An Evaluation of the Performance of Applied General Equilibrium Models of the Impact of NAFTA

Timothy J. Kehoe
University of Minnesota
and Federal Reserve Bank of Minneapolis

September 2003

www.econ.umn.edu/~tkehoe

Evaluate the performances of three of the most prominent multisectoral static applied general equilibrium models used to predict the impact of the North American Free Trade Agreement.

Findings:

- Models drastically underestimated the impact of NAFTA on trade.
- Models failed to capture much of the relative impacts on different sectors.

Suggestions for future work:

- Develop mechanisms that generate large increases in trade in product categories with little or no previous trade.
- Explain changes in productivity.

What Went Wrong in Modeling the Impact of the North American Free Trade Agreement?

Applied general equilibrium models were the only analytical game in town when it came to analyzing the impact of NAFTA in 1992-1993.

Typical sort of model: Static applied general equilibrium model with large number of industries and imperfect competition (Dixit-Stiglitz or Eastman-Stykolt) and finite number of firms in some industries. In some numerical experiments, new capital is placed in Mexico owned by consumers in the rest of North America to account for capital flows.

Examples:
Brown-Deardorff-Stern model of Canada, Mexico, and the United States
Cox-Harris model of Canada
Sobarzo model of Mexico

In 1993 Ross Perot said

The reason that most U.S. policymakers are so blind to the job shifting that will occur if NAFTA is ratified is that they rely on dozens of "reputable" academic studies that say it won't happen. Yet these studies are based on unrealistic assumptions and flawed mathematical models…Let's be clear about this: these studies certainly do not provide a basis on which Congress can make an informed decision about NAFTA.

Ross Perot with Pat Choate, ***Save Your Job, Save Our Country: Why NAFTA Must Be Stopped — Now!*** 1993.

In his comments, Timothy J. Kehoe observes that investment flows have generated a sharp increase in Mexican investment, GDP, and trade deficits. Policy makers have become concerned about the sustainability of this behavior, an issue not addressed by the CGE models. Kehoe also stresses that CGE remains at an early stage of development.   He emphasizes the need for ex-post verification to achieve validation of these models. Kehoe also argues for more work on the impact of NAFTA on the behavior of financial intermediaries, policy credibility, demographic structures, and total factor productivity growth.

Nora Lustig, Barry P. Bosworth, and Robert Z. Lawrence, editors, ***North American Free Trade: Assessing the Impact***, 1992.

Research Agenda:

- Compare results of numerical experiments of models with data.
- Determine what shocks — besides NAFTA policies — were important.
- Construct a simple applied general equilibrium model and perform experiments with alternative specifications to determine what was wrong with the 1992-1993 models.

Applied GE Models Can Do a Good Job!

Spain: Kehoe-Polo-Sancho (1992) evaluation of the performance of the Kehoe-Manresa-Noyola-Polo-Sancho-Serra MEGA model of the Spanish economy: A Shoven-Whalley type model with perfect competition, modified to allow government and trade deficits and unemployment (Kehoe-Serra). Spain's entry into the European Community in 1986 was accompanied by a fiscal reform that introduced a value-added tax (VAT) on consumption to replace a complex range of indirect taxes, including a turnover tax applied at every stage of the production process. What would happen to tax revenues? Trade reform was of secondary importance.

Canada-U.S.: Fox (1999) evaluation of the performance of the Brown-Stern (1989) model of the 1989 Canada-U.S. FTA.

Other changes besides policy changes are important!

Changes in Consumer Prices in the Spanish Model
(Percent)

sector	data 1985-1986	model policy only	model shocks only	model policy&shocks
food and nonalcoholic beverages	1.8	-2.3	4.0	1.7
tobacco and alcoholic beverages	3.9	2.5	3.1	5.8
clothing	2.1	5.6	0.9	6.6
housing	-3.3	-2.2	-2.7	-4.8
household articles	0.1	2.2	0.7	2.9
medical services	-0.7	-4.8	0.6	-4.2
transportation	-4.0	2.6	-8.8	-6.2
recreation	-1.4	-1.3	1.5	0.1
other services	2.9	1.1	1.7	2.8
weighted correlation with data		-0.08	0.87	0.94
variance decomposition of change		0.30	0.77	0.85
regression coefficient *a*		0.00	0.00	0.00
regression coefficient *b*		-0.08	0.54	0.67

Measures of Accuracy of Model Results

1. Weighted correlation coefficient.
2. Variance decomposition of the (weighted) variance of the changes in the data:

$$vardec(y^{data}, y^{model}) = \frac{var(y^{model})}{var(y^{model}) + var(y^{data} - y^{model})}.$$

3, 4. Estimated coefficients a and b from the (weighted) regression

$$x_i^{data} = a + bx_i^{model} + e_i.$$

Changes in Value of Gross Output/GDP in the Spanish Model (Percent)

sector	data 1985-1986	model policy only	model shocks only	model policy&shocks
agriculture	-0.4	-1.1	8.3	6.9
energy	-20.3	-3.5	-29.4	-32.0
basic industry	-9.0	1.6	-1.8	-0.1
machinery	3.7	3.8	1.0	5.0
automobile industry	1.1	3.9	4.7	8.6
food products	-1.8	-2.4	4.7	2.1
other manufacturing	0.5	-1.7	2.3	0.5
construction	5.7	8.5	1.4	10.3
commerce	6.6	-3.6	4.4	0.4
transportation	-18.4	-1.5	1.0	-0.7
services	8.7	-1.1	5.8	4.5
government services	7.6	3.4	0.9	4.3
weighted correlation with data		0.16	0.80	0.77
variance decomposition of change		0.11	0.73	0.71
regression coefficient *a*		-0.52	-0.52	-0.52
regression coefficient *b*		0.44	0.75	0.67

Changes in Trade/GDP in the Spanish Model (Percent)

direction of exports	data 1985-1986	model policy only	model shocks only	model policy&shocks
Spain to rest of E.C.	-6.7	-3.2	-4.9	-7.8
Spain to rest of world	-33.2	-3.6	-6.1	-9.3
rest of E.C. to Spain	14.7	4.4	-3.9	0.6
rest of world to Spain	-34.1	-1.8	-16.8	-17.7
weighted correlation with data		0.69	0.77	0.90
variance decomposition of change		0.02	0.17	0.24
regression coefficient *a*		-12.46	2.06	5.68
regression coefficient *b*		5.33	2.21	2.37

Changes in Composition of GDP in the Spanish Model (Percent of GDP)

variable	data 1985-1986	model policy only	model shocks only	model policy&shocks
wages and salaries	-0.53	-0.87	-0.02	-0.91
business income	-1.27	-1.63	0.45	-1.24
net indirect taxes and tariffs	1.80	2.50	-0.42	2.15
correlation with data		0.998	-0.94	0.99
variance decomposition of change		0.93	0.04	0.96
regression coefficient *a*		0.00	0.00	0.00
regression coefficient *b*		0.73	-3.45	0.85
private consumption	-0.81	-1.23	-0.51	-1.78
private investment	1.09	1.81	-0.58	1.32
government consumption	-0.02	-0.06	-0.38	-0.44
government investment	-0.06	-0.06	-0.07	-0.13
exports	-3.40	-0.42	-0.69	-1.07
-imports	3.20	-0.03	2.23	2.10
correlation with data		0.40	0.77	0.83
variance decomposition of change		0.20	0.35	0.58
regression coefficient *a*		0.00	0.00	0.00
regression coefficient *b*		0.87	1.49	1.24

Public Finances in the Spanish Model
(Percent of GDP)

variable	data 1985-1986	model policy only	model shocks only	model policy&shocks
indirect taxes and subsidies	2.38	3.32	-0.38	2.98
tariffs	-0.58	-0.82	-0.04	-0.83
social security payments	0.04	-0.19	-0.03	-0.22
direct taxes and transfers	-0.84	-0.66	0.93	0.26
government capital income	-0.13	-0.06	0.02	-0.04
correlation with data		0.99	-0.70	0.92
variance decomposition of change		0.93	0.08	0.86
regression coefficient *a*		-0.06	0.35	-0.17
regression coefficient *b*		0.74	-1.82	0.80

Models of NAFTA Did Not Do a Good Job!

Ex-post evaluations of the performance of applied GE models are essential if policy makers are to have confidence in the results produced by this sort of model.

Just as importantly, they help make applied GE analysis a scientific discipline in which there are well-defined puzzles and clear successes and failures for alternative hypotheses.

Changes in Trade/GDP in Brown-Deardorff-Stern Model (Percent)

variable	data 1988-1999	model
Canadian exports	52.9	4.3
Canadian imports	57.7	4.2
Mexican exports	240.6	50.8
Mexican imports	50.5	34.0
U.S. exports	19.1	2.9
U.S. imports	29.9	2.3
weighted correlation with data		0.64
variance decomposition of change		0.08
regression coefficient *a*		23.20
regression coefficient *b*		2.43

Changes in Canadian Exports/ GDP in the Brown-Deardorff-Stern Model (Percent)

	exports to Mexico		exports to United States	
sector	1988–1999	model	1988–1999	model
agriculture	122.5	3.1	106.1	3.4
mining and quarrying	-34.0	-0.3	75.8	0.4
food	89.3	2.2	91.7	8.9
textiles	268.2	-0.9	97.8	15.3
clothing	1544.3	1.3	237.1	45.3
leather products	443.0	1.4	-14.4	11.3
footwear	517.0	3.7	32.8	28.3
wood products	232.6	4.7	36.5	0.1
furniture and fixtures	3801.7	2.7	282.6	12.5
paper products	240.7	-4.3	113.7	-1.8
printing and publishing	6187.4	-2.0	37.2	-1.6
chemicals	37.1	-7.8	109.4	-3.1
petroleum and products	678.1	-8.5	-42.5	0.5
rubber products	647.4	-1.0	113.4	9.5
nonmetal mineral products	333.5	-1.8	20.5	1.2
glass products	264.4	-2.2	74.5	30.4
iron and steel	195.2	-15.0	92.1	12.9
nonferrous metals	38.4	-64.7	34.7	18.5
metal products	767.0	-10.0	102.2	15.2
nonelectrical machinery	376.8	-8.9	28.9	3.3
electrical machinery	633.9	-26.2	88.6	14.5
transportation equipment	305.8	-4.4	30.7	10.7
miscellaneous manufactures	1404.5	-12.1	100.0	-2.1
weighted correlation with data		-0.91		-0.43
variance decomposition of change		0.003		0.02
regression coefficient *a*		249.24		79.20
regression coefficient *b*		-15.48		-2.80

Changes in Mexican Exports/GDP in the Brown-Deardorff-Stern Model (Percent)

sector	exports to Canada 1988–1999	exports to Canada model	exports to United States 1988–1999	exports to United States model
agriculture	-20.5	-4.1	-15.0	2.5
mining and quarrying	-35.5	27.3	-22.9	26.9
food	70.4	10.8	9.4	7.5
textiles	939.7	21.6	832.3	11.8
clothing	1847.0	19.2	829.6	18.6
leather products	1470.3	36.2	618.3	11.7
footwear	153.0	38.6	111.1	4.6
wood products	4387.6	15.0	145.6	-2.7
furniture and fixtures	4933.2	36.2	181.2	7.6
paper products	23.9	32.9	70.3	13.9
printing and publishing	476.3	15.0	122.1	3.9
chemicals	204.6	36.0	70.4	17.0
petroleum and products	-10.6	32.9	66.4	34.1
rubber products	2366.2	-6.7	783.8	-5.3
nonmetal mineral products	1396.1	5.7	222.3	3.7
glass products	676.8	13.3	469.8	32.3
iron and steel	32.5	19.4	40.9	30.8
nonferrous metals	-35.4	138.1	111.2	156.5
metal products	610.4	41.9	477.2	26.8
nonelectrical machinery	570.6	17.3	123.6	18.5
electrical machinery	1349.2	137.3	744.9	178.0
transportation equipment	2303.4	3.3	349.0	6.2
miscellaneous manufactures	379.4	61.1	181.5	43.2
weighted correlation with data		0.19		0.71
variance decomposition of change		0.01		0.04
regression coefficient *a*		120.32		38.13
regression coefficient *b*		2.07		3.87

Changes in U.S. Exports/GDP in the Brown-Deardorff-Stern Model (Percent)

	exports to Canada		exports to Mexico	
sector	1988–1999	model	1988–1999	model
agriculture	-24.1	5.1	6.5	7.9
mining and quarrying	-23.6	1.0	-19.8	0.5
food	62.4	12.7	37.7	13.0
textiles	177.2	44.0	850.5	18.6
clothing	145.5	56.7	543.0	50.3
leather products	29.9	7.9	87.7	15.5
footwear	48.8	45.7	33.1	35.4
wood products	76.4	6.7	25.7	7.0
furniture and fixtures	83.8	35.6	224.1	18.6
paper products	-20.5	18.9	-41.9	-3.9
printing and publishing	50.8	3.9	507.9	-1.1
chemicals	49.8	21.8	61.5	-8.4
petroleum and products	-6.9	0.8	-41.1	-7.4
rubber products	95.6	19.1	165.6	12.8
nonmetal mineral products	56.5	11.9	55.9	0.8
glass products	50.5	4.4	112.9	42.3
iron and steel	0.6	11.6	144.5	-2.8
nonferrous metals	-20.7	-6.7	-28.7	-55.1
metal products	66.7	18.2	301.4	5.4
nonelectrical machinery	36.2	9.9	350.8	-2.9
electrical machinery	154.4	14.9	167.8	-10.9
transportation equipment	36.5	-4.6	290.3	9.9
miscellaneous manufactures	117.3	11.5	362.3	-9.4
weighted correlation with data		-0.01		0.50
variance decomposition of change		0.14		0.02
regression coefficient *a*		37.27		190.89
regression coefficient *b*		-0.02		3.42

Changes in Canadian Trade/GDP in Cox-Harris Model (Percent)

variable	data 1988-2000	model
total trade	57.2	10.0
trade with Mexico	280.0	52.2
trade with United States	76.2	20.0
weighted correlation with data		0.99
variance decomposition of change		0.52
regression coefficient *a*		38.40
regression coefficient *b*		1.93

Changes in Canadian Trade/GDP in the Cox-Harris Model (Percent)

sector	total exports 1988-2000	total exports model	total imports 1988-2000	total imports model
agriculture	-13.7	-4.1	4.6	7.2
forestry	215.5	-11.5	-21.5	7.1
fishing	81.5	-5.4	107.3	9.5
mining	21.7	-7.0	32.1	4.0
food, beverages, and tobacco	50.9	18.6	60.0	3.8
rubber and plastics	194.4	24.5	87.7	13.8
textiles and leather	201.1	108.8	24.6	18.2
wood and paper	31.9	7.3	97.3	7.2
steel and metal products	30.2	19.5	52.2	10.0
transportation equipment	66.3	3.5	29.7	3.0
machinery and appliances	112.9	57.1	65.0	13.3
nonmetallic minerals	102.7	31.8	3.6	7.3
refineries	20.3	-2.7	5.1	1.5
chemicals and misc. manufactures	53.3	28.1	92.5	10.4
weighted correlation with data		0.49		0.85
variance decomposition of change		0.32		0.08
regression coefficient *a*		41.85		22.00
regression coefficient *b*		0.81		3.55

Changes in Mexican Trade/GDP in the Sobarzo Model (Percent)

sector	exports to North America 1988–2000	exports to North America model	imports from North America 1988–2000	imports from North America model
agriculture	-15.3	-11.1	-28.2	3.4
mining	-23.2	-17.0	-50.7	13.2
petroleum	-37.6	-19.5	65.9	-6.8
food	5.2	-6.9	11.8	-5.0
beverages	42.0	5.2	216.0	-1.8
tobacco	-42.3	2.8	3957.1	-11.6
textiles	534.1	1.9	833.2	-1.2
wearing apparel	2097.3	30.0	832.9	4.5
leather	264.3	12.4	621.0	-0.4
wood	415.1	-8.5	168.9	11.7
paper	12.8	-7.9	68.1	-4.7
chemicals	41.9	-4.4	71.8	-2.7
rubber	479.0	12.8	792.0	-0.1
nonmetallic mineral products	37.5	-6.2	226.5	10.9
iron and steel	35.9	-4.9	40.3	17.7
nonferrous metals	-40.3	-9.8	101.2	9.8
metal products	469.5	-4.4	478.7	9.5
nonelectrical machinery	521.7	-7.4	129.0	20.7
electrical machinery	3189.1	1.0	749.1	9.6
transportation equipment	224.5	-5.0	368.0	11.2
other manufactures	975.1	-4.5	183.6	4.2
weighted correlation with data		0.61		0.23
variance decomposition of change		0.0004		0.002
regression coefficient *a*		495.08		174.52
regression coefficient *b*		30.77		5.35

What Do We Learn from these Evaluations?

The Spanish model seems to have been far more successful in predicting the consequences of policy changes than the three models of NAFTA, but

- Kehoe, Polo, and Sancho (KPS) knew the structure of their model well enough to precisely identify the relationships between the variables in their model with those in the data;

- KPS were able to use the model to carry out numerical exercises to incorporate the impact of exogenous shocks.

- KPS had an incentive to show their model in the best possible light.

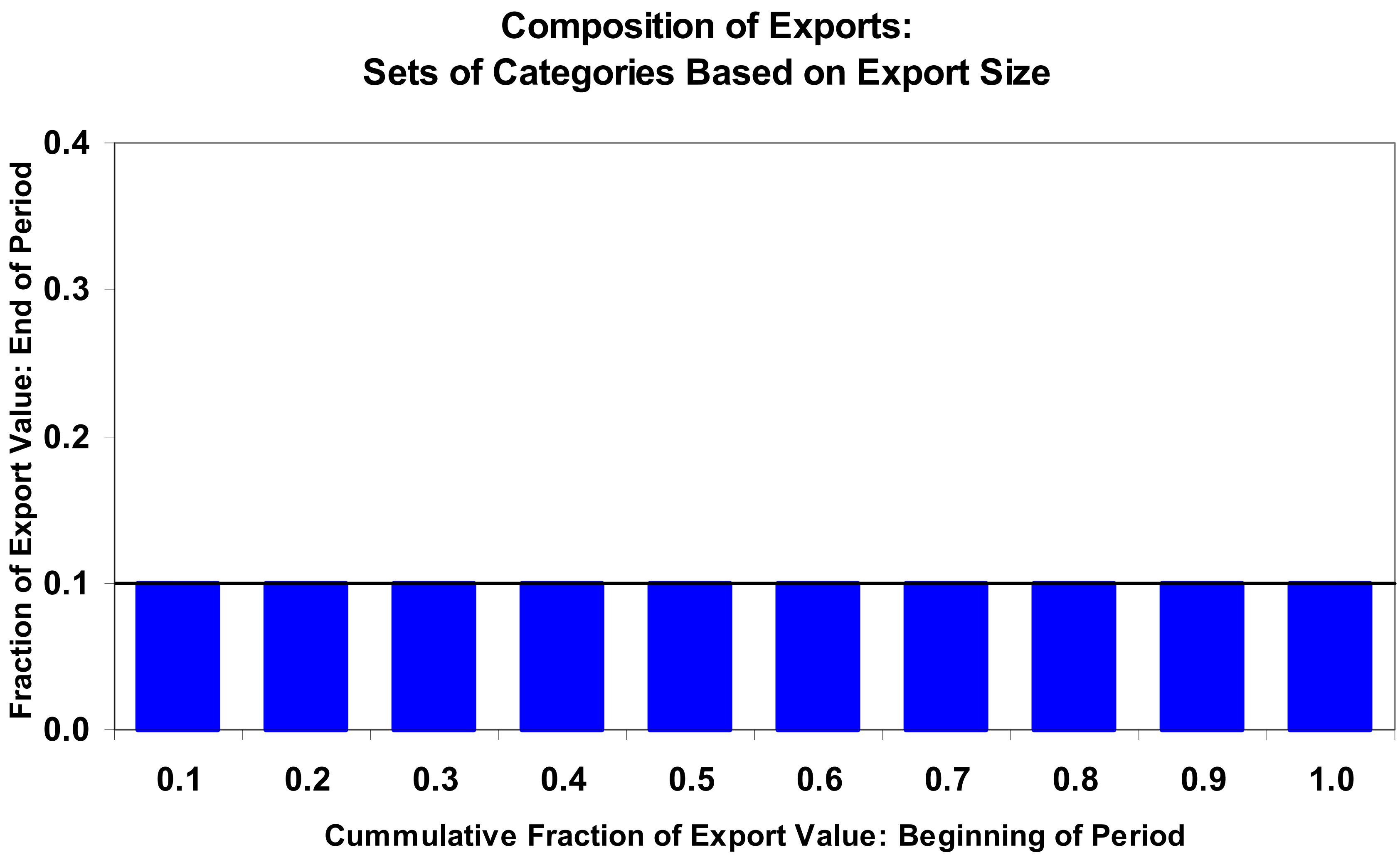
Sectoral Detail:
What Drives Increases In Trade?

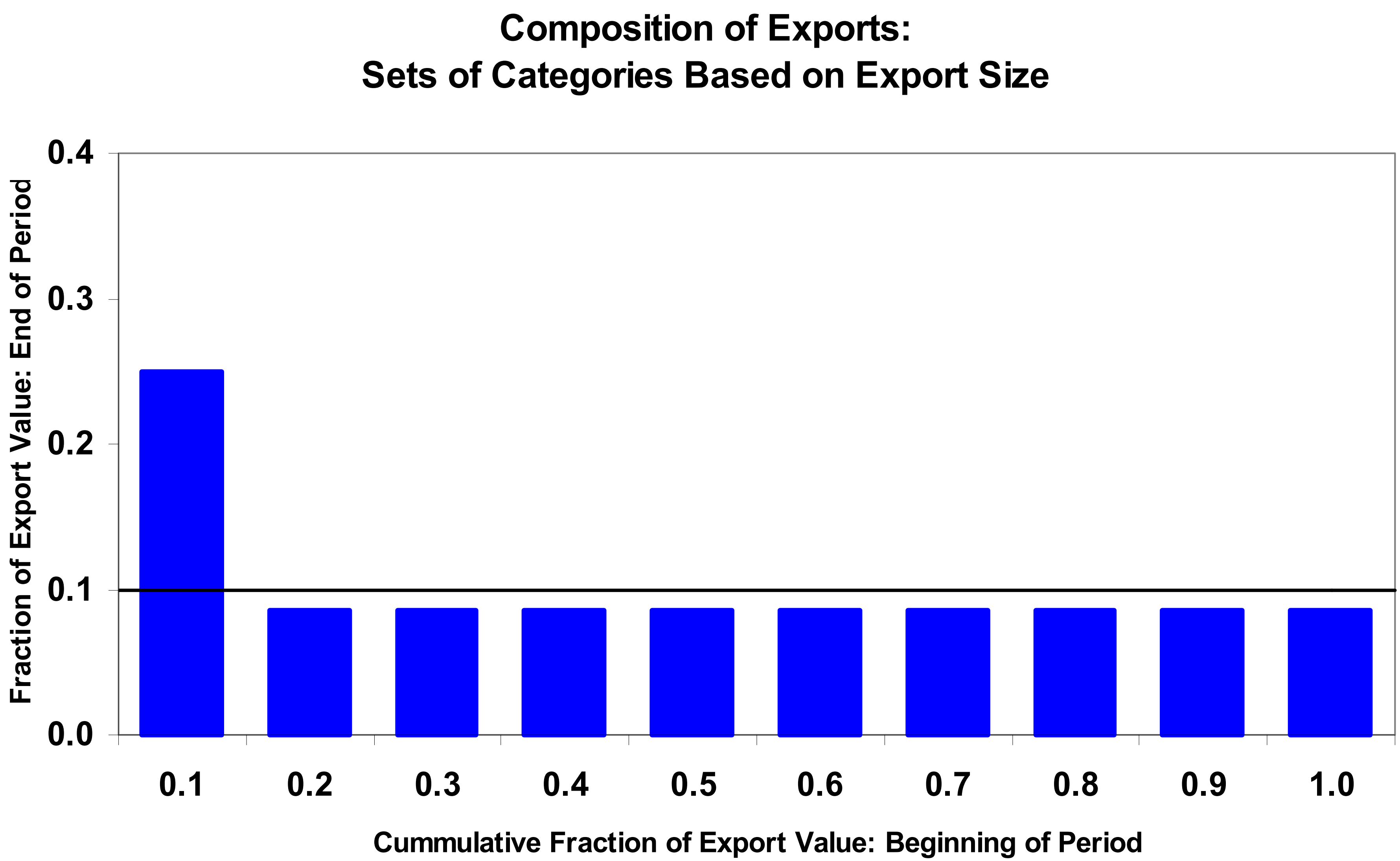
Kehoe and Ruhl (2002)

Data:
four-digit SITC bilateral trade data (789 categories — source: OECD).

Exercise:

- rank categories in order of base year exports.
- form sets of categories by cumulating exports — the first 2 categories account for 10 percent of exports, for example; the next 4 categories account for 10 percent of exports; and so on.
- calculate the fraction of exports in subsequent years accounted for by each set of categories.


Composition of Exports:
Sets of Categories Based on Export Size
Fraction of Export Value: End of Period
0.4
0.3
0.2
0.1
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Cummulative Fraction of Export Value: Beginning of Period


Composition of Exports:
Sets of Categories Based on Export Size
Fraction of Export Value: End of Period
0.4
0.3
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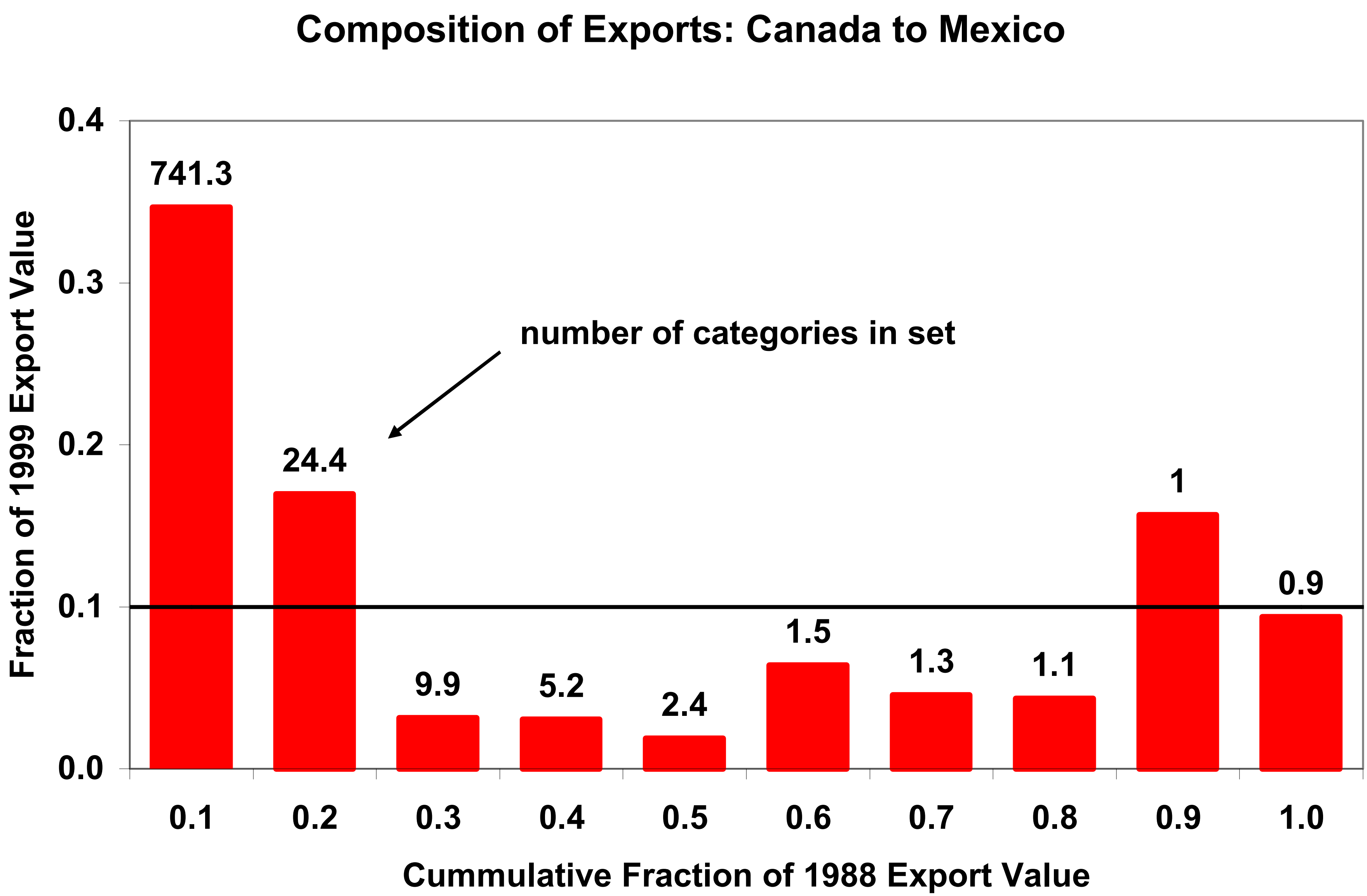
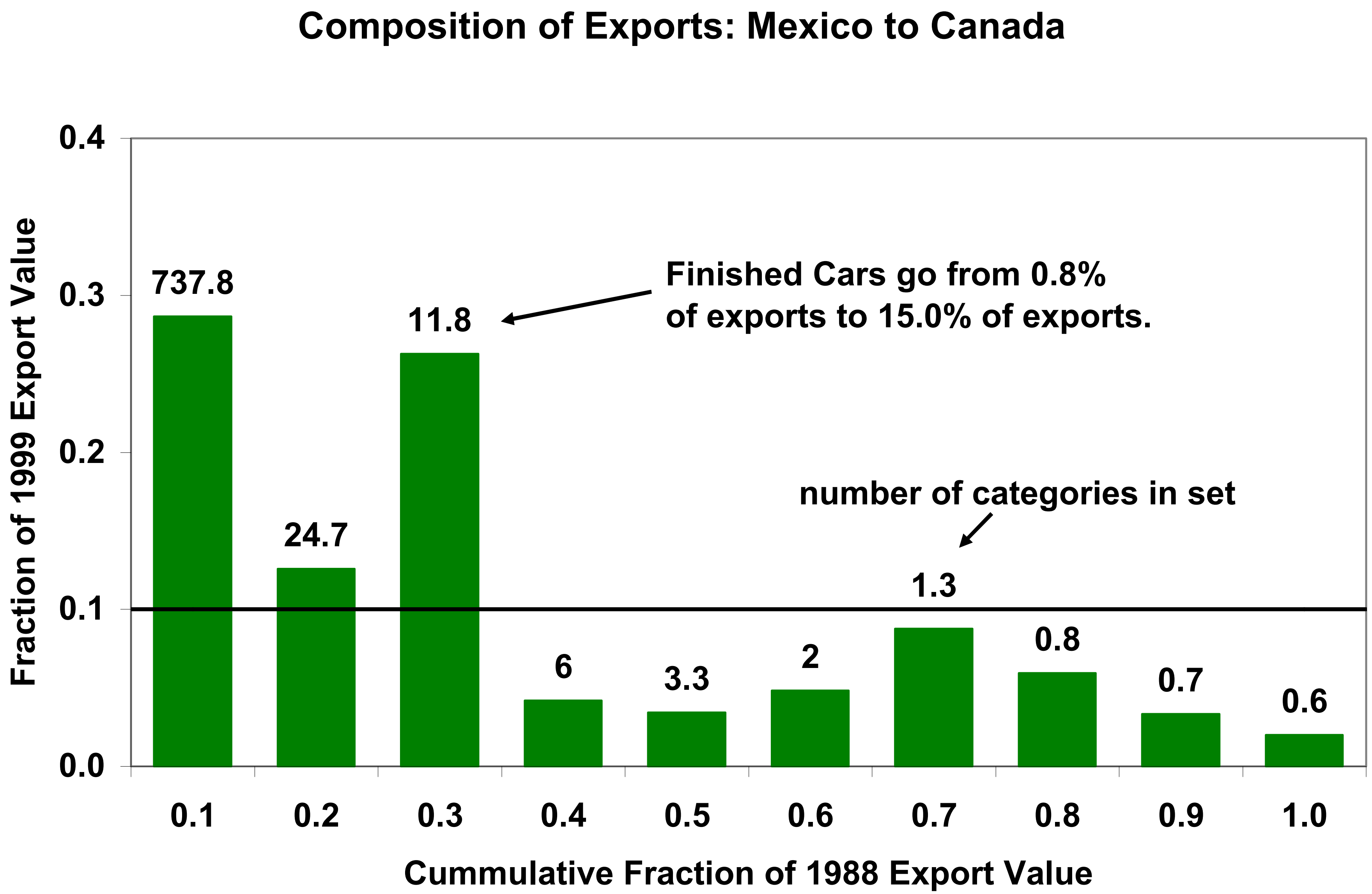
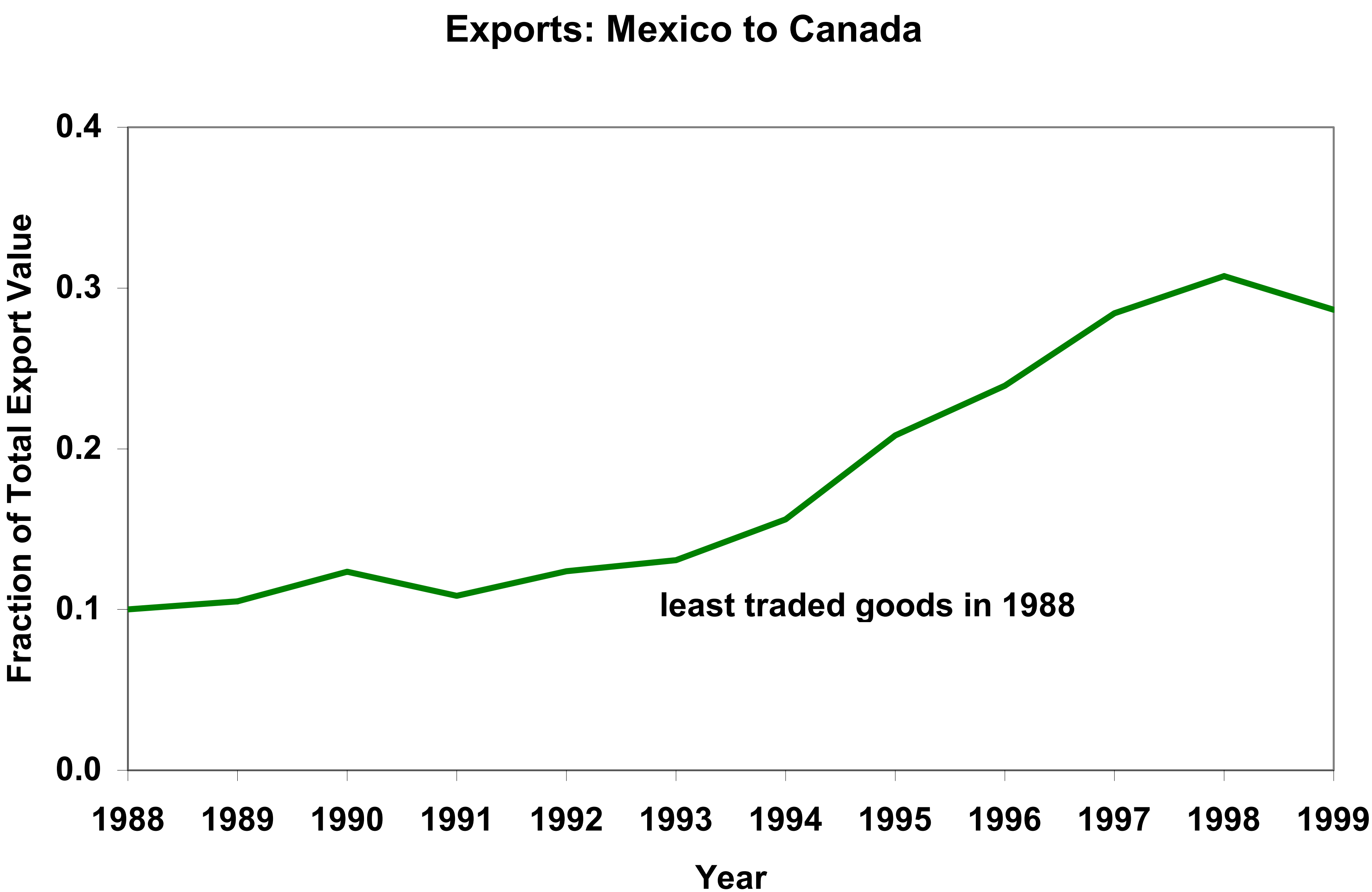
1.0
Cummulative Fraction of Export Value: Beginning of Period


Composition of Exports: Canada to Mexico
Fraction of 1999 Export Value
0.4
0.3
0.2
0.1
0.0
741.3
24.4
9.9
5.2
2.4
1.5
1.3
1.1
1
0.9
number of categories in set
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Cummulative Fraction of 1988 Export Value


Composition of Exports: Mexico to Canada
Fraction of 1999 Export Value
0.4
0.3
0.2
0.1
0.0
737.8
24.7
11.8
6
3.3
2
1.3
0.8
0.7
0.6
Finished Cars go from 0.8% of exports to 15.0% of exports.
number of categories in set
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Cummulative Fraction of 1988 Export Value

Exports: Canada to Mexico
0.4
0.3
0.2
0.1
0.0
Fraction of Total Export Value
least traded goods in 1988
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Year


Exports: Mexico to Canada
0.4
0.3
0.2
0.1
0.0
Fraction of Total Export Value
least traded goods in 1988
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Year

Dixit-Stiglitz (1977) taste for variety: the inputs of goods, into either consumption or production, from the same sector but from different firms, are close, but not perfect substitutes:

$$x_i = \theta_i \left(\sum_{j=1}^{n_i} x_{i,j}^{\rho} \right)^{1/\rho}.$$

n_i is the total number of firms in sector i in the whole world.

Because of home country bias:

$$x_i^{mex} = \theta_i \left(\begin{array}{l} \alpha_{i,can}^{mex} \sum_{j=1}^{n_{i,can}} x_{i,j,can}^{\rho} + \alpha_{i,mex}^{mex} \sum_{j=1}^{n_{i,mex}} x_{i,j,mex}^{\rho} \\ \qquad + \alpha_{i,us}^{mex} \sum_{j=1}^{n_{i,us}} x_{i,j,us}^{\rho} + \alpha_{i,rw}^{mex} \sum_{j=1}^{n_{i,rw}} x_{i,j,rw}^{\rho} \end{array} \right)^{1/\rho}.$$

Inputs are differentiated not just by firm but by country of origin — Canada, Mexico, the United States, or the rest of the world.

$\alpha_{i,can}^{mex}$, $\alpha_{i,us}^{mex}$, $\alpha_{i,rw}^{mex}$ are smaller than $\alpha_{i,mex}^{mex}$ and are calibrated to base year trade flows.

Ricardian model with a continuum of goods $x \in [0,1]$

production technologies $y(x) = \ell(x) / a(x)$, $y^*(x) = \ell^*(x) / a^*(x)$
ad valorem tariffs τ, τ^*

$$(1+\tau^*) w a(x) < w^* a^*(x) \Leftrightarrow \frac{a(x)}{a^*(x)} < \frac{w^*}{(1+\tau^*) w}$$

$\Rightarrow$ home country produces good and exports it to the foreign country.

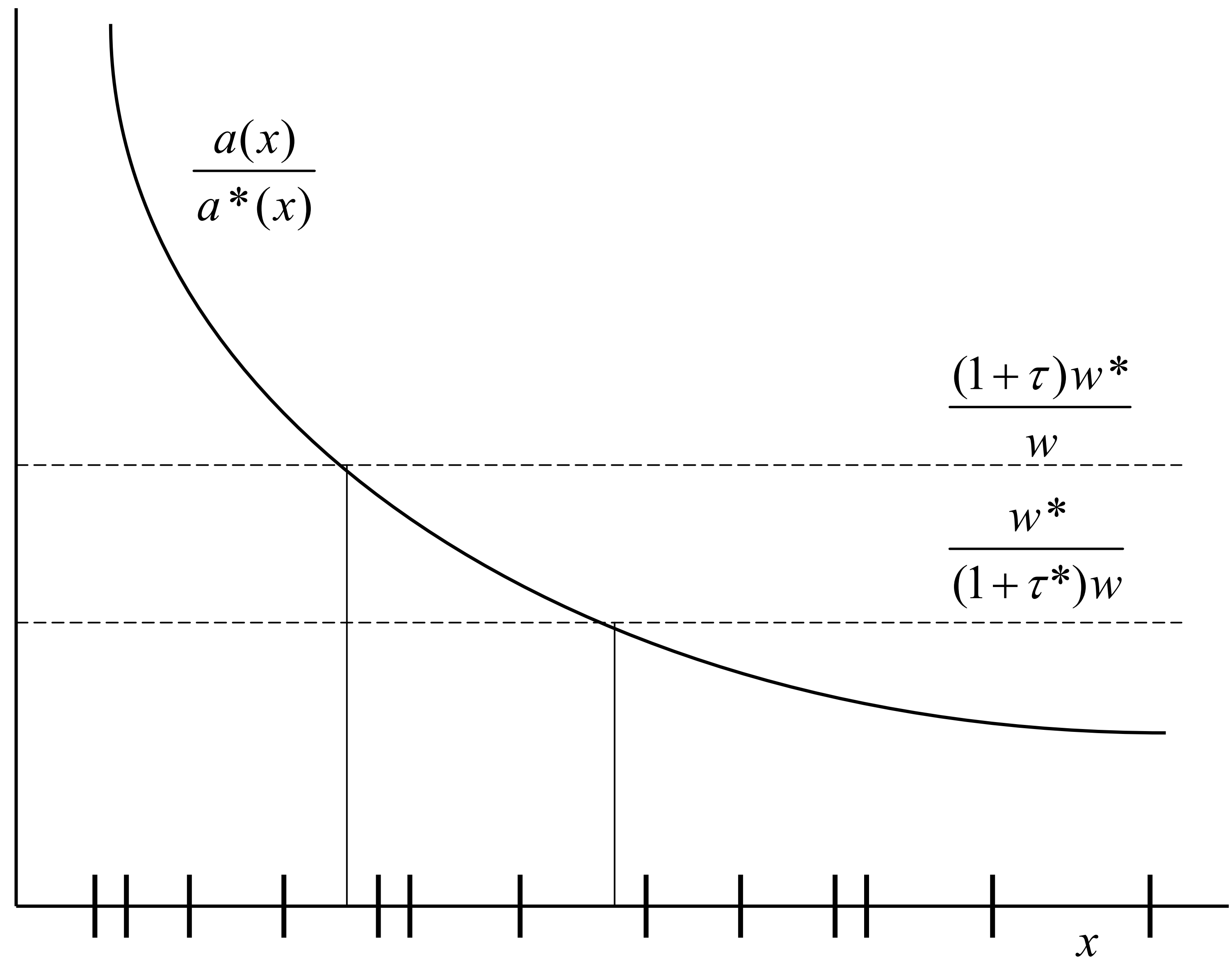
$$\frac{a(x)}{a^*(x)} > \frac{(1+\tau) w^*}{w}$$

$\Rightarrow$ foreign country produces good and exports it to the home country.

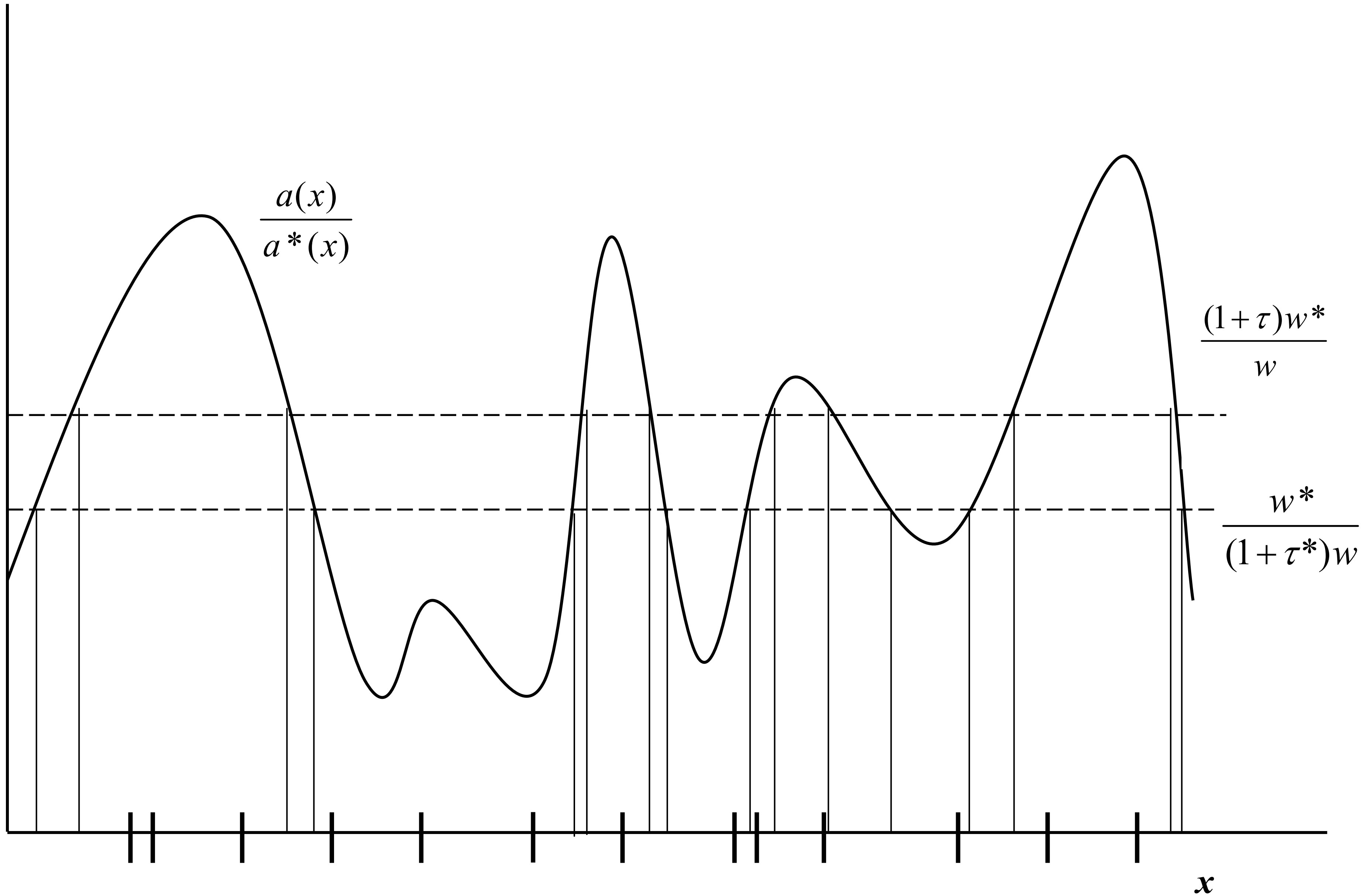
$$\frac{w^*}{(1+\tau^*) w} < \frac{a(x)}{a^*(x)} < \frac{(1+\tau) w^*}{w}$$

$\Rightarrow$ good is not traded.

Lowering tariffs can generate trade in previously nontraded goods.



$\frac{a(x)}{a^*(x)}$
$\frac{(1+\tau)w^*}{w}$
$\frac{w^*}{(1+\tau^*)w}$
x



$\frac{a(x)}{a^*(x)}$
$\frac{(1+\tau)w^*}{w}$
$\frac{w^*}{(1+\tau^*)w}$
x

Great Depressions of the Twentieth Century Project

Use growth accounting and applied dynamic equilibrium models to reexamine great depression episodes:

United Kingdom (1920s and 1930s) — Cole and Ohanian
Canada (1930s) — Amaral and MacGee
France (1930s) — Beaudry and Portier
Germany (1930s) — Fisher and Hornstein
Italy (1930s) — Perri and Quadrini
Argentina (1970s and 1980s) — Kydland and Zarazaga
Chile and Mexico (1980s) — Bergoeing, Kehoe, Kehoe, and Soto
Japan (1990s) — Hayashi and Prescott

(Review of Economic Dynamics, January 2002 revised and expanded version forthcoming as Minneapolis Fed volume)

Lessons from Great Depressions Project

- The main determinants of depressions are not drops in the inputs of capital and labor — stressed in traditional theories of depressions — but rather drops in the efficiency with which these inputs are used, measured as total factor productivity (TFP).

- Exogenous shocks like the deteriorations in the terms of trade and the increases in foreign interest rates that buffeted Chile and Mexico in the early 1980s can cause a decline in economic activity of the usual business cycle magnitude.

- Misguided government policy can turn such a decline into a severe and prolonged drop in economic activity below trend — a great depression.

Big Question: What Drives Changes in Productivity?

one-sector growth model

maximize $\sum_{t=1988}^{\infty} \beta^t \left[\gamma \log C_t + (1-\gamma)\log(\bar{h}N_t - L_t)\right]$

subject to $C_t + K_{t+1} - K_t = w_t L_t + (1-\tau_t)(r_t - \delta)K_t + T_t - X_t$

feasibility constraint

$$C_t + K_{t+1} - (1-\delta)K_t + X_t = A_t K_t^{\alpha} L_t^{1-\alpha}.$$

A_t and X_t are treated as exogenous.

Growth Accounting

Y_t : real GDP (national income accounts)

X_t: real investment (national income accounts)

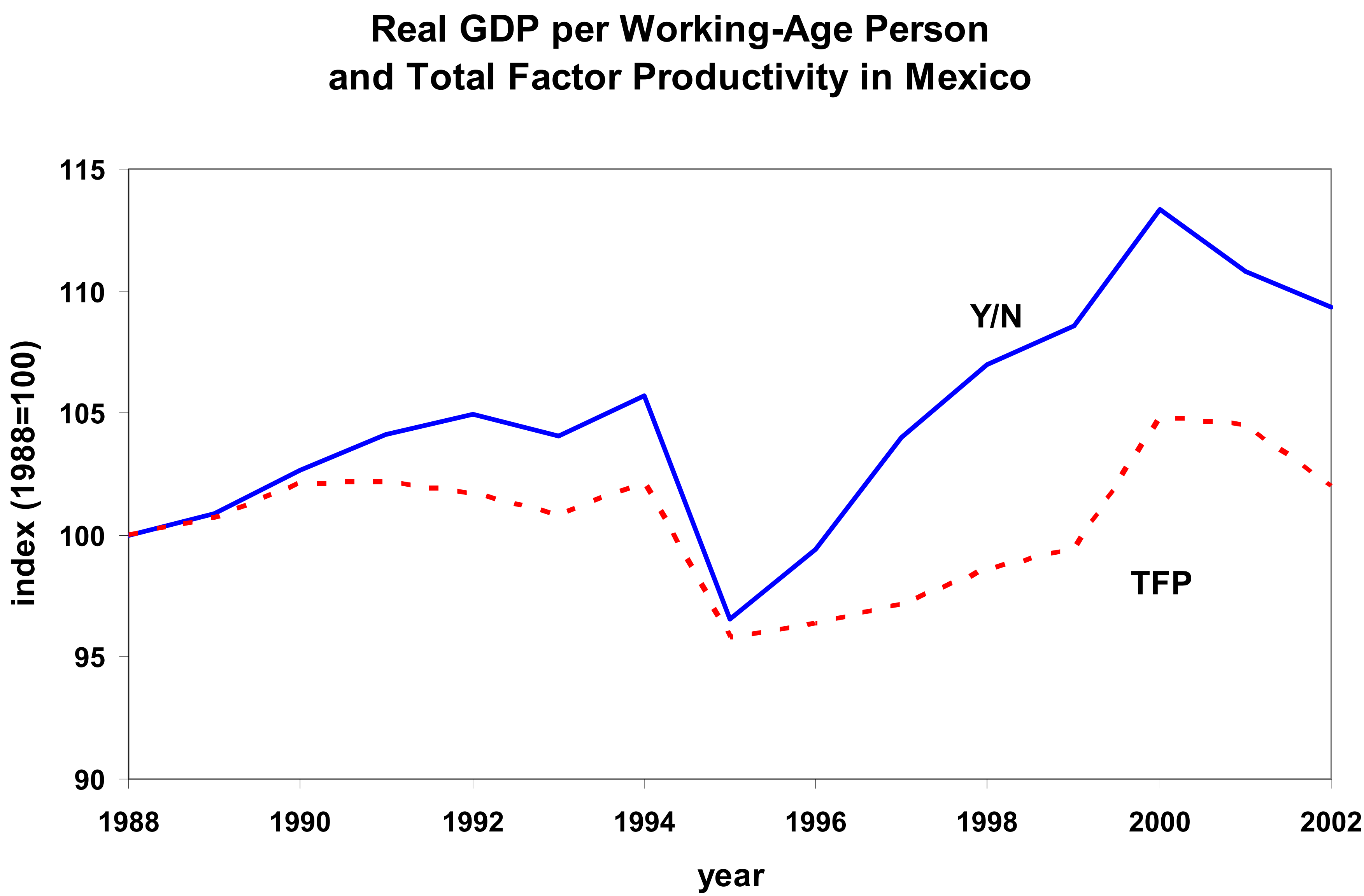
L_t : hours worked (labor surveys)

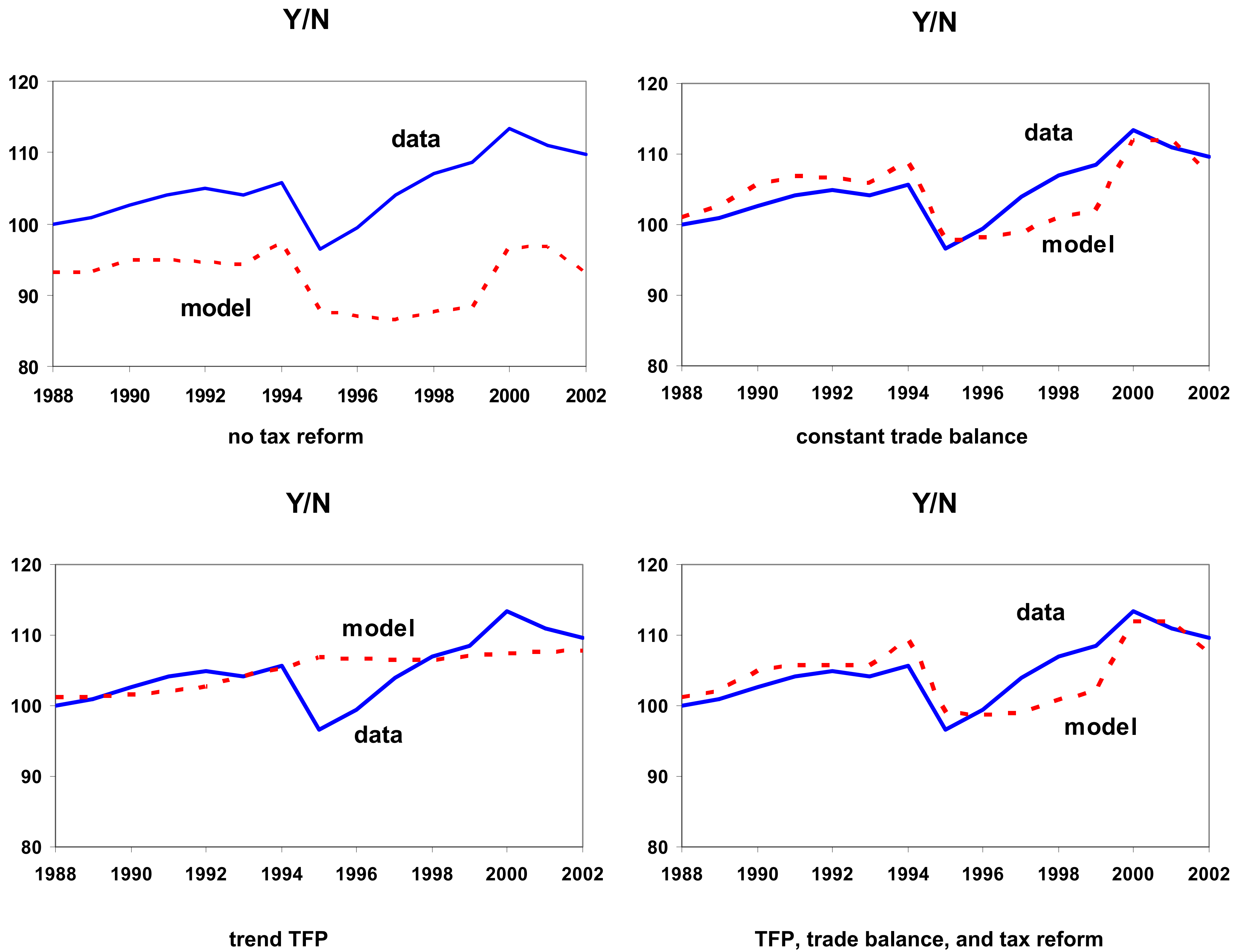
Construct Capital Stocks:

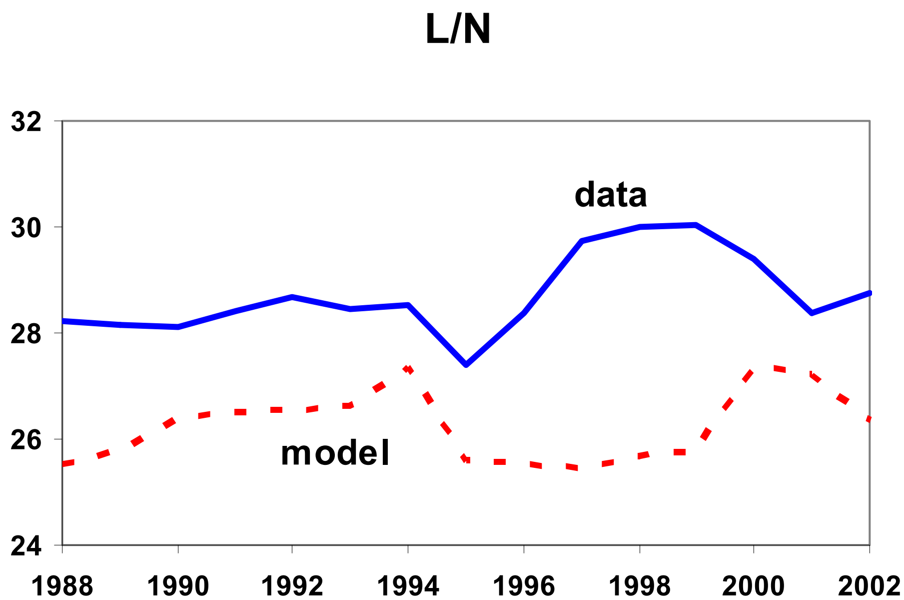
$$K_{t+1} = (1-\delta)K_t + X_t$$

Total factor productivity is the residual:

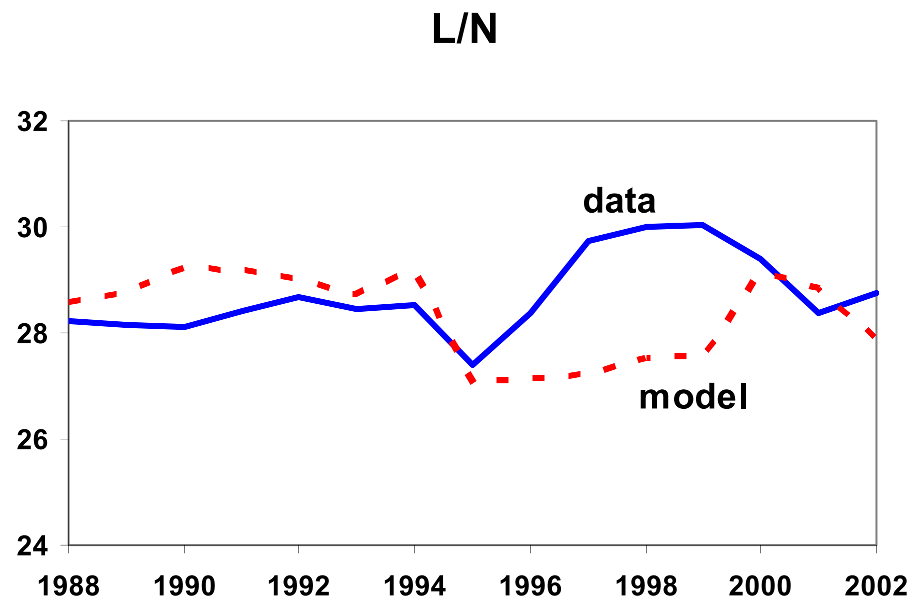
$$A_t = Y_t \big/ K_t^{\alpha} L_t^{1-\alpha}$$


Real GDP per Working-Age Person
and Total Factor Productivity in Mexico
115
110
105
100
95
90
index (1988=100)
Y/N
TFP
1988
1990
1992
1994
1996
1998
2000
2002
year

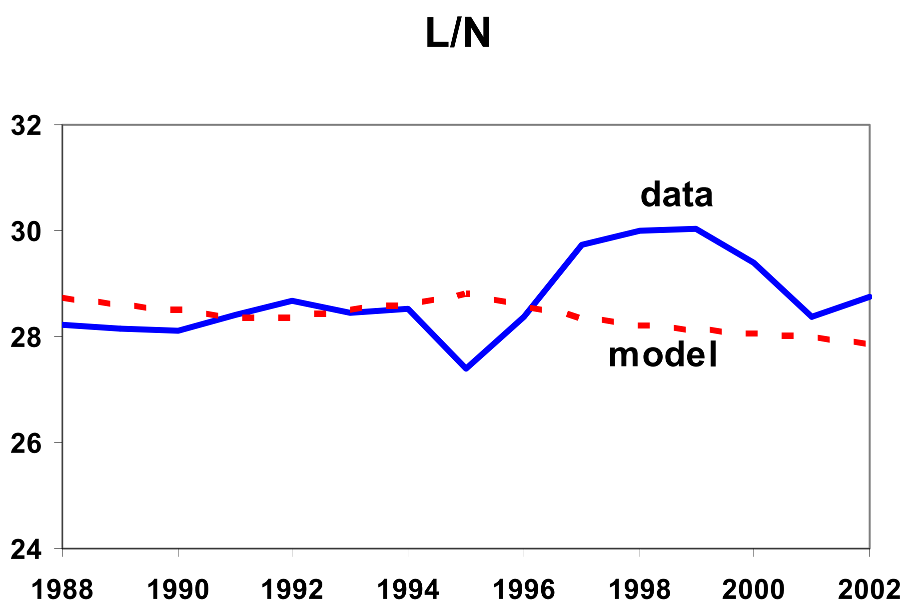

Y/N
120
110
100
90
80
1988
1990
1992
1994
1996
1998
2000
2002
data
model
no tax reform
Y/N
data
model
constant trade balance
Y/N
model
data
trend TFP
Y/N
data
model
TFP, trade balance, and tax reform



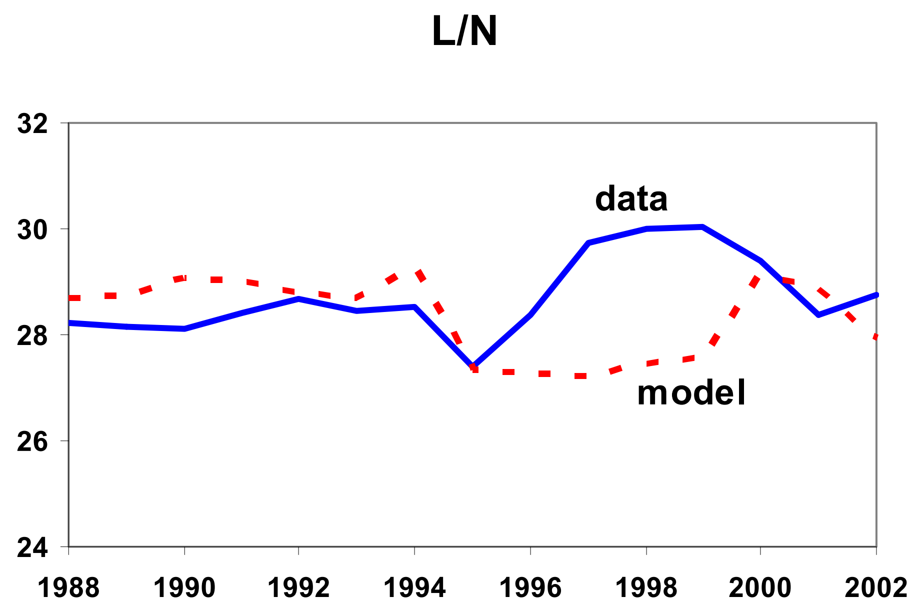
no tax reform



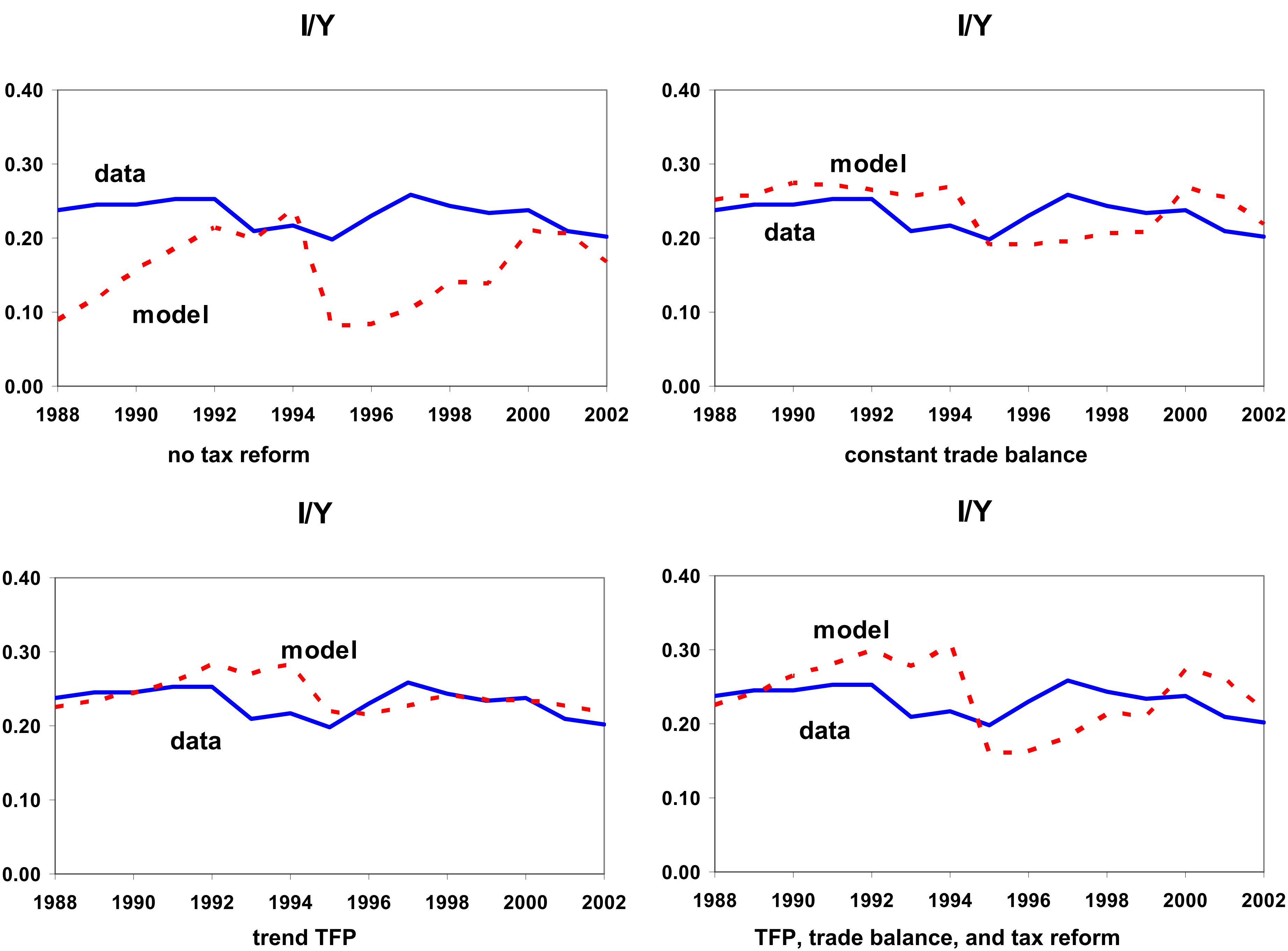
constant trade balance



trend TFP



TFP, trade balance, and tax reform


I/Y
0.40
0.30
0.20
0.10
0.00
1988
1990
1992
1994
1996
1998
2000
2002
data
model
no tax reform
I/Y
model
data
constant trade balance
I/Y
model
data
trend TFP
I/Y
model
data
TFP, trade balance, and tax reform

Conjecture: No plausible parameter changes can get the models of NAFTA built on the Dixit-Stiglitz specification to match what has happened in North America.

Imposing large elasticities of substitution between different types of goods is capable of generating large increases in trade flows in response to tariff changes, but

- it is likely to do so in the wrong sectors;
- high elasticities of substitution imply that trade liberalization has very small welfare consequences;
- high elasticities imply implausibly large volatilities of the trade balance.

If a modeling approach is not capable of reproducing what has happened, then we should discard it.

Conjecture: The biggest effect of liberalization of trade and capital flows is on productivity — through changing the distribution of firms and encouraging technology adoption — rather than the effects emphasized by the models used to analyze the impact of NAFTA.