Congressional Research Service

Report 98-782

NAFTA: ESTIMATED U.S. JOB "GAINS" AND "LOSSES" BY STATE OVER 5-1/2 YEARS

Mary Jane Bolle, Economics Division

Updated February 2, 2000

Abstract. U.S. job "gains" and "losses" from trade with Mexico and Canada stem from changes in trade. Job gain data cover the North American Free Trade Agreement's (NAFTA's) first four years and job loss data cover NAFTA's first five and one-half years. Between January 1, 1994 and September 29, 1999, about 259,618 workers were certified as potentially suffering NAFTA-related job losses. These data are sorted by state.

98-782 E

CRS Report for Congress

NAFTA: Estimated U.S. Job "Gains" and "Losses" by State Over 5½ Years

Updated February 2, 2000

Mary Jane Bolle
Specialist in International Trade
Foreign Affairs, Defense, and Trade Division

ABSTRACT

U.S. job "gains" and "losses" from trade with Mexico and Canada stem from changes in trade. Job "gain" data cover the North American Free Trade Agreement (NAFTA)'s first *five* years and job "loss" data cover a little more than NAFTA's *first five and one-half* years. Between January 1, 1994 and September 28 1999, approximately 259,618 workers were certified as potentially suffering NAFTA-related job "losses." These data are sorted by state. Earlier versions of this report also included a table which sorted these data within states by business, indicating for each business, its products, reason for certification, and industry. Because of its increasingly unwieldy size, this table has been dropped from this report. However, these data for any state are available from CRS by calling the author at 7-7753. In addition, between January 1994 and the end of December 1998, nearly 710,000 net jobs were "created" from new exports to Mexico and Canada. These figures are sorted by state. In all, six tables present the data from varying perspectives, including major industries of job certifications and major industries of increased exports to Mexico and Canada . This report is generally updated once or twice a year.

NAFTA: Estimated U.S. Job "Gains" and "Losses" by State Over 5½ Years

Summary

What has been the effect of the North American Free Trade Agreement (NAFTA) on jobs in individual states? NAFTA — the trade agreement between the United States, Mexico, and Canada — appears to have served primarily to accelerate trade-related job trends that were already ongoing. Thus, any reference in this report to effects "*of* NAFTA" is really a reference to effects "*since* NAFTA." Since NAFTA went into effect January 1, 1994, both imports from and exports to Mexico and Canada have increased — boosted by reductions in tariff, nontariff, and investment barriers, particularly in Mexico.

U.S. job "gains" and "losses" from trade with Mexico and Canada stem from changes in trade. In 1998 the value of trade with Mexico was slightly more than half the value of trade flows with Canada. Since NAFTA went into effect through the end of 1998, exports to Mexico and Canada combined have increased 64%, while imports have increased by 78%. Between 1993 and 1998, the annual merchandise trade deficit with Canada increased from $13 billion to $24 billion, while a $1 billion surplus with Mexico evolved into a $17 billion deficit. (The U.S. trade positions with both Mexico and Canada worsened in 1998 over 1997.)

"Job gain" data cover NAFTA's first *five* years, and "job loss" data cover NAFTA's first *five-and-a-half* years. Measuring "job gains" and "losses" from trade with NAFTA partners is an inexact process. "Job loss" and "job gain" data were derived from different methods and databases and, therefore, are not comparable. In addition, job loss figures represent the outside limit of, rather than actual job losses. That is, they represent total employment at plants where workers have been certified to receive NAFTA-Transitional Adjustment Assistance (NAFTA-TAA) benefits. Only 20-30% of these workers actually collect benefits. Trying to further apportion these job gains and losses by state compounds the problems. Thus, the figures come with strong caveats. Nevertheless, they provide some useful information.

Moreover, estimates of NAFTA-related job "gains" and "losses" are small relative to total U.S. employment. Approximately 259,618 workers were certified between January 1, 1994, and September 28, 1999, as potentially suffering NAFTA-related job *losses*. This represents less than the number of jobs *created* in a single month in 1998. On the other hand, an estimated 1,212,357 gross jobs and 709,989 *net* jobs were created from new exports to Mexico and Canada between 1994 and 1998. (The net figure factors in job losses from countervailing productivity growth and inflation).

States suffering the greatest potential total job *losses* from trade with Mexico and Canada since NAFTA went into effect are North Carolina (27,725), Texas (23,386), Pennsylvania (18,663), New York (17,487), California (14,825), Georgia (12,457), and Tennessee (12,191). States estimated to have experienced the greatest *gross* job *gains* (not reduced by productivity and inflation growth) from trade with Mexico and Canada since NAFTA went into effect are Texas (175,407), Michigan (149,382), California (147,284), Illinois (60,181), New York (56,256), Ohio (53,895), and Indiana (43,192).

Contents

List of Figures

List of Tables

Special thanks to Cathi Jones for assistance in compiling data for this report.

NAFTA: Estimated U.S. Job "Gains" and "Losses" by State Over 5½ Years

What has been the effect of the North American Free Trade Agreement NAFTA on jobs in individual states? NAFTA — the trade agreement between the United States, Mexico, and Canada — appears to have served primarily to accelerate trade-related job trends that were ongoing before NAFTA. Thus, any reference in this report to effects "*of* NAFTA" is really a reference to effects "*since* NAFTA." One broad observation that can be made is that since NAFTA went into effect in January 1994, both imports from and exports to Mexico and Canada have increased — boosted by reductions in tariff, nontariff, and investment barriers, particularly in Mexico.[1]

U.S. job "gains" and "losses" from trade with Mexico and Canada (the U.S.'s first and third largest trading partners) stem from changes in trade flows, but are also affected by domestic increases in productivity. Since NAFTA, exports to and imports from Canada have each increased by about 55-60%. This has resulted in relatively suggests few net job effects from trade with Canada. Exports to and imports from Mexico, however, have more or less doubled (exports less and imports more than doubled). This suggests some sectoral job "losses" from production shifts to Mexico. However, since about two-thirds of the increase in imports is covered by an increase in exports, net job effects are estimated to be relatively small in relation to overall U.S. employment.[2]

Figure 1. Quick NAFTA State Data* Finder

* State data may include data on the District of Columbia and U.S. territories.

In fact, NAFTA's overall effect on the U.S. economy has been relatively small. Foreign trade itself accounts for about 14% of U.S. gross domestic product (GDP);

---

[1]For details on exports and imports traded with NAFTA partners, by industry, see NAFTA: Estimates of Job Effects and Industry Trade Trends After Five and One-Half Years, by Mary Jane Bolle. CRS Report 98-783E.

[2]See also, U.S. Library of Congress. Congressional Research Service. NAFTA, Mexican Trade Policy, and U.S.-Mexico Trade: A Longer-Term Perspective, by J.F. Hornbeck. CRS Report 97-811 E.

and trade with Mexico and Canada represents roughly one-fifth all U.S. trade. Larger effects on the overall U.S. economy result from structural changes taking place as companies shed employment due to trade and other economic factors. At the same time, however, the U.S. economy is both dynamic and robust. As jobs are eliminated in one industry, they are added in another. The United States, as a job-creating nation, is the envy of many developed countries, particularly Canada and many European nations, where employment growth has stagnated in recent years, and where unemployment is in some cases one-and-a-half to two times the U.S. rate.

This report provides estimates on NAFTA-related job effects. Included, by state, are estimates of job gains covering NAFTA's first *five* years, and potential job-losses covering roughly NAFTA's first *five-and-a-half* years. (State export data, from which job gains by state are derived, are available only annually.) Measuring job gains and losses from trade with NAFTA partners is an inexact process. Trying to further apportion these job gains and losses by state compounds the difficulties. Thus, these figures come with strong caveats:

First, the terms "job gains" and "losses" are, to a certain extent, misnomers. In an economy operating *at full employment, trade results in neither net job gains nor net job losses, only in relocations* from less efficient to more efficient industries. Economy-wide, job gains balance out job losses. However, at the industry and firm level, *job "gains" from trade* will not likely equal *job "losses" from trade*.[3]

Second, it should be emphasized that job-effect estimates included in this report were developed by different methods and are arguably incomplete and incompatible. In particular, job "losses" captured by Department of Labor (DOL) certifications arguably both underestimate and overestimate the actual number of job losses from NAFTA, for reasons mentioned below. Job "gains," while perhaps reasonably reflective of actual job gains from exports at the national level, are not as accurate at the state level, for reasons discussed below.

Estimated Job "Losses" [4]

The DOL certifies the eligibility of workers to apply at the state level for benefits under the NAFTA-Transitional Adjustment Assistance (NAFTA-TAA) Program. The certification identifies potential dislocated workers who, if separated from their jobs, would be eligible for training and income replacement benefits because, either imports from Mexico and Canada "contributed importantly" to their job loss, or their plant relocated to Mexico or Canada. Hence, the certified NAFTA job losses are but a subset of total job losses from NAFTA; they include only those job losses for which

---

[3]Economists continue to debate what level the full-employment rate of unemployment should be. Many believe unemployment rates below 5.5% suggest an excess demand for labor. During the past several years, unemployment rates have dipped to under 4.5% — the lowest they have been since the late 1960s.

[4] The lengthy table included in previous versions of this report that listed each certified business in each state, together with reasons for certification, has been omitted because of size. However, these data for any state are available from CRS by calling the author at 7-7753.

the displaced worker applied for benefits and a direct linkage to trade with Mexico or Canada, or a shift in production to either of these countries, can be verified.

However, NAFTA-TAA certification figures may overestimate job losses among certified workers. This is because not all workers certified actually lose their jobs. In fact, recent data from the Department of Labor suggest that as few as 20- 30% of the certified workers actually collect NAFTA-TAA benefits. (The others who were precertified may either not have actually lost their jobs, may have found another job in lieu of needing benefits, or for other reasons may not have collected their benefits.)

Table 1. NAFTA-TAA Certification by Reason, January 1, 1994-September 28, 1999

Reason for Certification	Cases	Workers	% of all certified workers
C-1 Production shift to Mexico	948	120,888	47
C-2 Production shift to Canada	233	23,010	9
C-3 Increased customer imports from Mexico	196	22,852	9
C-4 Increased customer imports from Canada	168	14,955	6
C-5 Increased customer imports not identified by source country	214	27,497	11
C-6 Increased company imports from Mexico	194	26,352	9
C-7 Increased company imports from Canada	66	8,802	3
C-8 Increased company imports not identified by source country	19	3,419	1
C-9 High and Rising aggregate imports from Mexico and/or Canada[1]	141	11,843	5
TOTAL CERTIFIED	**2,179**	**259,618**	**100**

Source of data: U.S. DOL Office of Trade Adjustment Assistance. Compiled by CRS.
[1] C-9 represents a new category in 1997.

Table 1 sorts certified workers by reason for certification. The growth in the number of workers certified under the NAFTA-TAA program has leveled off in the past year. The single most important reason for certification, and with it eligibility to receive income and job training benefits under NAFTA-TAA, continues to be production shifts to Mexico. This accounts for the largest and the largest growing part of all worker certifications — 47%. Numbers of workers potentially dislocated are sorted by state in table 2.[5]

[5] The DOL Office of Trade Adjustment Assistance keeps several different lists of numbers reflecting workers certified under the NAFTA-TAA program. Thus, totals in table 1 do not (continued...)

Table 2. Potential Job Loss by State: Number of Cases and Workers Certified by the NAFTA-TAA Program, January 1, 1994-September 28, 1999

STATE	Total Jan. 1, 1994-Sept. 28, 1999 NAFTA-TAA Certified Cases	Workers	STATE	Total Jan.1, 1994-Sept. 28, 1999 NAFTA-TAA Certified Cases	Workers
North Carolina	171	27,725	Arizona	30	2,054
Texas	252	23,386	Minnesota	20	1,921
Pennsylvania	193	18,663	New Mexico	12	1,771
New York	126	17,487	Maine	18	1,702
California	124	14,825	Kansas	13	1,364
Georgia	110	12,457	West Virginia	18	1,343
Tennessee	109	12,191	Connecticut	11	1,291
Indiana	59	9,406	Mississippi	4	1,144
Arkansas	48	8,993	Puerto Rico	2	1,090
Michigan	74	8,334	Utah	13	1,047
Wisconsin	52	7,776	Montana	24	790
Washington	85	7,351	Alaska	5	780
New Jersey	69	7,064	Wyoming	19	620
Alabama	40	6,627	South Dakota	5	566
South Carolina	46	6,551	Iowa	9	454
Virginia	64	6,513	Vermont	4	429
Ohio	53	6,074	North Dakota	4	393
Missouri	67	5,984	Maryland	3	390
Florida	72	5,756	Oklahoma	12	331
Illinois	50	5,718	Nebraska	4	283
Oregon	90	4,907	Nevada	10	257
Louisiana	18	4,688	New Hampshire	7	224
Idaho	38	3,073	Delaware	0	0
Kentucky	30	2,904	Rhode Island	0	0
Massachusetts	31	2,562	Hawaii	0	0
Colorado	28	2,359	Dist. of Columbia	0	0
			TOTAL	**2,346**	**259,618**

Source: U.S. Department of Labor, Office of Trade Adjustment Assistance. Database sorted by CRS.

[5](...continued)
agree precisely with totals in table 2 because of errors in the data base. (Entries for which certain data are missing are not picked up by various “sorts” of the data.)

While certification figures may overestimate some potential NAFTA job loses, they may miss others. Other workers whose job losses may be related to NAFTA, but who are not counted in the NAFTA-TAA figures, include the following major groups: (1) primary job losers who for some reason either: (a) did not apply for NAFTA-TAA benefits; or (b) applied and were rejected because they did not meet the criterion for certification (e.g., trade with Mexico or Canada contributed "somewhat" rather than "importantly" to their job loss); (2) some secondary job losers (who typically account for more than half the total number of job losers) in supplier or distributor industries, who for reasons similar to (1) above were not certified to receive NAFTA-TAA benefits; and (3) other job losers whose job loss is less directly related to NAFTA.[6]

Some workers may be able to claim loss of jobs due to NAFTA even though other factors may be involved. For example, some argue that labor-intensive jobs are shifted out of the United States to Mexico because the U.S. job market is tight and Mexico has a ready supply of workers willing to work for lower wages.

Estimated Job "Gains"

NAFTA-related job-gain estimates are based on Department of Commerce (DOC) data. The DOC publishes data on the number of total jobs in the economy supported by exports. This figure is derived through an input-output model which incorporates output-per-worker ratios for each sub-industry. Thus, the model estimates jobs added to the economy when output for any given sector increases. DOC data on *all* jobs supported by *total* merchandise exports can be used to derive the *average* number of jobs supported by *$1 billion* in merchandise exports each year. The number of jobs supported by $1 billion in exports declines each year because of productivity gains and inflation.[7]

Table 3 (p. 7) includes two measures of job gains from exports. One is a *gross* number. It focuses only on jobs created by new exports each year. The other is a *net* number. It takes into consideration jobs created by new exports and jobs lost by productivity gains among workers producing for export both before and since

---

[6]U.S. Department of Commerce, Economics and Statistics Administration. U.S. Jobs Supported by Goods and Services Exports, 1983-94, p. 27 suggests that approximately two additional jobs support each manufacturing job by producing intermediate inputs, capital goods, and transportation and other services to the goods going to market. The NAFTA-TAA program covers some workers whose job loss is indirectly linked to trade with Mexico or Canada — for example, workers in a business which supplies a company directly affected by trade with Mexico or Canada. Others, however, whose supplier relationship is less direct, may "slip between the cracks."

[7]Data published by the Department of Commerce Economics and Statistics Administration included in a November 1996 report: U.S. Jobs Supported by Goods and Services Exports, 1983-1994 and updated by a separate data release, show that the number of jobs supported by $1 billion in merchandise exports was 15,123 in 1993,14,361 in 1994, 13,774 in 1995, 13,258 in 1996, and 12,755 in 1997. The average annual decline in the number of jobs supported by a billion dollars worth of exports is about 4%; thus, the estimated figure for 1998 is 12, 245.

NAFTA went into effect. Thus, the net figure measures the difference between all workers needed to produce exports to Mexico and Canada in 1998 and all workers needed to produce exports in 1993. Gross and net numbers would be identical if productivity gains and inflation did not reduce the number of workers required to produce a given dollar value of exports each year. (More detail on the mathematics of this is included in the appendix, p. 14.)

Results of the gross and net measures of NAFTA-related job growth are shown in table 3. Figures in table 3 are derived using data from two sources: 1) DOC state export data (included in appendix table 6, p. 11); and 2) DOC averages of jobs supported by exports (listed in footnote 6). From these numbers it can be estimated that increased merchandise exports to Mexico and Canada combined during NAFTA's first five years (1994 through 1998) have *created* approximately 1,212,357 *gross* export-related jobs in the United States (table 3, TOTAL). It can also be estimated that when job losses from productivity gains among those producing for export before and since NAFTA are additionally taken into consideration, new exports since NAFTA have *added* to the total number of workers producing for export to Mexico and Canada combined, only about 709,988 *net* jobs.

Estimated numbers of net jobs in each state which support *total* exports to Mexico and Canada for 1993, and 1998 are included in columns (5) and (6) of table 7.

For the country as a whole, the net jobs-from-new-NAFTA-exports figure covering the period 1994-1998, is less than two-thirds the gross figure (59%). However, *net* job gains may be a much higher percent of *gross* job gains in specific states whose export levels started out small and increased since NAFTA went into effect. See, for example, in table 3, Alaska, (right hand column) where the net figure is 76% of the gross figure. For Alaska, exports, initially at a low level, grew by 172% between 1993 and 1997 (as can be seen in appendix table 6, p. 11).

It should be emphasized that estimates of jobs supporting exports in each state (in table 3) are only very rough estimates, and not an accurate reflection of actual jobs supporting exports, for two reasons. First, state export data on which these figures are based reflect *total sales*, not *value added* by each state. Second, the jobs-supporting-each-billion-dollars-worth-of-exports figure includes jobs both *directly* and *indirectly* involved in manufacturing the merchandise. Since more than half the jobs are indirect — either "upstream" (primarily supplier) or "downstream" (primarily distribution) — and indirect jobs can be carried out anywhere in the country, they are not necessarily attached to the state which the export figures represent.

Table 3. Job Gain by State: Estimated Number of Gross and Net Jobs Supporting New Merchandise Exports to Canada and Mexico Combined, 1993-98

(1) STATE	Jobs added in export industries 1993-1998 (2) GROSS jobs added	(3) NET jobs added adjusted for productivity changes*	(3) NET jobs added as a % of gross jobs	(1) STATE	Jobs added in export industries 1993-1998 (2) GROSS jobs added	(3) NET jobs added adjusted for productivity changes*	(3) NET jobs added as a % of gross jobs
Texas	175,407	116,816	67	Connecticut	8,990	3,237	36
Michigan	149,382	79,304	53	Colorado	8,402	4,312	51
California	147,284	101,406	69	Louisiana	6,594	4,858	74
Unallocated[1]	79,859	27,713	35	Delaware	5,802	3,124	54
Illinois	60,181	37,389	62	Vermont	5,501	(996)	(18)
New York	56,256	28,387	50	Mississippi	5,262	3,991	76
Ohio	53,895	24,583	46	Arkansas	5,123	3,207	63
Indiana	43,192	24,591	57	Oklahoma	4,784	2,812	59
Pennsylvania	38,565	23,261	60	Puerto Rico	4,296	2,186	51
N. Carolina	35,298	24,559	70	N. Hamp.	4,229	2,623	62
Minnesota	27,733	19,206	69	Nebraska	4,163	2,775	67
Wisconsin	23,119	14,798	64	Maryland	4,115	2,019	49
Kentucky	20,636	15,112	73	W. Virginia	3,297	2,217	67
Tennessee	20,506	12,212	60	Utah	2,947	1,598	54
New Jersey	20,049	8,775	44	Nevada	2,526	1,903	75
S. Carolina	19,652	14,157	72	N. Dakota	2,387	1,479	62
Arizona	19,128	12,861	67	Maine	2,126	763	36
Georgia	19,036	12,701	67	Alaska	2,075	1,584	76
Missouri	14,860	8,791	59	Idaho.	1,973	1,195	61
Mass.	14,474	4,304	30	D. of Col.	1,799	1,481	82
Washington	13,672	6,833	50	Rhode Island	1,392	428	31
Virginia	13,437	8,692	65	Montana	1,387	877	63
Florida	12,525	5,365	43	S. Dakota	1,005	576	57
Louisiana	11,938	8,190	69	Wyoming	544	366	67
Alabama	11,760	8,132	69	Hawaii	128	23	18
Oregon	10,084	6,991	69	New Mexico	(7)	(407)	5,758
Kansas	9,664	6,719	70	V. Islands	(67)	(106)	158
				TOTAL	**1,212,357**	**709,988**	**59**

[1] Unall: unallocated among states.

* **Net jobs added** takes into account estimates of people already working to produce exports who would have lost their jobs to productivity improvements between 1994 and 1998, and subtracts this from the number of jobs added from new exports. Thus, a negative net jobs added number generally means either very slowly growing exports, or an actual decline in exports to Mexico and Canada combined.

Source of data: calculated by CRS from DOC data. This table is a condensation of appendix table 7, p. 12. See footnotes to that table. For explanation of difference between gross and net jobs, see discussion on p. 5, and discussion of the algebraic formula beginning on p. 14.

Perspective on NAFTA-Related Job Effects

As mentioned, data on job losses and job gains due to trade are derived from different methods and data bases. They are therefore incompatible and comparisons between the two could be inaccurate.

Estimates presented above on NAFTA-related job losses are relatively small. The more than 259,618 workers certified as of September 28, 1999 as potentially suffering NAFTA-related job *losses* represent less than the number of U.S. jobs *created* in a single month in 1998.

According to the Department of Commerce,[8] roughly half of all jobs supporting exports are included in the manufacturing sector. This suggests that of the approximately 710,000 estimated *net jobs gained* from trade with Mexico and Canada between 1993 and 1998, about 355,000 would be in manufacturing. After four straight years of decline just prior to NAFTA, during NAFTA's first four years, manufacturing jobs increased from about 18 to almost 18.7 million. The NAFTA-related estimated job gain in manufacturing represents about 50% of all manufacturing jobs gained between 1993 and 1998. Therefore, it can be argued that NAFTA may have made a significant contribution to the manufacturing employment turnaround.

To complete the larger picture, tables 4 and 5 identify major industries of potential *job loss* and *export gains* since NAFTA. (*Job gains* from increased exports have not been estimated for specific industries because the number of jobs supported by each billion dollars worth of exports varies by industry.) Several industries [identified by boldface type and by an asterisk (*)] are included on both lists. These are: electronics, transportation equipment, nonelectrical machinery, apparel, paper products, and scientific instruments. This suggests that certain less efficient parts of these industries are being shifted to Mexico and Canada while more efficient parts are expanding domestically. The apparel industry is the biggest potential job loser, with 28% of all NAFTA-related potential job losses. Electronics is second, with 13%.

As mentioned at the beginning of this report, in an economy operating at full employment, trade results in neither net job gains nor net job losses, only in relocations from less efficient to more efficient industries. Job *gains* from trade with Mexico and Canada under NAFTA do not necessarily have to equal job *losses* from such trade under NAFTA. Even before NAFTA went into effect there were some estimates that job losses would be concentrated in early years after NAFTA was adopted. Tables 4 and 5 document mid-term industry relocations.

[8]U.S. Jobs Supported by Goods and Services Exports, 1983-94, op. cit., p. 27.

Table 4. Major Industries of NAFTA-TAA Job Certification, Jan.1, 1994 -Sept. 28, 1999

SIC	Industry	No. of jobs certified	% of all NAFTA-TAA certified jobs
23	***Apparel**	**73,568**	**28**
36	***Electronics**	**33,684**	**13**
37	***Transportation equip.**	**17,090**	**7**
34	Fabricated metals	15,372	6
22	Textiles	14,150	5
35	***Nonelec. Machinery**	**11,747**	**5**
24	Lumber	9,826	4
38	***Scientif. instruments**	**9,433**	**4**
26	***Paper products**	**8,982**	**3**
30	Rubber	7,722	3
31	Leather	7,521	3
	SUBTOTAL	**209,095**	**81**
	Other Manufacturing	35,171	14
	ALL MANUFACTURING	**244,266**	**95**
	Non-Manufacturing	15,352	6
	TOTAL	**259,618**	**101**

SIC: Standard Industrial Classification codes. Manufacturing includes 20 2-digit codes which span numbers 20-39.

Source: NAFTA-TAA database, sorted by CRS. See also text footnote 5.

* indicates industries listed in both tables 4 and 5.

Table 5. Major Industries of Increased Exports to Mexico and Canada, 1993-1998

SIC	Industry	Growth in Industry Export Value 1993-98		% of total NAFTA commodity export gain
		in $billions	% change 93-98	
37	***Transportation Equip**	**16**	**56**	**18**
36	***Electronics**	**17**	**81**	**18**
35	***Nonelectric machinery**	**16**	**74**	**17**
28	Chemicals	8	72	9
33	Primary metals	4	76	5
30	Rubber	4	81	5
38	***Scientific instruments**	**3**	**48**	**3**
26	***Paper products**	**2**	**69**	**3**
23	***Apparel**	**2**	**100**	**2**
20	Food	2	45	3
	SUBTOTAL	74	—	82
	Other Manufacturing	12	—	13
	TOTAL MANUFACTURING	**87**	**66**	**95**
	Nonmanufacturing	4	44	4
	TOTAL	**91**	**64**	**100**

Source: DOC Office of Trade and Economic Analysis.

* indicates industries listed in both tables 4 and 5.

Appendix:
Data and Explanation of Methodology

This appendix includes supplemental data and explanations. Table 6 includes state exports to Canada, Mexico, and the two countries combined for 1993, 1997, and 1998, and also shows growth rates for exports for 1993-98.

Table 7 includes calculations supporting job gain figures in table 3. In table 7, column (4) lists *gross* job gains, by state during NAFTA's first five years. The same figures also appear in table 3, p. 7, column (2). In table 7, column (7), lists *net* job gains. The same figures also appear in table 3, p. 7, column (3). Net job gains are gross job gains from new exports minus job losses from productivity growth and inflation in manufacturing and services. Actual calculations are explained in the table 7 footnotes. In table 7, estimates of the total number of workers supporting all exports to Mexico and Canada combined for 1993 and 1998, are included in columns (5), and (6), respectively.

Pages 14 and 15 include an algebraic formula showing how the numbers were calculated.

Table 6. Merchandise Exports to Canada, Mexico, and Combined, 1993-1998

	U.S. Exports to Canada (in $millions)			U.S. Exports to Mexico (in $millions)			U.S. Exports to Mexico and Canada Combined (in $millions)			% Δ
STATE	1993	1997	1998	1993	1997	1998	1993	1997	1998	93-98
U.S. TOTAL	100,190	150,124	154,151	41,635	71,378	79,010	141,826	221,503	233,161	62%
Ala.	622	1,251	1,281	185	814	380	807	2,065	1,661	106%
Ak.	84	305	229	1	2	5	85	307	234	175%
Ariz.	533	1,072	1,059	1,087	1,963	1,993	1,621	3,035	3,052	88%
Ark.	421	820	688	69	141	179	490	961	867	77%
Calif.	7,158	11,492	12,644	5,117	9,942	10,798	12,274	21,434	23,442	91%
Colo.	595	672	729	604	1,418	1,105	1,200	2,090	1,834	53%
Conn.	1,407	1,848	1,872	336	530	544	1,743	2,377	2,417	39%
Del.	628	788	938	159	308	290	788	1,097	1,228	56%
D.C.	36	142	158	17	17	29	53	159	187	253%
Fla.	1,572	1,928	2,058	770	1,221	1,272	2,341	3,149	3,330	42%
Ga.	1,469	2,000	2,116	324	686	1,136	1,793	2,685	3,252	81%
Hi.	14	33	17	0	1	2	14	34	19	36%
Idaho	157	278	280	36	44	56	193	322	336	74%
Ill.	4,860	8,044	7,943	1,364	2,190	2,798	6,224	10,234	10,741	73%
Ind.	4,265	5,060	5,672	1,168	2,573	3,046	5,432	7,634	8,718	60%
Iowa	919	1,569	1,742	78	168	158	997	1,737	1,900	91%
Ks.	473	834	879	187	449	485	660	1,284	1,364	107%
Ky.	1,058	2,369	2,325	190	345	451	1,248	2,714	2,776	122%
La.	372	663	736	61	133	196	433	796	932	115%
Maine	362	557	528	29	18	17	391	576	545	39%
Md.	601	653	690	96	199	337	698	752	1,027	47%
Mass.	2,541	3,677	3,388	374	468	564	2,915	4,145	3,952	36%
Mich.	11,434	19,760	19,666	5,630	6,458	7,888	17,065	26,218	27,554	61%
Minn.	1,950	3,190	3,390	229	823	870	2,179	4,013	4,260	96%
Miss.	306	430	493	25	127	242	331	558	735	122%
Mo.	1,113	1,490	1,570	540	1,042	1,190	1,653	2,532	2,760	67%
Mont.	145	236	193	1	21	59	146	257	252	73%
Neb.	296	529	524	61	142	143	357	671	667	87%
Nev.	123	272	301	13	60	23	137	332	324	136%
N.H.	377	672	643	40	74	86	417	746	729	75%
N.J.	2,539	3,837	3,873	789	884	954	3,328	4,721	4,827	45%
N.M.	47	56	68	106	87	87	152	142	155	2%
N.Y.	6,581	10,616	9,957	1,171	1,805	1,936	7,752	10,421	11,893	53%
N.C.	2,289	3,748	3,719	365	1,321	1,565	2,654	5,069	5,284	99%
N.D.	227	428	387	3	18	18	230	445	405	76%
Ohio	7,672	10,472	10,669	927	1,584	1,959	8,598	12,055	12,628	47%
Okla.	426	670	656	158	240	295	584	910	951	63%
Ore.	871	1,082	1,329	109	89	452	980	1,170	1,781	82%
Penn.	3,730	5,616	5,857	627	1,140	1,425	4,358	6,756	7,282	67%
R.I.	286	330	372	42	77	68	328	407	440	34%
S.C.	1,009	1,621	1,711	293	936	1,054	1,303	2,557	2,765	112%
S.D.	108	167	166	4	11	19	112	179	185	65%
Tenn.	1,679	2,389	2,589	650	1,188	1,288	2,329	3,577	3,874	66%
Texas	3,811	8,118	8,506	12,861	18,864	21,627	16,672	26,982	30,133	81%
Utah	343	514	505	30	73	87	374	587	592	58%
Vt.	2,075	2,310	2,486	12	9	11	2,087	2,319	2,497	20%
Va.	1,052	1,536	1,836	302	430	547	1,355	1,966	2,383	76%
Wash.	1,723	2,457	2,360	208	272	583	1,931	2,730	2,943	52%
W.Va.	285	479	503	21	34	56	306	513	559	83%
Wis.	1,947	3,096	3,457	288	427	512	2,235	3,524	3,969	78%
Wyo.	38	88	76	4	5	6	42	93	82	95%
P.R.	387	690	657	129	217	160	517	906	817	58%
V.I.	10	4	3	0	4	1	10	8	4	-60%
Unall.	15,163	17,162	17,658	3,744	9,288	7,958	18,907	26,451	25,616	74%

Source: DOC, Office of Trade and Economic Analysis. Website: **http://www.ita.doc.gov**. Go to "Trade Statistics" and then to "State Export Data."
%Δ = % change.

Table 7. Gross and Net Jobs Supported by *New* and *All* Merchandise Exports to Mexico and Canada Combined, by State, 1993-1998

(See column explanations at end of table)

	GROSS Jobs Added Each Year by *New* Exports to Mexico and Canada				NET Jobs (after compensating for Productivity Growth and inflation) from *All* Exports to Mexico and Canada:			NET as % of GROSS
STATE	(1) 1994	(2) 1997	(3) 1998	(4) [1] TOTAL 1994-1998	(5) 1993	(6) 1998	(7) TOTAL 1993-1998	(8) Col. (7) /Col. (4)
ALL U.S.	334,167	410,175	142,777	1,212,357	2,144,834	2,854,823	709,989	59%
Alabama	2,939	7,175	(4,947)	11,760	12,205	20,337	8,132	69%
Alaska	534	1,589	(894)	2,075	1,281	2,865	1,584	76%
Arizona	3,304	5,651	208	19,128	24,508	37,369	12,861	67%
Arkansas	1,800	3,114	(1,151)	5,123	7,409	10,616	3,207	63%
California	24,953	39,157	24,586	147,284	185,618	287,024	101,406	69%
Colorado	(556)	7,367	(3,134)	8,402	18,143	22,455	4,312	51%
Conn.	2,580	3,211	478	8,990	26,357	29,594	3,237	36%
Delaware	1,686	901	1,616	5,802	11,912	15,036	3,124	54%
D.C.	1,399	615	343	1,799	809	2,290	1,481	82%
Florida	2,256	9,957	2,216	12,525	35,408	40,773	5,365	43%
Georgia	4,635	3,464	6,930	19,036	27,116	39,817	12,701	67%
Hawaii	78	(463)	(184)	128	210	233	23	18%
Idaho	709	106	171	1,973	2,919	4,114	1,195	61%
Illinois	19,598	20,687	6,208	60,181	94,124	131,513	37,389	62%
Indiana	9,392	6,045	13,285	43,192	82,152	106,743	24,591	57%
Iowa	3,665	4,455	1,996	11,938	15,074	23,264	8,190	69%
Kansas	3,980	(707)	992)	9,644	9,982	16,701	6,719	70%
Kentucky	7,970	6,741	759	20,636	18,877	33,989	15,112	73%
Louisiana	1,790	1,369	1,665	6,594	6,553	11,411	4,858	74%
Maine	738	951	(367)	2,126	5,910	6,673	763	36%
Maryland	341	1,584	2,143	4,115	10,556	12,575	2,019	49%
Mass.	6,900	3,437	(2,363)	14,474	44,084	48,388	4,304	30%
Michigan	155,574	(5,334)	16,358	149,382	258,067	337,371	79,304	53%
Minnesota	3,724	3,904	3,024	27,733	32,953	52,159	19,206	69%
Miss.	1,243	1,004	2,179	5,262	5,008	8,999	3,991	76%
Missouri	6,722	1,981	2,792	14,860	25,002	33,793	8,791	59%
Montana	(11)	642	(61)	1,387	2,208	3,085	877	63%
Nebraska	1,140	1,075	(49)5	4,163	5,392	8,167	2,775	67%
Nevada	386	729	(98)	2,526	2,064	3,967	1,903	75%
N.Hamp.	704	510	(208)	4,229	6,303	8,926	2,623	62%
N.Jersey	9,822	8,446	1,298	20,049	50,327	59,102	8,775	44%
N.Mexico	(157)	(114)	147	(7)	2,305	1,898	(407)	(5758%)
New York	15,213	27,566	(6,456)	56,256	117,231	145,618	28,387	50%
N.C.	8,929	7,986	2,632	35,298	40,138	64,697	24,559	70%
N.Dakota	320	701	(502)	2,387	3,480	4,959	1,479	62%
Ohio	19,045	14,411	7,004	53,895	130,034	154,617	24,583	46%
Oklahoma	753	2,040	502	4,784	8,832	11,644	2,812	59%
Oregon	2,323	2,901	7,469	10,084	14,816	21,807	6,991	69%
Penn.	8,262	14,073	6,440	38,565	65,900	89,161	23,261	60%
R.Island	(452)	778	404	1,392	4,959	5,387	428	31%
S.C.	5,748	5,314	2,547	19,652	19,698	33,855	14,157	72%
S.Dak.	352	87	86	1,005	1,689	2,265	576	57%
Tennessee	5,740	5,918	3,636	20,506	35,221	47,433	12,212	60%
Texas	36,236	60,951	38,581	175,407	252,132	368,948	116,816	67%
Utah	746	865	61	2,947	5,650	7,248	1,598	54%
Vermont	(101)	(857)	2,179	5,501	31,569	30,573	(996)	(18%)
Virginia	3,329	3,409	5,106	13,437	20,485	29,177	8,692	65%
Wash.	4,836	479	2,620	13,672	29,201	36,034	6,833	50%
W.Va.	651	1,480	563	3,297	4,627	6,844	2,217	67%
Wisconsin	8,839	6,218	6,461	23,119	33,798	48,596	14,798	64%
Wyoming	151	260	(135)	544	638	1,004	366	67%
P.R.	4,185	1,321	(1,102)	4,296	7,817	10,003	2,186	61%
V.I.	16	(139)	(49)	(67)	155	49	(106)	158%
Unalloctd	(70,790)	115,159	(10,211)	79,859	285,929	313,642	27,713	35%

For explanation of calculations, see next page. Numbers in parentheses are negative. Numbers may not total exactly because of rounding.

[1] Figures for 1995 and 1996 are not shown [(between columns (1) and (2)] because of space constraints.

Explanation of columns in table 7: (Export data are taken from table 6).

Columns (1)–(4): GROSS jobs supported by new NAFTA-related exports (i.e., additional exports to Mexico or Canada since NAFTA).

Column (1): Total number of *gross* jobs supported by new exports to Mexico and Canada in 1994: Value of *export growth* in 1994 (in $billions) **times 14,361** (the estimated number of workers supported by each $billion in exports in 1994). Not shown are figures for 1995 and 1996: the value of export growth times **13,774** and **13,258**, respectively.

Column (2): Same figure for 1997: Value of *export growth* in 1997 **times 12,755**. (The number representing additional workers supported by each $billion in exports each year takes into consideration both productivity changes and inflation *since the previous year*.)

Column (3): Same figure for 1998: Value of *export growth* in 1998 **times 12,245**.

Column (4): Total number of *gross* jobs supported by new NAFTA-related exports during NAFTA's first five years (94 + 95 + 96 + 97 + 98).

Columns (4)–(8): NET jobs supported by NAFTA-related exports

Column (5): Total estimated number of *net* jobs supported by exports to Mexico and Canada combined in 1993: Value of *exports* in 1993, in $billions, **times 15,123** (number of workers supported by $1 billion in exports).

Column (6): Same figure for 1998: Value of *exports* in 1998 **times 12,245**.

Column (7): *Net* job growth from new NAFTA-related exports, 1993-1998: Columns (6)-(5).

Column (8): *Net* NAFTA-related job growth as a percent of **gross** NAFTA-related job growth: Column (7)/column (4).

NOTE: See p. 14 for the algebraic formula by which these figures were calculated.

Algebraic Formula: Relationship Between Gross and Net Jobs Created from New Exports since NAFTA

This section sets forth the equation that quantifies the relationship between the gross and net methods for calculating job changes from trade with Mexico and Canada since NAFTA went into effect. (Gross and net job changes are included in table 3, p. 7, and table 7, p. 12.)

The estimated *gross* number looks only at the *increase in the dollar value* of exports each year, in billions, and *multiplies it by the number of workers required* to produce a billion dollars worth of exports. It ignores any decline in employment of those already working to produce exports, which occurs because productivity growth renders them "redundant" or no longer necessary.

The *net* number looks at the *total value of exports each year*, in billions of dollars, and *multiplies that by the number of workers required* to produce a billion dollars worth of exports.

The estimated number of *net* workers added to the payrolls to produce exports for each state calculated in this way reflects three things:

1. Additions to the number of workers because of an increase in exports;

2. Subtractions to the number of workers from:
   a. productivity gains that occurred during that year; and

   b. inflation (meaning that fewer items produced would represent the same value as the previous year.)

For any state, the difference between the two numbers (gross and net) is equal to the *sum, for each of the years (1994, 1995, etc.) of:*

> *the value of exports* (in $billions) to Mexico and Canada combined in that year **times** the number of *jobs* supporting each billion dollars worth of exports which are *lost to productivity* and inflation in that year.

MATHEMATICS of CALCULATION:

Let symbols represent values as follows:

L_g = gross jobs supporting new exports to NAFTA partners, 1993-1998.

L_n = net number of jobs supporting new exports to NAFTA partners, 1993-1998.

X_i = value of exports in initial year "i" in billions of dollars (numbers listed in table 6 divided by 1,000)

J_i = number of jobs estimated to produce a billion dollars worth of exports in initial year; and

J_f = number of jobs estimated to produce a billion dollars worth of exports in final year ("f").

Where, for both X and J:

i = 1993;
i+1 = 1994;
i+2 = 1995;
i+3 = 1996;
i+4 = 1997; and
i+5 = f = 1998.

And in actual numbers,

$J_i = J_{93} = 15{,}123$;
$J_{i+1} = J_{94} = 14{,}361$;
$J_{i+2} = J_{95} = 13{,}774$;
$J_{i+3} = J_{96} = 13{,}258$;
$J_{i+4} = J_{97} = 12{,}755$;
$J_{i+5} = J_f = J_{98} = 12{,}245$[9]

The *gross* number of jobs supporting new exports to NAFTA partners can be represented by multiplying the number of jobs supporting a billion dollars worth of exports in a given year by the growth in exports for that year:

$$(1) \quad L_g = J_{i+1}(X_{i+1} — X_i) + J_{i+2}(X_{i+2} — X_{i+1}) + J_{i+3}(X_{i+3} — X_{i+2}) \ldots J_f(X_f — X_{f-1}).$$

The *net* number of jobs supporting new exports to NAFTA partners can be represented by the following equation showing the difference between the number of jobs supporting a billion dollars worth of exports and the value of exports for the beginning and end years:

$$(2) \quad L_n = J_f X_f — J_i X_i.$$

To find the difference between the gross and net numbers of new jobs created from trade with Mexico and Canada since NAFTA went into effect equation (2) is subtracted from (1):

Thus, for any state, for any year, the *difference between the gross and net estimates* of jobs created from new exports to Mexico and Canada combined since NAFTA went into effect represents the sum total of the number of jobs held by previously employed workers producing exports which are subsequently lost to productivity growth.

---

[9] The figure for 1998 is a CRS estimate based on Department of Commerce estimates for the previous 5 years.