THE DEPENDENCE OF U.S. EMPLOYMENT ON CANADA

by

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Summary

Canada is biggest market for U.S. exports and the second biggest source of U.S. imports, behind China. It is also a significant foreign supplier of direct investment to the U.S. In this report we quantify the role of Canada in supporting jobs in the U.S. through trade and investment.

To calculate the dependence of U.S. employment on trade with Canada, we use an economic model to look at how employment in the U.S. would be affected by a cessation of Canada/U.S. trade. In this way we find that Canada/U.S. trade:

- *supports 7.88 million jobs in the U.S.* This is about 4.53 per cent of U.S. employment[1].
- *has a net positive effect on GDP of 5.8 per cent* resulting from a positive effect on output in 476 industries and a negative effect in 57 industries. The most obvious U.S. beneficiaries are industries with a heavy reliance on exports to Canada. However many other industries benefit from the availability of imported inputs from Canada. The only U.S. industries that lose from Canada/U.S. trade are those that face strong competition from Canadian imports. But of course this import competition has beneficial effects in keeping prices down in the U.S. for business inputs and for consumer goods.
- *has a positive effect on employment in every state and the District of Columbia*. Because of links between states, even states that have little direct connection with Canada/U.S. trade are beneficiaries.

To calculate the dependence of U.S. employment on Canadian direct investment we use statistics from the Bureau of Economic Analysis on U.S. employment in Canadian-majority-owned affiliates operating in the U.S. We find that Canadian direct investment:

- *supports 0.47 million employees in the U.S.* This is about 0.39 per cent of employee jobs in the U.S.
- *provides more than 1 per cent of U.S. employee jobs in Manufacturing, Information, and Finance & insurance*.
- *provides jobs in every state and the district of Columbia*. In Delaware, Kansas, Nevada, Maine, New Hampshire, Minnesota, Alaska, Massachusetts, Arizona, South Dakota, Wisconsin, Alabama, Vermont and Washington., Canadian-majority-owned affiliates provide more than 0.5 per cent of employee jobs.

[1] U.S. employment in 2010 was 173.8 million jobs. The number of employed people on average through the year was about 142 million.

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1. Introduction

Canada is of major economic importance to the U.S. both as a trade partner and as a direct investor in the U.S. In this report we quantify the economic contribution of Canada to the U.S. by estimating how many jobs in the U.S. depend on trade with Canada and on Canadian-owned businesses in the U.S.

To provide our trade estimate we conducted a simulation with a general equilibrium model. This shows the effects on U.S. macro variables including employment and on U.S. industries and states of an elimination of both U.S. exports to Canada and U.S. imports from Canada.

Our main macro results for cessation of Canada/U.S. trade are in Table 1.1. This table shows reductions in U.S. GDP and employment of 5.84 per cent and 4.53 per cent, equivalent to a loss in GDP of about $860 billion and a loss of 7.88 million jobs (or employment for 6.44 million people).

Table 1.1 Macro effects on the U.S. of ceasing trade with Canada (%)

GDP	-5.84
Employment	-4.53

In a previous study, using a similar methodology to that adopted here, Baughman and Francois (2010) found that 4.4 per cent of U.S. jobs in 2008 depended on trade with Canada. That is, they found that U.S. employment would be reduced by 4.4 per cent if trade with Canada ceased. They translated this estimate into a loss of jobs of 8.028 million. Our estimates are similar to theirs (4.53 per cent compared with 4.4 per cent, and job losses of 7.88 million compared with 8.03 million[2]).

On U.S. GDP, Baughman and Francois estimated that the reduction associated with cessation of Canada/U.S. trade would be 3.3 per cent. We think this is too low. A loss of 4.53 per cent in employment imparts a direct loss of about 3.2 per cent in GDP (equals 4.53 times the share of labor in GDP). Our estimate of a 5.84 per cent loss in GDP takes account not only of the direct loss but also the loss in U.S. efficiency associated with the substitution in the U.S. market of less suitable U.S. and third-country products for Canadian products.

To provide our estimate of U.S. employment dependence on Canadian businesses, we accessed data from the Bureau of Economic Analysis (BEA) on numbers of employees in Canadian-majority-owned businesses in the U.S. These data show for 2009 that Canadian businesses in the U.S. provided jobs for about 474 thousand U.S. residents.

The rest of this report is organized as follows. In section 2 we explain our methodology for the trade-cessation estimates and provide some more macroeconomic results. In sections 3 and 4 we look at industry and state results for the effects of trade cessation. Section 5 discusses employment dependence in the U.S. on Canadian businesses

[2] The number of jobs in the U.S. in 2008 was higher than in 2010.

operating in the U.S. Estimates are presented at the macro, sectoral and state levels. Concluding remarks are in section 6.

2. Employment dependence in the U.S. of trade with Canada: methodology and macroeconomic results

2.1 The USAGE model

Our trade-cessation simulations were conducted with the USAGE model of the U.S. USAGE is a 533-industry/commodity dynamic computable general equilibrium (CGE) model of the U.S. developed at the Centre of Policy Studies, Monash University in collaboration with the U.S. International Trade Commission.[3] The theoretical structure of USAGE is similar to that of Australia's MONASH model, Dixon and Rimmer (2002). USAGE has been applied by the U.S. International Trade Commission and the U.S. Departments of Commerce, Agriculture, Homeland Security and Energy in studies concerned with trade, biofuels, immigration, the Obama stimulus package, the President's National Export Initiative, greenhouse policy and economic aspects of security threats.

The standard version of USAGE relies on a database for 2005. For the present study we updated key aspects of the database to 2010. The update covered all macro aggregates together with U.S. imports from Canada and U.S. exports to Canada disaggregated to the 533 commodity level. These trade data were obtained from the U.S. International Trade Commission.

2.2 Assumptions underlying the USAGE simulation and further macro results

We simulated the effects of cessation of Canada/U.S. trade under the assumption that there would be no effect on real wage rates in the U.S. The same assumption was made by Baughman and Francois. The idea is to find out how many jobs in the U.S. at current wage rates depend on Canada/U.S. trade. If there were a cessation of Canada/U.S. trade, then U.S. wages would eventually fall allowing U.S. employment to return to normal levels. So in this sense, U.S. employment in the long run does not depend on Canada/U.S. trade. However, maintenance of employment at current real wage rates *does* depend on Canada/U.S. trade. It is this dependence that we measure by calculating the number of jobs that would be lost if Canada/U.S. trade ceased and U.S. wages did not fall.

In our simulations we assume that cessation of Canada/U.S. trade does not affect the U.S. balance of trade. Put another way, we assume that there would be no change in U.S. reliance on foreign borrowing. As shown in Table 2.1, both U.S. exports and imports would contract sharply. The trade balance would be maintained via adjustment of the U.S. exchange rate. U.S. exports to Canada and imports from Canada in 2010 were both about $300 billion. Thus cancellation of this trade without a change in the U.S. trade deficit would require balanced changes in U.S. imports from and exports to the rest of the world. Cessation of Canada/U.S. trade would raise costs in the U.S. and with no change in the real wage rates, real devaluation of the U.S. currency would be required for maintenance of the U.S. trade balance.

In percentage terms the contraction in total U.S. exports would exceed that in total U.S. imports because the value of U.S. imports exceeds that of U.S. exports. Although Canada accounts for only 16 per cent of U.S. exports, the elimination of these exports leads to a contraction in total U.S. exports of more than 16 per cent (23.35 per cent). What our model is reflecting is that with the elimination of Canada as a partner, trade becomes a less efficient way for the U.S. economy to satisfy the requirements of its citizens. Without the

[3] For USAGE applications by the U.S. International Trade Commission see USITC (2004, 2007, 2009).

ability to import from Canada, there is a reduction in the value to the U.S. of earning foreign currency by selling exports in other countries.

With cessation of Canada/U.S. trade and no change in the trade balance, our model implies that changes in real GDP must be accommodated by reductions in absorption. We see this in Table 2.1 where private consumption, public consumption and investment all fall by 4.95 per cent. That they fall by the same percentage reflects an assumption built into the simulation: cessation of Canada/U.S. trade does not affect the broad composition of U.S. absorption (or gross national expenditure, GNE). That the percentage reduction in absorption (4.95) is less than the percentage reduction in GDP (5.84) arises from two factors. First, in nominal terms (current dollars), GNE for the U.S. is greater than GDP. With the balance of trade fixed, the change in nominal GNE must be the same as the change in nominal GDP, implying a smaller percentage decline in nominal GNE than in nominal GDP. This nominal effect is reinforced in real terms by the second factor, a terms-of-trade improvement. With a reduction in its exports, not only to Canada but to the rest of the world, the U.S. gets minor compensation via increases of the prices of its exports on world markets (a terms-of-trade improvement). This allows GNE in real terms to increase relative to GDP in real terms.

The final macro assumption underlying our simulation is that cessation of Canada/U.S. trade does not affect the total quantity of capital stock in the U.S. This is a short-run assumption, consistent with our assumption that wages do not change, also a short-run assumption.

Table 2.1 Further macro effects on the U.S. of ceasing trade with Canada (%)

Private consumption	-4.95
Public consumption	-4.95
Investment	-4.95
Exports	-23.35
Imports	-14.07
GDP	-5.84
Employment	-4.53
Capital stock	0.00

3. U.S. industry dependence on Canada/U.S. trade

Table 3.1 shows effects of cessation of Canada/U.S. trade on U.S. outputs of 533 commodities. For 476 commodities the effect is negative while for 57 commodities the effect is positive. A simple average of the effects is -5.23 per cent, close to the GDP effect of -5.84.

A priori we would expect cessation of Canada/U.S. trade to be particularly bad for output of U.S. commodities that are heavily exported to Canada. On the other hand we would expect cessation to be good for U.S. output of commodities that face considerable competition in the U.S. market from Canadian imports. We tested these expectation by running a regression of the form

$$y(i) = \alpha_0 + \alpha_1 * S_{exp}(i) + \alpha_2 * S_{imp}(i), \qquad \text{for } i = 1, 533 \qquad (3.1)$$

where

y(i) is the USAGE result for the percentage effect of Canada/U.S. trade cessation on U.S. output of commodity i;

Table 3.1. Commodity output effects (%) of Canada/U.S. trade cessation: USAGE & fitted results, and explanatory variables*

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
1 Dairyfarmprd	-3.18	-2.50	0.0009	0.0049	35 NaturalGas	6.57	1.54	0.0000	0.0965
2 PoultryEggs	-2.30	-2.83	0.0026	0.0018	36 crushedstone	-1.51	-2.67	0.0057	0.0133
3 BeefCattle	-0.18	-1.82	0.0002	0.0192	37 SandGravel	-2.08	-3.16	0.0067	0.0042
4 Hogs	2.44	-1.55	0.0001	0.0251	38 ClayCeramic	-2.60	-4.72	0.0327	0.0338
5 Livestckmisc	-2.16	-3.27	0.0155	0.0241	39 Nonmetminsrv	-1.00	-0.25	0.0311	0.1333
6 Cotton	4.52	-3.05	0.0039	0.0000	40 Chemfertiliz	-2.48	-1.77	0.0232	0.0782
7 Wheat	4.46	-2.14	0.0009	0.0134	41 Nresident1	-2.63	-2.62	0.0000	0.0000
8 Rice	2.34	-2.07	0.0009	0.0150	42 Nresid2to4	-2.48	-2.62	0.0000	0.0000
9 Corn	0.03	-3.47	0.0091	0.0031	43 AddAlter	-2.51	-2.62	0.0000	0.0000
10 OthFeedCrop	4.92	-0.49	0.0020	0.0545	44 GardHighrise	-2.57	-2.62	0.0000	0.0000
11 Grassseeds	0.70	-2.90	0.0222	0.0495	45 HighwysBrid	7.30	-2.62	0.0000	0.0000
12 Tobacco	6.41	-2.62	0.0000	0.0000	46 Farmresident	-2.55	-2.62	0.0000	0.0000
13 Fruits	-13.40	-15.48	0.1217	0.0083	47 PetNgDrill	3.66	-2.62	0.0000	0.0000
14 Treenuts	0.29	-6.52	0.0359	0.0000	48 PetNgExplor	3.98	-2.62	0.0000	0.0000
15 Vegetables	-7.09	-8.75	0.0804	0.0603	49 AccStrucSMD	-5.63	-2.62	0.0000	0.0000
16 SugarCane	1.19	-2.65	0.0003	0.0000	50 IndComBuild	-8.28	-2.62	0.0000	0.0000
17 SugarBeets	-3.09	-2.82	0.0019	0.0000	51 OthrConstruc	-5.14	-2.62	0.0000	0.0000
18 Cropsmisc	-3.86	-5.49	0.0337	0.0185	52 MRresident	-1.76	-2.62	0.0000	0.0000
19 SwitchGrass	-8.82	-2.62	0.0000	0.0000	53 MRstreets	-6.16	-2.62	0.0000	0.0000
20 Cropresidue	-3.90	-2.62	0.0000	0.0000	54 MRpetngwell	9.43	-2.62	0.0000	0.0000
21 CellMaterial	-4.53	-2.62	0.0000	0.0000	55 OthMRconst	-4.59	-2.62	0.0000	0.0000
22 OrgByProds	-4.38	-2.62	0.0000	0.0000	56 GuidedMiss	-5.97	-2.75	0.0017	0.0013
23 Soybeans	2.86	-2.71	0.0027	0.0048	57 Ammunition	-2.29	-3.17	0.0050	0.0000
24 OthOilseeds	-1.03	-8.01	0.0812	0.0796	58 Tanks	-2.49	-0.97	0.0233	0.0970
25 Greennursery	-1.53	-3.39	0.0143	0.0182	59 SmallArms	-0.58	-7.73	0.0533	0.0159
26 Forestryprds	1.24	-2.54	0.0007	0.0036	60 SmArmsAmmu	-5.70	-9.24	0.0719	0.0275
27 ComFishing	-0.52	16.56	0.1322	0.7785	61 Ordnance	-1.72	-4.46	0.0170	0.0001
28 AgForFshserv	-1.53	-2.63	0.0001	0.0000	62 BeefPack	-0.77	-3.10	0.0146	0.0257
29 Lndscaphort	-2.87	-2.62	0.0000	0.0000	63 OthMeatPack	-3.74	-2.77	0.0128	0.0288
30 Ironmetlores	-28.78	-27.88	0.2570	0.0617	64 Sausages	-7.30	-4.24	0.0162	0.0034
31 Copperore	0.02	-10.01	0.0681	0.0003	65 Pltryslaught	-2.06	-3.79	0.0131	0.0057
32 Nonferrores	-20.52	-22.17	0.1837	0.0095	66 Butter	-4.27	-3.34	0.0069	0.0008
33 Coal	-1.24	-4.19	0.0181	0.0091	67 Cheese	-3.89	-2.81	0.0022	0.0012
34 CrudeOil	10.83	2.10	0.0084	0.1307	68 DairyCE	-2.70	-4.84	0.0220	0.0039

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
69 DairyDry	0.13	-3.30	0.0065	0.0008	103 Sweeteners	-4.31	-2.62	0.0000	0.0000
70 ConcMilkProt	-0.27	-7.04	0.0410	0.0006	104 Chocolate	-29.52	-20.94	0.4122	0.6143
71 Icecream	-3.42	-2.68	0.0013	0.0019	105 NutsSeeds	-4.57	-7.94	0.0596	0.0268
72 Fluidmilk	-4.45	-2.79	0.0018	0.0006	106 Candy	-1.35	-2.63	0.0134	0.0336
73 TunaOil	-8.35	-2.25	0.0000	0.0086	107 Maltbevrage	-2.54	-3.34	0.0107	0.0102
74 TunaWat	-7.46	-2.67	0.0005	0.0003	108 Malt	9.35	1.35	0.0166	0.1340
75 CanFishnec	-6.71	2.25	0.0988	0.3621	109 WinesSpirit	-1.56	-6.57	0.0374	0.0025
76 Canndspecial	-5.31	-4.95	0.0268	0.0133	110 Distliqour	-1.33	-3.09	0.0259	0.0545
77 Cannedfruit	-4.00	-4.60	0.0228	0.0117	111 Softdrinks	-5.49	-3.63	0.0103	0.0026
78 Dehydfruit	-1.29	-6.67	0.0451	0.0197	112 Flavorsyrups	7.17	0.77	0.0070	0.0963
79 Pickles_dres	-4.64	-5.39	0.0334	0.0200	113 Cottnsdmills	1.23	-2.66	0.0004	0.0000
80 PreparedFish	-8.82	-4.74	0.0195	0.0000	114 Soybeanmills	-1.18	-6.06	0.0349	0.0081
81 Frozenfruit	-3.36	-5.99	0.0691	0.0959	115 Vegetmills	-20.51	-15.82	0.2461	0.3142
82 Froznspecial	-3.58	-2.62	0.0000	0.0000	116 FatsOilsnonv	-2.06	-6.80	0.0463	0.0197
83 Flour	-5.52	-4.12	0.0150	0.0030	117 Coffee	-15.99	-13.80	0.1269	0.0606
84 Cereal	-3.12	-4.70	0.0375	0.0462	118 EdblfatsOils	-3.39	-3.94	0.0203	0.0208
85 Prepdough	-3.09	-4.73	0.0384	0.0480	119 Ice	64.81	30.04	0.0087	0.7799
86 DogCatfood	-8.46	-8.57	0.0622	0.0189	120 Noodles	-3.92	-4.35	0.0220	0.0153
87 Prepfeeds	-1.19	-3.45	0.0108	0.0080	121 Potatochips	-3.32	-2.96	0.0046	0.0037
88 Ricemill	-3.10	-9.76	0.0677	0.0050	122 Foodprepnec	-4.29	-6.01	0.0432	0.0304
89 HFCS	-2.70	-2.32	0.0007	0.0087	123 Cigarettes	-0.51	-2.44	0.0001	0.0045
90 Glucose	-2.72	-7.19	0.0498	0.0196	124 Cigars	-3.83	-5.33	0.0255	0.0014
91 Dextrose	-1.70	-2.57	0.0000	0.0012	125 tobaccoSnuff	-7.09	-7.47	0.0448	0.0005
92 Dextrin	-15.44	-26.08	0.2164	0.0013	126 TobStmRedry	12.86	-2.68	0.0086	0.0203
93 Starch	-9.03	-14.41	0.1093	0.0019	127 Broadfabric	-3.98	-3.64	0.0147	0.0136
94 ModStarch	-11.38	-18.81	0.1492	0.0004	128 Narrowfabric	-0.61	-5.98	0.0585	0.0695
95 WetMillingne	2.70	1.70	0.0051	0.1131	129 YarnFinish	-2.55	-3.58	0.0123	0.0088
96 Bread	-3.15	-3.56	0.0200	0.0286	130 Threadmills	-3.04	-3.66	0.0196	0.0254
97 Cookies	-3.21	-2.62	0.0000	0.0000	131 CarpetsRugs	-8.36	-6.35	0.0376	0.0082
98 Froznbakery	-3.79	-2.62	0.0000	0.0000	132 Coatdfabric	-0.50	-3.79	0.0479	0.0936
99 RawSugar	1.53	-3.03	0.0038	0.0002	133 TirecordFab	-13.39	-10.28	0.1025	0.0806
100 RefCaneSugar	-5.55	-2.62	0.0000	0.0000	134 CordageTwine	-6.29	-6.45	0.0435	0.0208
101 RefBeetSugar	-2.77	-2.37	0.0000	0.0058	135 Nonwovenfab	-7.41	-8.72	0.0650	0.0224
102 RefinedSugar	-4.67	-3.21	0.0054	0.0000	136 Textilegoods	-5.56	-6.77	0.0427	0.0114

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
137 Womenhosiery	-4.56	-3.37	0.0086	0.0043	171 OfFurnXwood	-6.66	-3.49	0.0248	0.0423
138 Hosierynec	-4.10	-4.46	0.0224	0.0138	172 PubBldFurnit	-19.34	-15.44	0.1595	0.1045
139 Knitfabric	-0.23	-3.71	0.0178	0.0196	173 Woodfixture	-6.69	-2.62	0.0000	0.0000
140 Apparel	-6.31	-5.78	0.0397	0.0268	174 FixturExwood	-11.64	-7.61	0.1131	0.1695
141 Curtains	-7.24	-8.02	0.0524	0.0068	175 DraphardBlnd	-2.45	-2.86	0.0035	0.0033
142 Housefurnish	-8.34	-6.90	0.0451	0.0143	176 Furnfixnec	-39.59	-31.47	0.3462	0.2035
143 Textilebags	-2.66	-4.77	0.0296	0.0247	177 Pulpmills	22.44	10.36	0.0220	0.3569
144 Canvasprods	-4.09	-5.15	0.0265	0.0082	178 Envelopes	-6.78	-4.12	0.0151	0.0033
145 Pleating	-2.66	-2.85	0.0040	0.0047	179 SanitPapProd	-7.26	-5.55	0.0459	0.0479
146 AutoAppTrim	-5.96	-3.44	0.0075	0.0000	180 PaperCoat	-6.06	-4.71	0.0238	0.0115
147 Embroideries	-5.38	-2.62	0.0000	0.0000	181 BagsExtext	-4.69	-4.72	0.0376	0.0463
148 Fabtxtprods	-17.20	-15.32	0.1301	0.0333	182 Cardboard	-3.85	-5.37	0.0514	0.0657
149 Logging	2.45	-5.05	0.0254	0.0076	183 Stationery	-4.58	-3.95	0.0143	0.0053
150 Sawmills	5.88	0.39	0.0131	0.1028	184 PapProdsnec	-4.97	-2.49	0.0046	0.0146
151 Hrdwdfloor	-4.85	-2.50	0.0018	0.0073	185 Papermills	0.71	-1.95	0.0391	0.1139
152 Sawmillprod	13.71	14.43	0.0508	0.5238	186 Boxes	-5.43	-3.23	0.0117	0.0153
153 Millwork	-3.97	-2.92	0.0103	0.0189	187 Newspapers	-5.27	-2.79	0.0017	0.0003
154 kitchencab	-2.48	-2.89	0.0096	0.0179	188 Periodicals	-9.01	-6.59	0.0382	0.0042
155 VeneerPlywd	-4.32	-2.60	0.0170	0.0433	189 BookPublish	-7.65	-5.61	0.0304	0.0074
156 Structwood	-4.11	-2.95	0.0043	0.0032	190 Bookprint	-7.44	-2.64	0.0001	0.0000
157 PrefabBlding	-6.08	-3.70	0.0156	0.0143	191 MiscPublish	-5.67	-3.36	0.0088	0.0049
158 Mobilehomes	-3.22	-2.82	0.0019	0.0000	192 CommercPrnt	-5.23	-3.06	0.0085	0.0114
159 Woodpreserv	-1.44	-2.00	0.0011	0.0173	193 BusinessForm	-6.24	-4.33	0.0190	0.0083
160 PalletsSkids	-5.82	-2.41	0.0065	0.0213	194 Blankbooks	-4.69	-4.39	0.0185	0.0055
161 Woodprodnec	-6.25	-1.95	0.0201	0.0662	195 Greetingcard	-7.37	-5.31	0.0267	0.0050
162 Reconstwood	14.24	3.34	0.0153	0.1769	196 Bookbinding	-6.60	-2.62	0.0000	0.0000
163 Containernec	-9.38	-5.72	0.0292	0.0017	197 Typesetting	-5.31	-2.62	0.0000	0.0000
164 HldfurnrUnup	-2.17	-3.04	0.0263	0.0567	198 Platemaking	-4.91	-2.68	0.0006	0.0000
165 Hhldfurnnec	-5.72	-3.42	0.0141	0.0171	199 IndustChem	-4.79	-5.27	0.0612	0.0927
166 TVcabinets	-7.49	-2.58	0.0003	0.0017	200 CornEthanol	-4.57	-2.62	0.0000	0.0000
167 HldfurnUp	-4.32	-5.72	0.0334	0.0122	201 DDGS	-0.70	-2.62	0.0000	0.0000
168 Metalhldfurn	-3.29	-4.60	0.0209	0.0069	202 CellEthanol	-4.86	-2.62	0.0000	0.0000
169 Mattresses	-4.81	-3.86	0.0135	0.0052	203 AltEthanol	-4.86	-2.62	0.0000	0.0000
170 WoodOffFurn	1.06	3.15	0.0008	0.1358	205 OthEthanol	0.00	-2.62	0.0000	0.0000

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
206 Ethanol	-4.86	-2.62	0.0000	0.0000	240 BootCutStock	-1.34	-6.72	0.0449	0.0182
207 MotorFuels	-4.94	-2.62	0.0000	0.0000	241 ShoesExrub	-8.90	-8.22	0.0949	0.1093
208 NitPhosFert	3.04	-2.05	0.0323	0.0948	242 Slippers	-3.34	-4.14	0.0148	0.0022
209 Pesticidnec	-2.56	-5.52	0.0309	0.0107	243 Leathrgloves	-7.61	-5.27	0.0254	0.0025
210 GumWoodchm	-1.39	-7.28	0.0472	0.0108	244 Luggage	-17.16	-19.87	0.1764	0.0445
211 Adhesives	-8.54	-5.66	0.0312	0.0080	245 WmnsHandbag	-15.08	-23.38	0.1928	0.0044
212 Explosives	0.78	-4.91	0.0513	0.0761	246 PerLeathrGds	-5.75	-8.06	0.0506	0.0015
213 PrintingInk	-10.08	-6.35	0.0368	0.0062	247 LeathrGdsnec	-9.95	-8.38	0.0660	0.0328
214 CarbonBlack	-12.70	-5.11	0.0824	0.1501	248 Glass	-7.97	-7.43	0.0506	0.0161
215 Chemicalsnec	-4.91	-5.99	0.0387	0.0193	249 Glasscontain	-4.84	-5.48	0.0300	0.0091
216 Plastics	-8.31	-8.00	0.0797	0.0762	250 Cement	-0.05	-2.59	0.0104	0.0269
217 SyntheticRub	-5.82	-7.89	0.0599	0.0290	251 BrickClyTile	-4.67	-3.81	0.0116	0.0018
218 CellMmdeFibr	-8.39	-7.53	0.0453	0.0001	252 CeramicTile	-2.17	-5.17	0.0237	0.0006
219 MmadeFibOth	-5.76	-3.96	0.0248	0.0314	253 ClayRefract	-4.32	-4.82	0.0317	0.0290
220 Drugs	-0.17	-4.66	0.0284	0.0243	254 StrClyPrdnec	-2.45	-3.64	0.0097	0.0008
221 Soap	-11.83	-7.75	0.0541	0.0174	255 VitChinaPlmb	-6.43	-10.73	0.0752	0.0014
222 Polishes	-6.24	-3.15	0.0064	0.0038	256 VitChinaTble	-5.53	-7.62	0.0460	0.0001
223 SurfActAgent	-8.69	-9.86	0.0803	0.0345	257 Earthenware	-13.63	-18.44	0.1457	0.0002
224 ToiletPrep	-8.05	-6.76	0.0505	0.0311	258 PorclainElec	-7.00	-6.91	0.0417	0.0055
225 Paints	-9.35	-6.16	0.0372	0.0117	259 PottryPrdnec	-5.76	-10.18	0.0722	0.0065
226 Gasoline	-4.93	-2.78	0.0032	0.0042	260 ConcrtBrick	-2.96	-3.11	0.0078	0.0084
227 Diesel	-2.24	-0.89	0.0000	0.0401	261 ConcrtPrdnec	-1.72	-3.86	0.0163	0.0123
228 OthPetFuels	-8.81	-9.12	0.1037	0.1107	262 Readymix	-1.86	-2.62	0.0000	0.0000
229 LubricatOils	-4.17	-2.84	0.0020	0.0000	263 Lime	-2.57	-3.06	0.0149	0.0272
230 PetClPrdnec	-6.99	-9.52	0.0657	0.0055	264 GypsumPrd	-7.10	-5.86	0.0332	0.0086
231 AsphaltPav	-0.97	-3.05	0.0080	0.0103	265 CutStone	-8.93	-3.93	0.0286	0.0419
232 AsphaltFelts	-3.82	-5.57	0.0357	0.0216	266 AbrasivePrd	-5.48	-5.42	0.0403	0.0367
233 Tires	-12.21	-6.77	0.0986	0.1524	267 AsbestosPrd	-24.19	-5.24	0.2197	0.4932
234 RubPlFootwr	-13.95	-10.44	0.1222	0.1267	268 MineralsGrnd	-2.94	-3.57	0.0128	0.0101
235 FabRubPrdnec	-5.57	-4.72	0.0340	0.0370	269 MineralWool	-6.62	-6.24	0.0455	0.0306
236 MiscPlPrdnec	-7.38	-4.10	0.0244	0.0271	270 NonClayRefrc	-8.83	-10.63	0.0872	0.0339
237 RubPlHose	-17.31	-18.69	0.1841	0.0913	271 NonmtMinPrd	-1.96	-2.00	0.0335	0.0988
238 Gaskets	-6.69	-9.37	0.0861	0.0605	272 BlastFurnace	-8.12	-9.23	0.0957	0.0881
239 LeatherTan	0.48	-3.99	0.0127	0.0001	273 ElectMetPrds	-19.70	-14.56	0.1320	0.0558

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
274 SteelWire	-5.51	-4.74	0.0595	0.1008	308 PlatingPolsh	-3.12	-2.62	0.0000	0.0000
275 IronSteel	-7.33	-2.67	0.0009	0.0012	309 Coating	-5.23	-2.62	0.0000	0.0000
276 IronStlForg	-5.49	-8.06	0.0501	0.0000	310 MisFabWirPrd	-6.01	-4.90	0.0255	0.0116
277 MetalHeatTr	-6.31	-2.62	0.0000	0.0000	311 SteelSpring	-10.58	-11.87	0.1353	0.1265
278 PrimMetPrd	0.32	-3.96	0.0354	0.0582	312 PipeValves	-9.76	-12.49	0.1041	0.0334
279 SmeltCopper	8.68	-3.15	0.0680	0.1594	313 MtlFoilLeaf	-5.56	-3.89	0.0197	0.0203
280 PrimAluminum	24.93	30.04	0.0559	0.8988	314 FabMtlPrdnec	-10.25	-9.01	0.0885	0.0749
281 PrimNfMetnec	8.17	2.92	0.0461	0.2447	315 Turbines	-4.68	-12.76	0.1004	0.0179
282 ExtrudCopper	-9.94	-5.96	0.0416	0.0273	316 IntCombusEng	-9.70	-9.33	0.0680	0.0157
283 AluminumRoll	-14.41	-8.51	0.0779	0.0597	317 FarmMachin	-19.88	-17.18	0.2259	0.2318
284 NferRollnec	-1.46	-8.77	0.0671	0.0265	318 GardenEquip	-8.36	-7.73	0.0488	0.0045
285 NfWireDraw	-8.64	-9.70	0.1222	0.1437	319 ConstMachin	-14.87	-15.15	0.1262	0.0273
286 AluminCast	-8.20	-2.66	0.0005	0.0004	320 MiningMachin	-10.68	-13.89	0.1158	0.0303
287 NfForging	-5.42	-2.62	0.0000	0.0000	321 OilGsFldMach	12.02	-2.10	0.0184	0.0585
288 MetalCans	-8.77	-5.51	0.0288	0.0055	322 Elevators	-18.56	-14.51	0.1349	0.0642
289 MetalBarrels	-19.21	-14.91	0.1441	0.0782	323 Conveyors	-5.90	-6.12	0.0331	0.0022
290 EnamSanWare	-4.83	-6.01	0.0348	0.0091	324 Hoists	-18.05	-14.72	0.1187	0.0187
291 PlumbFixFit	-6.71	-5.19	0.0246	0.0025	325 IndTrukTrac	-15.21	-12.12	0.1285	0.1035
292 HeatingEquip	-14.47	-10.36	0.0948	0.0594	326 MachToolCut	-4.90	-8.12	0.0618	0.0280
293 FabStrMetal	-4.62	-2.71	0.0094	0.0216	327 MachToolForm	-3.77	-6.09	0.0833	0.1295
294 MetalDoors	-5.62	-3.43	0.0155	0.0204	328 SpecialDies	-5.47	-5.55	0.0463	0.0487
295 FabPlateWork	-6.29	-4.22	0.0249	0.0259	329 PdrivnHandTl	-13.82	-13.46	0.1013	0.0038
296 SheetMtlWork	-5.73	-2.85	0.0028	0.0019	330 Rolmilmach	5.72	-4.03	0.0304	0.0439
297 ArchMtlWork	-8.10	-6.56	0.0413	0.0128	331 ElecGasWeld	-11.54	-13.43	0.1176	0.0455
298 PrefabMtlBld	-10.39	-8.55	0.0640	0.0239	332 IndPatterns	-7.61	-3.64	0.0137	0.0111
299 MiscStMtlWrk	-8.10	-6.46	0.0692	0.0854	333 MtlWorkMach	-6.10	-2.62	0.0000	0.0000
300 ScrewMach	-8.48	-6.79	0.0444	0.0153	334 FoodPrdMach	-8.87	-9.99	0.0760	0.0206
301 AutoStamp	-9.61	-5.93	0.0332	0.0069	335 TextMach	-2.26	-6.14	0.0346	0.0056
302 Crowns	-18.38	-17.90	0.1637	0.0581	336 WoodwrkMach	-8.63	-6.02	0.0493	0.0452
303 MtlStampnec	-6.33	-2.66	0.0010	0.0015	337 PaperIndMach	-5.20	-6.06	0.0447	0.0329
304 Cutlery	-4.03	-8.89	0.0592	0.0037	338 PrintMach	-13.39	-13.07	0.1046	0.0213
305 Handtools	-9.15	-6.92	0.0418	0.0058	339 SpecIndMach	-3.06	-4.87	0.0465	0.0650
306 Handsaws	-4.37	-6.02	0.0423	0.0277	340 PumpsCompres	-12.46	-15.61	0.1400	0.0515
307 Hardwarenec	-11.32	-6.91	0.0692	0.0749	341 Ballbearings	-7.42	-8.05	0.0624	0.0314

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
342 Fans	-26.44	-22.07	0.2184	0.0993	376 RecordTapes	-7.83	-7.55	0.0847	0.0992
343 MecPwrTEqup	-13.39	-14.92	0.1303	0.0431	377 Telephones	-0.94	-6.79	0.0613	0.0579
344 Furnaces	-3.22	-6.50	0.0539	0.0459	378 CommunEquip	-2.09	-4.44	0.0284	0.0296
345 IndMachEquip	-7.59	-12.09	0.1181	0.0780	379 ElectronTube	-3.58	-3.05	0.0042	0.0004
346 PackagMach	-8.19	-7.24	0.0788	0.0916	380 Semiconduct	1.67	-4.82	0.0237	0.0088
347 Carburetors	-7.49	-2.62	0.0000	0.0000	381 OthElectronC	-1.67	-3.67	0.0133	0.0093
348 FluidPwEquip	-10.87	-7.40	0.0759	0.0805	382 StoragBatt	-12.99	-11.11	0.0837	0.0140
349 Scales	-16.09	-17.93	0.1595	0.0469	383 Primarybatt	-11.37	-10.03	0.0713	0.0078
350 IndMachnec	0.32	-3.52	0.0096	0.0034	384 ElecteqICE	-14.42	-14.77	0.1166	0.0120
351 Calculatmach	-7.30	-4.91	0.0298	0.0218	385 Recordmedia	-19.78	-23.91	0.2043	0.0210
352 Computers	-9.73	-11.70	0.0939	0.0262	386 ElectMachnec	4.49	-1.87	0.0400	0.1184
353 ComPerEquip	-3.69	-3.48	0.0144	0.0163	387 TruckBusBdy	-4.53	-0.97	0.0236	0.0976
354 OffMachnec	-6.63	-2.76	0.0040	0.0068	388 Trucktrailer	-25.18	-21.03	0.1807	0.0283
355 VendingMach	-9.06	-5.58	0.0313	0.0104	389 Motorvehicle	-5.78	-1.59	0.0617	0.1794
356 ComLaundryEq	-26.36	-22.14	0.1800	0.0009	390 MotvehParts	-10.95	-11.00	0.1163	0.0990
357 RefrigHtEq	-10.27	-6.70	0.0430	0.0139	391 Aircraft	-4.03	-1.39	0.0049	0.0409
358 MeasurPump	-18.12	-13.86	0.1053	0.0047	392 AircrftEngin	-4.68	-3.84	0.0289	0.0446
359 ServIndMach	-6.28	-3.54	0.0158	0.0184	393 AircrftEquip	1.01	-0.20	0.0136	0.0904
360 PowerTrnsfrm	-11.54	-9.69	0.1190	0.1359	394 Shipbuild	-7.94	-2.92	0.0028	0.0002
361 Switchboard	-6.25	-6.31	0.0381	0.0105	395 Boatbuild	-11.55	-6.20	0.0390	0.0153
362 Motors	-10.29	-5.49	0.1323	0.2669	396 RailroadEq	-13.30	-14.27	0.1211	0.0349
363 Relays	-6.45	-6.29	0.0507	0.0425	397 Motorcycles	-8.22	-6.98	0.0464	0.0157
364 Carbonprods	-5.67	-9.16	0.0628	0.0066	398 TravelTraler	-24.91	-19.60	0.1688	0.0317
365 ElectIndApp	-7.58	-3.29	0.0066	0.0010	399 Motorhomes	-10.89	-2.62	0.0000	0.0000
366 Hldcookequip	-8.61	-9.06	0.0840	0.0625	400 TrnsprtEqnec	-24.77	-23.84	0.1996	0.0108
367 Hldrefrig	-13.02	-15.02	0.1164	0.0058	401 NavigEquip	-5.82	-3.82	0.0143	0.0082
368 Hldlaundry	-7.93	-7.01	0.0573	0.0426	402 LabApparat	-4.03	-7.50	0.0478	0.0072
369 ElecHousware	-11.67	-14.40	0.1175	0.0229	403 MechMeasur	-4.21	-10.48	0.0846	0.0308
370 HldVacuumCl	-3.62	-5.88	0.0481	0.0455	404 Environcontr	-6.01	-5.13	0.0278	0.0118
371 HldApplianec	-15.08	-14.69	0.1450	0.0853	405 MedicInst	1.78	-8.16	0.0553	0.0108
372 ElecLampbulb	-7.23	-7.75	0.0602	0.0329	406 SurgiclAppl	0.17	-8.45	0.0577	0.0103
373 LightingFixt	-16.08	-14.78	0.1354	0.0591	407 DentalEquip	-9.11	-8.83	0.0587	0.0039
374 Wiringdevice	-3.80	-11.12	0.0895	0.0284	408 Watches	-8.17	-7.00	0.0409	0.0016
375 HldAudioVid	-7.48	-11.13	0.0841	0.0145	409 XrayAppar	2.31	-8.58	0.0556	0.0018

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
410 ElctroMedApp	5.02	-6.85	0.0424	0.0086	444 CblePyTVserv	-4.08	-2.62	0.0000	0.0000
411 LabInstrum	1.54	-8.30	0.0586	0.0158	445 RadioTVbroad	-4.90	-2.62	0.0000	0.0000
412 InstrumElec	-4.94	-10.75	0.0877	0.0323	446 Electricserv	-5.08	-2.78	0.0032	0.0042
413 Ophthalmic	-10.98	-10.92	0.0771	0.0016	447 NatgasTransp	-11.96	-2.62	0.0000	0.0000
414 PhotoEquip	-4.41	-3.39	0.0165	0.0237	448 NatgasDistrb	-5.13	-2.68	0.0005	0.0000
415 Jewelry	-4.82	-5.42	0.0290	0.0081	449 Watersupply	-2.01	-2.63	0.0001	0.0000
416 JewelMater	1.75	-3.81	0.0138	0.0071	450 Sanitaryserv	-5.00	-2.62	0.0000	0.0000
417 Silverware	-10.22	-10.06	0.0719	0.0086	451 WholesleTrde	-7.26	-2.65	0.0003	0.0000
418 CostumJewel	-7.95	-5.56	0.0283	0.0033	452 RetailTrade	-6.51	-2.62	0.0000	0.0000
419 Musicalinstr	-6.11	-4.29	0.0197	0.0110	453 Banking	-3.43	-2.94	0.0029	0.0000
420 Games	-13.57	-9.15	0.0642	0.0102	454 Creditagency	-3.83	-2.67	0.0004	0.0000
421 Dolls	-10.13	-7.11	0.0433	0.0051	455 SecCombroker	-3.43	-2.82	0.0019	0.0000
422 SportGdsnec	-8.44	-5.12	0.0284	0.0136	456 InsurnceCarr	-3.08	-2.60	0.0011	0.0031
423 Pens	-6.59	-4.05	0.0138	0.0018	457 InsurnceBrok	-2.88	-2.65	0.0003	0.0000
424 PencilsArt	-7.12	-3.75	0.0117	0.0032	458 OwnoccDwell	3.39	-2.62	0.0000	0.0000
425 MarkingDevic	-5.92	-3.55	0.0089	0.0009	459 RestateAgent	-3.63	-2.66	0.0004	0.0000
426 Carbonpaper	-6.28	-7.15	0.0431	0.0038	460 Hotels	-2.78	-2.63	0.0001	0.0000
427 Fasteners	-5.68	-5.55	0.0284	0.0034	461 Othlodging	-0.62	-2.62	0.0000	0.0000
428 Brooms	-7.31	-4.93	0.0256	0.0110	462 Laundry	-5.26	-2.62	0.0000	0.0000
429 HrdsurFlrCov	-6.91	-6.87	0.0611	0.0556	463 Funeralserv	-5.54	-2.62	0.0000	0.0000
430 Burialcasket	-5.41	-2.62	0.0000	0.0000	464 PortraitStud	-4.97	-2.62	0.0000	0.0000
431 SignsAdvert	-8.64	-3.41	0.0110	0.0093	465 ElectRepair	-4.92	-2.63	0.0001	0.0000
432 ManuIndnec	-7.88	-5.82	0.0370	0.0190	466 WatchRepair	-5.11	-2.65	0.0002	0.0000
433 Railroadserv	-5.24	-2.69	0.0007	0.0001	467 Beautyshops	-5.37	-2.62	0.0000	0.0000
434 PassengTrans	-3.89	-2.63	0.0001	0.0000	468 MiscRepair	-3.20	-3.01	0.0036	0.0000
435 TruckingServ	-7.38	-2.66	0.0005	0.0004	469 ServtoDwell	-4.09	-2.63	0.0001	0.0000
436 WarehseStore	-4.67	-2.86	0.0022	0.0000	470 PersonnelSup	-4.79	-2.62	0.0001	0.0002
437 WaterTransLR	-18.49	-2.62	0.0000	0.0000	471 ComputerServ	-4.55	-2.68	0.0006	0.0001
438 WaterTransCD	-10.00	-2.62	0.0000	0.0000	472 DetectiveSer	-4.69	-2.65	0.0003	0.0000
439 AirTrans	-4.87	-2.62	0.0000	0.0000	473 MiscEqRent	-4.47	-2.74	0.0011	0.0000
440 PipelinExng	-2.64	-2.88	0.0024	0.0000	474 ComPhoto	-5.18	-2.73	0.0010	0.0000
441 FreightForw	-1.56	-3.73	0.0102	0.0000	475 OthBusServ	-5.00	-2.62	0.0000	0.0000
442 ArrangPTrans	-2.54	-2.96	0.0031	0.0000	476 ManageServ	-2.90	-2.89	0.0028	0.0008
443 TelephonCom	-5.02	-2.63	0.0006	0.0013	477 ResearchDev	-4.59	-2.69	0.0008	0.0003

Table 3.1 continues …

Table 3.1 continued

Commodity	USAGE	Fitted	S_{exp}	S_{imp}	Commodity	USAGE	Fitted	S_{exp}	S_{imp}
478 Advertising	-4.83	-2.52	0.0022	0.0079	507 JobTraining	-5.49	-2.62	0.0000	0.0000
479 Legalserv	-3.84	-2.71	0.0010	0.0003	508 ChildDaycare	-4.89	-2.62	0.0000	0.0000
480 EngineerSer	-2.81	-2.86	0.0029	0.0018	509 ResidCare	-5.22	-2.62	0.0000	0.0000
481 AccountServ	-4.48	-2.64	0.0003	0.0002	510 SocialSernec	-5.29	-2.62	0.0000	0.0000
482 EatDrinkPlce	-4.90	-2.63	0.0000	0.0000	511 PostalServ	-4.81	-2.64	0.0002	0.0000
483 AutoRental	-5.32	-2.62	0.0000	0.0000	512 OthFedGovEnt	-3.59	-2.62	0.0000	0.0000
484 AutoRepair	-5.50	-2.62	0.0000	0.0000	513 OthSLGentpr	-1.86	-2.62	0.0000	0.0000
485 AutoPark	-4.23	-2.62	0.0000	0.0000	517 GenGovInd	-5.08	-2.62	0.0000	0.0000
486 Theatres	-6.94	-5.80	0.0342	0.0123	518 Hhldind	-4.98	-2.62	0.0000	0.0000
487 VideoTpeRent	-3.68	-2.63	0.0000	0.0000	519 FGCEnatdef	-4.95	-2.62	0.0000	0.0000
488 TheatPrducer	-4.07	-2.66	0.0004	0.0002	520 FGCEnondef	-4.95	-2.62	0.0000	0.0000
489 BowlingCentr	-3.89	-2.62	0.0000	0.0000	521 SLCEpubSch	-4.95	-2.62	0.0000	0.0000
490 ProSportClub	-4.29	-2.62	0.0000	0.0000	522 SLCEpubHied	-4.95	-2.62	0.0000	0.0000
491 Racing	-3.67	-2.62	0.0000	0.0000	523 SLCEothedLib	-4.95	-2.62	0.0000	0.0000
492 MembSprtClub	-4.55	-2.62	0.0000	0.0000	524 SLCEhealth	-4.95	-2.62	0.0000	0.0000
493 OthAmuseServ	-3.50	-2.67	0.0004	0.0000	525 SLCEwelfare	-4.95	-2.62	0.0000	0.0000
494 DoctorsDent	-4.67	-2.62	0.0000	0.0000	526 SLCEsanitat	-4.95	-2.62	0.0000	0.0000
495 Hospitals	-5.10	-2.62	0.0000	0.0000	527 SLCEpolice	-4.95	-2.62	0.0000	0.0000
496 NursingFacil	-5.08	-2.62	0.0000	0.0000	528 SLCEfire	-4.95	-2.62	0.0000	0.0000
497 HomeHealth	-5.26	-2.62	0.0000	0.0000	529 SLCEcorrect	-4.95	-2.62	0.0000	0.0000
498 VetServ	-4.83	-2.62	0.0000	0.0000	530 SLCEhighway	-4.95	-2.62	0.0000	0.0000
499 OthMedServ	-4.95	-2.62	0.0000	0.0000	531 SLCEnatural	-4.95	-2.62	0.0000	0.0000
500 Schools	-4.61	-2.62	0.0000	0.0000	532 SLCEother	-4.95	-2.62	0.0000	0.0000
501 CollegeUni	-3.90	-2.63	0.0001	0.0000	533 Holiday	-4.50	-1.90	0.0000	0.0167
502 Libraryetc	-2.69	-2.60	0.0001	0.0006	535 ExpTour	7.82	-6.64	0.0370	0.0000
503 BusinAssoc	-4.70	-2.62	0.0000	0.0000	536 ExpEdu	15.45	-6.64	0.0370	0.0000
504 LaborOrgan	-4.57	-2.65	0.0003	0.0000	538 WatInternat	-15.82	-2.62	0.0000	0.0000
505 ReligiousOrg	-4.67	-2.62	0.0000	0.0000	539 AirInternat	-4.11	-0.72	0.0000	0.0441
506 OthmemOrg	-4.89	-2.62	0.0000	0.0000					

* Commodities in USAGE are numbered from 1 to 539. This table lists 533 commodities. The other six USAGE commodities are artificial, such as domestic production of noncomparable imports.

$S_{exp}(i)$ is the share of U.S. output of commodity i that is exported to Canada;

$S_{imp}(i)$ is U.S. imports from Canada as a share of U.S. output of commodity i; and

the αs are parameters to be estimated.

The resulting regression equation is :

$$y(i) = -2.62 - 108.64 * S_{exp}(i) + 43.09 * S_{imp}(i), \qquad R^2 = 0.60 \tag{3.2}$$

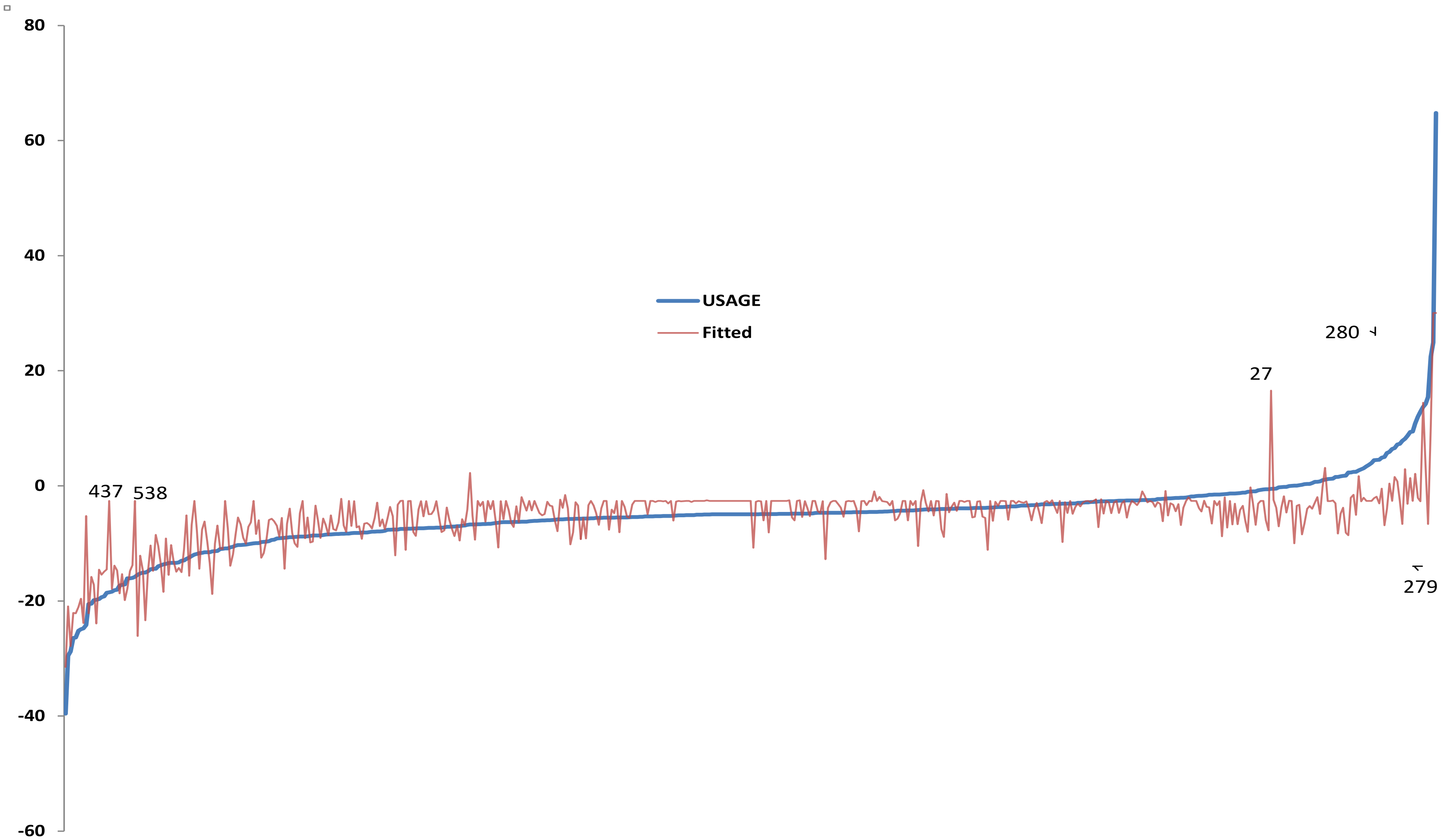
As expected, outputs of commodities with high export shares to Canada are systematically reduced by cessation: the coefficient on S_{exp} is negative. Outputs of commodities with a high ratio of imports from Canada to domestic output are systematically increased by cessation: the coefficient on S_{imp} is positive. These two shares, S_{exp} and S_{imp}, explain about 60 per cent of the variation in the USAGE output results across commodities.

This still leaves 40 per cent of the variation to be explained. Another way of looking at this is that we need to understand the gaps between the two lines in Figure 3.1. The smooth line shows the USAGE results for commodity outputs ranked from the worst affected at the left hand side to the most favorably affected at the right hand side. The jagged line shows fitted regression values from equation (3.2). The gaps reflect factors that USAGE knows about but the regression doesn't.

To start the process of locating these factors, we examine a few of the large gaps in Figure 3.1, beginning with Commercial fishing (commodity 27). The USAGE result (see Table 3.1) for this commodity is a contraction of 0.52 per cent. The fitted result is an expansion of 16.56 per cent, dominated by a very high ratio of imports from Canada to domestic output (S_{imp} = 0.7785). What does USAGE know that causes it to project that the disappearance of these imports will not be of great benefit to the U.S. Commercial fishing industry? Nearly 80 per cent of U.S. Commercial fishing output is exported to countries other than Canada. Thus for most of the U.S. Commercial fishing industry, competition with Canada inside the U.S. market is irrelevant. This is recognized by USAGE, but not by the regression.

Next we look at Copper smelting and Primary aluminum (commodities 279 and 280). The regression underestimates the USAGE result for Copper smelting. On the other hand (while not clear in Figure 3.1 but as can be seen from Table 3.1), the regression overestimates the result for Primary aluminum. A difference between the two industries that is understood by USAGE, but not by the regression, is that Primary aluminum (280) has a considerable reliance on imported inputs from Canada. Its costs are seriously escalated by lack of availability of these inputs. This reduces U.S. exports of Primary aluminum to countries other than Canada. By contrast, Copper smelting has low reliance on imported inputs from Canada. At the same time, it faces considerable competition in the U.S. market from non-Canadian imports. While our regression accounts for competition from Canadian imports, it does not account for competition from non-Canadian imports. Because cessation of Canada/U.S. trade is accompanied by U.S. devaluation, industries such as Copper smelting that face strong competition from non-Canadian imports receive a benefit in the USAGE simulation that is missed in the regression.

Figure 3.1. Commodity output effects (%) of Canada/U.S. trade cessation: USAGE & fitted results from equation (3.2)



The final pair of products that we will consider here are Water transport lakes and rivers (437) and Water international (538). Neither of these commodities is directly exported to or imported from Canada ($S_{exp} = S_{imp} = 0$) or any other country. Consequently their fitted value in the regression is the constant, -2.62. However USAGE knows that these commodities act as margins facilitating trade. Thus with the elimination of trade with Canada and the contraction of trade more generally, USAGE correctly projects poor prospects for these commodities.

The process of comparing USAGE and fitted results for individual commodities can encompass any commodity of interest to a policy maker or analyst, and additional variables can be included on the right hand side of the explanatory regression equation. On the basis of the analysis of Figure 3.1 conducted in this section, we can see that candidates for inclusion in the regression are: the share of production costs of the U.S. product accounted for by inputs from Canada; the share of non-Canadian imports in the U.S. market; and the indirect connection of a commodity with trade via sales to exporting activities.

4. State dependence on Canada/U.S. trade

The first two columns of Table 4.1 show the employment losses (numbers of jobs and percentage) by state that would occur with cessation of Canada/U.S. trade. These state effects were calculated by applying the USAGE regional extension to the results generated at the national level and described in previous sections. The theory of the regional extension is set out in Dixon *et al.* (2007). In distributing results from the national level to the states, the regional extension takes account of three factors. The most important is the industrial composition of activity in each state. If employment in a state is heavily concentrated in industries that are relatively harmed by the national shock under consideration (in this case a cessation of Canada/U.S. trade) then the regional extension will generate relatively large negative results for that state. The second factor is interstate trade. If a state relies heavily on exports to states that are strongly negatively impacted by the shock under consideration, then on this account the regional extension will generate negative effects for that state. Finally, the regional extension encompasses local multiplier effects. If traded-goods industries[4] in a state are relatively badly affected by the first two factors, then in the regional extension, nontraded-goods industries (e.g. Retail trade) will also be relatively badly affected.

The most striking feature of the employment results in Table 4.1 is that every state loses jobs from cessation of Canada/U.S. trade. These losses range from 1.54 per cent in Oklahoma to 7.20 per cent in South Carolina. A state need have no direct connection with Canada/U.S. trade to experience significant job losses. This is because the states of the U.S. are closely linked by interstate trade and movements of labor and capital. Thus, negative effects for one state flow on to negative effects for other states.

What explains the differences in employment effects between states? The most obvious explanation is the first factor taken into account in the regional extension: differences between states in their mix of industries. To test the importance of this factor, we regress the percentage employment results in Table 4.1 against a national index worked out for state r as:

$$\text{NationalIndex}(r) = \Sigma_j \, \text{Sh}(j,r) \times \text{emp}(j) \tag{4.1}$$

where

Sh(j,r) is the share of employment in state r accounted for by production of good j; and
emp(j) is the percentage change in national employment in the production of j.

[4] These are industries that produce goods that are traded across state or international boundaries.

Table 4.1 Employment effects by state of Canada/U.S. trade cessation: USAGE results and explanatory variables

		Millions of jobs	% effect on employment	National index	Port index	Tourism index
		(1)	(2)	(3)	(4)	(5)
1	Alabama	-0.1064	-4.26	-4.63	0.18	0.19
2	Alaska	-0.0158	-3.52	-3.91	0.23	0.97
3	Arizona	-0.1173	-3.66	-4.38	0.26	1.38
4	Arkansas	-0.0667	-4.31	-4.68	0.17	0.14
5	California	-1.1213	-5.67	-4.51	3.06	1.59
6	Colorado	-0.1027	-3.25	-4.09	0.21	0.67
7	Connecticut	-0.0885	-4.06	-4.55	0.23	0.35
8	Delaware	-0.0230	-4.36	-4.41	1.84	0.38
9	Florida	-0.5356	-5.43	-4.63	1.64	4.28
10	Georgia	-0.3266	-6.19	-4.75	1.58	0.48
11	Hawaii	-0.0305	-3.66	-4.71	1.55	18.60
12	Idaho	-0.0308	-3.51	-4.33	0.18	0.41
13	Illinois	-0.2991	-4.11	-4.67	0.23	0.49
14	Indiana	-0.1804	-5.10	-5.02	0.18	0.25
15	Iowa	-0.1036	-5.30	-4.99	0.18	0.21
16	Kansas	-0.0619	-3.43	-4.10	0.18	0.20
17	Kentucky	-0.0964	-4.12	-4.68	0.18	0.21
18	Louisiana	-0.0876	-3.44	-3.82	0.72	0.45
19	Maine	-0.0292	-3.65	-4.49	0.21	0.89
20	Maryland	-0.1733	-5.15	-4.67	0.80	0.29
21	Massachusetts	-0.1618	-3.92	-4.51	0.38	1.02
22	Michigan	-0.2180	-4.32	-5.01	0.20	0.29
23	Minnesota	-0.1615	-4.72	-4.81	0.20	0.37
24	Mississippi	-0.0618	-4.14	-4.43	0.35	0.14
25	Missouri	-0.1422	-4.07	-4.67	0.19	0.25
26	Montana	-0.0233	-3.74	-4.29	0.19	0.53
27	Nebraska	-0.0535	-4.36	-4.56	0.18	0.22
28	Nevada	-0.0603	-4.03	-4.32	0.46	4.54
29	New Hampshire	-0.0328	-4.02	-4.63	0.21	0.47
30	New Jersey	-0.2276	-4.59	-4.62	0.24	0.39
31	New Mexico	-0.0319	-3.00	-3.93	0.17	0.33
32	New York	-0.5575	-5.08	-4.59	1.81	1.74
33	North Carolina	-0.2307	-4.43	-4.61	0.29	0.35
34	North Dakota	-0.0231	-4.60	-4.63	0.18	0.38
35	Ohio	-0.2867	-4.44	-4.80	0.19	0.27
36	Oklahoma	-0.0330	-1.54	-2.97	0.16	0.15
37	Oregon	-0.1112	-5.05	-4.44	0.81	0.54
38	Pennsylvania	-0.3158	-4.42	-4.59	0.38	0.46
39	Rhode Island	-0.0271	-4.62	-4.78	0.21	0.48
40	South Carolina	-0.1766	-7.20	-4.68	3.63	0.60
41	South Dakota	-0.0253	-4.54	-4.69	0.19	0.31
42	Tennessee	-0.1601	-4.52	-4.83	0.20	0.33
43	Texas	-0.3522	-2.47	-3.36	0.66	0.55
44	Utah	-0.0727	-4.45	-4.52	0.20	0.65
45	Vermont	-0.0142	-3.39	-4.35	0.22	1.06
46	Virginia	-0.2671	-5.61	-4.59	1.63	0.28
47	Washington	-0.2305	-6.07	-4.48	3.38	0.68
48	West Virginia	-0.0312	-3.44	-3.88	0.17	0.18
49	Wisconsin	-0.1449	-4.21	-4.82	0.19	0.34
50	Wyoming	-0.0090	-2.32	-3.32	0.19	0.71
51	District of Columbia	-0.0366	-4.44	-4.58	0.38	4.19
	Total or average	-7.8767	-4.53	-4.53	1.00	1.00

The National index, shown in the third column of Table 4.1, gives the effect on employment in each state under the assumption that the national result for each industry applies in each state. This assumption would mean that the percentage change in employment in industry j in state r is emp(j) for all states r.

The outcome of the regression with the National index is:

$$Emp\_S(r) = 3.289 + 1.697*NationalIndex(r), \quad r \in REG \qquad R\text{-squared} = 0.52 \tag{4.2}$$

where

Emp_S(r) is the percentage change in employment in state r [column (2) of Table 4.1); and REG is the set of 50 states and the District of Columbia.

In (4.2), the coefficient on NationalIndex(r) has expected sign. Its magnitude (1.697) is also plausible. It indicates multiplier effects. If state r has a mix of industries that give it an initial 1 per cent employment loss relative to the national percentage loss, then r's eventual employment loss is 1.697 per cent relative to the national percentage loss. This multiplier effect arises because the sourcing of inputs (especially service inputs) by industries in state r is skewed towards suppliers in state r. However, NationalIndex(r) explains only 52 per cent of the variation across the states in the USAGE employment results. As illustrated in Figure 4.1, there must be other factors contributing to the state employment effects.

On studying Figure 4.1, we see that regression equation (4.2) strongly over-predicts the USAGE employment results for South Carolina, Washington, Florida, Oregon, New York and California. A factor that these six states have in common is major ports. In our USAGE simulation, a state is harmed by having a major port via the general trade-contracting effects of the cessation of Canada/U.S. trade. The idea that ports are the missing factor in the NationalIndex explanation of the USAGE state employment results is strengthened by (4.2)'s under-prediction of employment results for Idaho, Tennessee, Vermont, Kentucky, Arkansas and Wisconsin. These states have no major ports. On this basis we decided to add a port index to our regression explanation of the USAGE results. The index we chose was a ratio of two shares: the state's share of U.S. trade going through its ports and the state's share of national employment. The values of this index are in the fourth column of Table 4.1. With the Port index included, our regression equation becomes:

$$Emp\_S(r) = 3.137 + 1.567*NationalIndex(r) - 0.664*PortIndex(r), \quad r \in REG \tag{4.3}$$

$$R\text{-squared} = 0.84$$

The Port index enters the regression with the expected sign and raises R-squared to 0.84. Nevertheless, as can be seen from Figure 4.2, our explanation of the state employment results is still incomplete. For example, regression equation (4.3) strongly under-predicts the USAGE employment result for Hawaii.

A key feature of the Hawaiian economy is over representation of international tourism. In the USAGE simulation, cessation of Canada/U.S. trade is good for international tourism to the U.S. This is because devaluation makes U.S. vacations cheaper for foreigners. This favorable effect for tourist destinations such as Hawaii is taken into account in USAGE but are not fully recognized in regression equation (4.3). In USAGE there is no direct employment in the tourism industries. These industries simply supply a package of hotel, entertainment, restaurant and travel services. Consequently, favorable movements in the output of the tourism industries enter the national index in only a muted way through their effects on employment in hotels, etc. The regression (but not USAGE) fails to recognize that states in which hotels, etc. are used mainly in international tourism activities benefit in the

Figure 4.1. Employment effects of cessation of Canada/U.S. trade explained by a one-variable regression: equation (4.2)

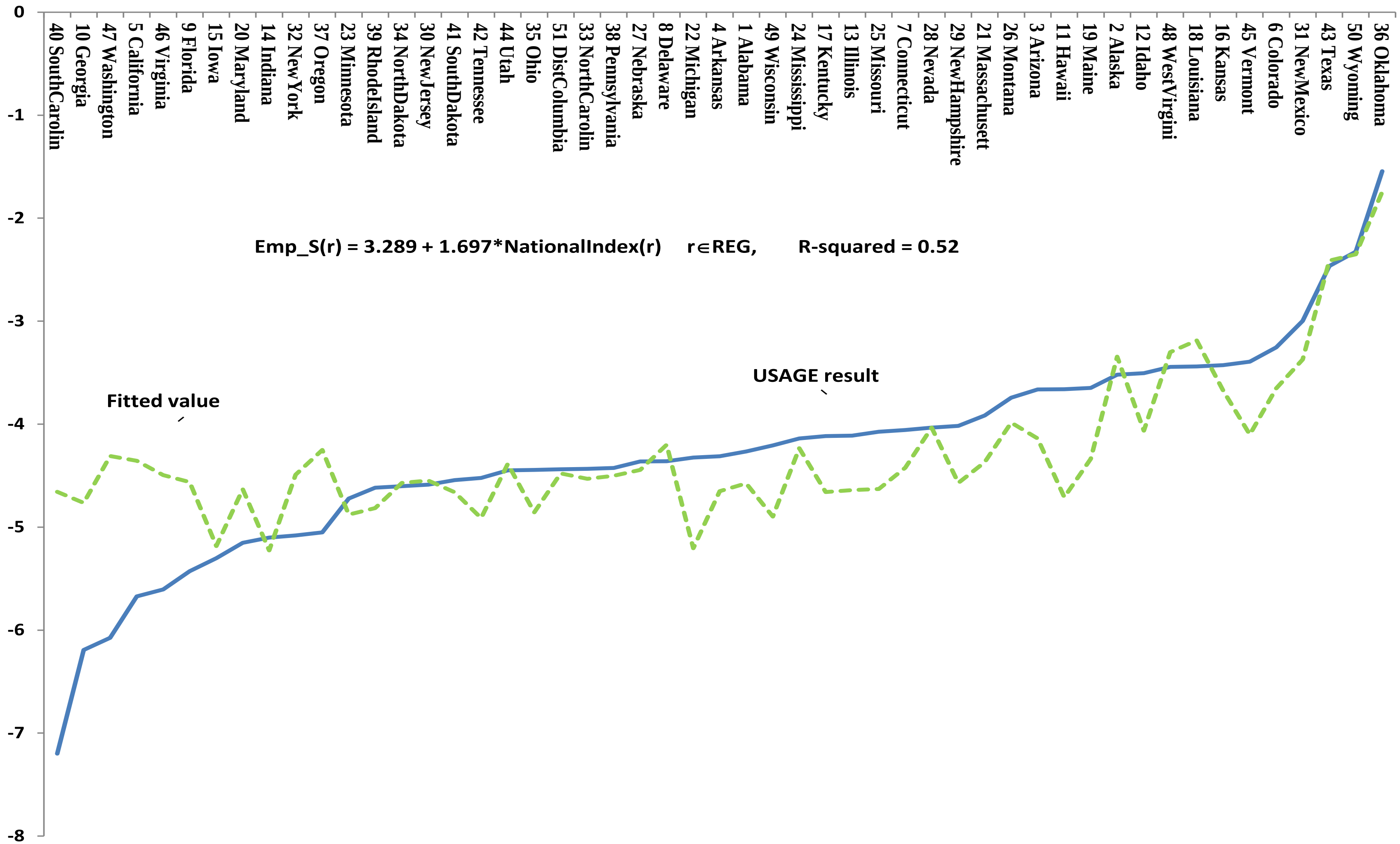
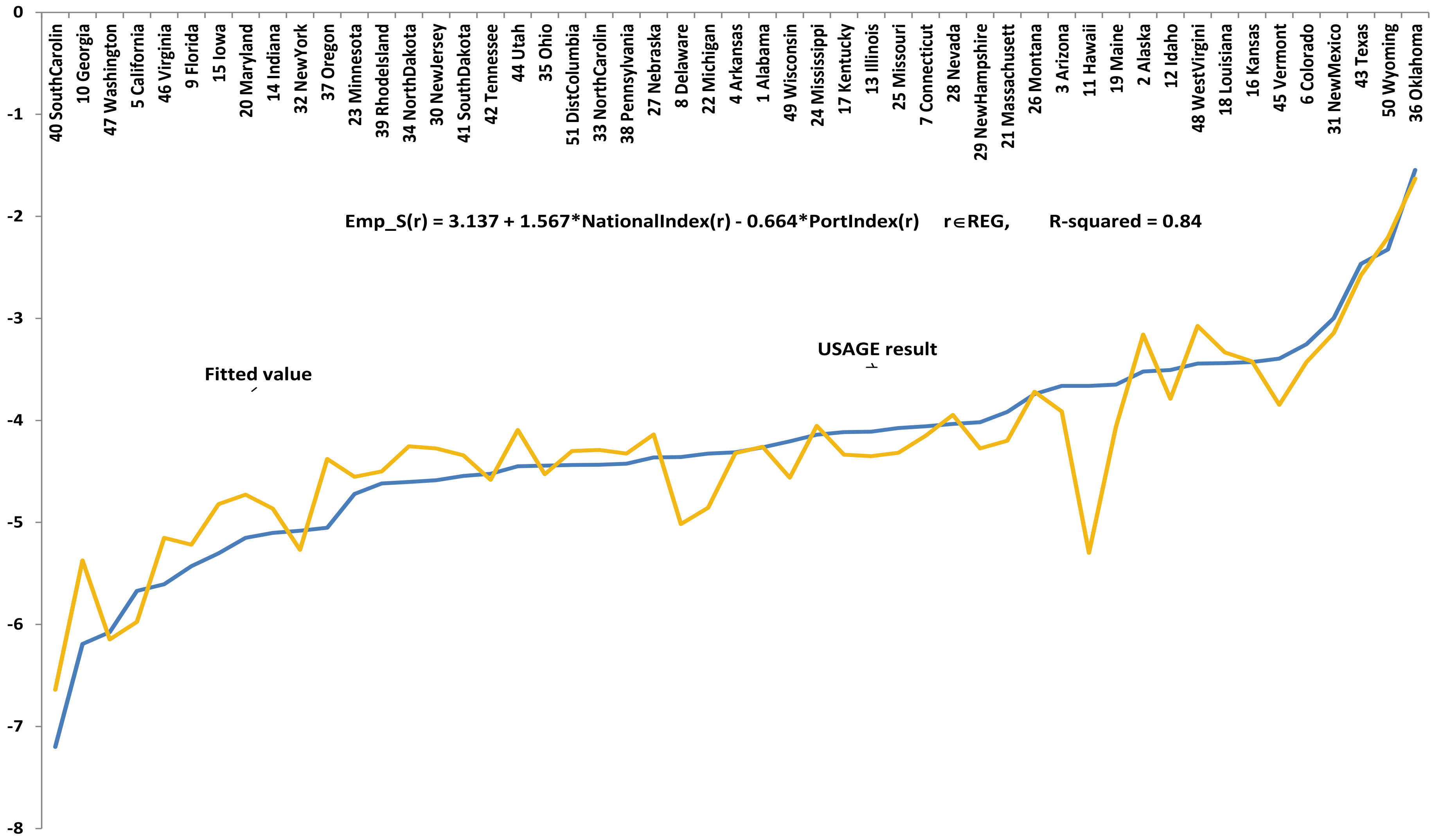


Figure 4.2. Employment effects of cessation of Canada/U.S. trade explained by a two-variable regression: equation (4.3)



USAGE simulation relative to regions in which hotels, etc. are used mainly for other purposes.

Thus we decided to add a tourism index to our regression equation. This is calculated for state r as the ratio of r's share in international tourism activities to r's share in national employment. The values of this index are in the fifth column of Table 4.1. With the inclusion of the Tourism index, the regression equation becomes:

$$\text{Emp\_S}(r) = 3.229 + 1.603*\text{NationalIndex}(r) - 0.725*\text{PortIndex}(r) + 0.086*\text{TourismIndex}(r)$$

$$r \in \text{REG}, \text{R-squared} = 0.89 \quad (4.4)$$

The Tourism index improves the overall fit of the regression equation and moves the fitted value for Hawaii close to the USAGE result (compare Figures 4.2 and 4.3).

At this stage, the gaps between the fitted values and the USAGE results are quite small, see Figure 4.3. Thus we judge that (4.4) is an adequate explanation of the USAGE results.

5. U.S. employment in U.S. affiliates of Canadian companies

Trade is not the only way in which Canada supports jobs in the U.S. As can be seen from BEA statistics reproduced in Table 5.1, 474 thousand U.S. residents are employees in Canada's majority-owned U.S. affiliates. This represents 0.39 per cent of total employee jobs in the U.S. [5]

Jobs in Canada's majority-owned affiliates in the U.S. are concentrated in Manufacturing, Information, and Finance & insurance . In each of these sectors Canada's majority-owned affiliates provide between 1.17 and 1.36 per cent of U.S. employment.

At the state level, Table 5.2 shows that the state with the least dependence on Canadian affiliates to provide employment is Rhode Island. For this state, the Canadian-affiliate share in employment is 0.07 per cent. At the other end of the spectrum is Delaware where Canadian affiliates account for 1.31 per cent. Other states that have significant dependence on Canadian affiliates for employment (more than 0.5 per cent) are Kansas, Nevada, Maine, New Hampshire, Minnesota, Alaska, Massachusetts, Arizona, South Dakota, Wisconsin, Alabama, Vermont and Washington.

[5] In the summary we mentioned that employment in the U.S. was 173.8 million jobs in 2010. Table 5.1 shows a total of 121.86 million jobs in the U.S. This latter number refers to employees, it excludes self-employment jobs. Another difference is that the data in Table 5.1 are for 2009, whereas those referred to in earlier sections are for 2010.

Figure 4.3. Employment effects of cessation of Canada/U.S. trade explained by a three-variable regression: equation (4.4)

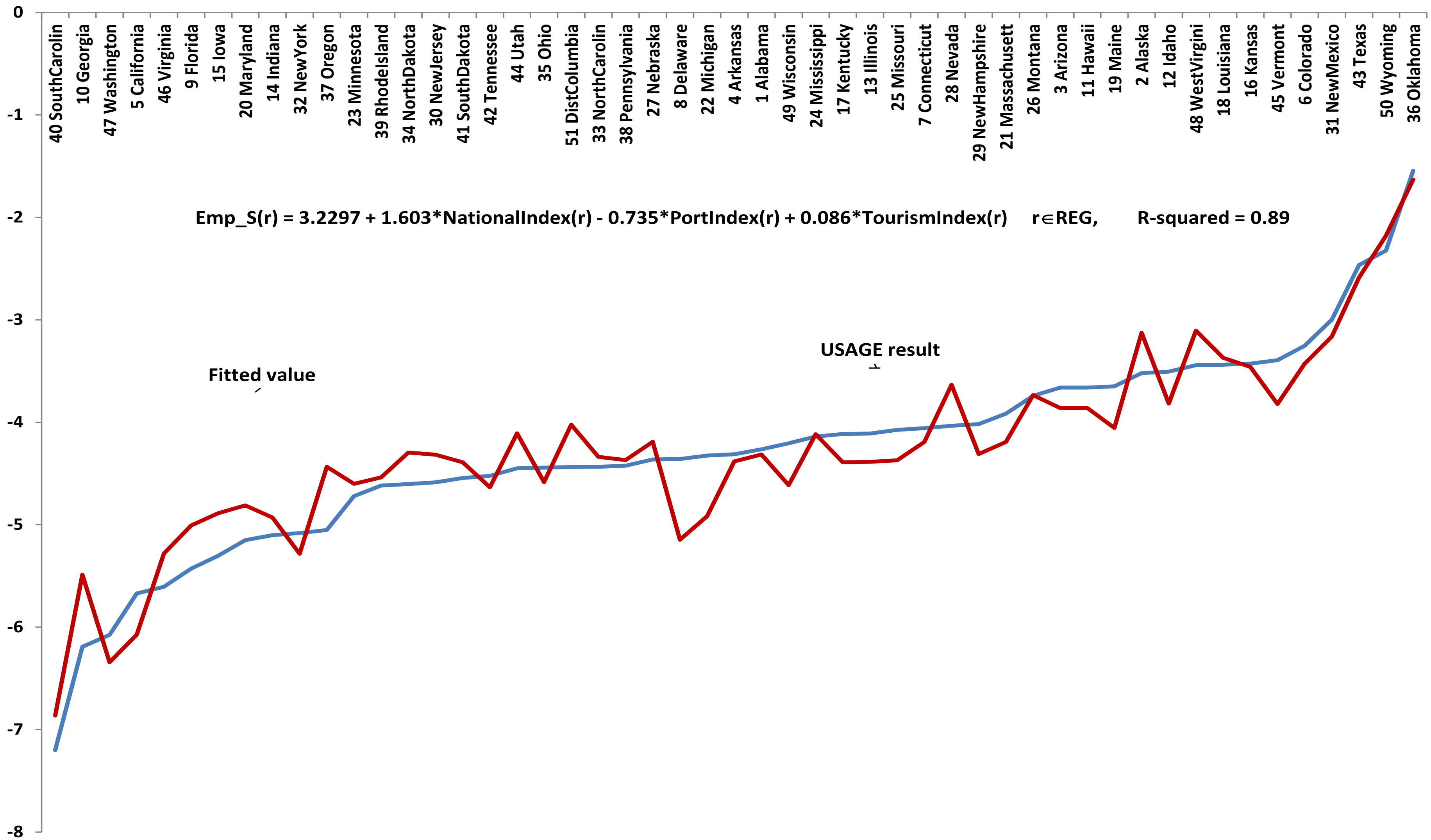


Table 5.1. Employees by sector in 2009: millions of jobs (and percentages of affiliates in sectoral employment)

	Total U.S. employees[(a)]	Employees in foreign affiliates[(b)]		Employees in Canadian affiliates[(c)]	
Manufacturing	11.53	1.96	(17.04%)	0.15	(1.30%)
Wholesale trade	5.41	0.56	(10.35%)	0.03	(0.46%)
Retail trade	12.70	0.47	(3.69%)	0.04	(0.33%)
Information	2.64	0.25	(9.55%)	0.04	(1.36%)
Finance and insurance	5.57	0.38	(6.89%)	0.07	(1.17%)
Real estate and rental and leasing	1.87	0.04	(2.03%)	0.01	(0.70%)
Professional, scientific, and technical services	7.17	0.25	(3.42%)	0.04	(0.49%)
Other	74.96	1.37	(1.82%)	0.11	(0.14%)
Total or average	121.86	5.28	(4.33%)	0.47	(0.39%)

(a) Source: NIPA Table 6.5d available from the Bureau of Economic Analysis (BEA) website at http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=197&Freq=Year&FirstYear=2009&LastYear=2010 , downloaded on April 22, 2012.

(b) Source: Data in Table II.F3 on employees by sector in foreign-owned affiliates in the U.S. available on the BEA website at http://www.bea.gov/international/fdius2009_preliminary.htm , downloaded on April 22, 2012.

(c) Source: Data in Table II.F3 on employees by sector in Canadian-owned affiliates in the U.S. available on the EA website at http://www.bea.gov/international/fdius2009_preliminary.htm , downloaded on April 22, 2012.

6. Concluding remarks

In 2010 Canada was the biggest market for U.S. exports and the second biggest source of U.S. imports, behind China. Trade with Canada has a profound effect on the U.S. economy. Our simulation with the USAGE model suggests that about 7.88 million jobs in the U.S. depend on Canada/U.S. trade.

Nearly 90 per cent of U.S. industries would suffer output loss if Canada/U.S. trade ceased. Output loss is easy to explain for industries that have a heavy dependence on exports to Canada. For other industries, output losses would reflect increases in the cost of their inputs caused by the unavailability of imports from Canada. Industries with little or no direct connection with Canada would suffer from the overall contraction in the U.S. economy. The main group of industries that would gain from cessation of Canada/U.S. trade are those that have little dependence on imports from Canada, export little to Canada and face significant import competition from Canadian products in the U.S. market. Another group of winning industries are those that are trade-exposed but do not have direct connection with Canada. These industries would gain from real devaluation.

With the number of losing industries far outweighing the number of winning industries, it is not surprising that our simulation shows that every state and the District of Columbia would lose from a cessation of Canada/U.S. trade. Job losses in several states

Table 5.2. Employees by state in 2009: millions of jobs (and percentages of affiliates in sectoral employment)

		Total U.S. employees	Employees in foreign affiliates[(a)]		Employees in Canadian affiliates[(b)]	
1	Alabama	1.819	0.073	(4.013%)	0.0096	(0.528%)
2	Alaska	0.296	0.010	(3.378%)	0.0020	(0.676%)
3	Arizona	2.007	0.075	(3.737%)	0.0132	(0.658%)
4	Arkansas	1.110	0.030	(2.703%)	0.0026	(0.234%)
5	California	14.002	0.567	(4.049%)	0.0373	(0.266%)
6	Colorado	2.095	0.082	(3.914%)	0.0099	(0.473%)
7	Connecticut	1.556	0.107	(6.877%)	0.0061	(0.392%)
8	Delaware	0.366	0.034	(9.290%)	0.0048	(1.311%)
9	Florida	6.336	0.261	(4.119%)	0.0243	(0.384%)
10	Georgia	3.530	0.171	(4.844%)	0.0089	(0.252%)
11	Hawaii	0.566	0.030	(5.300%)	0.0008	(0.141%)
12	Idaho	0.564	0.014	(2.482%)	0.0018	(0.319%)
13	Illinois	5.454	0.259	(4.749%)	0.0223	(0.409%)
14	Indiana	2.721	0.117	(4.300%)	0.0087	(0.320%)
15	Iowa	1.441	0.050	(3.470%)	0.0037	(0.257%)
16	Kansas	1.321	0.052	(3.936%)	0.0165	(1.249%)
17	Kentucky	1.714	0.075	(4.376%)	0.0044	(0.257%)
18	Louisiana	1.855	0.046	(2.480%)	0.0049	(0.264%)
19	Maine	0.573	0.031	(5.410%)	0.0063	(1.099%)
20	Maryland	2.292	0.104	(4.538%)	0.0086	(0.375%)
21	Massachusetts	2.993	0.202	(6.749%)	0.0200	(0.668%)
22	Michigan	4.119	0.126	(3.059%)	0.0153	(0.371%)
23	Minnesota	2.440	0.099	(4.057%)	0.0181	(0.742%)
24	Mississippi	1.119	0.021	(1.877%)	0.0037	(0.331%)
25	Missouri	2.592	0.080	(3.086%)	0.0068	(0.262%)
26	Montana	0.413	0.006	(1.453%)	0.0008	(0.194%)
27	Nebraska	0.874	0.024	(2.746%)	0.0027	(0.309%)
28	Nevada	0.875	0.036	(4.114%)	0.0097	(1.109%)
29	New Hampshire	0.566	0.041	(7.244%)	0.0055	(0.972%)
30	New Jersey	3.456	0.241	(6.973%)	0.0152	(0.440%)
31	New Mexico	0.729	0.015	(2.058%)	0.0034	(0.466%)
32	New York	7.634	0.473	(6.196%)	0.0336	(0.440%)
33	North Carolina	3.605	0.178	(4.938%)	0.0114	(0.316%)
34	North Dakota	0.335	0.011	(3.284%)	0.0011	(0.328%)
35	Ohio	5.065	0.196	(3.870%)	0.0138	(0.272%)
36	Oklahoma	1.505	0.031	(2.060%)	0.0050	(0.332%)
37	Oregon	1.549	0.042	(2.711%)	0.0031	(0.200%)
38	Pennsylvania	5.144	0.254	(4.938%)	0.0206	(0.400%)
39	Rhode Island	0.426	0.025	(5.869%)	0.0003	(0.070%)
40	South Carolina	1.695	0.092	(5.428%)	0.0038	(0.224%)
41	South Dakota	0.380	0.007	(1.842%)	0.0021	(0.553%)
42	Tennessee	2.557	0.103	(4.028%)	0.0073	(0.285%)
43	Texas	8.988	0.395	(4.395%)	0.0314	(0.349%)
44	Utah	1.008	0.027	(2.679%)	0.0019	(0.188%)
45	Vermont	0.291	0.009	(3.093%)	0.0015	(0.515%)
46	Virginia	3.240	0.150	(4.630%)	0.0057	(0.176%)
47	Washington	2.599	0.092	(3.540%)	0.0133	(0.512%)

Table 5.2 continues …

Table 5.2 continued

		Total U.S. employees	Employees in foreign affiliates[a]		Employees in Canadian affiliates[b]	
48	West Virginia	0.673	0.018	(2.675%)	0.0017	(0.253%)
49	Wisconsin	2.514	0.068	(2.705%)	0.0136	(0.541%)
50	Wyoming	0.239	0.008	(3.347%)	0.0007	(0.293%)
51	Dist. of Columbia	0.612	0.022	(3.595%)	0.0011	(0.180%)
		121.855	5.280	(4.333%)	0.4738[c]	(0.389%)

[a] Source: Data on employees by state (and sector) in foreign-owned affiliates in the U.S. is in Table II.F7, available on the Bureau of Economic Analysis website at http://www.bea.gov/international/fdius2009_preliminary.htm , downloaded on April 22, 2012.

[b] Source: Table II.F 8. Employment of Affiliates, State by Country of UBO http://www.bea.gov/international/fdius2009_preliminary.htm , downloaded on July 27, 2012.

(c) Includes a small number of U.S. employees in Canadian affiliates in U.S. areas other than the states and DC.

would exceed 5 per cent (California, Florida, Georgia, Indiana, Iowa, Maryland, New York, Oregon, South Carolina, Virginia and Washington).

While less important than trade, Canadian direct investment is also a significant source of jobs in the U.S., particularly in Manufacturing, Information, and Finance & insurance. All together, about 470 thousand U.S. residents are employees in Canadian-majority-owned affiliates operating in the U.S. This is about 0.39 per cent of U.S. employees. At the state level, dependence on Canadian-majority-owned affiliates varies between 0.07 per cent in Rhode Island and 1.31 per cent in Delaware.

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