Using the New Products Margin to Predict the Sectoral Impact of Trade Reform

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Kehoe (2005) showed that several of the leading models built to predict the industry level effects of NAFTA performed poorly

We confirm this finding for Brown-Deardorff-Stern (BDS), Cox-Harris, and Sobarzo models over the 1989-2009 period.

Focus on the BDS model since it has bilateral trade predictions for all importer-exporter pairs between Canada, Mexico, and the U.S.

Methodology for Evaluating the NAFTA Models

Download all bilateral trade flows at the 5-digit SITC level between Canada, Mexico, and the U.S. from 1989-2009

Map the 1,836 5-digit SITC codes into 3-digit ISIC codes and then aggregate those ISIC codes into the industries of each model.

Compute the percentage growth in exports for each industry normalized by GDP, z_j, and compare to the model predictions

We compute the weighted correlation coefficient between the model predictions and the results from the data

We also compute the weighted regression coefficients *a* and *b* from

$$\min_{a,b} \sum_{j=1}^{23} \omega_j \left(a + b z_j^{model} - z_j^{data}\right)^2$$

Where *a* indicates how well the models did in matching average change (*a=0* is ideal) and *b* indicates how well the models did in matching the signs and magnitudes of the changes (*b=1* is ideal)

Results for the BDS Model: As we can see the BDS model fared poorly in predicting industry level changes in bilateral trade

exporter	**Importer**	**correlation**	***a***	***b***
Canada	Mexico	-0.10	645.29	-7.94
Canada	United States	-0.28	21.82	-3.33
Mexico	Canada	0.06	135.79	0.16
Mexico	United States	-0.13	66.64	-0.11
United States	Canada	0.39	-26.62	1.34
United States	Mexico	-0.06	88.47	-0.24
weighted average		0.00	19.83	-0.94
pooled regression		0.06	10.54	0.17

Kehoe and Ruhl (2013) show that products that are traded very little or not at all account disproportionately for aggregate changes in bilateral trade

Hypothesis: Industries with more trade due to these little-traded and non-traded products should experience more growth following a trade liberalization

The New Product or Extensive Margin

We sort each of the 1,836 products by average amount of trade over the first three years of our period

We then place each product into bins sequentially until each bin accounts for 10% of total trade in the base period.

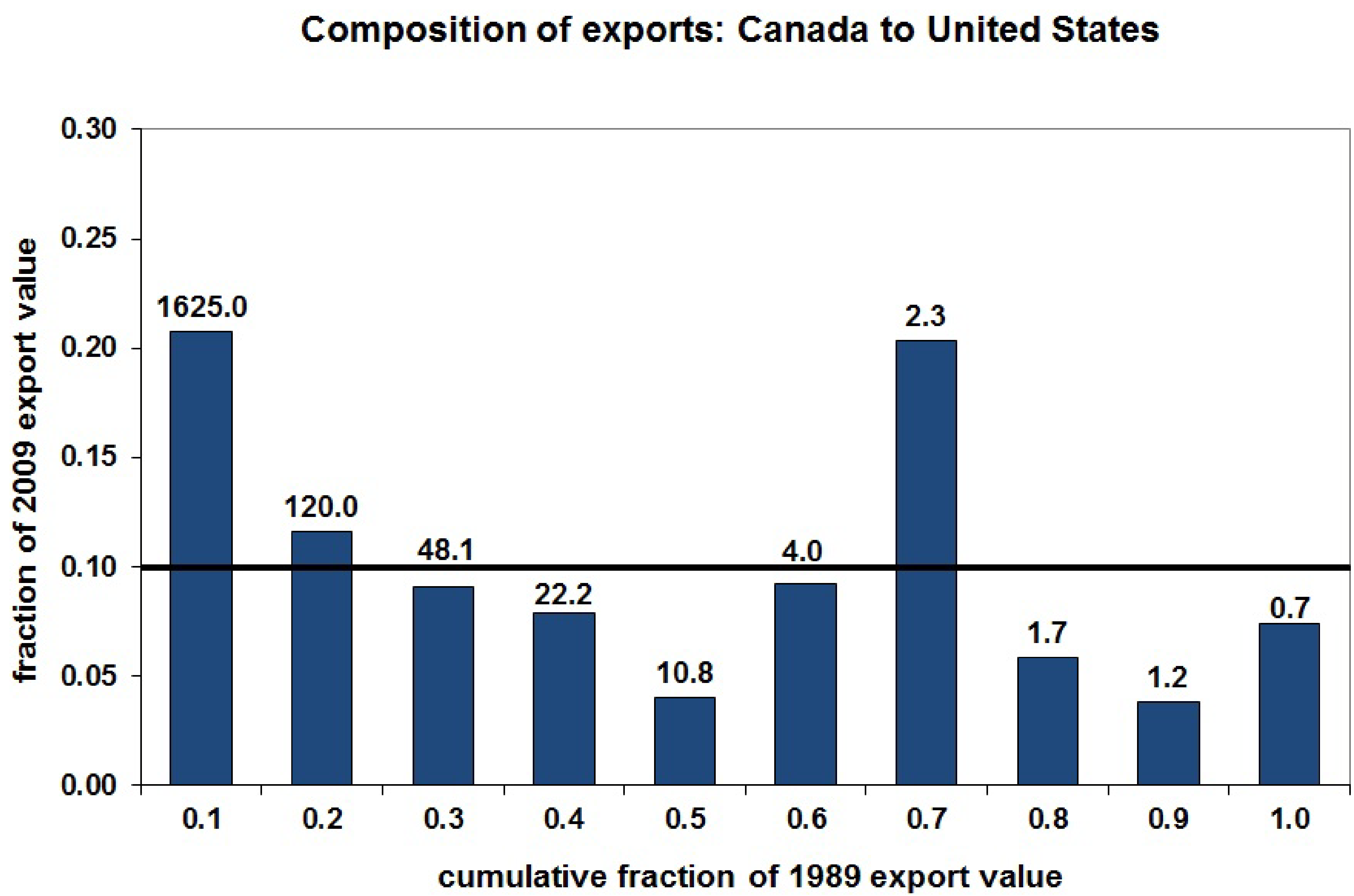
We define Least Traded Products (LTP) to be the products in the final 10% bin, the products with the least amount of trade over the first three years.

Comparison to other extensive margins

Most of the literature uses a fixed cutoff when deciding whether a product is part of the extensive margin, Feenstra (1994) uses a value of $0, and Evenett and Venables (2002) use $50,000

In contrast, our measure varies by country. The cutoff for Ecuador-Peru differs from the cutoff for U.S.-Canada.

We keep our set of extensive margin products fixed, as opposed to focusing on movement into and out of the extensive margin


Composition of exports: Canada to United States
fraction of 2009 export value
0.30
0.25
0.20
0.15
0.10
0.05
0.00
1625.0
120.0
48.1
22.2
10.8
4.0
2.3
1.7
1.2
0.7
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
cumulative fraction of 1989 export value

Methodology for Evaluating the New Products Margin

Using the same data, compute the percentage of trade in each industry accounted for by LTP in the base period, s_j.

Compare each industry's share of LTP in 1989 and compare it to that industry's growth rate normalized by GDP, z_j, over 1989-2009

Compare the average growth rates of LPT and non-LTP

We compute the weighted correlation coefficient between LTP share in 1989 and industry growth over 1989-2009

Also compute α and β from solving

$$\min_{a,b} \sum_{j=1}^{23} \omega_j \left(\alpha + \beta s_j - z_j^{data}\right)^2$$

Where α indicates the average growth of non-least traded products, and β indicates how much the average growth rate of LTP exceeded that of non-LTP

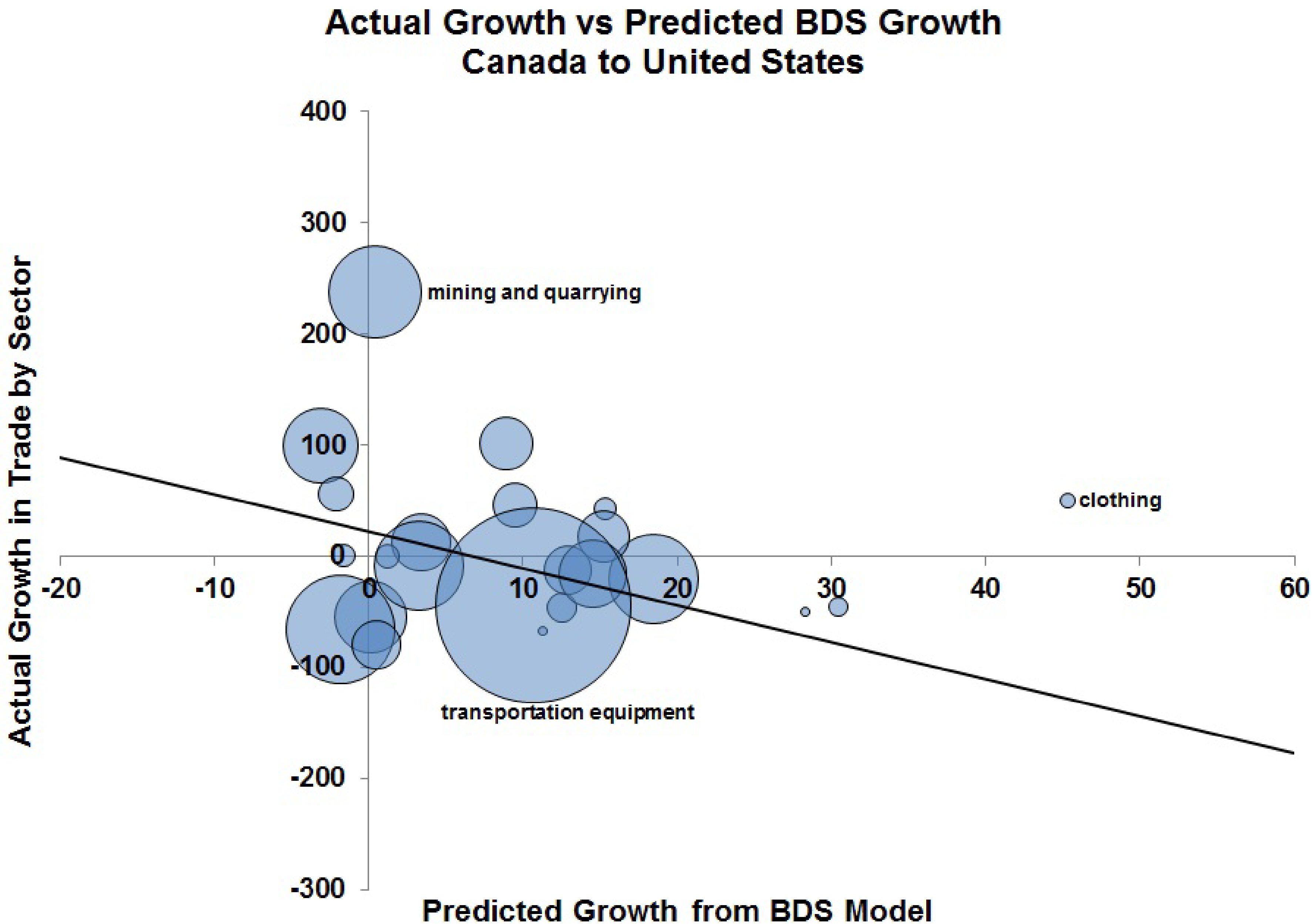
Results for the LTP exercise: As we can see this exercise fares much better in predicting industry level changes in bilateral trade

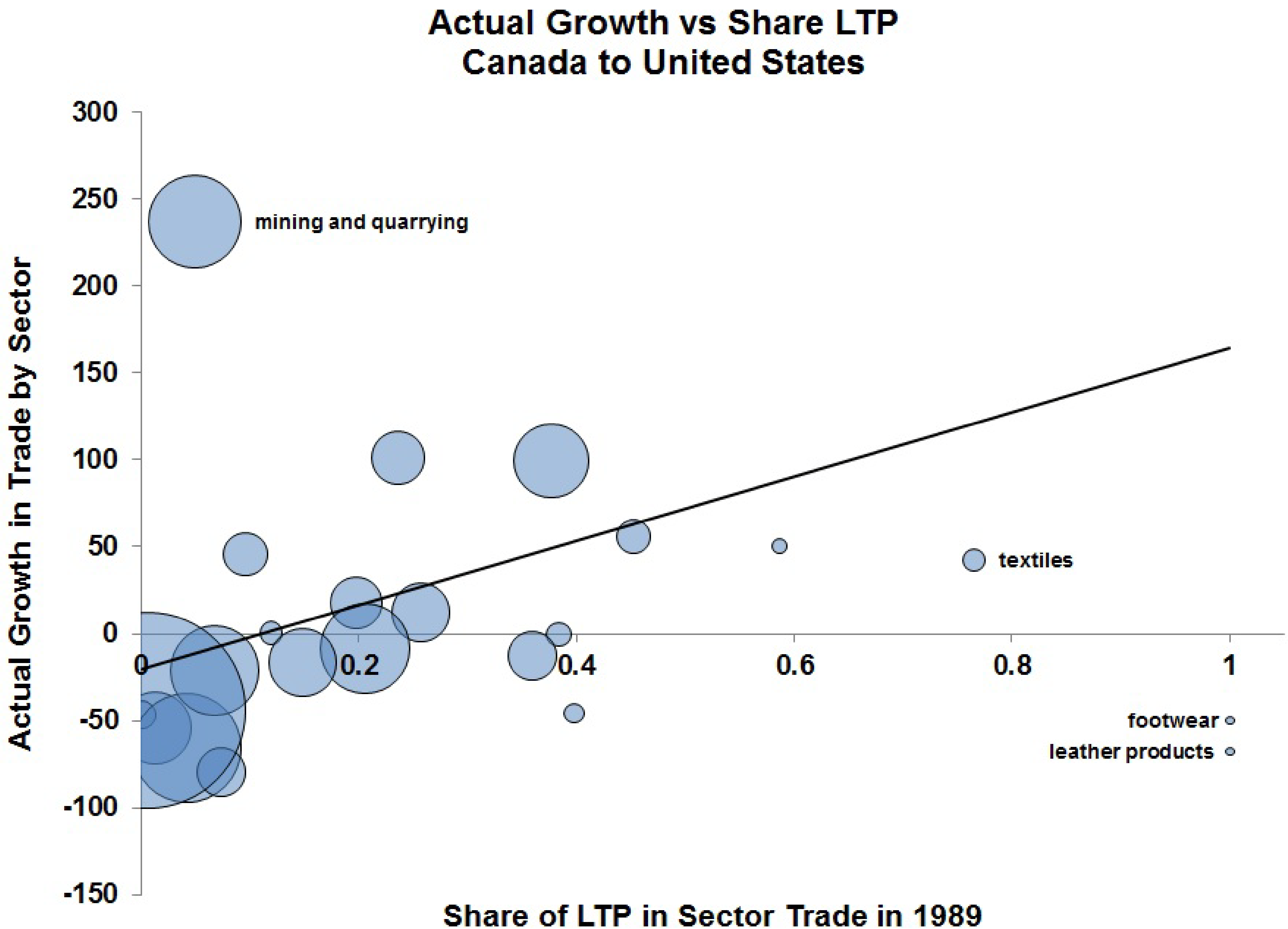
exporter	**Importer**	**correlation**	***a***	***b***
Canada	Mexico	0.55	254.23	4468.37
Canada	United States	0.30	-20.42	185.24
Mexico	Canada	0.33	115.16	286.39
Mexico	United States	0.19	51.52	77.54
United States	Canada	0.54	-34.54	175.84
United States	Mexico	0.47	62.31	265.44
weighted average		0.39	-5.74	87.29
pooled regression		0.24	-5.30	181.18

Comparison between BDS results and LTP exercise results:

Our exercise performs better for every country pair.

exporter	Importer	BDS correlation	LTP correlation
Canada	Mexico	-0.10	0.55
Canada	United States	-0.28	0.30
Mexico	Canada	0.06	0.33
Mexico	United States	-0.13	0.19
United States	Canada	0.39	0.54
United States	Mexico	-0.06	0.47
weighted average		-0.00	0.39
pooled regression		0.06	0.24


Actual Growth vs Predicted BDS Growth
Canada to United States
Actual Growth in Trade by Sector
400
300
200
100
0
-100
-200
-300
-20
-10
0
10
20
30
40
50
60
mining and quarrying
clothing
transportation equipment
Predicted Growth from BDS Model


Actual Growth vs Share LTP
Canada to United States
Actual Growth in Trade by Sector
Share of LTP in Sector Trade in 1989
300
250
200
150
100
50
0
-50
-100
-150
0
0.2
0.4
0.6
0.8
1
mining and quarrying
textiles
footwear
leather products

Our exercise shows that looking at the share of least traded products in an industry is a useful predictor of which industries will experience the most growth following a trade liberalization.

Two obvious downsides to our method:

1. As of now it is atheoretical
2. It is only a predictor of relative growth across industries, not the actual levels of growth for each industry

It is our hope that our results will spur the development of models able to account for the importance of the new product margin in trade and address these downsides

Robustness:

The α and β computed from our industry-level regressions tell us how much LTP and non-LTP products grew on average

We compare these industry-based estimates to the average growth rates computed directly from the product data.

The industry level growth rates won't account for products with zero trade in 1989, while the product level growth rates will. If the estimated growth rates are similar it indicates the important products are the ones with small, but positive trade.

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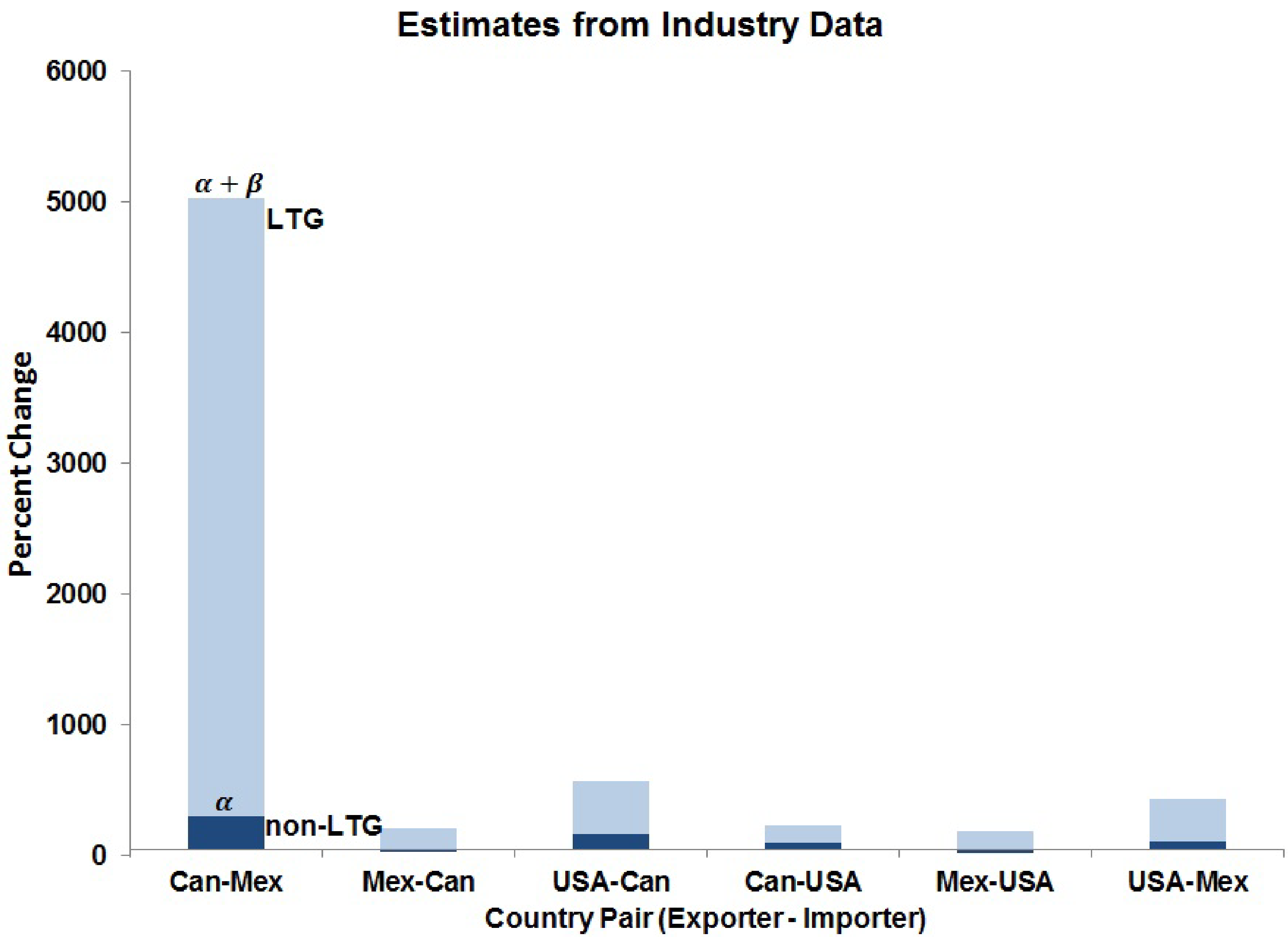
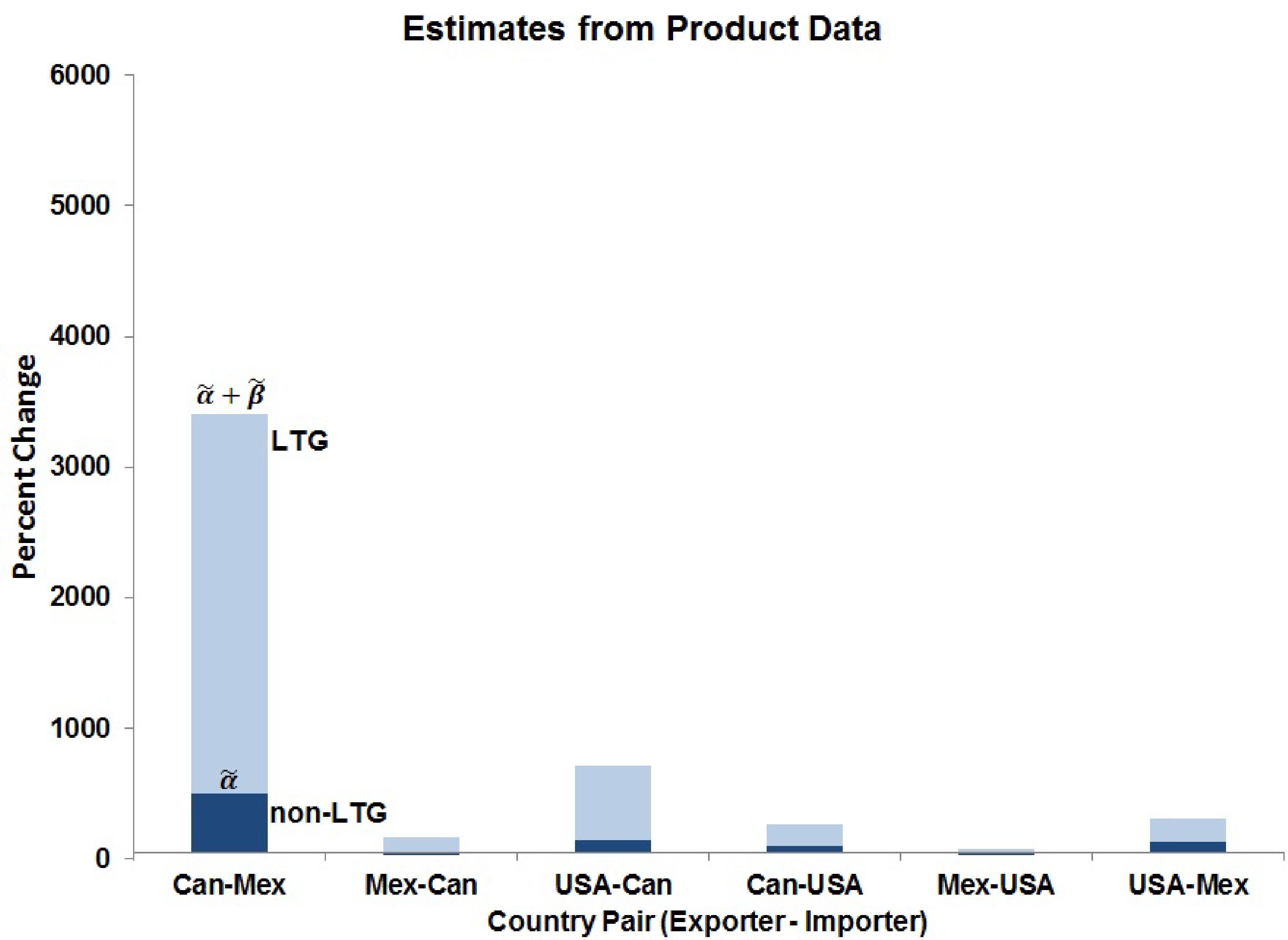
We find a weighted correlation of 0.97 for α and 0.88 for β



Estimates from Industry Data
6000
5000
4000
3000
2000
1000
0
Percent Change
$\alpha + \beta$
LTG
α
non-LTG
Can-Mex
Mex-Can
USA-Can
Can-USA
Mex-USA
USA-Mex
Country Pair (Exporter - Importer)



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6000
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$\tilde{\alpha}+\tilde{\beta}$
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$\tilde{\alpha}$
non-LTG
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Mex-Can
USA-Can
Can-USA
Mex-USA
USA-Mex
Country Pair (Exporter - Importer)

Robustness

We also find that our results hold when changing our end dates. For example if we use 1988-2007 to avoid the great recession.

We also find that, for goods for which we have both price and quantity data, after deflating by the exporter’s PPI – most changes in value are driven by changes in quantity.

Our exercise similarly performs well when compared to alternative models used to predict the effects of NAFTA, for example Cox-Harris for Mexico and Sobarzo for Canada.

Changes in North American trade deflated by Exporter's PPI: Growth due to quantities versus change due to prices

		average share of total growth	
exporter	**importer**	**P**	**Q**
Canada	Mexico	2.3	97.7
Canada	United States	-2.5	102.5
Mexico	Canada	31.7	68.3
Mexico	United States	24.9	75.1
United States	Canada	-8.9	108.9
United States	Mexico	5.3	94.7
weighted average		-0.2	100.2
pooled		0.8	99.2

Changes in Mexican trade relative to Mexican GDP in the Sobarzo Model (Percent)

sector	Exports to North America			Imports from North America		
	1989–2009 data	**Sobarzo growth rate**	**1989 fraction least traded**	**1989–2009 data**	**Sobarzo growth rate**	**1989 fraction least traded**
Agriculture	-15.3	-11.1	0.07	3.2	3.4	0.10
Beverages	161.8	5.2	0.01	85.2	-1.8	0.32
Chemicals	34.1	-4.4	0.60	104.2	-2.7	0.23
Electrical Machinery	54.7	1.0	0.02	6.6	9.6	0.01
Food	100.8	-6.9	0.41	46.7	-5.0	0.15
Iron and Steel	19.6	-4.9	0.37	23.1	17.7	0.24
Leather	-64.6	12.4	0.53	2.5	-0.4	0.67
Metal Products	86.2	-4.4	0.30	24.8	9.5	0.14
Mining	27.7	-17.0	0.01	15.0	13.2	0.17
Nonelectrical Machinery	166.5	-7.4	0.12	38.3	20.7	0.09
Nonferrous Metals	36.8	-9.8	0.13	37.1	9.8	0.10
Nonmetallic Min. Prod.	-16.0	-6.2	0.26	5.3	10.9	0.49
Other Manufactures	88.4	-4.5	0.23	26.1	4.2	0.16
Paper	-35.9	-7.9	0.30	-4.1	-4.7	0.07
Petroleum	-98.0	-19.5	0.12	-81.6	-6.8	0.06
Rubber	158.9	12.8	0.43	78.3	-0.1	0.06
Textiles	69.5	1.9	0.76	48.3	-1.2	0.44
Tobacco	-61.3	2.8	1.00	333.0	-11.6	1.00
Transportation Equip.	126.1	-5.0	0.02	26.7	11.2	0.02
Wearing Apparel	197.2	30.0	0.23	-17.2	4.5	0.20
Wood	30.8	-8.5	0.04	-34.0	11.7	0.05
weighted correlation with data		0.43	0.02		-0.12	0.47
regression coefficient $a \backslash \alpha$		62.91	81.13		30.91	9.61
regression coefficient $b \backslash \beta$		7.92	3.06		-0.49	175.76

Changes in Canadian trade relative to Canadian GDP in the Cox-Harris Model (Percent)

	Exports to World			Imports from World		
sector	**1989–2009 data**	**C-H growth rate**	**1989 fraction least traded**	**1989–2009 data**	**C-H growth rate**	**1989 fraction least traded**
Agriculture	39.1	-4.1	0.13	13.4	7.2	0.18
Chem. & Misc. Man.	70.9	28.1	0.34	59.1	10.4	0.20
Fishing	-30.9	-5.4	0.05	32.9	9.5	0.22
Food, Bev., and Tobacco	95.5	18.6	0.22	86.6	3.8	0.19
Forestry	-24.8	-11.5	0.15	4.5	7.1	0.24
Machinery and Appl.	11.7	57.1	0.19	-6.6	13.3	0.06
Mining	117.0	-7.0	0.03	103.0	4.0	0.06
Nonmetallic Minerals	20.9	31.8	0.64	3.4	7.3	0.32
Refineries	-67.8	-2.7	0.06	-71.9	1.5	0.03
Rubber and Plastics	107.3	24.5	0.22	56.0	13.8	0.07
Steel and Metal Products	6.6	19.5	0.15	33.2	10.0	0.17
Textiles and Leather	18.4	108.8	0.86	-1.9	18.2	0.33
Transportation Equip.	-37.5	3.5	0.01	-19.7	3.0	0.01
Wood and Paper	-58.5	7.3	0.02	12.8	7.2	0.09
weighted correlation with data		0.06	0.40		0.04	0.48
regression coefficient $a \backslash \alpha$		2.00	-13.73		9.77	-7.55
regression coefficient $b \backslash \beta$		0.16	199.46		0.30	199.46