,576	66,820	105	0	0	550,210	448
20	202,380,861	248,873	194,480,563	235,390	7,735,389	13,341	0	0	164,909	142
21	83,447,750	51,676	82,950,471	51,249	62,387	84	0	0	434,892	343
22	511,389,626	990,724	255,893,728	353,182	254,824,070	636,928	0	0	671,828	615
23	9,584,576	20,291	4,474,219	9,894	5,110,357	10,397	0	0	0	0
24	18,702,868	8,949	8,358,896	2,304	10,309,234	6,637	0	0	34,738	7
25	57,804,088	1,322,882	15,963,246	203,919	41,840,842	1,118,963	0	0	0	0
26	126,992,969	75,212	82,893,818	42,625	44,099,151	32,587	0	0	0	0
27	97,149,076	690,261	27,368,376	179,141	5,908,562	54,917	5,955,999	59,100	57,916,139	397,102
28	211,044,262	510,476	72,983,606	134,481	135,916,955	312,621	2,119,749	62,797	23,952	576
29	136,980,262	98,195	111,418,621	72,777	24,227,378	24,890	0	0	1,334,263	528
30	16,059,979	2,012	15,950,347	2,003	53,848	8	0	0	55,784	1
31	2,865,150	5,852	2,376,180	4,871	488,970	981	0	0	0	0
32	42,888,259	18,688	42,806,198	18,527	44,491	155	0	0	37,570	6
33	51,058,711	10,323	51,052,615	10,321	6,096	3	0	0	0	0
34	114,100,576	104,220	111,108,233	101,340	2,992,343	2,881	0	0	0	0
35	11,424,389	5,462	11,419,963	5,462	4,426	0	0	0	0	0
36	10,320,349	2,864	10,320,349	2,864	0	0	0	0	0	0
37	74,376,558	4,529	74,027,012	4,528	2,160	0	0	0	347,386	1
38	91,676,845	59,693	78,958,313	39,258	12,712,064	20,433	0	0	6,468	2
39	718,313,971	404,424	669,587,595	355,397	48,565,926	49,015	0	0	160,450	12
40	285,850,322	129,793	278,960,039	126,228	6,878,838	3,562	0	0	11,445	4
41	53,138,011	8,160	52,934,924	8,155	200,887	4	0	0	2,200	0
42	178,487,239	34,851	178,134,422	34,833	74,850	13	0	0	277,967	5
43	2,991,657	272	2,991,657	272	0	0	0	0	0	0
44	390,796,051	648,684	371,601,019	584,572	18,716,193	63,631	2,239	6	476,600	474
45	811,207	183	811,207	183	0	0	0	0	0	0
46	1,863,421	1,037	1,717,723	931	145,698	106	0	0	0	0
47	12,234,088	34,340	3,951,527	12,786	8,282,561	21,554	0	0	0	0
48	306,487,695	320,179	281,381,065	251,470	25,033,955	68,690	0	0	72,675	18
49	104,101,625	24,226	104,064,239	24,223	2,720	1	0	0	34,666	2
50	265,979	9	265,979	9	0	0	0	0	0	0
51	9,428,495	1,127	8,857,352	1,097	0	0	0	0	571,143	29
52	182,054,651	60,996	182,054,651	60,996	0	0	0	0	0	0
53	409,740	1,211	252,285	236	157,455	974	0	0	0	0
54	120,172,862	45,570	120,119,161	45,554	43,864	14	0	0	9,837	2
55	119,592,387	78,910	119,381,948	78,856	156,353	46	0	0	54,086	8
56	47,384,075	14,799	46,829,413	14,172	534,554	627	0	0	20,108	0
57	18,961,896	10,955	18,942,717	10,950	17,554	4	0	0	1,625	0
58	21,991,646	2,023	21,987,522	2,023	3,394	1	0	0	730	0
59	29,602,317	5,895	29,601,940	5,895	0	0	0	0	377	0
60	29,146,104	3,721	29,086,563	3,716	0	0	0	0	59,541	5
61	1,421,263,170	147,497	1,420,673,070	147,441	564,576	53	0	0	25,524	2
62	2,202,244,232	173,098	2,197,420,026	172,767	2,033,553	273	0	0	2,790,653	58
63	347,855,175	90,036	347,180,927	89,919	646,937	114	0	0	27,311	3
64	273,337,755	27,620	265,294,327	27,182	326,367	38	0	0	7,717,061	400
65	50,381,968	6,451	50,355,203	6,447	14,864	2	0	0	11,901	1
66	824,599	201	812,449	199	12,150	2	0	0	0	0
67	2,410,804	701	2,410,804	701	0	0	0	0	0	0
68	148,080,812	291,611	145,785,391	281,798	2,295,421	9,813	0	0	0	0
69	283,148,514	626,918	279,351,805	618,684	3,734,710	8,183	0	0	61,999	51
70	469,239,928	463,387	460,606,578	457,930	8,623,152	5,457	0	0	10,198	1
71	366,226,585	4,740	314,211,628	4,687	1,247,018	0	0	0	50,767,939	53
72	603,605,645	1,410,499	488,318,946	1,042,574	114,920,984	367,544	0	0	365,715	381
73	868,633,875	704,251	775,472,003	646,234	87,557,063	53,855	0	0	5,604,809	4,161

Table 14.13
1996 Trans-Surface Data—U.S. Imports from Mexico

Comm Code	Total Value	Total Tonnage	Road Value	Road Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Unknown Value	Unknown Tonnage
74	446,806,076	211,561	323,983,034	154,923	120,545,474	55,390	0	0	2,277,568	1,249
75	818,857	301	818,857	301	0	0	0	0	0	0
76	266,613,468	128,968	265,889,610	128,636	721,919	332	0	0	1,939	0
78	46,297,620	70,238	10,202,076	16,988	36,095,544	53,250	0	0	0	0
79	106,155,582	109,396	19,242,374	14,702	86,913,208	94,694	0	0	0	0
80	1,476,662	912	1,471,431	912	0	0	0	0	5,231	1
81	10,515,528	3,798	10,515,528	3,798	0	0	0	0	0	0
82	104,428,612	17,319	103,438,107	16,657	978,519	658	0	0	11,986	4
83	357,384,385	69,454	356,346,780	69,373	49,140	26	0	0	988,465	55
84	7,543,998,522	1,197,184	6,214,581,234	934,447	653,251,825	134,338	0	0	676,165,463	128,399
85	19,037,136,759	2,186,996	18,181,810,727	2,151,093	41,275,485	8,068	0	0	814,050,547	27,835
86	131,315,465	65,993	130,453,699	62,371	861,766	3,622	0	0	0	0
87	13,443,708,877	2,554,512	2,846,298,423	622,045	10,560,023,877	1,910,414	0	0	37,386,577	22,054
88	21,325,722	279	21,289,327	275	0	0	0	0	36,395	4
89	701,529	198	697,520	196	0	0	0	0	4,009	2
90	2,274,300,785	138,866	1,889,302,062	112,106	404,420	43	0	0	384,594,303	26,717
91	25,992,167	2,308	25,787,176	2,285	186,446	23	0	0	18,545	0
92	64,293,428	5,691	64,291,892	5,691	0	0	0	0	1,536	0
93	8,730,826	579	8,730,826	579	0	0	0	0	0	0
94	1,810,215,203	378,973	1,808,333,018	378,633	1,736,368	339	0	0	145,817	1
95	733,804,867	121,811	733,233,658	121,627	446,739	169	0	0	124,470	15
96	173,228,260	22,664	173,117,084	22,637	6,555	0	0	0	104,621	27
97	1,867,770	203	1,683,975	202	0	0	0	0	183,795	1
98	2,057,949,481	399,360	1,992,470,349	384,880	8,594,191	12,908	0	0	56,884,941	1,573
99	494,064,617	0	0	0	0	0	0	0	494,064,617	0
Total	63,864,985,853	22,050,361	48,754,954,539	15,972,041	12,470,740,021	5,262,971	8,077,987	121,902	2,631,213,306	693,446

Source: U.S. Bureau of Transportation Statistics (BTS)

Table 14.14
1996 Trans-Surface Data—U.S. Exports to Mexico

Comm Code	Total Value	Total Tonnage	Road Value	Road Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
01	79,480,157	64,604	78,664,972	64,311	492,085	208	0	0	323,100	85
02	498,699,832	221,364	495,397,654	220,024	2,961,293	1,250	0	0	340,885	90
03	32,842,304	5,278	31,231,846	4,607	1,565,390	661	0	0	45,068	11
04	97,516,170	66,911	68,450,730	47,853	28,893,234	18,875	0	0	172,206	183
05	39,971,143	23,622	38,745,707	21,809	890,069	1,813	0	0	335,367	0
06	26,372,534	18,483	26,358,303	18,477	14,231	6	0	0	0	0
07	123,069,724	221,742	87,823,578	158,563	35,246,146	63,178	0	0	0	0
08	113,200,338	253,267	111,910,055	251,997	1,275,863	1,248	0	0	14,420	22
09	5,345,061	2,614	5,345,061	2,614	0	0	0	0	0	0
10	817,421,698	845,321	308,070,330	631,411	502,727,743	212,164	0	0	6,623,625	1,746
11	82,749,226	162,198	49,110,189	152,652	33,632,812	9,544	0	0	6,225	2
12	710,308,745	661,805	228,557,965	249,536	395,897,932	389,643	0	0	85,852,848	22,626
13	23,075,263	11,443	16,366,063	10,476	6,709,200	967	0	0	0	0
14	5,546,333	8,596	2,409,219	2,050	3,137,114	6,546	0	0	0	0
15	223,533,759	269,567	95,325,299	82,375	127,141,149	184,714	0	0	1,067,311	2,477
16	38,138,602	12,943	37,855,396	12,840	217,100	92	0	0	66,106	12
17	113,122,279	307,933	57,229,937	51,049	55,652,720	255,937	0	0	239,622	947
18	44,202,314	23,788	44,080,011	23,673	122,303	114	0	0	0	0
19	56,191,019	62,070	54,667,689	59,776	1,380,518	2,178	0	0	142,812	116
20	44,420,491	54,700	42,568,536	51,523	1,832,580	3,161	0	0	19,375	17
21	126,379,849	80,853	122,537,367	75,707	3,776,281	5,094	0	0	66,201	52
22	57,308,123	92,602	32,785,464	45,250	15,724,374	39,303	0	0	8,798,285	8,049
23	231,626,733	488,630	98,564,191	217,952	133,041,335	270,673	0	0	21,207	6
24	37,977,666	9,941	27,237,941	7,509	490,469	316	0	0	10,249,256	2,116
25	83,409,308	1,464,692	51,156,955	653,493	30,313,642	810,687	0	0	1,938,711	511
26	44,034,899	25,332	31,227,318	16,058	12,409,366	9,170	0	0	398,215	105
27	801,254,514	5,750,727	604,524,751	3,956,954	179,588,927	1,669,195	2,299,845	22,821	14,840,991	101,757
28	400,233,809	832,359	293,371,846	540,575	104,748,248	240,931	0	0	2,113,715	50,854
29	726,082,999	511,644	614,618,996	401,462	104,608,278	107,469	0	0	6,855,725	2,713
30	63,335,094	7,990	61,893,149	7,772	1,441,945	218	0	0	0	0
31	81,134,127	163,721	30,573,014	62,672	50,327,098	100,987	0	0	234,015	62
32	253,706,747	129,951	246,839,885	106,833	6,643,881	23,080	0	0	222,981	38
33	139,276,610	29,044	128,108,975	25,898	1,379,014	566	0	0	9,788,621	2,580
34	106,240,248	97,019	100,930,730	92,057	5,095,880	4,906	0	0	213,638	56
35	97,180,901	44,818	93,594,739	44,767	3,499,185	28	0	0	86,977	23
36	10,234,714	2,840	10,234,714	2,840	0	0	0	0	0	0
37	166,789,582	10,198	166,721,818	10,197	60,062	0	0	0	7,702	0
38	476,051,066	298,436	416,303,971	206,985	56,173,104	90,290	0	0	3,573,991	1,162
39	3,509,625,545	1,905,348	3,416,372,437	1,813,309	91,025,192	91,867	0	0	2,227,916	172
40	747,201,100	343,171	666,815,830	301,731	79,483,216	41,153	0	0	902,054	287
41	272,930,133	41,773	270,370,644	41,651	2,049,340	46	0	0	510,149	76
42	38,843,667	7,586	38,447,684	7,518	393,218	68	0	0	2,765	0
43	3,064,918	278	3,064,918	278	0	0	0	0	0	0
44	247,751,214	409,434	236,694,232	372,348	10,846,789	36,877	0	0	210,193	209
45	1,906,876	430	1,903,435	428	3,441	1	0	0	0	0
46	635,061	344	635,061	344	0	0	0	0	0	0
47	332,616,419	942,831	122,008,644	394,789	210,596,725	548,039	0	0	11,050	3
48	1,425,848,517	1,413,518	1,348,900,612	1,205,509	75,691,264	207,689	0	0	1,256,641	320
49	216,589,248	50,363	215,560,544	50,177	954,614	183	0	0	74,090	4
50	9,930,372	343	9,930,372	343	0	0	0	0	0	0
51	15,124,598	1,923	14,957,250	1,853	167,348	71	0	0	0	0
52	458,763,783	164,369	336,081,692	112,601	122,638,869	51,757	0	0	43,222	11
53	897,236	2,190	640,291	600	256,945	1,590	0	0	0	0
54	272,902,045	102,499	259,255,747	98,320	11,886,549	3,894	0	0	1,759,749	286
55	116,027,933	75,685	113,439,777	74,931	2,559,267	749	0	0	28,889	4
56	177,587,236	53,941	177,313,734	53,659	240,483	282	0	0	33,019	1
57	51,859,413	29,879	51,556,687	29,804	297,015	74	0	0	5,711	1
58	137,701,027	12,687	137,366,960	12,637	282,772	46	0	0	51,295	4
59	81,018,481	16,168	80,713,111	16,074	205,797	87	0	0	99,573	7
60	60,487,253	7,763	60,312,996	7,706	124,086	52	0	0	50,171	4
61	689,460,971	71,495	684,893,047	71,080	3,159,397	298	0	0	1,408,527	117
62	928,697,219	73,185	918,163,825	72,188	6,844,750	919	0	0	3,688,644	77
63	130,324,384	33,713	129,884,994	33,640	372,957	66	0	0	66,433	8
64	66,473,723	6,810	66,104,129	6,773	276,432	32	0	0	93,162	5
65	8,628,860	1,105	8,628,860	1,105	0	0	0	0	0	0
66	1,502,473	369	1,502,473	369	0	0	0	0	0	0
67	2,737,486	797	2,728,452	794	5,822	2	0	0	3,212	1
68	69,380,785	134,987	68,926,759	133,233	407,464	1,742	0	0	46,562	12
69	79,600,951	175,761	75,749,473	167,763	3,529,364	7,733	0	0	322,114	264
70	255,337,254	243,215	226,028,316	224,715	29,224,732	18,494	0	0	84,206	6
71	59,634,815	889	59,581,017	889	39,228	0	0	0	14,570	0
72	817,779,094	1,956,732	613,114,788	1,309,016	201,486,958	644,402	0	0	3,177,348	3,314
73	1,717,605,977	1,398,972	1,568,189,071	1,306,840	147,623,447	90,801	0	0	1,793,459	1,332
74	355,857,654	170,072	349,618,587	167,181	5,968,820	2,743	0	0	270,247	148

Table 14.14
1996 Trans-Surface Data—U.S. Exports to Mexico

Comm Code	Total Value	Total Tonnage	Road Value	Road Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
75	11,279,440	4,148	11,128,412	4,093	95,428	40	0	0	55,600	15
76	754,107,584	362,454	694,045,267	335,776	57,947,325	26,665	0	0	2,114,992	13
78	42,393,235	65,381	14,956,228	24,905	27,437,007	40,476	0	0	0	0
79	13,605,323	10,396	13,593,792	10,386	7,777	8	0	0	3,754	1
80	16,699,601	10,344	16,692,276	10,341	7,325	3	0	0	0	0
81	13,472,592	4,869	13,392,088	4,837	67,443	28	0	0	13,061	3
82	162,724,052	26,826	160,828,149	25,899	939,880	632	0	0	956,023	294
83	453,864,487	105,663	400,799,952	78,027	52,880,520	27,626	0	0	184,015	10
84	6,482,475,458	986,938	6,259,702,233	941,232	216,042,133	44,428	0	0	6,731,092	1,278
85	12,778,171,920	1,521,266	12,644,489,063	1,495,972	128,500,822	25,117	0	0	5,182,035	177
86	45,024,187	67,109	32,544,294	15,560	12,251,529	51,489	0	0	228,364	60
87	5,551,305,719	1,151,093	3,878,549,201	847,638	1,670,711,575	302,248	0	0	2,044,943	1,206
88	389,239,943	36,961	37,853,692	489	34,593	15	0	0	351,351,658	36,458
89	10,654,991	3,667	7,622,291	2,146	46,719	20	0	0	2,985,981	1,502
90	1,227,047,351	73,913	1,202,381,513	71,346	23,360,590	2,476	0	0	1,305,248	91
91	48,163,557	2,998	33,531,483	2,971	51,078	6	0	0	14,580,996	21
92	21,212,874	1,882	21,201,348	1,877	11,526	5	0	0	0	0
93	4,890,456	357	4,796,894	318	93,562	39	0	0	0	0
94	673,053,699	140,875	671,127,528	140,522	1,802,395	352	0	0	123,776	1
95	248,469,743	41,502	247,081,249	40,985	1,355,328	512	0	0	33,166	4
96	127,855,217	17,593	120,349,184	15,737	259,565	7	0	0	7,246,468	1,849
97	5,908,971	707	5,896,621	707	0	0	0	0	12,350	0
98	2,232,021,457	114,672	252,388,674	48,753	7,591,890	11,403	0	0	1,972,040,893	54,516
Total	51,753,439,559	27,941,285	44,091,802,245	20,805,312	5,119,248,882	6,810,563	2,299,845	22,821	2,540,088,587	302,588

Source: Barton-Aschman estimates based on 1996 BTS data.

A comparison of the 1995 and 1996 value and tonnage tallies is very interesting. As shown in Table 14.15, Transborder Trade Trends, while imports (northbound movements) increased by 19 percent in value, from $53.65 billion to $63.86 billion, the tonnage carried by all modes increased by only six percent. Relative to truck movements, the tonnage moved was virtually unchanged from 1995 to 1996 despite a 14.4 percent increase in the value of goods moved by truck. Of the total increase in tonnage from one year to the next (1,280,000 tons), the rail mode captured 94 percent of the increase in goods moved. One-half of this increase in tonnage moved by rail was in commodity code 87, “Vehicles (other than railway or tramway rolling stock) and Parts and Accessories Thereof.”

For exports, the change in volume from 1995 to 1996 was equally interesting. Overall, land transported exports (southbound movements) increased by 22.6 percent when measured by value, from $42.22 billion to $51.73 billion.

When measured by weight however, the tonnage dropped by nearly five percent (1,344,000 tons). Southbound rail tonnage was cut by 28 percent (2.64 million tons) while tonnage moved by truck increased by 1.28 million tons (6.6 percent). The biggest changes in tonnage were attributable to a steep decline in commodity 47, “Wood Pulp, Waste Paper or Paperboard,” most of which moved by rail in 1995; a large increase in rail transported commodity 27, “Mineral Fuels, Mineral Oils and Products of their Distillation” (note that 1 million tons shifted from road to rail in 1996); a huge decrease in the tonnage attributable to commodity 12, “Oil Seeds, Miscellaneous Grains, Seeds and Fruit, etc.,” most of which moved by rail (despite a steep increase in value), and a significant fall in rail tonnage for commodity 10, “Cereals.”

Table 14.15
Transborder Trade Trends

Year	Total Value	Total Tonnage	Truck Value	Truck Tonnage	Rail Value	Rail Tonnage	Pipeline Value	Pipeline Tonnage	Other Value	Other Tonnage
U.S. Northbound (Imports)										
1995	$53,648B	20.770M	$42.615B	15.941M	$9.138B	4.058M	$.027B	.341M	$1.868B	.430M
1996	63.865B	22.050M	48.755B	15.972M	12.471B	5.263M	.008B	.122M	2.631B	.693M
% Change	+19.0%	+6.2%	+14.4%	+0.2%	+36.5%	+29.7%	-70.4%	-64.2%	+40.8%	+61.2%
Southbound (U.S. Exports)										
1995	$42.224B	29.285M	$35.503B	19.524M	$4.694B	9.451M	$.001B	.010M	$2.026B	.299M
1996	51.753B	27.941M	44.092B	20.805M	5.119B	6.811M	.002B	.022M	2.540B	.303M
% Change	+22.6%	-4.6%	+24.2%	+6.6%	+9.1%	-27.9%	+100%	+120%	+25.4%	+1.3%

Source: Barton-Aschman estimates based on BTS data.

As the issue of estimating freight weight has not been fully explored elsewhere in this report series, we elected to study the accuracy of using recent year value to weight ratios to forecast future tonnages based on value of trade forecasts. To examine this issue, we used the value to weight ratios (by mode) derived from the 1995 data set, and applied these ratios to the actual 1996 trade values by commodity. We then compared these weight "forecasts" to the actual weights reported by U.S. customs for imports. We also compared our estimates of 1996 export weight with our "forecasts" derived from our 1995 estimates.

Table 14.16 presents the results of our test for imports transported by truck. The "Road Value 96" and the "Actual Road Tonnage '96" are the 12-month summaries of BTS data. The "Estimated Road Tonnage '96" is our forecast based on 1995 value to weight ratios for each commodity for the truck mode. The outcome of this test, as measured by total borderwide freight moved by truck, is within 3.6 percent. This level of variance could easily be attributed to inflation.

For exports, our model was not quite as accurate. Table 14.17 presents the results of our test for exports transported by truck. The forecast value is within 16.3 percent of the actual observed tonnage. Most of the variance is attributable to one commodity tonnage estimation, Code 27, "Mineral Fuels, Mineral Oils and Products of their Distillation; Bituminous Substances; Mineral Waxes;" as without this error, the forecast would have been just six percent higher than actual.

Closer examination of Commodity Code 27 indicates that the import value to weight ratio (for trucks), upon which the export rate was based, increased from $91.30 per ton in 1995 to $152.77 per ton in 1996. While this did not present a statistical problem for imports by truck in 1996, as the tonnage was small, it did skew the overall export tonnage estimates since the export value, and corresponding tonnage, was very high. By using the lower 1995 value to weight ratio to forecast 1996 tonnage, we thus over predicted the observed result.

Table 14.16
1996 Trans-Surface Data—U.S. Imports from Mexico

Comm Code	Road Value '96	Actual Road Tonnage '96	Estimated Road Tonnage '96[1]
01	104,684,344	85,583	71,032
02	8,712,198	3,869	2,961
03	362,570,969	53,478	50,460
04	6,018,773	4,208	4,474
05	12,928,172	7,277	7,354
06	16,177,256	11,340	11,662
07	1,287,630,387	2,324,783	2,599,436
08	522,247,685	1,175,987	1,038,499
09	377,464,466	184,626	149,221
10	1,524,825	3,125	4,313
11	4,243,551	13,191	14,192
12	34,469,247	37,633	45,083
13	13,224,634	8,465	3,482
14	33,586,049	28,577	29,886
15	19,287,513	16,667	13,066
16	27,169,197	9,215	6,161
17	73,801,696	65,831	60,506
18	22,337,787	11,997	11,705
19	116,674,164	127,576	106,657
20	194,480,563	235,390	231,788
21	82,950,471	51,249	48,498
22	255,893,728	353,182	334,488
23	4,474,219	9,894	9,239
24	8,358,896	2,304	3,798
25	15,963,246	203,919	302,082
26	82,893,818	42,625	30,521
27	27,368,376	179,141	276,021
28	72,983,606	134,481	160,106
29	111,418,621	72,777	92,427
30	15,950,347	2,003	3,115
31	2,376,180	4,871	6,758
32	42,806,198	18,527	20,772
33	51,052,615	10,321	11,529
34	111,108,233	101,340	95,844
35	11,419,963	5,462	5,745
36	10,320,349	2,864	2,214
37	74,027,012	4,528	4,150
38	78,958,313	39,258	64,127
39	669,587,595	355,397	376,609
40	278,960,039	126,228	139,410
41	52,934,924	8,155	9,821
42	178,134,422	34,833	31,405
43	2,991,657	272	378
44	371,601,019	584,572	580,660
45	811,207	183	286
46	1,717,723	931	820
47	3,951,527	12,786	15,564
48	281,381,065	251,470	269,069
49	104,064,239	24,223	26,895
50	265,979	9	8
51	8,857,352	1,097	1,759
52	182,054,651	60,996	50,415
53	252,285	236	535
54	120,119,161	45,554	45,976
55	119,381,948	78,856	83,077
56	46,829,413	14,172	13,499
57	18,942,717	10,950	6,163
58	21,987,522	2,023	2,867
59	29,601,940	5,895	6,088
60	29,086,563	3,716	4,815
61	1,420,673,070	147,441	148,300
62	2,197,420,026	172,767	183,409
63	347,180,927	89,919	76,960
64	265,294,327	27,182	26,333
65	50,355,203	6,447	6,619
66	812,449	199	212
67	2,410,804	701	727
68	145,785,391	281,798	288,916
69	279,351,805	618,684	608,215
70	460,606,578	457,930	512,369
71	314,211,628	4,687	2,783
72	488,318,946	1,042,574	940,152
73	775,472,003	646,234	657,776
74	323,983,034	154,923	133,963
75	818,857	301	590
76	265,889,610	128,636	147,755
78	10,202,076	16,988	15,563
79	19,242,374	14,702	22,184
80	1,471,431	912	937
81	10,515,528	3,798	4,768
82	103,438,107	16,657	15,844
83	356,346,780	69,373	66,945
84	6,214,581,234	934,447	983,713
85	18,181,810,727	2,151,093	2,050,289
86	130,453,699	62,371	128,052
87	2,846,298,423	622,045	693,318
88	21,289,327	275	833
89	697,520	196	131
90	1,889,302,062	112,106	110,646
91	25,787,176	2,285	1,937
92	64,291,892	5,691	5,595
93	8,730,826	579	565
94	1,808,333,018	378,633	401,259
95	733,233,658	121,627	119,524
96	173,117,084	22,637	22,153
97	1,683,975	202	207
98	1,992,470,349	384,880	563,459
99	0	0	0
Total	48,754,954,539	15,972,041	16,542,489

[1] Based on 1995 Value to Weight Ratio

Source: Barton-Ashman Associates, Inc.

Table 14.17
1996 Trans-Surface Date—U.S. Exports to Mexico

Comm Code	Road Value '96	Actual Road Tonnage '96	Estimated Road Tonnage '96[1]
01	78,664,972	64,311	53,377
02	495,397,654	220,024	168,393
03	31,231,846	4,607	4,347
04	68,450,730	47,853	50,880
05	38,745,707	21,809	22,039
06	26,358,303	18,477	19,001
07	87,823,578	158,563	177,296
08	111,910,055	251,997	222,535
09	5,345,061	2,614	2,113
10	308,070,330	631,411	871,399
11	49,110,189	152,652	164,240
12	228,557,965	249,536	298,939
13	16,366,063	10,476	4,309
14	2,409,219	2,050	2,144
15	95,325,299	82,375	64,576
16	37,855,396	12,840	8,584
17	57,229,937	51,049	46,920
18	44,080,011	23,673	23,098
19	54,667,689	59,776	49,974
20	42,568,536	51,523	50,735
21	122,537,367	75,707	71,642
22	32,785,464	45,250	42,855
23	98,564,191	217,952	203,529
24	27,237,941	7,509	12,375
25	51,156,955	653,493	968,074
26	31,227,318	16,058	11,498
27	604,524,751	3,956,954	6,096,878
28	293,371,846	540,575	643,578
29	614,618,996	401,462	509,853
30	61,893,149	7,772	12,087
31	30,573,014	62,672	86,954
32	246,839,885	106,833	119,778
33	128,108,975	25,898	28,930
34	100,930,730	92,057	87,064
35	93,594,739	44,767	47,081
36	10,234,714	2,840	2,196
37	166,721,818	10,197	9,346
38	416,303,971	206,985	338,105
39	3,416,372,437	1,813,309	1,921,538
40	666,815,830	301,731	333,240
41	270,370,644	41,651	50,161
42	38,447,684	7,518	6,778
43	3,064,918	278	387
44	236,694,232	372,348	369,856
45	1,903,435	428	672
46	635,061	344	303
47	122,008,644	394,789	480,562
48	1,348,900,612	1,205,509	1,289,881
49	215,560,544	50,177	55,710
50	9,930,372	343	296
51	14,957,250	1,853	2,970
52	336,081,692	112,601	93,069
53	640,291	600	1,358
54	259,255,747	98,320	99,230
55	113,439,777	74,931	78,943
56	177,313,734	53,659	51,112
57	51,556,687	29,804	16,774
58	137,366,960	12,637	17,914
59	80,713,111	16,074	16,600
60	60,312,996	7,706	9,984
61	684,893,047	71,080	71,494
62	918,163,825	72,188	76,635
63	129,884,994	33,640	28,792
64	66,104,129	6,773	6,562
65	8,628,860	1,105	1,134
66	1,502,473	369	392
67	2,728,452	794	823
68	68,926,759	133,233	136,598
69	75,749,473	167,763	164,924
70	226,028,316	224,715	251,429
71	59,581,017	889	528
72	613,114,788	1,309,016	1,180,419
73	1,568,189,071	1,306,840	1,330,179
74	349,618,587	167,181	144,563
75	11,128,412	4,093	8,020
76	694,045,267	335,776	385,681
78	14,956,228	24,905	22,816
79	13,593,792	10,386	15,672
80	16,692,276	10,341	10,628
81	13,392,088	4,837	6,072
82	160,828,149	25,899	24,634
83	400,799,952	78,027	75,296
84	6,259,702,233	941,232	990,855
85	12,644,489,063	1,495,972	1,425,868
86	32,544,294	15,560	31,945
87	3,878,549,201	847,638	944,760
88	37,853,692	489	1,480
89	7,622,291	2,146	1,434
90	1,202,381,513	71,346	70,417
91	33,531,483	2,971	2,519
92	21,201,348	1,877	1,845
93	4,796,894	318	310
94	671,127,528	140,522	148,919
95	247,081,249	40,985	40,277
96	120,349,184	15,737	15,401
97	5,896,621	707	726
98	252,388,674	48,753	71,374
Total	44,091,802,245	20,805,312	24,185,482

[1] Based on 1995 Value to Weight Ratio

Source: Barton-Aschman Associates, Inc.

14.5.2 Estimating Freight Weight Passing Through Customs Districts and Ports of Entry

The U.S. Bureau of the Census is greatly concerned about protecting the confidentiality of its sources of data. As a result, the BTS data matrices are separated so that commodity-by-mode information is not linked to a specific geographic border crossing or customs district. This limitation is discussed at length in the Task 8 report and summarized in Table 8.3.

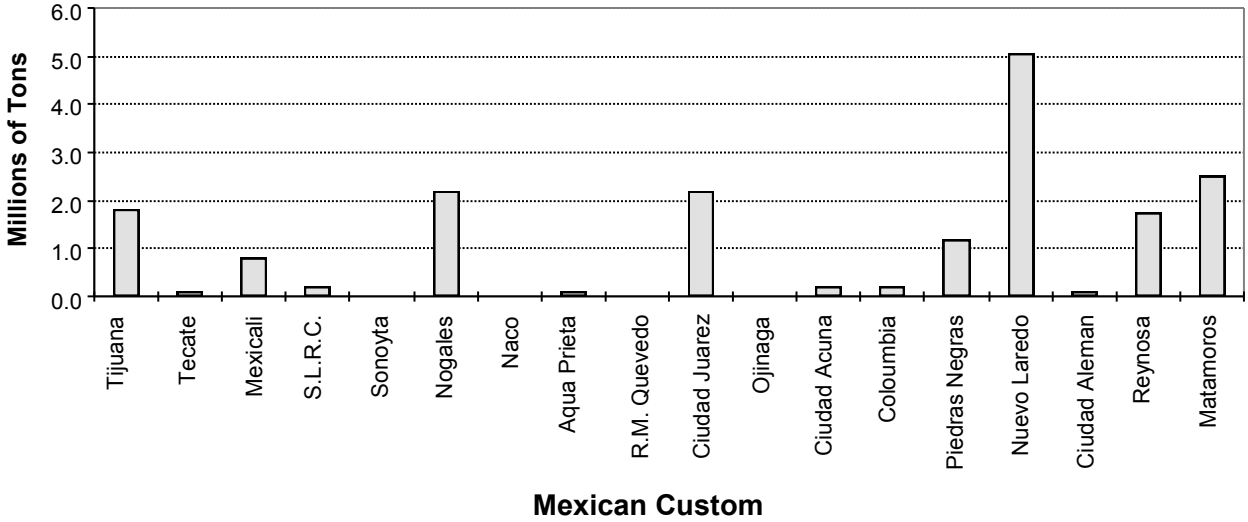
To a certain extent, this limitation could be overcome by simulating a transportation network of roads and rail lines (such as exists in GIS form already); building an origin destination matrix of U.S. State to Mexico State freight flows, and assigning the freight flows to the transportation network using various impedance factors and assumptions. Such a modeling exercise is relatively straight forward and should be undertaken in the future for the benefit of statewide goods movement planners. The Transborder Surface Transportation Data could then be combined with the periodic Commodity Flow Survey information to provide a more comprehensive picture of interstate freight movement within the U.S. and to and from its NAFTA partners.

Absent this modeling exercise, one can split the borderwide freight flow information into customs district as was performed in Task 10. Chapter 10.4 of that report and the *Task 10.4 - Supplement: Estimates of 1995 Transborder Freight Weight* provide complete detail with respect to the Binational Study team's tabulation of cross border freight value and weight by commodity, mode, and by customs district. This distribution of freight traffic was based on the value of shipments by mode as reported in the U.S. Merchandise Import and Export data files, available for purchase from the U.S. Department of Commerce.

A finer disaggregation of freight weight, to the individual port of entry, is possible using Secretaria de Comercio y Formento Industrial (SECOFI) data. SECOFI maintains its Export and Import Histories by mode, value, Schedule B commodity, port of entry, and Mexican state of origin or destination. (See Table 8.3 in the Task 8 report.) The borderwide weights by commodity and mode could be distributed to the individual ports, proportional to value by mode, recognizing that accuracy would be reduced as the geographic level of detail became finer.

Mexican customs also supplies records of freight weight by shipment to SECOFI for tabulation, however there is no control or verification of the declared weights and the records are incomplete. In 1995, for example, only 33 percent of the export records supplied to SECOFI recorded weight data while 45 percent of the records did so. (See Section 8.2.4 of the Task 8 report.) Based on this information, La Empresa expanded the data to produce estimates of freight weight flows through the Mexican Customs Districts. Figure 8.12 of the Task 8 report is repeated here as Figure 14.2 to illustrate the results of this process. In the future, this Mexican Customs data may become more reliable and thus serve as an accurate means to determine freight tonnage flowing through individual ports of entry.

Figure 14.2 Northbound Freight Through the U.S.-Mexican Border by Mexican Customs District



Source: La Empresa estimates based on SECOFI data

14.5.3 Estimating Freight Volumes (Conveyances) Passing Through Customs Districts and Ports of Entry

Having estimates of freight tonnage flowing across the border is unquestionably more useful for transportation planning than having reported or estimated freight values alone. Freight weight, however, must ultimately be converted to the number of freight conveyances (truck trailers and railcars) and the number of equivalent single-axle loads for transportation network capacity planning.

Currently, there is a lack of reliable information on which to base calculations equating freight tonnage to the number of conveyances crossing the border. U.S. customs maintains records of northbound, commercial truck/trailers such as reported in Table 14.18. This table covers Fiscal Years 1994 through 1996 (October through September) and is thus not totally compatible with some other counts, also available through Customs. It does however record loaded versus empty conveyances. Table 3.5 on the other hand, reproduced here as Table 14.19, provides a record of total (loaded plus empty) northbound truck crossings. It paints a slightly different picture of truck crossing activity, perhaps due to its calendar year coverage.

A comparison of loaded trucks/trailers for Fiscal Year 1995 versus Fiscal Year 1996 from Table 14.18 indicates that the volume of loaded conveyances increased by 16.8 percent between these two years. Table 14.15 on the other hand, reported the tonnage carried by truck increased by only 0.2 percent between calendar year 1995 and 1996. For unknown reasons, the change of value transported by truck, reported as an increase of 14.4 percent, was more closely correlated to the increase in loaded truck conveyances. These comparisons suggest the need for a continued watch of these weight, count and value trends to reveal more trustworthy correspondence patterns.

Table 14.18 Northbound Commercial Truck Traffic at U.S.-Mexican Border Ports, Fiscal Year 1994-Fiscal Year 1996

	Fiscal Year 1994			Fiscal Year 1995			Fiscal Year 1996		
	Full	Empty	Total	Full	Empty	Total	Full	Empty	Total
San Ysidro-Tijuana	42	14	56	0	21	21	0	0	0
Otay Mesa-Mesa de Otay	148,627	182,418	331,045	215,270	249,557	464,827	258,719	257,665	516,384
Tecate-Tecate	12,553	13,631	26,184	18,046	22,226	40,272	22,416	20,625	43,041
Calexico-Mexicali	134,140	112,165	246,305	60,078	88,721	148,799	72,822	91,547	164,369
Andrade-Los Algodones	911	2,472	3,383	1,022	2,790	3,812	1,140	2,948	4,088
San Luis-San Luis Rio Colorado	20,669	12,646	33,315	7,221	6,644	13,865	22,344	14,952	37,296
Lukeville-Sonoyta	190	575	765	237	1,113	1,350	267	578	845
Sasabe-Sasabe	630	507	1,137	172	589	761	583	589	1,172
Nogales-Nogales	120,117	63,856	183,973	141,304	60,038	201,342	154,259	53,503	207,762
Naco-Naco	2,523	1,239	3,762	3,094	1,053	4,147	3,431	1,677	5,108
Douglas-Agua Prieta	8,939	11,964	20,903	11,630	14,709	26,339	8,890	13,257	22,147
Columbus-Palomas	969	1,213	2,182	1,890	1,013	2,903	2,243	944	3,187
Santa Teresa-San Jeronimo	216	1,197	1,413	2,303	1,899	4,202	4,722	2,961	7,683
El Paso-Cd. Juarez	223,138	271,944	495,082	259,683	238,723	498,406	281,085	282,042	563,127
Fabens-Guadalupe Bravo	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Presidio-Ojinaga	2,185	2,467	4,652	3,384	1,732	5,116	2,331	1,040	3,371
Del Rio-Cd. Acuña	20,664	6,900	27,564	24,666	7,538	32,204	28,497	9,273	37,770
Eagle Pass-Piedras Negras	23,658	30,132	53,790	27,454	23,269	50,723	33,051	19,352	52,403
Laredo-Nuevo Laredo	331,216	318,152	649,368	402,902	303,275	706,177	502,824	355,468	858,292
Roma-Miguel Aleman	3,750	8,462	12,212	4,217	6,860	11,077	5,205	7,276	12,481
Rio Grande City-Cd. Camargo	4,796	7,783	12,579	5,021	6,549	11,570	7,211	3,058	10,269
Hidalgo-Reynosa	94,633	60,514	155,174	116,850	55,918	172,768	122,330	56,769	179,099
Progreso-Nuevo Progreso	8,697	14,018	22,715	9,067	13,711	22,778	8,298	13,710	22,008
Brownsville-Matamoros	78,828	131,305	210,133	101,062	107,184	208,246	111,438	111,719	223,157
Totals	1,242,091	1,255,574	2,497,665	1,416,573	1,215,132	2,631,705	1,654,106	1,320,953	2,975,059

n/a = not available

Source: U.S. Custom Service

Table 14.19
Northbound Commercial Vehicle (Truck) Volumes By Gateway

Port	1991	1992	1993	1994	1995	Total	%
El Paso-Ciudad Juarez	455,121	552,171	563,413	580,200	610,177	2,761,082	22.5%
Laredo-Nuevo Laredo	337,866	432,061	473,480	659,924	733,783	2,637,114	21.5
Otay Mesa-Mesa de Otay	312,752	374,141	384,615	428,086	477,390	1,976,984	16.1
Brownsville-Matamoros	182,715	203,116	224,147	264,345	233,615	1,107,938	9.0
Nogales–Nogales	167,388	154,845	185,107	187,423	203,298	898,061	7.3
Calexico-Mexicali	122,174	152,317	156,381	176,825	176,420	784,117	6.4
Hidalgo-Reynosa	115,576	129,354	147,492	158,405	174,049	724,876	5.9
Eagle Pass-Piedras Negras	36,060	41,868	45,318	55,046	54,779	233,071	1.9
Tecate–Tecate	49,625	41,833	36,710	34,674	41,064	203,906	1.7
San Luis-San Luis Rio Colorado	32,456	34,847	36,620	43,356	44,214	191,493	1.6
Del Rio-Ciudad Acuña	27,943	30,448	32,672	32,719	36,601	160,383	1.3
Douglas-Agua Prieta	18,744	26,113	18,300	47,522	38,242	148,921	1.2
Progreso-Nuevo Progreso	30,320	35,179	23,760	22,711	22,962	134,932	1.1
Rio Grande-Ciudad Camargo	9,009	11,639	15,649	15,665	14,936	66,898	0.5
Roma-Miguel Aleman	13,825	14,881	14,110	12,273	11,426	66,515	0.5
Naco–Naco	7,683	7,082	4,521	5,043	5,789	30,118	0.2
Presidio-Ojinaga	6,215	5,712	5,606	4,764	5,291	27,588	0.2
San Ysidro-Tijuana	24,138	88	0	0	0	24,226	0.2
Fabens-Guadalupe Bravo	7,208	8,587	3,199	700	269	19,963	0.2
Andrade-Los Algodones	2,042	1,577	1,420	3,114	3,818	11,971	0.1
Lukeville-Sonoyta	1,501	1,765	2,278	2,419	2,665	10,628	0.1
Santa Teresa-San Jeronimo	0	0	0	4,554	5,360	9,914	0.1
Columbus-Palomas	1,353	1,311	1,345	1,351	2,087	7,447	0.1
Sasabe–Sasabe	1,376	1,333	1,691	1,308	1,180	6,888	0.1
Total	1,965,081	2,264,260	2,379,827	2,744,421	2,901,410	12,245,034	100.0%

Source: U.S. Customs Service

No consistent counts are recorded of southbound truck crossings. The toll bridge operators in Texas do maintain individual facility counts of tolls collected by vehicle type, but no record is kept of loaded versus empty trailers. No such counts are maintained at land crossings where tolls are not collected; e.g., New Mexico, Arizona, and California.

Prior to 1995, Mexico's FNM railroad maintained counts of railcars and tonnage crossing the U.S.-Mexico border. Tables 2.12 through 2.15 and Tables 2.18 and 2.20 from the Task 2, "Inventory of Existing and Projected Binational Border (Mexican) Transportation Facilities," are reproduced below as Tables 14.20 through 14.24. One column of data has been added to three of these tables to indicate the average number of tons transported by each railcar. While the variation in tonnage rates is substantial, this information is nevertheless useful for corridor capacity planning.

Table 14.20
Mexico Imports: Number of Rail Cars (Southbound)

Place	1990	1991	1992	1993	1994
Northern Border	120,130	128,809	156,191	158,853	160,971
Mexicali	1,337	1,328	199	66	1,510
Nogales	5,648	7,608	9,016	8,090	5,516
Cd.. Juarez	9,896	11,549	16,913	19,975	18,898
Ojinaga	535	235	404	269	470
Piedras Negras	18,108	15,959	16,832	18,168	19,144
Nuevo Laredo	75,290	83,399	100,586	100,007	98,530
Matamoros	9,316	8,731	11,241	12,278	16,903

Source: E-6 1990-1994 FNM Information

Table 14.21
Mexico Imports: Rail Tons (Southbound)

Place	1990	1991	1992	1993	1994	1994 Tons/Car
Northern Border	7,429,185	7,888,699	9,899,523	10,419,323	11,078,164	68.8
Mexicali	71,129	68,006	10,637	3,593	77,592	51.4
Nogales	355,424	473,455	598,629	604,972	408,016	74.0
Cd.. Juarez	620,775	721,478	1,143,531	1,438,625	1,500,240	79.4
Ojinaga	35,134	18,543	26,622	20,611	40,461	86.1
Piedras Negras	1,066,356	808,174	909,676	883,353	1,012,359	52.9
Nuevo Laredo	4,675,320	5,205,593	6,411,092	6,609,643	6,716,762	68.2
Matamoros	605,047	593,450	799,336	858,526	1,322,734	78.3

Source: E-6 1990-1994 FNM Information

Table 14.22
Mexico Exports: Number of Rail Cars (Northbound)

Place	1990	1991	1992	1993	1994
Northern Border	45,894	49,375	49,769	72,774	66,203
Mexicali	3,061	0	950	792	504
Nogales	12,180	14,304	16,870	17,302	18,455
Cd.. Juarez	8,202	4,678	3,670	4,739	417
Ojinaga	4	0	0	0	0
Piedras Negras	1,390	10,395	8,969	14,055	13,476
Nuevo Laredo	18,988	18,643	17,340	33,261	26,891
Matamoros	2,069	1,355	1,970	2,625	2,460

Source: E-6 1990-1994 FNM Information

Table 14.23
Mexico Exports: Rail Tons (Northbound)

Place	1990	1991	1992	1993	1994	1994 Tons/Car
Northern Border	2,373,831	1,914,082	1,884,514	2,686,903	2,428,423	36.7
Mexicali	136,090	0	38,057	30,433	24,831	49.3
Nogales	479,212	485,628	574,007	612,689	548,745	29.7
Cd.. Juarez	521,406	279,849	198,974	286,464	256,203	61.4
Ojinaga	309	0	0	0	0	-
Piedras Negras	378,555	394,985	342,508	547,394	537,626	39.9
Nuevo Laredo	716,694	667,400	603,091	1,082,879	891,151	33.1
Matamoros	141,565	86,220	127,877	127,044	169,867	69.1

Source: E-6 1990-1994 FNM Information

Table 14.24
Train Units Driven Across the Border (January through March 1996)

Border	Type of Train	# of Trains	Product	Tons/Train	Cars/Train	Tons/Car
Nuevo Laredo	Unit	3/day	Automotive	3,300	47	70.2
	Unit	2/wk	Intermodal	2,470	47	52.6
	Express	2/day	Various	3,450	80	43.1
Nogales	Unit	4/wk	Automotive	2,000	30	66.7
	Unit	2/wk	Cement	4,217	39	108.1
	Unit	2/wk	Vegetables	1,417	46	30.8
Piedras Negras	Unit	2/wk	Automotive	2,870	51	56.3
	Unit	2/wk	Intermodal	2,938	62	47.4

Source: FNM Information

The U.S. Customs Service also maintains counts of northbound rail cars as both loaded and empty conveyances. Table 14.25 reports these U.S. Custom Service tallies for Fiscal Year 1994 through Fiscal Year 1996 by port-of-entry. As these are fiscal year totals, they differ from the calendar year counts recorded by FNM for 1994, as reported in Table 14.22.

Table 14.25
Northbound Commercial Rail Traffic (Cars) at U.S.-Mexican Border Ports Fiscal Year 1994-Fiscal Year 1996

	Fiscal Year 1994		Fiscal Year 1995		Fiscal Year 1996	
U.S. Port	Full	Empty	Full	Empty	Full	Empty
San Ysidro,CA	1,063	936	182	1,610	6	3,087
Calexico, CA	855	5,257	888	3,594	1,325	4,927
Nogales, AZ	12,085	9,110	13,901	7,229	14,014	10,888
El Paso, TX	6,074	16,292	8,507	13,121	7,583	12,409
Presidio, TX	77	474	438	456	832	986
Eagle Pass, TX	23,190	10,494	27,773	10,812	37,911	23,564
Laredo, TX	31,240	74,585	41,778	68,013	70,098	47,829
Brownsville, TX	7,761	17,508	8,075	18,771	11,685	38,177
Totals	82,345	134,656	101,542	123,606	143,454	141,867

Source: U.S. Customs Service

A comparison of loaded rail cars for Fiscal Year 1995 versus Fiscal Year 1996 indicates an increase of 41.3 percent between these two years. A look back at Table 14.15 reveals an increase in northbound rail tonnage of 29.7 percent between calendar year 1995 and 1996, indicating at least some positive correlation between car counts and tonnage moved. The comparison of rail value transported, between 1995 and 1996, shows an even stronger correlation, a 36.5 percent increase, again for unknown reasons, at this gross level of examination.

For the purpose of calculating roadway consumption costs in Task 10, the Binational Study Team examined the weight distribution of loaded trucks crossing the border at Laredo-Nuevo Laredo as measured by the University of Texas at Austin, Center for Transportation Research. Based on the distribution of gross vehicle weights reported in Figure 10.7, we computed the average payload to be 12 tons for 5-axle trucks involved in binational trade.

We checked this calculation by dividing the total import tonnage transported by trucks for 1995 (15,940,993 tons) by 12 tons to yield 1,328,416 equivalent 5-axle trucks. We took the count of full truck/trailers for Fiscal Year 1995 from Table 14.18 (1,416,573) and multiplied this figure by the percentage of large 4, 5, and 6-axle trucks observed at Laredo (90.4 percent), assuming that the two and three-axle trucks were involved in local transportation. The resulting estimate of full-size northbound truck crossings was 1,280,582 which we considered to be close enough to the 1,328,415 estimate derived from assuming a 12-ton average payload.

The Center for Transportation Research has since done follow up weight-in-motion studies at Laredo and El Paso. The results of these studies indicate that the ESAL factor for 5-axle trucks has increased over time at Laredo; or that the measurement techniques and calculation of ESALS has been improved. The original research effort was based on data collected over a relatively short time frame, from June 6, 1994 to July 15, 1994.[6] It reported an ESAL factor of 0.89 for northbound 5-axle loaded trucks crossing the border. A second, follow up research effort captured data over a seven month period from August 1994 through February 1995. This study found ESAL factors to be in the 0.95 to 1.15 range, with 1.03 as the average for the data reported.[7] A subsequent and third data collection effort collected data from March 1996 through June 1996 and found the Laredo 5-axle trucks averaging an ESAL factor of 1.20.[8]

Data collected from El Paso found a more constant pattern of loads, with an average ESAL factor of 1.54 for northbound 5-axle trucks, and an average ESAL factor of 1.51 for southbound 5-axle trucks. This data was collected over a lengthy period of time, from August 1994 to June 1996.[9]

While direct measurement of vehicle weights crossing the border is direct and reliable, it only produces average payload information (or ESAL factors) which cannot be correlated to the type of commodities being transported. While this may not be a fatal flaw, other approaches to calculating volumes are available.

During the 1994 to 1996 time frame, the California Department of Transportation undertook an ambitious project to create an Intermodal Transportation Management System. The *Basic Documentation* for this project makes the following reference to a table of shipment densities used to convert tons to trailer and railcar equivalents.[10]

> "The California Freight Traffic Data Base has been processed to convert tons by commodity to 40-foot container equivalents (FCE) for use as a shipment unit measure of activity. A table of shipment densities by commodity is employed in the process. Because of their density, many commodities reach payload maximum before the interior cubic feet of capacity becomes an issue. This maximum density is calculated and used in the processing. The maximum payload used is 22 tons per container. For the remaining light-density commodities, the process divides the usable cubic feet of the trailer by the density to determine tons per container. These

[6] Joseph Leidy, et al, center for Transportation Research, "Measurement and Analysis of Traffic Loads Across the Texas-Mexico Border, March 1995, pg. 48.

[7] Luis Sanchez-Ruiz, et al, Center for Transportation Reaseach, "Heavy Vehicle Characteristics at the Laredo and El Paso Ports of Entry," October 1996, pg. 39.

[8] Derrick King, et al, Center for Transportation Research, "Truck Traffic Characteristics at the Laredo and El Paso, Texas-Mexico Border," February 1997, pg. 60.

[9] Ibid, pg. 60.

[10] California Intermodal Transportation Management System (ITMS), *Basic Documentation,* April 6, 1996, by Booz•Allen & Hamilton, et al., pg. 4-31.

in turn can be divided into the total tons moved to provide an estimate of FCEs moved."

The actual "Equipment/Payload matrix" employed is organized by truck and rail average payloads for various Standard Transportation Commodity Classifications (STCC) for which a bridge table is needed to compress this detailed commodity schedule to the 98 commodity classes of Schedule B.

An example page of the Equipment/Payload Matrix is displayed as Figure 14.3. A full copy of this matrix has been supplied to the state and federal sponsors of the Binational study for subsequent refinement of the methodologies described above, should that be desired.

14.5.4 Cost of Flow Through Trade

Section 10.4.9 of the Task 10 report makes reference to an ESAL-mile cost of $0.15 developed by the center for Transportation Research and reported in a document entitled "Texas Cost Allocation Analysis for Trucks Engaged in U.S./Mexico Truck Trade."[11] This unit cost was derived by CTR based on 1993 TxDot expenditures for highways and the findings of the 1994 *Texas Highway Cost Allocation Study* that was conducted by the Texas Transportation Institute. Using this cost data, CTR converted the average equivalent single axle load for the 5 axle combination truck group to a cost per ESAL-mile. The procedure used to calculate the resulting value of $0.15/ESAL-mile is shown in a worksheet, reproduced here as Figure 14.4.

Use of a Texas based unit cost was deemed to be representative for this investigation as almost 74 percent of the binational trade transported by truck (when measured by weight), crossed the Texas border with Mexico in 1995.

The mileage associated with the flow through trade was based on engineering judgment and some prior research by Shiner et al.[12] and McCray.[13] The depth and scope of this analysis was limited; however the accuracy of these mileage assumptions could be improved with additional research.

[11] Mark Euritt, Center for Transportation Research, published as study four of "Impacts of Bigger Trucks on Texas," by Ray Barnhart & Associates, December 1995.

[12] *Trade Flows and Transportation: U.S. (Texas)-Mexico Border,* Appendix B, Office of the Governor, by Shiner, Moseley & Associates, Summer 1993.

[13] "Impact of NAFTA Truck Trade on the U.S. and Texas Highway Systems," by John P. McCray, University of Texas at San Antonio, July, 1996, published as the Appendix of *Transportation Issues and the U.S.-Mexico Free Trade Agreement*, Center of Transportation Research, university of Texas of Austin, February 1997.

Figure 14.3
Equipment/Payload Matrix-Truck

STCC	Commodity	%
	DRY VAN TRAILER LIGHT-5.00 tons.	
		94
842	BARKS OR GUMS, CRUDE	100
2399	MISC FABRICATED TEXTILE PRODUCTS	100
2441	WOODEN CONTAINERS OR BOX SHOOKS	100
2511	BENCHES, CHAIRS, STOOLS	100
2513	SOFAS, COUCHES, ETC	100
2515	BEDSPRINGS OR MATTRESSES	100
2517	CABINETS OR CASES	100
2518	CHILDRENS FURNITURE	100
2519	HOUSEHOLD OR OFFICE FURN, NEC	100
2531	PUBLIC BUILDING OR RELATED FURNITURE	100
2599	FURNITURE OR FIXTURES, NEC	100
2643	PAPER BAGS	100
3071	MISC PLASTIC PRODUCTS	91
3631	HOUSEHOLD COOKING EQUIPMENT	100
3632	HOUSEHOLD REFRIGERATORS	100
3633	HOUSEHOLD LAUNDRY EQUIPMENT	100
3639	MISC HOUSEHOLD APPLIANCES	100
3651	RADIO OR TV RECEIVING SETS	100
3831	OPTICAL INSTRUMENTS OR LENSES	100
3841	SURGICAL OR MEDICAL INSTRUMENTS	100
3842	ORTHOPEDIC OR PROSTHETIC SUPPLIES	100
3941	GAMES OR TOYS	100
3943	CHILDRENS VEHICLES OR PARTS, NEC	100
4211	NON REVENUE CONTAINERS RETURNED EMPTY	46
4221	SEMI-TRAILERS RETURNED EMPTY	80
4231	REVENUE MOVES OF EMPTY EQUIPMENT	70
	DRY VAN TRAILER MEDIUM LIGHT-10.00 tons	
112	COTTONS, RAW	97
2052	BISCUITS, CRACKERS OR PRETZELS	34
2291	FELT GOODS	100
2293	PADDINGS, UPHOLSTERY FILL, ETC	100
2392	TEXTILE HOUSE FURNISHINGS	100
2394	CANVAS PRODUCTS	100
2433	PREFAB WOOD BUILDINGS	96
2434	KITCHEN CABINETS, WOOD	100
2516	BEDS, DRESSERS, CHESTS, ETC	100
2541	WOOD LOCKERS, PARTITIONS, ETC	100
2542	METAL LOCKERS, PARTITIONS, ETC	100
2591	VENETIAN BLINDS, SHADES, ETC	100
2646	PRESSED OR MOLDED PULP GOODS	29
2647	SANITARY PAPER PRODUCTS	100

Source: Reebie Associates

Figure 14.4
Worksheet 1
Estimating Costs/ESAL-Mile from the Texas HCA Study

	5 Axle Combinations	Source
1993 Avg. ESAL	.84	a
Number of Trucks	110,789	b
Avg. Miles/Truck	64,419	c
% Cost Responsibility	31.47%	b
Costs	$927,065,918	d
Cost per Truck	$8,368	e
Cost per Truck Mile	$0.13	f
Cost per Truck ESAL- Mile	$0.15	g

Source: Center for Transportation Research, "Texas Cost Allocation Analysis for Trucks Engaged in U.S./Mexico Truck Trade".

a-Zane Goff, Texas Transportation Institute, Output from Texas HCA Study, 9/27/95 fax.

b-Mark Euritt, C. Michael Walton, Zane Goff, Dock Burke, "Texas Highway Cost Allocation Analysis, and Estimates, 1993-1995," Center for Transportation Research Report 1919-3F/1910-4F, November 1994.

c-Mark Euritt, "1993-94 HCA Study: Data Output for 1919-3 Report"

d-Calculated from "% of Cost Responsibility" and "1993 TxDOT Expenditures" table (below).

e-equals "Costs divided by "Number of Trucks."

f-equals "Cost per Truck" divided by "Avg. Miles/Truck."

g-equals "Cost per Truck Mile" divided by "1993 Avg. ESAL."

1993 TxDOT Expenditures Estimate

	Total State	Turnpike Authority	1993 TxDOT
Capitol Outlay	$1,978,812,000	$33,592,000	$1,945,220,000
Maintenance	$674,529,000	$10,726,000	$663,803,000
Administration	$341,505,000	$4,656,000	$336,849,000
Debt Fin.	$174,382,000	$174,382,000	$0
TOTAL	$3,169,228,000	$223,356,000	$2,945,872,000

Source: Federal Highway Administration, 1993.

McCray reports that for his work, 1994 "Data from the U.S. Department of Commerce were used to estimate the total exports and imports moving between the U.S. and Mexico. McCray Research has developed a proprietary procedure to estimate the dollar value and weight of trade shipments by mode of transportation, including a rail/truck percentage for land-transported goods. The database within this program includes shipments, by equivalent full rail car and full truck, from the U.S. state of origin to the border port, as well as from the border port to the destination, in more than 40 different commodity group classifications. The values in the database are derived from an analysis of statistics obtained from the United Nations (UN), the Organization for Economic Development and Cooperation (OECD.), Statistics Canada, U.S. Department of Commerce, U.S. Department of transportation, Mexican federal agencies, and from U.S. and Mexican border cities."[14]

McCray in turn used his procedure to create an illustration for his paper depicting 1994 dominant U.S.-Mexico highway trade corridors, reproduced here as Figure 14.5. The more recent data releases available through the Bureau of Transportation Statistics (BTS) have improved the accuracy of the data records and may have made reliance upon proprietary procedures unnecessary.

As reported in Section 14.3 of this report, BTS reports U.S. state-by-state export and import data by mode, by Schedule B commodity for shipments between the U.S., Mexico, and Canada. Import data includes value and weight information from Mexico as a whole. Export data includes value information and Mexico State of destination. This information may be downloaded from the Internet, free of charge. Import weight data has been reported since April, 1995 while most of the other data has been available since April , 1993. Missing geographic level of detail can be estimated, proportional to value by commodity and mode, based on the U.S. Exports of Merchandise and Imports date files, available on CD.-ROM for purchase from the Bureau of the Census, Foreign Trade Division. Origin to destination matrices can thus be created, by mode and commodity, and assigned to the transportation network using conventional, transportation modeling software. At least one software developer, INRO Consultants, Inc. Of Montreal, Canada,[15] markets a modeling software product (STAN) specifically tailored for the strategic planning of freight transportation. The transportation network representation can be acquired from the "National Transportation Atlas Databases," available on CD.-ROM from BTS, with updates published annually.[16]

Before proceeding down this investigative path, however, the researcher is cautioned that the underlying data upon which the analysis is based has shortcomings. The UCLA North American Integration and Development Center (NAID Center) reports the following assessment of the quality of trade data insofar as detailed analysis of freight flows.

> "The NAID Center is particularly interested in the dynamic effect of trade on regional economic development. Unfortunately, it is in this arena that the available data is the weakest, leaving the analyst dependent on case study observations. The weaknesses apply to both measuring the effect of competing imports on local manufacture and to evaluating the comparative export capabilities of local firms."
>
> "An import tracking system which could capture the effects of regionally competing imports would be extensive, most likely prohibitively expensive. It's difficult to imagine a tracking

[14] Ibid, pg.25.

[15] INRO Consultants Inc, 5160 Decarie Boulevard, Suite 610, Montreal, Canada H3X21-19; telephone: (514) 369-2023; e-mail: sales@inro.ca

[16] Bureau of Transportation Statistics, telephone: (202) 366-DATA, e-mail at: ntad@bts.gov.

system which could follow an imported good from its port of entry to its eventual consumption through the many articulations of the U.S. distribution system. The increased paperwork for U.S. wholesalers and retailers would be substantial, almost certainly adding something more than negligible to the cost of the good itself. Consequently, the only data available to develop an analysis of regional import impacts is port of entry and aggregate national data by HTS classification. Given the sophistication and complexity of the U.S. transportation system, port of entry data probably tell us very little about the final destination of an import. As a consequence, we almost never know with absolute certainty where in the United States a good captured in reliable quantitative data is consumed. Moreover, it's unlikely we ever will understand in detail the distribution of import consumption in the United States."

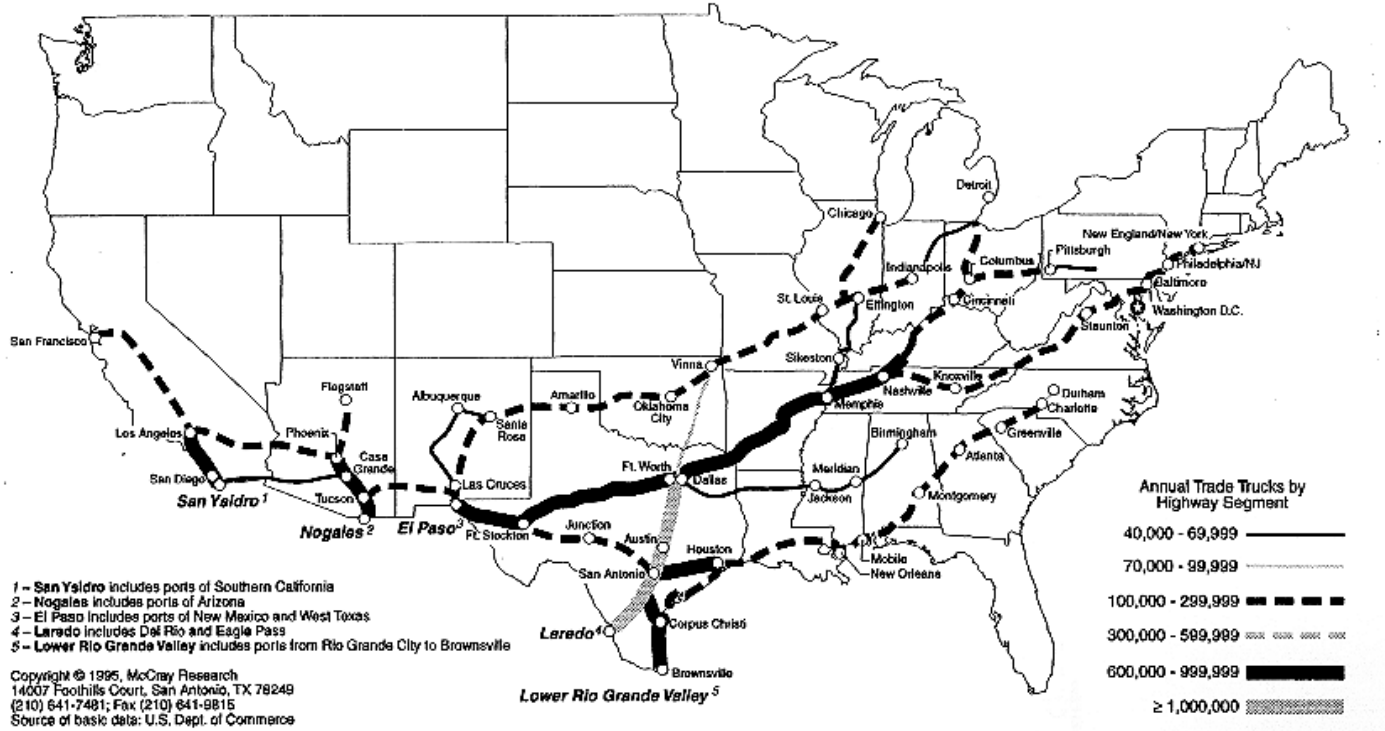
"On the export side, the problems are even more severe. **The major problem with inter-regional comparisons of export prowess is that no one in the U.S. government collects reliable data on the regional location of the manufacturer of good leaving the United States.** The data widely but improperly used to analyze regional export capacity is currently drawn from the zip code portion of Item No. 1a on the Shipper's Export Declaration or SED (U.S. Customs Form 7525V). This information, however, merely locates **the party responsible for exporting the product**. This may be the manufacturer, but in many cases can be a downstream distributor of the product or even a shipping agent or broker. Thus, the **Export Locator Series** in the wrong hands can provide a false sense of regional export prowess by confusing distribution and production."

"Another Census data series often used to discuss exports, the **Origin of Movement Series**, is an even worse indicator of manufacturing site, although it is also sometimes used to discuss regional manufacturing capacities. This data, drawn from Item No. 6 on the SED, identifies nothing more than the two-digit state zip code of the physical location of the product as it begins its last direct move to the border. This often means nothing more than the location of the warehouse where the product sat before it was loaded on the truck that actually took it to the border. These data are collected and published only at the state level. So they can't be used as an indicator for sub-state regional export manufacturing capacity. Even at the state level they tell us nothing about manufacturing. All we know from that series is that $U.S. 7.05 billion in 1992 and $U.S. 6.84 billion of merchandise in 1993 made its last stop on the way to the border somewhere in California. These data have no research purpose that we can see."[17]

The entire appendix of this referenced document is well worth reading as it addresses the complexities and inter-relationships of U.S. and Asian suppliers to producers on the Mexican export platform.

[17] UCLA North American Integration and Development Center: "North American Integration Three Years After NAFTA: A Framework for Tracking, Modeling and Internet Accessing the National and Regional Labor Market Impacts," by Raul Hinojosa Ojeda et. al., December 1996. Appendix 3: U.S. Trade Data for an Analysis of Binational Integration in the Southern California/Baja California Region, pgs. 6, 7 and 9. [http://naid.sppsr.ucla.edu/NAFTA96/]

Figure 14.5 1994 Dominant U.S.—Mexico Highway Trade Corridors



Figu

Source: Exports from Manufacturing Establishments: 1990 and 1991, U.S. Department of Commerce, 1994.

14.5.5 External Social Costs

The analysis contained Section 10.4.12 of Report 10 relies on an extensive research investigation undertaken by The Transportation Research Board's Committee for Study of Public Policy for Surface Freight Transportation. This TRB Special Report 246[18] should be referenced for a detailed review of assumptions and technical considerations. The unit costs used in the Binational Study and reported in Table 10.33 are directly taken from the text, or derived from an analysis of the report's case studies.

[18] *Paying Our Way: Estimating Marginal Social Costs of Freight Transportation, Special Report 246,* Transportation Research Board, 1996

14.6

General Methodology—Mexico

14.6.1 Sources of Information

Sources of information on the performance of both the national domestic economy and the economy of border state economies can be grouped in six categories:

a) National industrial Census Reports

The two latest Industrial Census Reports[19] published by the National Institute offor Statistics, Geography, and Information Data Processing (INEGI, for its acronym in Spanish) were one source used in the economic analyses. These census reports break down information by activity sector, both at national level and by individual federal agencies, for the Binational Study as follows:

1. Gross Output Value
2. Total Inputs
3. Gross Added Value
4. Remunerations (payroll)
5. Employed personnel (annual average)

However, these gross data need to be processed and cross-referenced with other information sources, because of the following shortcomings:

- Census-related statistics do not include the maquiladora industry, whose macroeconomic indicators are published in other specialized publications;
- There is information only from two census years for each five-year period, with units expressed in current pesos, even though there was a change inof valuationdenomination of in the national currency in 1993;
- There are no census values expressed in constant pesos and ; in addition, there are no growthevolution rates in physical volume, therefore,and for this reason the significant inflation that accrued in the 1988-1993 period distorts results;
- None of the aforementioned indicators is directly related to foreign trade; in other words, Census reports do not include data on the proportion of the Gross Output Value corresponding to exports, or as well as the proportion of inputs imported by field of activity sector and federal agency.

This basic information was compared to import and export statistics, in order to evaluate the impact of foreign trade both on the Gross Output Value and Inputs, Gross Added Value, and Direct Employment. This information was broken down for each one of the six border states and the rest of the country.

b) System of National Accounts

The System of National Accounts (SCN, for its acronym in Spanish) includes the same economic indicators as the Industrial Census, broken down by activity sector until 1995. Furthermore, it

[19] 13th Industrial Census, INEGI, 1989 with data in 1988 current pesos.

14th Industrial Census, INEGI, 1994 with data in 1993 current pesos.

includes assessments in 1980 constant pesos and implicit growth~~evolution~~ rates in physical volume.

As in the previous case, data available could not be used directly for the following reasons:

- The number of sectors and subsectors ~~is~~are different than that used by the Industrial Census; they are~~it is~~ the same as the United Nations (UN) universal nomenclature which, in turn, is somewhat different from the American standard industrial classification (SIC) nomenclature;
- The information furnished is nationwide and~~; hence,~~ there is no break-down by federal agencies as is~~which was~~ the case in the census report;
- Estimates in 1980 constant pesos are not very useful; INEGI's latest publications (in particular those on the maquiladora industry) are in 1993 constant pesos, as this was the first year when maquiladora imports and exports were included in the general statistical reports of Mexican foreign trade published by BANXICO, BANCOMEXT, and SECOFI.

A correlation was established between the Industrial ~~c~~Census ~~data~~ and ~~data from the~~ System of National Accounts (SCN) data~~,~~ in order to complement the 1988 and 1993 Census information with the SCN data reported for the years 1990-1995. Likewise, the 1980 constant-peso basis was converted into 1993 constant pesos for all the years in the 1988-1995 SCN historical series, so as to obtain results consistent with those of the maquiladora industry and INEGI's most recent publications on economic activity and Mexican foreign trade.

~~However, n~~Numerous discrepancies were detected in the totals~~amounts~~ by activity sector in ~~the years~~ 1988 and 1989~~, based on~~ when comparing the SCN data and the 1989 Industrial Census~~,~~ which may be as a result of insufficient thoroughness in data collection for the census. ~~Given that the~~It was desirable to use the SCN statistics since they include the total number of listed companies.~~,~~ However, only the 1990-1995 SCN historical series ~~was kept, whose~~were used because the values for 1993 were ~~are~~ consistent with that year's Industrial Census.

c) ~~Statistics on the~~ Maquiladora Industry Statistics

This is the most complete information available on Mexican foreign trade. In addition to periodical publications on the overall performance of the maquiladora industry~~-~~[20], INEGI publishes, on a monthly basis, a Notebook of Timely Information on the activity of this industry, as well as a Statistical Yearbook breaking down the annual maquiladora activity between border and non-border municipalities.

As in the case of the other data~~However~~, this information also requires some additional~~type of~~ processing, as:

- Data for the~~by~~ border municipalities~~y~~ are totals for all activity sectors~~global, that is, they do no~~ providing~~e~~ no ~~the~~ break-down by activity sector~~s~~ which is included in other publications ~~of~~by the same Institute;
- Data by activity sector is not broken down by ~~encompass the overall group of~~ border and nonborder municipalities; this information is ~~thus~~ reported to determine the relative weight of the maquiladora industry at national level, but cannot be used to directly ascertain its economic impact on individual~~every~~ border municipalities~~y~~ or states;
- Information by activity sectors is aggregated~~divided~~ into nine groups even though~~, while~~ there are 26 industrial sectors involved in maquila manufacturing; hence, the difficulty of

[20] INEGI's latest publication covers the 1988-1995 period including data by production sector, inputs, added value, wages, employment, and productivity of the maquiladora industry.

comparing data by activity sector with ~~for~~ the 1988-1995 ~~period published by the~~ System of National Accounts data.

For purposes of this Study, national level data~~information~~ by activity sector ~~was used,~~ and aggregate data by municipality were used~~kept~~, ~~in order~~ to consolidate information by border state based on the summation of data by municipality. Likewise, part of the aggregate statistical series from the municipalities making up the six case-study POE's were also included.

d) ~~Basic Statistics by~~ State Level Statistics

Basic statistics published by the states of Baja California, Chihuahua and Nuevo Leon were available. For the other states, reference information is the same as that published by INEGI including the ~~; in other words,~~ statistical series submitted ~~end~~ in 1993 for Economic Census reports~~,~~ and the~~in~~ 1995 ~~for~~ population counts. These basic statistics describe the sociodemographic situation in each state, as well as general information about economic activity and employment~~economically active population~~. However, only the state of Baja California provides complete statistics on statewide foreign trade including a break~~ing~~ down of the maquiladora industry activity.

A decision was made to not use these sources of information, since the base~~as they provide~~ data are from the original sources listed above -- ~~at~~ the System of National Accounts, the Census, and the five-year population and housing counts conducted by INEGI.

e) Municipal ~~s~~Statistical ~~n~~Notebooks

These municipal notebooks have been published since 1993. They include detailed information on five border municipalities, four of which are included in the case studies: Tijuana, Mexicali, Cd. Juarez, Piedras Negras, and Matamoros. There is no updated information for~~on~~ the municipalities of Nuevo Laredo and Nogales, whose publications are ~~is~~ still under review at INEGI.

Among the numerous statistical data included in these publications~~,~~ the most valuable information are: ~~is~~ the number of jobs per sector, and ~~as it allows~~ the estimated number of jobs generated by foreign trade activity, ~~to be inferred, as well as by~~ transportation, business, and urban services sectors.

f) ~~Research conducted by the~~ Colegio de la Frontera Norte Research

Research conducted by the Colegio de la Frontera Norte (COLEF) includes data on ~~among other areas use of the~~ land use, demography and migration patterns, and the socioeconomic impact of the maquiladora industry. Within the framework of the~~is~~ Study, all information on urban employment generated by ~~this industry~~foreign trade in each ~~one~~ of the case-study POE's was estimated from COLEF data. ~~processed,~~These estimates includ~~ed~~ed~~ing its~~ three components of ~~direct~~ employment:~~,~~ direct, indirect ~~employment~~ (suppliers), and secondary employment (jobs induced by the maquiladora industry and its suppliers in the business and urban services sectors.) To this end, the methodology used by COLEF for the 1987-1989 period was extended to the more recent 1993-1995 period.

Nevertheless, the methodology used by COLEF seems too general since~~extensive, as~~ it mixes the impact of direct and indirect employment generated by the production and intermediate consumption of the maquiladora industry with the impact of employment on urban services induced by family expenses of maquiladora industry workers and suppliers. For purposes of this Study, it was decided to leave out urban employment and include a classical analysis of direct and indirect employment (impact of direct suppliers), in order not to introduce distortions in the comparison with US data.

Moreover, COLEF does not provide the same type of information on employment generated by the traditional manufacturing industry in border municipalities. This led to the development of a specific line of research by border agencies, without reaching the level of detail of each border municipality as in the case of the maquiladora industry.

14.7
Detailed Methodology Used in the Study—Mexico

Several methodologies were developed for economic data analysis~~processing~~, measurement of foreign trade impact in terms of employment, and logistical costs at the border. These methodologies were applied to perform two categories of evaluation:

1. economic data by activity sector (maquiladora and traditional), and
2. estimates of the impact of binational trade on employment.

~~*a)Economic data processing by sector*~~

Two types of methodologies were used – one for the maquiladora industry and another ~~one~~ for the traditional manufacturing industry.

In terms of estimating the impact on employment of Binational trade, four different procedures were utilized:

- COLEF's methodology (UEB Model) for the maquiladora industry
- Propensity-to-export method for other primary and secondary activity sectors
- Input-Output matrices for the same sectors
- Technical ratio matrix for indirect employment

The following sections describe these methodologies.

14.7.1 Maquiladora Industry

In this case, all direct and indirect employment generated is related~~refers~~ to foreign trade, and almost all~~the totality~~ of these jobs are related to Mexico-U.S. binational trade, since Mexico does not yet have large-scale maquila trade with ~~third~~ countries other than the United States.

Annual information from INEGI's statistical yearbooks (1988-1995) and data from the System of National Accounts for the same period were used to break down ~~activities in~~ the maquiladora industry by activity sector ~~in~~for border and non-border municipalities.

The following economic indicators were available~~detected~~:

- Gross Output Value
- Intermediate Consumption (domestic, imported, and total)
- Gross Added Value
- Total ~~r~~Remuneration (payroll)
- Employed ~~p~~Personnel (annual average)

These indicators were selected given their consistency with economic data by activity sector as published by the two recent~~aforementioned~~ Industrial Census Reports.

Using this data, ~~Likewise,~~ a series of ~~unit or percent~~ ratios ~~was~~were prepared:

- Gross Output Value/Employee
- Gross Added Value/Employee
- Gross Added Value/Gross Output Value
- Remuneration/Employee

- Imported l~~i~~nputs/Total ~~i~~Inputs
- Exports/Gross Output Value

The first two ratios measure productivity in the maquiladora industry. The third ratio measures the Gross Domestic Product (GDP) of this industry as a proportion of its Gross Output Value (GOV), that is, a measurement of the maquiladora sector's actual added value output ~~productivity~~.~~the degree of integration of its productive processes~~. The fourth ratio refers to the nominal and actual growth rates in ~~evolution of~~ remunerations. The fifth ratio is used to determine the participation of domestic suppliers in the maquiladora industry. Finally, the sixth ratio is by definition equal to 100% in the case of this industry which is exclusively engaged in foreign trade.

For both numerical series, current pesos and constant pesos (using 1993 as the reference year) were considered~~,~~ in accordance with statistical information obtained from the System of National Accounts for the 1988-1995 period.

Moreover, information obtained was broken down into three different categories:

- National Total by sector
- Border Municipality Total by sector
- Nonborder Municipality Total by sector

The last two categories had to be inferred from SECOFI's information on the maquiladora industry's foreign trade figures, since data from the System of National Accounts does not provide detailed information on maquiladora activity by sector for each border municipality. To this end, the following procedure was conducted:

Step 1: Determining ~~i~~Imports and ~~e~~Exports by ~~p~~Product

An estimate was made of the relative significance of the group of border states on import and export movements by product from the maquiladora industry through the Northern Border during the 1993-1995 period. To this end, information from SECOFI's ~~D~~database was used, including data on origin and destination of foreign trade movements after adjustment of monetary flows based on reassignment of internal customs activities related to flows through the Northern Border (See Task 8).

Step 2: Quantifying ~~f~~Foreign ~~t~~Trade by ~~a~~Activity ~~s~~Sector

Using a product-sector interrelation matrix, the proportion represented by each sector of the maquiladora industry in foreign trade monetary flows by product as reported by SECOFI during the 1993-1995 period was determined.

In turn, by combining this information with data obtained in step one, it was possible to prepare import-export matrices for each sector of the maquiladora industry at the national level and by border state. Results by sector for each border state represent the performance of the maquiladora industry for the group of border municipalities. It was necessary~~determined~~ ~~that~~ for this total to match the ~~coincided with the~~ total from border municipalities as published by SECOFI. But the information was not broken down by activity sector for each case-study POE, since only the state of Baja California reports such detailed information.

14.7.2 Traditional ~~m~~Manufacturing ~~i~~Industry

The same methodology ~~is~~ was used to calculate macroeconomic indicators and ratios for~~from~~ the traditional manufacturing industry. As opposed to the maquiladora industry, the Exports/Gross Output Value ratio is, in this case, always less than one, since a large proportion of the traditional manufacturing industry's output is destined for the domestic market.

Another major difference between traditional industry and maquiladora industry is that the latter exports all its output to the United States. Therefore, taking into consideration the flow of goods for binational trade crossing the Northern Border (See Task 8), it was necessary to use the aforementioned product-sector interrelation matrices, in order to infer exports by sector destined for the United States.

Furthermore, since the System of National Accounts~~, in contradistinction to the maquiladora industry,~~ does not break down the traditional industry activities by federal agency in the two Industrial Census reports, a series of product-sector matrices by border state had to be developed, in order to calculate the proportion of traditional industry activity in those states vis-à-vis the national total, for each one of the above-mentioned macroeconomic indicators.

~~*b) Impact of foreign and binational trade on employment*~~

~~Four different procedures were utilized:~~

- ~~COLEF's methodology (UEB Model) for the maquiladora industry~~
- ~~Propensity-to-export method for other primary and secondary activity sectors~~
- ~~Input-Output matrices for the same sectors~~

14.7.3 COLEF's Methodology for Estimating Employment

COLEF's methodology refers to direct and indirect employment generated~~ion~~ by the maquiladora industry in border and nonborder cities. The Urban Economic Base (UEB) Model ~~(UEB Model) used~~ assumes that there are no Input-Output matrices with reliable technical coefficients in the locality due to the~~, as a result of~~ practical difficulties for defining the radius of influence of any geographic area, especially ~~when dealing with~~ an urban area.

The ~~aforementioned~~ UEB Model assumes that each city or geographic area can be defined as an open economic system where two types of physical and monetary flows come together: those related to internal or local consumption (endogenous) and those generated by its "exporting sector" (exogenous), in other words, the whole set of economic sectors entering into commercial exchanges with its regional *hinterland* and the foreign markets.

It can be said that the size of the labor market related to ~~strictly~~ internal consumption is a constant proportion of the total employment in each geographic area, given that each local consumer generates, through his family expenditures, a specific number of indirect jobs. ~~And~~ If one assumes this is to be true, any ~~given that the~~ variations ~~thereof~~ in the size of the labor market depend proportionally on ~~proportionally fixed~~ changes ~~in~~ within the "exporting sector." On the other hand, the labor market related to the "exporting sector" in each geographic area varies when external (regional and international) demand changes – a demand that is not determined from within the local ~~milieu~~environment.

Hence, the following basic ratio is established in each geographic area:

$$\mathbf{T = X + a.\,T} \quad \text{or} \quad \mathbf{T / X = 1 / (1-a)} \qquad \mathbf{(1)}$$

where **T** is defined as the total jobs in the area under study, **X** is employment in its exporting sector, and **a. T** is local employment, ~~and it~~which maintains a constant proportion with total employment (measured by coefficient **a**).

It is clear that this is a theoretical model ~~that~~ which "simplifies" reality. In other words, it has certain limitations, such as:

- The implicit hypothesis that the total supply related to employment generation is inflexible to any variation in local factor prices and, in particular, remunerations;
- The **T/X** multiplier of total employment is not constant over time vis-à-vis exporting sector employment, as a result of inter-temporal variations of the **a** component in local employment;
- The main engine of growth in any given geographic area would be its ability to generate exports towards its *hinterland* or international markets, which tends to minimize endogenous factors showing an increase in local consumption, especially in urban areas;
- There is no pre-established model to guarantee accurate estimates of "exports" from any given geographic area.

However, when the UEB~~is~~ Model is applied to the very limited area of maquiladora industry exports, located in a small number of Mexican cities, a large number of these limitations decrease. COLEF used this methodology in more than ten cities, mostly border cities, with the 1987-1989 statistical series. For purposes of this Study, this information was updated to 1995, and most cities in border states where maquiladora activities took place were included, for a total of 17 cities, as listed below:

- State of Baja California: Ensenada, Mexicali, Tecate, Tijuana
- State of Sonora: Agua Prieta, Nogales [21]
- State of Chihuahua: Cd. Juarez, Chihuahua [22]
- State of Coahuila: Cd. Acuña, Monclova, Piedras Negras, Saltillo, Torreon [23]
- State of Nuevo Leon: Metropolitan are of the city of Monterrey
- State of Tamaulipas: Matamoros, Nuevo Laredo, Reynosa [24]

Following COLEF's methodology[25], direct and indirect effects on total employment were detected as a result of time variations in maquiladora industry activities. In particular, it was found that:

- Foreign trade activities (in this case, the international market) of each maquiladora sector generate direct employment related to the import-export process;
- In turn, these overall direct employments are related to indirect employment in national sectors (industry and services) supplying the maquiladora industry in every locality or federal agency;
- Finally, direct and indirect employments thus generated also induce additional local employment related to family consumption patterns of this exporting industry's workers and suppliers.

Within the framework of this Study, the evaluation of indirect employment as described in paragraph three above was omitted. In fact, this COLEF definition appears to be too broad ~~extensive~~, first and foremost, because the creation of indirect jobs as a result of surplus income could also be obtained with any other economic activity not related to foreign trade. In other words, this "second-level" indirect effect is not exclusively related to ~~of~~ the exporting sector.

[21] No information was found for San Luis Río Colorado and Hermosillo.

[22] The same was true for Jimenez and Cd. Delicias.

[23] In the case of Torreon and Saltillo, no updated information was found until 1995.

[24] No information was found for Cd. Mier, Cd. Victoria, Cd. Mante, and G. Díaz Ordaz .

[25] Tito Alegría, "Efectos de la industria maquiladora en el empleo urbano", Revista del Comercio Exterior, Oct. 1995 ("Effects of maquiladora industry on urban employment")

Furthermore, by ~~thus~~ increasing the number of induced jobs, the impact of any given economic sector on the employment of its direct suppliers is overlooked, which is the main goal of all employment studies. Hence, in the case of the maquiladora industry, it is possible that as a result of its local salary surplus, this sector may indirectly maintain a significant number of jobs in urban services. However, this overall consideration cannot conceal the low multiplier effect of the sector towards its suppliers; that is, its low national backward integration rate–~~-~~a crucial point for analyzing the socioeconomic impact of foreign trade.

Finally, these "second-level" indirect employments were removed from the analysis because they distort the comparison of results with the United States, as U.S. statistics do not consider the secondary economic effect of surplus salaries in local and state economies engaged in commerce with Mexico.

14.7.4 Method of the ~~p~~Propensity to ~~e~~Export (Employment)

This method originally derived from Keynesian theory is also known as the Gross Output Value (GOV) differential method. It assumes that for the same product made with the same technology there exist distortions between its national and international price which are explained by practices of relative national protectionism, the existence of different economies of scale, and the involvement of a number of different economic agents (greater intermediation on the domestic market). The propensity-to-export ratio is determined, in each activity sector, by substituting its GOV at domestic prices with its GOV at international prices and relating the value of exports to the GOV at international prices.

As a direct consequence ~~of the above~~, the number of direct jobs generated by foreign trade is not proportional to the fraction of GOV devoted to exports when assessed at domestic prices, but it is proportional to this same fraction when assessed at international prices. In other words, for the few economic sectors that benefit from an international price higher than the domestic price[26], the GOV/Employment ratio at international prices is higher than the GOV/Employment ratio at domestic prices~~;~~. ~~t~~Therefore, the impact on direct jobs generated by foreign trade is less than proportional to the impact that would be obtained by dedicating production to the domestic market.

~~On the contrary, i~~In most cases, an inverse relationship is seen and, consequently, the impact on direct jobs generated by foreign trade is more than proportional to the impact that would be caused by the supply of the same amount of product on the domestic market, using the same production technology for both markets.

~~Now, v~~Very different relations are seen insofar as indirect employment is concerned. Both the incorporation of imported inputs and the globalization of logistical chains tend to eliminate numerous preexisting jobs among intermediaries and suppliers from the domestic market. This ~~It~~ is the reason why foreign trade may appear, overall, as generating less employment than the domestic market in numerous economic sectors.

This methodology has two constraints:

- It only considers export prices and underestimates the effects of substituting domestic inputs with imported inputs. Actually, for purposes of estimating direct employment generated by foreign trade, this constraint is not relevant, as said substitution only affects associated indirect employment;
- It assumes homogeneity in the dominant production technologies at all times when it is common to see a certain intersectoral disparity between the exporting sector and activities

[26] In the case of Mexico, some tropical crops, most nonferrous metals, some chemicals and pharmaceuticals, most measurement and monitoring devices.

related to the domestic market. However, exports also have a tendency to force all manufacturers to, sooner or later, adopt similar technologies and, in particular, to manufacture standardized products for both markets.

In spite of these constraints, this method is suitable to estimate, with an acceptable degree of accuracy, the impact on foreign trade-related direct employment. It was applied to all branches of the primary and secondary sectors, using as the representative indicator of the international price of exported Mexican products, the reference prices of the maquiladora industry, or lacking these, the international market prices (as is the case of agricultural and mineral products that are not manufactured by the maquiladora industry). Hence, in most industry sectors, the national price GOV/Employment ratios (obtained from SCN statistics) were substituted by new Exports/Employment ratios equal to GOV/Employment ratios seen in the maquiladora industry.

Clearly, the implicit hypothesis is that the tertiary (service) sector is not directly an exporting sector, but that it provides support ~~services~~ to foreign trade in the primary and secondary sectors. Even though the service~~is~~ sector has some exporting capability (e.g., engineering exports or international tourism hospitality), this restriction came about because the SECOFI ~~D~~database used as the reference for all foreign and binational (Mexico-U.S.) trade in 1995 only includes commerce of goods, excluding all services. Moreover, this methodology does not apply to the service sector, since it is almost impossible to identify "homogeneous products" with a clearly defined international reference price.

14.7.5 Input-Output Matrices (Employment)

These matrices characterize inter-sectorial relations that govern the economic life cycle of any given market economy in an open system. They are made up of technical coefficients measuring the proportion of GOV of each activity sector engaged in the purchase of domestic inputs from the other sectors. They encompass all activity sectors including services and civil service (a total of 72 activity sectors, according to the UN International Nomenclature). They are used in calculating the Gross Added Value (or GDP) of each activity sector, by subtracting the aggregate amount of inter-sectorial purchases (i.e., domestic inputs) from the GOV of each sector. In addition, they include workers' net remunerations, a component of imported inputs, net indirect taxes on subsidies, and a fictitious sector called 72a to account for imputed banking services (basically net interest from medium- and long-term national loans).

In addition to their economic usefulness in determining monetary flows associated to physical flows in any given market economy, these matrices have many other uses. Hence, the ~~aforementioned~~ technical coefficients are a quantitative means to assess indirect employment~~s~~ generated by any activity sector among its domestic input suppliers, just by making some simple mathematical transformations (See below).

In the case of Mexico, the System of National Accounts includes Input-Output matrices only for some years. Input-Output matrices were calculated for the years 1980 and 1985 using 1980 constant price series, and an inter-industry transaction matrix [27] for the year 1988 (also in 1980 constant prices) prepared by Nafin Bank. Similarly,~~Likewise, based on the 1993 Economic Census,~~ a new Input-Output matrix was estimated using new technical coefficients and 1993 constant price series based on the 1993 Economic Census. However,~~, but~~ net indirect taxes on subsidies and the import component were not treated with the same degree of accuracy in all economic sectors. ~~, and, t~~Therefore, this matrix is less reliable than the previous ones. ~~However,~~

[27] These matrices, sometimes called Input-Output semi-matrices, are technical ratio matrices characterizing the way in which each economic sector buys inputs from other sectors. They do not include imported inputs, net indirect taxes on subsidies, and imputed banking services which are usually assessed separately to complete the Input-Output matrix for a reference year.

~~at least a~~ A new 1993-price inter-industry transaction matrix was developed which was used in this Study.

Using the 1993 Economic Census~~Based on this~~ matrix, four adjustments were made, as follows:

- Estimating relative physical volume growth rates for every economic sector between 1993 and 1995 to calculate the technical coefficients of a transaction matrix for 1995;
- Calculating the import content of~~in~~ the output of each economic sector in 1995, based on SECOFI's database information and the above-described domestic product-sector interrelation matrix;
- Calculating the participation of remunerations (salaries + benefits) in the Gross Added Value of each economic sector in 1995, based on constant peso evolution rates published by INEGI[28] on a quarterly basis;
- Estimating net indirect taxes on subsidies by economic sector in 1995, based on data from the Federal Revenue and Expenditure Act and the evolution of Value-Added Tax (VAT) collection as a function of the activity in each economic sector for the same year.

An estimated Input-Output matrix was thus obtained for 1995, which was used to calculate the employment coefficient matrix described below.

14.7.6 Technical ~~c~~Coefficient ~~m~~Matrix for ~~i~~Indirect ~~e~~Employment

This type of matrix "translates" technical coefficients from a general Input-Output matrix for any reference year into indirect employment~~s~~, using the following procedure:

First, the **GOV v**, **c** fraction of the Gross Output Value is calculated for each sector **v** sold as an input to any buyer sector **c**, through the relation:

$$\mathbf{GOV\ v, c = a\ v, c\ .\ GOV\ c} \qquad \mathbf{(2)}$$

where **a v**, **c** represents the technical coefficient characterizing the inter-sectorial relation between both sectors, and **GOV c** is the Gross Output Value of the buyer sector **c**.

Moreover, the "productivity" of each selling sector **v** is calculated, that is, the **GOV v** / **E v** ratio, where **E v** represents total employment in each one of these activity sectors.

Thus, the total **EI v**, **c** of indirect employments generated in any selling sector **v** by the supply of inputs to any buying sector **c** is obtained from the ratio:

$$\mathbf{EI\ v, c = a\ v, c\ .\ GOV\ c\ /\ (GOV\ v\ /\ E\ v)} \qquad \mathbf{(3)}$$

Or:

$$\mathbf{EI\ v, c = (a\ v, c\ .\ E\ v\ /\ GOV\ v)\ .\ GOV\ c} \qquad \mathbf{(4)}$$

where the mathematical terms **a v**, **c . E v / GOV v** are the indirect employment technical coefficients characterizing the $v \rightarrow c$ ratio.

Among indirect employment~~s~~ thus characterized for the reference year 1995, special emphasis was placed on those related to transportation and storage of foreign trade products. Hence, total employments from this sector were broken down among the different types of transportation and related services, using statistics from the Mexican Transportation Institute's (IMT) Handbooks and

[28] INEGI, "Indicadores de la actividad económica" (Economic activity indicators), Serie Estadísticas Económicas, September 1996.

the estimated flows of vehicles and cars for 1995 obtained for the six case-study POE's (See Tasks 9.1 and 9.2).

14.8
Method to Assess Logistical Operation Costs at the Border

These costs were established as overall crossborder transaction costs. In other words, for each mode of transportation (motor and railroad) actual costs of services at the border, both north- and southbound, were assessed, either for traditional movements or for pre-inspected shipments. In addition, implicit costs borne by private brokers on account of delays at border crossings and customs complexes were also evaluated.

These latter costs are not necessarily reflected in transportation agreements (for example, in the form of surcharges or per-diem fees by time or mileage, common practices in railroad transportation). But they always result from external matters and are defrayed by private brokers engaged in Mexico-U.S. binational trade. In turn, "inefficiency costs" affect the whole community, because they are largely passed on to prices paid by final users.

Implicit costs herein described were estimated from field surveys in four out of six case-study POE's: Nuevo Laredo, Cd. Juarez, Nogales, and Piedras Negras. An explanation is provided later in the this report ~~given further ahead~~ of how these estimates were extended to include the six case-study POE's and~~, later,~~ to overall movements through the Northern Border.

It should be mentioned that these costs only include those defrayed by Mexican importers and exporters for any commercial transaction with the United States. They do not include any additional costs on the American side, such as, maneuvers (transfers, unloading & loading), storage, safekeeping of goods, local fees. These costs correspond to the going rate as of ~~03-~~March 31, ~~-~~1997. As there was no variation in real terms of the Mexican peso vis-à-vis the US dollar between December 1995 and March 1997, the 1997 rates were applied to 1995 vehicle and monetary flows to evaluate logistical costs at the border for the year 1995. Notwithstanding, in the case of the four POE's where surveys were conducted and where information is available on vehicular flows until the end of 1996, delay costs for motor transportation were also calculated for the year 1996.

These are the three types of costs analyzed:

- Unit costs for logistical services at the border
- Unit costs for delays in customs and border crossings
- Total logistical costs at the border

14.8.1 Unit ~~c~~Costs for ~~l~~Logistical ~~s~~Services at the ~~b~~Border

Unit costs for logistical services at the border vary with the type of movement; i.e., imports (southbound) or exports (northbound) and according to the mode of transportation used. The two tables included below summarize unit costs per vehicle and car as seen at the northern border.

It should be mentioned here that contrary~~in contradistinction~~ to motor transportation, delay costs are already included in the cost and fee structure of railroad transportation, as they are subject to pre-payment schedules before the train departs. Such is the case of per-diem fees charged by freight forwarders, which are set according to an estimate~~d~~ of the number of travel days or the mileage traveled per car in Mexican territory. Fees range from US$100/car in border states to US$150/car in the central area, and US$250/ car in the south and southeast regions of Mexico.

The average per-diem fee charged to Mexican importers (either using the mileage formula or by applying a fixed rate) is of US$150/car.

14.8.2 Unit ~~c~~Costs for ~~d~~Delays in ~~c~~Customs and ~~b~~Border ~~c~~Crossings

These costs were calculated for motor transportation based on field surveys conducted in four of six case-study POE's (Cd. Juarez, Nogales, Nuevo Laredo, and Piedras Negras). In the case of Matamoros and Tijuana, vehicular flows as described in Task 3 and 8 reports were used and complemented with some direct interviews conducted to ascertain delay times. The results of these calculations are shown in Tables 14.26 and 14.27.

Table 14.26
Unit ~~c~~Costs of ~~b~~Border ~~s~~Services for ~~i~~Imports (Southbound)

	Railroads		Motor Transport	
	Traditional	**Pre-inspection**	**Traditional**	**Pre-inspection**
Paid in the U.S.				
Bond	Included in RR rate	Included in RR rate	US$5	US$5
Freight Forwarder	US$~~/~~12.50 /20-30% cars	US$ 12.50 /20-30%	US$ 20	US$ 20
Per-diem fees (1)	US$ 100 - 250	US$ 100 - 250		
Mexican Customs broker (2)				
- Bill of lading	0.25% ad val.	0.25% ad val.	0.45% ad val.	0.30% ad val.
- Prior inspection	US$12.50	US$ 12.50	Incl. before	Incl. before
- Maneuvers	N/A	N/A	US$ 80 - 100 (50% veh.)	US$ 80 - 100 (50% veh.)
Transfer (Drayage)U.S. (3)	~~US$ 100 - 125~~	~~US$ 100 - 125~~	US$ 100 - 125	US$ 100 - 125
Average Paid in U.S.	**US$ 115 - 266 + 0.25 % ad val.**	**US$ 115 -266 + 0.25 % ad val.**	**US$ 165-200 + 0.45% ad val.**	**US$ 165 - 200 + 0.30% ad val.**
Paid in Mexico				
Bill validation	~~US$ 3~~	~~US$ 3~~	US$ 3	US$ 3
Cargo inspection	US$ 75 / 10% cars	US$ 75 / 10% cars	N/A	N/A
Moving/ Transfer	US$ 200 /3-5% grain cars	US$ 200 /3-5% grain cars		
D.T.A. (4)	0.79% ad val.	0.79% ad val.	US$ 11	
Other (5)	Up to US$ 26	Up to US$ 26		
Average Paid in Mexico	**US$ 14~~5~~ - 44 + 0.79% ad val.**	**US$ 14~~5~~ - 44 + 0.79% ad val.**	**US$ 14**	**US$ 3**
TOTAL	**US$ 130 - 310 + 1.04% ad val.**	**US$ 130 - 310 + 1.04% ad val.**	**US$ 179- 214 +0.45% ad val.**	**US$ 168 - 203 + 0.30% ad val.**

(1) Rail car use fee.

(2) This is the Mexican customs broker or his agent. Sometimes, these fees are collected in Mexico.

(3) It is paid only in the case of Nuevo Laredo and Colombia.

(4) D.T.A. = Customs User Fees.

(5) For agricultural products there is a plant health control charge of 228 pesos or US$ 28 /20-car train and car fumigation ~~for~~of 200 pesos or US$ 25/ car.

Table 14.27
Unit Costs for Export Border Services (Northbound)

	Railroads		Motor Transport	
	Traditional	**Pre-inspection**	**Traditional**	**Preinspection**
Paid in the U.S.				
US Customs Broker	US$ 20	US$ 25	US$ 75 - 115	US$ 75 - 115
Per-diem				
Average Paid in U.S.	**US$ 20**	**US$ 25**	**US$ 75 - 115**	**US$ 75 - 115**
Paid in Mexico				
Bond			US$ 5	US$ 5
Customs broker (1)				
- Bill of lading	0.13% ad val.	0.13% ad val.	0.18% ad val.	0.13% ad val.
- Prior inspection	US$ 6.5	US$ 6.5	Incl. before	Incl. before
- Maneuvers	N/A.	N/A	US$ 40 - 80 (20% veh.)	US$ 40 - 80 (20% veh.)
- Bill validation			US$3	US$ 3
- Cargo Inspection	US$75/ 5% cars grain cars	US$ 75 / 5% cars grain cars	N/A.	N/A.
- Moving/transfer	US$ 200 /2-3%	US$ 200 /2-3%		
Transfer Mex. (1)			US$ 80 - 95	US$ 80 - 95
D.T.A	0.40% ad val.	0.40% ad val.	US$ 11	
Average Paid in Mexico	**US$ 14 - 16 +0.40% ad val.**	**US$ 14 - 16 + 0.40% ad val.**	**US$ 107-134 +0.18% ad val.**	**US$ 96-119 + 0.13% ad val.**
TOTAL	**US$ 34 - 41 + 0.53% ad val.**	**US$ 34 - 41 + 0.53% ad val.**	**US$ 190 - 249 + 0.18% ad val.**	**US$ 179 - 238 + 0.13% ad val.**

(1) It is paid only in the case of Nuevo Laredo and Colombia.

In addition, the cost of vehicular operation of a T3-S2 set was established for the year 1995. This is the dominant mode of crossborder vehicular flows, considering the mean age of the national tractor-trailer truck ~~park~~fleet[29]. The mean fixed cost of a T3-S2 set was established at US$17.25/ hour for delays in customs complexes and US$21.45/hour for delays in lines to cross the border. The US$4.20/hour difference seen is due to diesel fuel use as the vehicle idles while waiting in line to cross the border.

~~next three t~~Tables 14.28, 14.29 and 14.30 summarize delay-related ~~hypotheses and~~ costs for motor vehicles in customs and border crossings, as expressed in 1995 US$/vehicle.~~:~~

For railroads, other costs (in addition to per-diem fees) are generated for delays after crossing the border: train documentation, convoy formation, train scheduling on the Mexican side with limited night hours, for routes through urban areas. These costs are established as described Table 14.31.

[29] Partners International S.A. de C.V.: "Contribución de la rama industrial automotriz en el desarrollo del Autotransporte Público Federal de carga", (Contribution of the automotive industrial sector to the development of public federal motor transport of cargo), a study developed for Nafin S.A., March 1996.

Table 14.28
Unit ~~c~~Costs for ~~m~~Motor ~~t~~Transport ~~d~~Delays at the ~~c~~Customs ~~c~~Complexes

Mexican Imports	Cost/Hour (1995 U.S. $)	Hours/Vehicle	Cost/Vehicle
Cd. Juarez	17.25	1.00 - 2.50	17.25 - 43.13
Nogales	17.25	2.00 - 3.50	34.50 - 60.38
Nuevo Laredo	17.25	3.00- 4.80	51.75- 82.80
Piedras Negras	17.25	2.00 - 3.00	34.50 - 51.75
Matamoros	17.25	2.00 - 3.00	34.50 - 51.75
Tijuana	17.25	2.00 - 3.00	34.50 - 51.75
Other POE's	17.25	2.00 - 3.00	34.50 - 51.75
Mexican Exports			
Cd. Juarez	17.25	0.75 - 1.25	12.93 - 21.56
Nogales	17.25	1.00 - 1.50	17.25- 25.88
Nuevo Laredo	17.25	0.95 - 1.33	16.38 - 22.94
Piedras Negras	17.25	7.75- 1.50	12.94 - 25.88
Matamoros	17.25	7.76- 1.50	12.93- 25.88
Tijuana	17.25	0.75 - 1.50	12.93 - 25.88
Other POE's	17.25	0.75 - 1.50	*12.93 - 25.88*

Note: Percentages of inspected vehicles vary considerably between the two countries.

On the Mexican side (Mexican imports): 10% of vehicles

On the American side (Mexican exports): 12% of vehicles in Cd. Juarez, 13% in Nogales, 14% in Nuevo Laredo and Piedras Negras. For the remaining POE's, the estimate is 14% of vehicles.

Table 14.29
Unit ~~c~~Costs for ~~m~~Motor ~~t~~Transport ~~d~~Delays at ~~b~~Border ~~c~~Crossings

Mexican Imports	Cost / Hour (1995 U.S. $)	Hours / Vehicle	Cost / Vehicle
Cd. Juarez	21.45	0.36 - 0.83	**7.72 - 17.80**
Nogales	21.45	0.33 - 0.60	**7.08 - 12.87**
Nuevo Laredo	21.45	0.42 - 0.94	**9.01 - 20.16**
Piedras Negras	21.45	0.08 - 0.33	**1.72 - 7.08**
Matamoros	21.45	0.25 - 0.75	**5.36 - 16.09**
Tijuana	21.45	0.25 - 0.75	**5.36 - 16.09**
Other POE's (1)	21.45	0.25 - 0.75	**5.36 - 16.09**
Mexican Exports			
Cd. Juarez	21.45	0.84-1.80	**18.02 - 38.61**
Nogales	21.45	0.78-1.66	**16.73 - 35.61**
Nuevo Laredo	21.45	1.04-2.62	**22.31 - 56.20**
Piedras Negras	21.45	0.10-0.45	**2.15 - 9.65**
Matamoros	21.45	0.50-1.00	**10.73 - 21.45**
Tijuana	21.45	0.50-1.00	**10.73 - 21.45**
Other POE's	21.45	0.50-1.00	**10.73 - 21.45**

Table 14.30
Total ~~u~~Unit ~~c~~Costs for ~~m~~Motor ~~t~~Transport ~~d~~Delays at the ~~b~~Border (in 1995 U.S $)

	Mexican Imports	Mexican Exports
Cd. Juarez	**9.45 - 22.12**	**19.57 - 41.20**
Nogales	**10.53 - 18.91**	**18.97 - 38.97**
Nuevo Laredo	**14.18 - 28.44**	**24.60 - 59.41**
Piedras Negras	**5.17 - 12.25**	**3.96 - 13.28**
Matamoros	**8.81 - 21.26**	**12.54 - 25.07**
Tijuana	**8.81 - 21.26**	**12.54 - 25.07**
Other POE's	**8.81 - 21.26**	**12.54 - 25.07**

Note: The numbers listed above take into account differences between vehicle inspection rates by customs in the two countries.

~~below:~~

14.8.3 Total ~~l~~Logistical ~~c~~Costs at the ~~b~~Border

Both for railroad and motor transportation, total logistical costs were assessed for 1995 by case-study POE and for the overall northern border, based on the following statistics:

- For POE's along the Rio Grande: Northbound cargo truck flows as recorded at the bridges administered by the Federal Highway and Bridge Agency (CAPUFE). These statistics had to be complemented with data from the states or private operators (as at the Zaragoza bridge in Cd. Juarez);
- For Nogales, statistics available are those from Mexican customs (SHCP). They only include information on ~~laden~~ loaded vehicles. This information had to be complemented with data from the US Customs Service (northbound), in order to infer the number of empty vehicles and the annual total of cargo trucks;
- For the remaining POE's, information was obtained from Task 3 reports and the US Customs Service (northbound);
- For all case-study POE's, southbound truck flows had to be inferred. On the one hand, the difference between the motor transport export and import values for 1995 in each POE was considered. On the other, the difference between average vehicular weight (whether north- or southbound) was also considered, based on data from SCT stations located in highway stretches along access roads to these POE's.
- Finally, National Railroad System (~~FFNN~~FNM) statistics on foreign trade movements by car and type of merchandise until 1994 were used. However, the year1995 had to be inferred (as it was not included in ~~FFNN's~~FNM's publications) from the evolution of foreign trade value via railroad, assuming that the average value by type of goods and the weight per car were identical to those recorded for 1994, both north- and southbound and for each case-study POE.

Table 14.31
Total Unit Costs for Railroad Delays at Border Crossings

	MEXICAN IMPORTS	MEXICAN EXPORTS
American side	U.S.$ 25/22-25% cars	U.S.$ 50/3-5% cars
Mexican side	U.S.$30/55-57% cars	U.S.$30/45-47% cars
	U.S.$55/3-5% cars	U.S.$55/3-5% cars

14.9 Findings and Conclusions

The assessment of economic benefits and costs associated with binational trade has drawn on much of the research investigations that have been part of this Binational study. The Task 1 inventory of applicable studies, assembled over 18 months ago, pointed out what prior research was available and the difficulties investigators face when examining a snapshot of border conditions – either in time or location. The Task 3 and 9 assessment of Ports of Entry allowed the study team to develop an in-depth knowledge of port operations and both infrastructure and institutional constraints, which in turn allowed for the follow-on assessment of costs reported in Task 10. Searching for and using binational trade data as reported in Task 8 and 10 brought to light both resources and shortfalls, and pointed out the need for creatively using complementary data from both nations to fill in the gaps to the extent possible. Analysis of world trade and technology trends reported in Task 11 provided an appreciation of how quickly the private sector is moving to integrate the North American production platform, and how public sector infrastructure investigations therefore need to be made for strategic purposes. Likewise, the analysis of the Planning and Programming Processes reported in Task 4 placed into perspective the relative importance of assessing benefits and costs as reported here and in Task 10.

This chapter thus reflects on the availability and use of much of the information for binational transportation planning, within the context of assessing benefits and costs. This broad review is drawn from the cost benefit exercise, but not limited by it.

14.9.1 Findings

1. The analysis of benefits associated with trade for both countries indicate that they far outweigh costs, despite pre-NAFTA warnings to the contrary. Trade, in general, is viewed positively by a majority of both countries' political leadership and should therefore be supported by North American transportation systems to the extent possible.
2. This study did not address the benefits and costs of the North American Free Trade Agreement. Other efforts have been commissioned to access the value of NAFTA, and their conclusions are generally positive. This study does address the growing volume of commerce between the U.S. and Mexico and what transportation infrastructure is needed to support this trade.
3. Continued, or periodic estimation of, benefits attributable to binational trade will require an investment of time and money. Mechanisms are already in place to measure U.S. countrywide jobs supported by trade—overall and with Mexico. Similarly, mechanisms are in place to measure Mexico's state and city employment by maquiladora industries. Given the ultimate end use of these job estimates and their political sensitivity, shortcut methods to approximate U.S. state employment supported by trade appear adequate. Periodic analysis of Mexico's nationwide jobs supported by trade will be driven by "need to know" investment decisions.
4. In the case of Mexico, the System of National Accounts (SCN, Sistema de Cuentas Nacionales) offers complete information in areas such as production figures, direct employment, and maquiladora industry remuneration. This information is also available on a municipality basis, although its consolidation by border and nonborder states could be improved. The same kind of indicators cannot be estimated through the SCN for the overall Mexican economy, however, much less for individual states. For this reason, specific methodologies such as the ones used in this task of the Binational Study are needed in order to create databases that may be tailored to each individual border state.

5. In the case of the United States, estimates of individual state employment attributable to trade should adhere to some basis of proportionality to U.S. nationwide estimates.
6. To conduct any meaningful analysis of transportation impacts (costs) or requirements, trade flow information in the form of weight, cubic volume, or loaded conveyances is essential. Changes in the aggregate value of trade are meaningless, and conclusions based on value parameters are often erroneous insofar as transportation impacts.
7. For conducting any type of trade analysis in Mexico, it is essential to first of all reconcile foreign trade information among the various official agencies (SECOFI, BANCOMEXT, BANXICO). BANXICO's per product information base could be a good starting point, in order to identify:
   - existing relations between amount flows by product and activity in each economic sector;
   - existing relations between amounts and volume of foreign trade by mode of transportation and type of movement (imports and exports).
8. For conducting more thorough investigations of trade flows in the United States, it will be necessary to acquire better information than is currently available through the Bureau of Transportation Statistics (BTS) Transborder monthly reports. While current BTS data releases are measurably better than data released even two or three years ago, further progress is warranted. Data matrices combining transportation mode with commodity weight, value and geographic level of detail are required.

14.9.2 Conclusions

1. While the cost impacts associated with roadway wear and tear and the marginal social costs of congestion, air pollution, noise and accidents are significant—particularly for the border states—they pale when compared to freight shipper and carrier costs that are ultimately borne by consumers as a result of avoidable border transaction costs.
2. Avoidable border transaction costs in the form of unnecessary or duplicate import authentication, pre-inspections, cargo transfers, and inspection delays amount to roughly one-half of the binational freight bill. Savings resulting from public-sector actions to reduce these avoidable border transaction costs could be passed onto producers and consumers, thereby promoting freer and faster binational trade; or they could be recaptured in part to finance new infrastructure, increased operational capacity, and reimbursement for the trade cost impacts noted above.
3. This study's assessment of avoidable border transaction costs points to the significance of implementing operational improvements and institutional changes to optimize the existing infrastructure. The study also confirms the strategic importance of supporting the emergence and consolidation of logistics facilitators at the border who are more in tune with technological and operational changes, and who are willing to promote and make better use of changes in customs legislation.
4. Investment decisions are being made daily by private firms who are trying to optimize the North American goods production platform. By the very nature of the problem, public-sector agencies responsible for transportation planning and programming will be reactive to this ebb and flow of goods movement across and along the border. In recognition of this phenomenon, border state and federal agencies need to lead rather than follow local initiatives in order to ascertain strategic infrastructure and operational capacity enhancements.
5. By developing objective and verifiable information related to the transaction costs experienced at each POE, traditional cost-benefit analyses can be enhanced to the point where this type of analysis may be included in new project studies to evaluate the

proposal's merits. Following this suggestion, to enhance the criteria for planning and selecting projects, is essential in the case of bridges and crossings which carry mainly commercial traffic. These projects are usually not very financially profitable, but are critical to cross-border movement.

Appendix
Standard Commodity Codes

CODE	DESCRIPTION OFCOMMODITY CODES AT TWO-DIGIT LEVEL
01	Live Animals
02	Meat And Edible Meat Offal
03	Fish And Crustaceans, Molluscs And Other Aquatic Invertebrates
04	Dairy Produce; Birds' Eggs; Natural Honey; Edible Products Of Animal Origin, Not Elsewhere Specified Or Included
05	Products Of Animal Origin, Not Elsewhere Specified Or Included
06	Live Trees And Other Plants; Bulbs, Roots And The Like; Cut Flowers And Ornamental Foliage
07	Edible Vegetables And Certain Roots And Tubers
08	Edible Fruit And Nuts; Peel Of Citrus Fruit Or Melons
09	Coffee, Tea, Mate And Spices
10	Cereals
11	Products Of The Milling Industry; Malt; Starches; Inulin; Wheat Gluten
12	Oil Seeds And Oleaginous Fruits; Miscellaneous Grains; Seeds And Fruit; Industrial Or Medicinal Plants; Straw And Fodder
13	Lac; Gums; Resins And Other Vegetable Saps And Extract
14	Vegetable Plaiting Materials; Vegetable Products Not Elsewhere Specified Or Included
15	Animal Or Vegetable Fats And Oils And Their Cleavage Products; Prepared Edible Fats; Animal Or Vegetable Waxes
16	Preparations Of Meat, Of Fish, Or Of Crustaceans, Molluscs Or Other Aquatic Invertebrates
17	Sugars And Sugar Confectionary
18	Cocoa And Cocoa Preparations
19	Preparations Of Cereals, Flour, Starch Or Milk; Bakers' Wares
20	Preparations Of Vegetables, Fruit, Nuts, Or Other Parts Of Plants
21	Miscellaneous Edible Preparations
22	Beverages, Spirits And Vinegar
23	Residues And Waste From The Food Industries; Prepared Animal Feed
24	Tobacco And Manufactured Tobacco Substitutes
25	Salt; Sulfur; Earths And Stone; Plastering Materials, Lime And Cement
26	Ores, Slag And Ash
27	Mineral Fuels, Mineral Oils And Products Of Their Distillation; Bituminous Substances; Mineral Waxes
28	Inorganic Chemicals; Organic Or Inorganic Compounds Of Precious Metals, Of Rare-Earth Metals, Of Radioactive Elements Or Of Isotopes
29	Organic Chemicals
30	Pharmaceutical Products
31	Fertilizers
32	Tanning Or Dyeing Extracts; Tannins And Their Derivatives; Dyes, Pigments And Other Coloring Matter; Paints And Varnishes; Putty And Other Mastics; Inks
33	Essential Oils And Resinoids; Perfumery, Cosmetic Or Toilet Preparations
34	Soap, Organic Surface-Active Agents, Washing Preparations, Lubricating Preparations, Artificial Waxes, Prepared Waxes, Polishing Or Scouring Preparations, Candles And Similar Articles, Modeling Pastes, "Dental Waxes" And Dental Preparations With A Basis Of Plaster Of Plaster
35	Albuminoidal Substances; Modified Starches; Glues; Enzymes
36	Explosives; Pyrotechnic Products; Matches; Pyrophoric Alloys; Certain Combustible Preparations
37	Photographic Or Cinematographic Goods
38	Miscellaneous Chemical Products
39	Plastics And Articles Thereof
40	Rubber And Articles Thereof
41	Raw Hides And Skins (Other Than Furskins) And Leather
42	Articles Of Leather; Saddlery And Harness; Travel Goods, Handbags And Similar Containers; Articles Of Animal Gut (Other Than Silkworm Gut)
43	Furskins And Artificial Fur; Manufactures Thereof
44	Wood And Articles Of Wood; Wood Charcoal
45	Cork And Articles Of Cork
46	Manufactures Of Straw, Of Esparto Or Of Other Plaiting Materials; Basketware And Wickerwork
47	Pulp Of Wood Or Of Other Fibrous Cellulosic Material; Waste And Scrap Of Paper Or Paperboard
48	Paper And Paperboard; Articles Of Paper Pulp, Of Paper Or Of Paperboard
49	Printed Books, Newspapers, Pictures And Other Products Of The Printing Industry; Manuscripts, Typescripts And Plans
50	Silk
51	Wool, Fine Or Coarse Animal Hair; Horsehair Yarn And Woven Fabric
52	Cotton

CODE	DESCRIPTION OFCOMMODITY CODES AT TWO-DIGIT LEVEL
53	Other Vegetable Textile Fibers; Paper Yarn And Woven Fabrics Of Paper Yarn
54	Man-Made Filaments
55	Man-Made Staple Fibers
56	Wadding, Felt And Nonwovens; Special Yarns; Twine, Cordage, Ropes And Cables And Articles Thereof
57	Carpets And Other Textile Floor Coverings
58	Special Woven Fabrics; Tufted Textile Fabrics; Lace; Tapestries; Trimmings; Embroidery
59	Impregnated, Coated, Covered Or Laminated Textile Fabrics; Textile Articles Of A Kind Suitable For Industrial Use
60	Knitted Or Crocheted Fabrics
61	Articles Of Apparel And Clothing Accessories, Knitted Or Crocheted
62	Articles Of Apparel And Clothing Accessories, Not Knitted Or Crocheted
63	Other Made-Up Textile Articles; Needle Craft Sets; Worn Clothing And Worn Textile Articles; Rags
64	Footwear, Gaiters And The Like; Parts Of Such Articles
65	Headgear And Parts Thereof
66	Umbrellas, Sun Umbrellas, Walking Sticks, Seatsticks, Whips, Riding Crops And Parts Thereof
67	Prepared Feathers And Down And Articles Made Of Feathers Or Of Down; Artificial Flowers; Articles Of Human Hair
68	Articles Of Stone, Plaster, Cement, Asbestos, Mica Or Similar Materials
69	Ceramic Products
70	Glass And Glassware
71	Natural Or Cultured Pearls, Precious Or Semiprecious Stones, Precious Metals; Metals Clad With Precious Metal, And Articles Thereof; Imitation Jewelry; Coin
72	Iron And Steel
73	Articles Of Iron Or Steel
74	Copper And Articles Thereof
75	Nickel And Articles Thereof
76	Aluminum And Articles Thereof
77	Reserved For Possible Future Use
78	Lead And Articles Thereof
79	Zinc And Articles Thereof
80	Tin And Articles Thereof
81	Other Base Metals; Cermets; Articles Thereof
82	Tools, Implements, Cutlery, Spoons And Forks, Of Base Metal; Parts Thereof Of Base Metal
83	Miscellaneous Articles Of Base Metal
84	Nuclear Reactors, Boilers, Machinery And Mechanical Appliances; Parts Thereof
85	Electrical Machinery And Equipment And Parts Thereof; Sound Recorders And Reproducers, Television Image And Sound Recorders And Reproducers, And Parts And Accessories Of Such Articles
86	Railway Or Tramway Locomotives, Rolling Stock And Parts Thereof; Railway Or Tramway Track Fixtures And Fittings And Parts Thereof; Mechanical (Including Electromechanical) Traffic Signaling Equipment Of All Kinds
87	Vehicles, Other Than Railway Or Tramway Rolling Stock, And Parts And Accessories Thereof
88	Aircraft, Spacecraft, And Parts Thereof
89	Ships, Boats, And Floating Structures
90	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical Or Surgical Instruments And Apparatus; Parts And Accessories Thereof
91	Clocks And Watches And Parts Thereof
92	Musical Instruments; Parts And Accessories Of Such Articles
93	Arms And Ammunition; Parts And Accessories Thereof
94	Furniture; Bedding, Mattress Supports, Cushions And Similar Stuffed Furnishings; Lamps And Lighting Fittings, Not Elsewhere Specified Or Included; Illuminated Signs, Illuminated Nameplates And The Like; Prefabricated Buildings
95	Toys, Games And Sports Equipment; Parts And Accessories Thereof
96	Miscellaneous Manufactured Articles
97	Works Of Art, Collectors' Pieces And Antiques
98	Special Classification Provisions
99	(Imports Only) Temporary Legislation; Temporary Modifications Established Pursuant To Trade Legislation; Additional Import Restrictions Established Pursuant To Section 22 Of The Agricultural Adjustment Act, As Needed