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Revealing Comparative Advantage
Chaotic or Coherent Patterns across Time and Sector and U.S. Trading Partner?

J. David Richardson and Chi Zhang

7.1 Introduction, Motivation, Novelty, Overview

In this paper we attempt to honor, by mimicry, Bob Lipsey's ongoing life work of innovative and painstaking measurement and analysis.[1]

We do so by mapping and interpreting U.S. comparative advantage across time, trading partners, and sectors at an increasing level of commodity detail. We use Bela Balassa's index of revealed comparative advantage (RCA), measured from U.S. export data. Balassa, like Lipsey, was a master of measurement and analysis (and the early mentor of one of the authors).

To our knowledge, we are among the first to do these mappings simulta-

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1. For example, Bob's early work with Irving Kravis to see how closely the available price indexes of internationally traded goods come to measures that were built up carefully from surveys of actual transactions prices (Kravis and Lipsey 1971), continuing in regular contributions to measures of relative prices through the International Comparisons Project (ICP; most recently Heston and Lipsey 1999, with many references within). Or, for example, Bob's many attempts (with Kravis) to measure the relative importance of MNC production in world trade and production (most recently Kravis and Lipsey 1992, which features the measures of revealed comparative advantage that we use later). We are particular fans of Bob's painstaking efforts to measure what economists really mean by *capital formation* (most recently Kirova and Lipsey 1998, with earlier references within).

neously across time, sectors, and regional markets (groups of trading partners).[2] To coin a term that emphasizes this, we call some of our indexes RRCA indexes—they measure regional revealed comparative advantage by market groups of U.S. trading partners.

We are interested in several patterns of variation. The most novel is the variation in U.S. comparative advantage from region to region. It turns out to be quite diverse; U.S. patterns of comparative advantage seem to be different in different parts of the world, and the differences seem to have changed during the period 1980–95 from which our data come. These differences look different at different levels of aggregation.

Aggregation defines our second pattern of interest. U.S. comparative advantage is naturally quite diverse from sector to sector (by definition), but the advantage differs in interesting ways as sectors are more specifically defined. Sectors in which U.S. exports are typically strong often include disaggregated subproducts in which they are not, and conversely. These patterns, too, change between 1980 and 1995. What accounts for these changes in differences? Why are they important? Our results yield several answers.

Obvious variables, such as proximity, underlie some of our findings, such as the quantitatively sharper (larger) U.S. comparative advantage in exports to the Western Hemisphere and disadvantage in exports to Asia. Less obvious is the apparent influence of per capita income, especially on manufactures; U.S. comparative advantage and disadvantage are quantitatively sharper (larger) in countries that are poorer than they are in richer trading partners.[3] We find this suggestive for evaluating natural regional trading blocs, and for detecting trade diversion, for which there seems to be some evidence with respect to the North American Free Trade Agreement (NAFTA).

Qualitatively, the United States has comparative advantage in differentiated producer goods (e.g., capital equipment) in all regions—though it is less marked in Japan—and comparative disadvantage (except for chemicals) in standardized producer goods (e.g., metals) and consumer goods of all sorts. The producer goods patterns are very stable over time, and

2. Both Kreinin and Plummer (1994a, 1994b) and Hoekman and Djankov (1997) examine the difference between RCA indexes defined for one particular region (East Asia and the European Union, respectively) and normal global-market RCA indexes. Balassa and Bauwens (1988, chap. 3) examine the determinants of regional/bilateral *net* exports, but that is a very different measure of comparative advantage than Balassa's purely export-based measure.

3. Both traditional and modern trade theories allow for this, of course, explaining it by environmental factors that range from cones of diversification (Schott 1998), to global vertical specialization (Hummels, Rapaport, and Yi 1998; Yeats 1998), to two-way trade within a differentiated products sector. In some variants of two-way trade, however (e.g., reciprocal dumping), the very conception of comparative advantage loses relevance, to say nothing of its measurement.

appear in both aggregated and disaggregated data. The consumer goods patterns are, however, both highly volatile and remarkably uneven across groups of trading partners and at different levels of aggregation.

We were far less successful in detecting sectoral niche comparative advantage than geographical niche comparative advantage. We expected increasing specialization as we deepened sectoral disaggregation, rising over time with the advent of vertical specialization (outsourcing or fragmentation), as described in Hummels, Rapaport, and Yi (1998) and Yeats (1998). There was only limited evidence for this among machinery and equipment exports, and none for manufactures in general.

7.2 Background

Indexes of revealed comparative advantage (RCA) have had a checkered history since Bela Balassa developed them decades ago.[4] They are arguably useful as one of the few formal ways of measuring the sector identity and intensity of a country's comparative advantage and disadvantage; yet their consistency with the most familiar theories of trade patterns has not always been clear, despite Balassa's efforts (see also Hillman 1980). Like gravity equations and Grubel-Lloyd indexes, RCA indexes are employed frequently but with little respect.

Even empirical properties of RCA indexes remain unexplored. For example, few researchers have attempted to see if RCA indexes using a country's import data alone suggest similar patterns of disadvantage and advantage as do RCA indexes using the same country's export data alone.[5] Likewise, trade-based RCA indexes could be compared to production-based RCA indexes[6] to see if a consistent story emerges.

Finally, only a few researchers have calculated RCA indexes by regional groupings of a country's trading partners in order to examine similarities and differences in the cross-regional pattern. This, and discovering how these patterns vary with aggregation, are the chief purposes of our paper.

4. Balassa (1965, 1977, 1979, 1989), Balassa and associates (1964), Balassa and Bauwens (1988), Balassa and Noland (1988, 1989).

5. We treat the issue of export-based versus import-based concepts very briefly toward the end of the paper. Balassa (1965), Balassa and Bauwens (1988), and Balassa and Noland (1988, 1989) all use imports to adjust exports either linearly (net exports) or in ratio form. Imports alone, however, give a uniquely different measure of comparative advantage, as we show later.

6. In a world of similar preferences, production-based or value-added-based RCA indexes would be very reasonable measures of comparative advantage. In practice, the requisite data are hard to compile. For recent examples, however, relying on OECD data, see Wolff (1999), using manufacturing production, or Leamer (1997), using value added. For an example using 1963 U.S. data on interstate merchandise shipments, see Greytak, Richardson, and Smith (1999).

7.3 What Do RCA Indexes Measure, Anyway?

RCA indexes measure a country's comparative advantage, and do so in a fairly natural way. One simple explanation is that an RCA index is a ratio of ratios—specifically, that it is relative relative trade shares. The two modifiers *relative* belong in the sentence together because the index is attempting to evaluate comparative advantage, which is itself a relative relative concept: the relative competitiveness of a country's industry to that of its other industries, relative to global norms.

A generic, export-based RCA index is the following (multiplied by 100), using the United States as a focus:

$$\frac{(\text{U.S. exports in sector } i)/(\text{U.S. exports in } \textbf{all} \text{ sectors})}{(\textbf{World} \text{ exports in sector } i)/(\textbf{World} \text{ exports in } \textbf{all} \text{ sectors})}$$

either in a designated importer's **market,** or in a region, or for the whole world.

As written, the measure corresponds naturally to colloquial and classroom challenges to "tell me what the United States has comparative advantage in!" The answer is sectors in which the index is high. The index itself is the U.S. share of *i* exports in U.S. total exports relative to the world counterpart. Equivalently,[7] it is the U.S. share in world exports of *i* relative to the U.S. share in world exports of everything else (non-*i*). When it is greater than 1 (or 100), the United States is a relatively[8] heavy exporter of *i*, and is said to have revealed comparative advantage in sector *i*; when it is less than 1, it is considered to have revealed comparative disadvantage.

The index is not unique, however. Each boldface word in the definition signals an important choice. Researchers must first define the sectoral boundaries captured by the word *all.* Does it mean all exports of goods and services, a usually troublesome data series to collect? Or does it mean all merchandise exports, a more available series? Or all manufactured exports?[9] Next, researchers must decide how exhaustively they wish to define the world of peer exporters captured by the word *world*—all exporters everywhere in the world, or only a group of close rivals, or perhaps even a particular country against whom a researcher wants to assess U.S. comparative advantage? Finally, researchers must be precise about the customer *market.* Is it U.S. comparative advantage in a single market that interests them? Or is it in a region, or the entire world? If regions are the focus (e.g.,

7. By rearranging the elements of the measure.
8. Relatively relatively.
9. The trouble with these narrower but more widely available measures of *all* exports is that they would fail to record comparative advantage accurately for a country that in reality had its exports principally in unrepresented industries—for example, in various services or raw materials—and had net imports of all sorts of goods, especially manufactures.

Europe and Asia), then researchers must be clear that the group of peer exporters will be different for each region; peer exporters into a unified European market do not include European exporters, and peer exporters into a unified Asian market do not include Asian exporters.[10]

The index is, however, quite robust. Export-based RCA and RRCA measures are not very sensitive to growth and business-cycle differences across trading partners, which tend to affect both the numerator and the denominator in the definition similarly. Nor, for the same reason, are they sensitive to the height of trade barriers, as long as they are across-the-board, nondiscriminatory protection against all exporters into the market of that trading partner. They *are* sensitive to discriminatory barriers against U.S. exports, and may vary also to the degree that U.S. exports vary with U.S. and foreign multinational-firm investment, outsourcing, and so on. Likewise, export-based RCA and RRCA measures are not very sensitive to across-the-board exchange rate strength or weakness of trading-partner currencies, but they are sensitive to unusual strength or weakness against the dollar alone.

7.4 Data and Terminological Conventions

In this paper we compare U.S. export performance in 1980 and 1995 to that of thirty-eight of its largest trading partners and rivals. These thirty-eight also form both the world of U.S. peer exporters and the markets (regional groups) in which U.S. and peer exporters compete.[11] We draw our export data from Statistics Canada's World Trade Data Base, which provides annual trade flow data among countries as reported to the United Nations.

We adopt several conventions in the terms we use. We will refer to cases of large distance from 100 in our RCA measures as *sharp* or *strong* comparative advantage and disadvantage. We will refer to variability over time in our RCA measures as *volatile* comparative advantage and disadvantage, and variability over trading partners and closely related commodity groups

10. The same difference exists when single-country markets are the focus. Peer exporters into the Japanese market include everyone *but* Japanese exporters. Production-based RCA indexes, such as those in Leamer (1997) and Wolff (1999), would not be subject to these differences, but neither could they be used to assess the comparative advantage of U.S. production relative to European rivals (e.g., in Japan).

11. Our selection of thirty-eight large partners was only partly dictated by the cumbersomeness of dealing with the universe of U.S. trading partners. But it occasionally causes anomalies, such as a measured U.S. comparative advantage in fuels in Japanese markets—the really big exporters of fuels to Japan (oil producing countries) are not among our thirty-eight country sample. We picked the countries according to several criteria: geographic location, size, and importance in U.S. trade; spectrum of traded merchandise; and change over time. The thirty-eight sample countries represent more than 75 percent of the 1995 U.S. trade. Areas that are not represented are most of Africa, Middle-Eastern oil-exporting countries, Eastern Europe and the former Soviet Union, South Asia, and Central America.

as *geographically diverse* and *sectorally diverse* comparative advantage and disadvantage, respectively.

We will describe the broad commodity classifications of the Standard International Trade Classification (SITC) by nicknames, as follows:[12]

SITC 1–4: primary products
SITC 5–8: manufactures
  SITC 5: chemicals
  SITC 6: manufactured materials
  SITC 7: machinery and equipment
  SITC 8: finished manufactures

We will often find it helpful to describe SITC 5 and 6 as *standardized manufactures* and SITC 7 and 8 as *differentiated manufactures,* although both caricatures do some violence to the diversity of the subproducts therein. We will also find it helpful to describe subaggregates of these broad one-digit classifications as subproducts or subcategories, and to further identify these as consumer goods or producer goods depending on their dominant buyers—wholesalers and retailers on behalf of households, or firms purchasing capital equipment and industrial supplies for themselves.

We explore U.S. export patterns across trading partners, usually aggregating them into regional groups (China and Japan are treated separately). The groups are described by the following nicknames:

EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom
NAFTA: Canada and Mexico
Latin6: Argentina, Brazil, Chile, Colombia, Peru, and Venezuela
Tiger: Hong Kong, Korea, Singapore, and Taiwan
OthAs4: Indonesia, Malaysia, the Philippines, and Thailand
China
Others: Australia, Egypt, Israel, New Zealand, South Africa

7.5 Highly Aggregated (One-Digit SITC) Patterns for All Merchandise

We start with a broad overview of U.S. comparative advantage. Table 7.1 records export-based RCA indexes at the one-digit SITC level for 1980 and 1995.

12. A more careful description of what belongs in each is as follows:

SITC 1–4: raw materials (fibers, wood, paper) and agricultural and mining products
SITC 5: chemicals, plastics, and pharmaceuticals
SITC 6: iron, steel, and other metals, and products of fiber, wood, paper, rubber, and stone
SITC 7: machinery (for power, industry, and metalworking), office machines, and electrical, telecommunications, and transportation equipment
SITC 8: apparel, footwear, household goods, and scientific and medical instruments

Table 7.1 **U.S. Export RCAs, SITC One-Digit Level, Merchandise**

SITC		RCA 1995	RCA 1980
0	Food and live animals used chiefly for food	142.1	128.4
1	Beverages and tobacco	129.9	94.8
2	Crude materials, inedible, except fuels	143.4	137.9
3	Mineral fuels, lubricants, and related materials	43.8	40.2
4	Animal and vegetable oils, fats, and waxes	127.3	135.6
5	Chemicals and related products, n.e.s.	139.3	141.9
6	Manufactured goods classified chiefly by material	85.8	77.1
7	Machinery and transport equipment	97.8	103.1
8	Miscellaneous manufactured articles	78.6	82.2
Weighted correlation[a]		0.88	
Unweighted correlation[b]		0.96	

Note: n.e.s. = not elsewhere specified.

[a]Cross-sectoral correlation coefficient between 1995 and 1980, weighted by export share.

[b]Cross-sectoral correlation coefficient between 1995 and 1980, unweighted.

Table 7.1 reveals the familiar U.S. comparative advantage with the rest of the world[13] in primary products (except fuels) and in manufactured chemicals, and the familiar mixed pattern across other manufactures. In these other manufactures, the United States performs best in machinery and equipment, but shows comparative *dis*advantage in manufactured materials and finished manufactures. Table 7.1 also shows that the worldwide cross-product pattern of broad (one-digit) U.S. comparative advantage did not change much between 1980 and 1995.[14] The correlation between the 1995 pattern and the 1980 pattern is 0.96, though lower (0.88) if the nine observations are weighted by export shares.[15]

In table 7.2, these worldwide patterns are broken down into RRCAs—RCAs across regional trading partners. There are noteworthy subpatterns, which are least parallel across trading partners in the differentiated manufactures sectors (SITC 7 and 8), as might be expected when the aggregates are not very homogeneous.[16] On balance, measures of both comparative advantage and comparative disadvantage are sharper for Asia than for the rest of the world. The United States "wins big" in some sectors and "loses big" in others against its export rivals there.

13. Our "world" is made up of thirty-eight countries.

14. Only food, beverages, and tobacco products show significant growth.

15. Each of our tables provides summary measures for both weighted and unweighted observations. We generally focus on the weighted summary measures in the text summary. Weights are for 1980 and 1995, the same years for which RCAs are calculated. Sectors such as machinery and equipment (SITC 7) and trading partners such as the EU account for disproportionately large shares of U.S. exports.

16. The patterns are also quite diverse across trading partners in fuels, SITC 3.

Table 7.2 U.S. Export RCAs by Region, SITC One-Digit Level, Merchandise

SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
1995												
0	130.1	100.4	57.8	271.1	209.3	100.0	213.0	100.1	0.50	0.52	0.91	0.80
1	91.3	45.5	76.8	274.1	231.9	220.8	142.8	120.2	0.61	0.62	0.91	0.69
2	180.6	76.6	76.7	271.4	228.2	127.1	247.3	56.5	0.53	0.61	0.94	0.89
3	86.1	23.6	15.1	228.5	181.8	61.8	36.8	67.0	0.99	0.94	0.87	0.64
4	88.5	124.5	140.1	243.5	232.6	16.0	288.0	146.5	0.58	0.92	0.22	0.91
5	98.9	132.4	156.2	158.5	206.0	217.5	211.7	110.6	0.29	0.30	0.93	0.56
6	64.7	94.4	72.4	102.6	98.0	107.8	63.6	53.7	0.21	0.26	0.22	0.13
7	99.3	106.3	154.3	57.7	96.5	116.2	135.3	122.5	0.23	0.30	0.78	0.89
8	93.3	122.3	100.5	118.4	36.6	37.2	15.9	97.7	0.47	0.74	0.88	0.85
Weighted dispersion[e]	0.22	0.23	0.51	0.69	0.53	0.39	0.71	0.28				
Dispersion[f]	0.29	0.57	0.72	0.55	0.63	0.84	0.99	0.36				

1980										
0	137.0	115.7	69.2	233.4	186.7	102.9	122.5	50.2	0.42	0.50
1	69.8	34.2	82.0	238.7	210.6	229.1	21.6	141.4	0.63	0.91
2	150.1	69.1	78.0	246.2	214.7	90.3	115.1	68.0	0.46	0.50
3	84.1	26.9	14.5	241.9	152.0	3.2	1.6	47.3	1.02	1.78
4	135.1	183.7	146.3	230.8	224.2	5.8	125.0	156.2	0.34	1.21
5	107.4	124.8	161.7	185.1	219.1	265.3	101.0	129.4	0.32	0.35
6	76.3	82.6	104.6	56.2	73.0	95.7	83.8	58.0	0.17	0.22
7	90.0	129.2	164.6	37.7	111.1	202.7	126.3	143.3	0.36	0.51
8	95.7	150.2	123.9	79.2	16.1	78.5	17.1	119.1	0.50	0.88
Weighted dispersion[e]	0.24	0.40	0.53	0.80	0.64	0.63	0.30	0.43		
Dispersion[f]	0.27	0.66	0.75	0.74	0.86	1.59	1.48	0.49		
Weighted correlation[g]	0.84	0.78	0.94	0.94	0.96	0.67	0.69	0.92		
Correlation[h]	0.74	0.95	0.99	0.97	0.98	0.75	0.69	0.79		

[a] RCA dispersion across regions by sector, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[b] RCA dispersion across regions by sector, unweighted, 1995 and 1980. Dispersion = standard deviaton of natural logs of indexes/100.

[c] Cross-regional correlation coefficient by sector, weighted by export share, between 1995 and 1980.

[d] Cross-regional correlation coefficient by sector, unweighted, between 1995 and 1980.

[e] RCA dispersion across sectors by region, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[f] RCA dispersion across sectors by region, unweighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[g] Cross-sectoral correlation coefficient, weighted by export share, between 1995 and 1980.

[h] Cross-sectoral correlation coefficient, unweighted by export share, between 1995 and 1980.

U.S. comparative advantage in primary products and chemicals (SITC 0–4, 5) is especially strong in Asia, far weaker in Europe, and often nonexistent in the Western Hemisphere (where U.S. exports compete against other strong primary product exporters).[17] These regional cross-market patterns are very stable between 1980 and 1995. Five of the first six cross-market correlations at the right of table 7.2 are higher than 0.87.

U.S. *dis*advantage in manufactured materials (SITC 6) is most pronounced in Japanese markets in 1980, but vanishes by 1995, whereas in Latin American markets U.S. disadvantage develops and deepens over the same period. In Europe and China, U.S. disadvantage in manufactured materials is already deep in 1980 and deepens still more by 1995.[18]

In machinery and equipment (SITC 7), U.S. exports are sharply disadvantaged in Japanese markets only, in both 1980 and 1995. In almost every other market the United States is a comparatively competitive machinery and equipment exporter in both years.[19] However, the cross-regional diversity of U.S. machinery and equipment exports was greatly reduced. That is, U.S. RCA indexes moved toward 1 (100) in almost every market between 1980 and 1995. Their weighted dispersion[20] fell by one third, from 0.36 to 0.23.

U.S. disadvantage in finished manufactures (SITC 8) is most pronounced in China and Southeast Asia in both 1980 and 1995, with some shift between the Tiger countries and the near-Tigers (OthAs4).

Regional RCAs can be used to detect trade diversion suggestively, if not definitively. Table 7.2's NAFTA countries column can illustrate how. Trade diversion in Canadian and Mexican markets would imply that each is rely-

17. The rival primary-producer exporters would include the Latin6 in NAFTA markets, NAFTA rivals in Latin6 markets, and all other (unmeasured) Western Hemisphere rivals in both markets. In Europe, U.S. export performance is being assessed against Asian and other exporter performances. In Asia, U.S. export performance is being assessed against European and other non-Asian exporters. It may seem paradoxical that U.S. comparative advantage in Asia could be so much stronger than it is in Europe; but there may be no paradox. This relative strength is what we would expect if, for example, U.S. exports were highly competitive against European exports (in Asia and elsewhere), but less competitive against Asian exports (in Europe and elsewhere).

18. One possible cause of the strange pattern of diminishing U.S. comparative disadvantage in Japan in manufactured materials is U.S. bilateral policy activism. Recurrent U.S. pressure on Japan to open its markets to imports in such areas as wood products may have tempted Japanese buyers simply to substitute U.S. suppliers for others. The same pattern is somewhat less pronounced in the Asian Tigers (such as Korea), which were also subject to such policy activism.

19. The United States had very mild 1980 and 1995 disadvantage in Europe and mild 1995 disadvantage in the Asian Tiger markets.

20. Our measures of dispersion are the standard deviations of the natural logarithms of the RCA indexes divided by 100 (so as to be centered symmetrically on zero). See Wolff (1999) or Leamer (1997, 13ff), for views favoring a similar measure of dispersion, using logarithmic transformations of the RCA indexes, in order to avoid the skewness implicit in a ratio of ratios that is centered on 100 or 1, limited in downward variation to zero, but unlimited in upward variation.

ing more on U.S. exporters after NAFTA in products that are better produced in non-NAFTA countries. U.S. comparative advantage in NAFTA markets would thus shift toward middling categories; it would correspondingly decline for categories in which it was strongest before NAFTA.[21] This pattern actually occurs in table 7.2—U.S. RRCA in NAFTA markets is more concentrated on middling categories in 1995 and on the top three RRCAs in 1980; all decline by 1995 in NAFTA markets. This pattern, however, is much less distinct for manufactures alone and within machinery and equipment at the two- and three-digit levels of disaggregation summarized later in tables 7.4 and 7.6.[22]

7.6 Modestly Aggregated (Two-Digit SITC) Patterns for Manufactures

Because the most interesting patterns at the two-digit level are in manufactures, we neglect primary products from here on.

Table 7.3 refines the picture of U.S. worldwide comparative advantage revealed in table 7.1.[23] Virtually all two-digit subproducts show stable comparative advantage over time.[24] For those goods with fairly standardized specifications and production processes (SITC 51–69), U.S. patterns of comparative advantage and disadvantage are also quite uniform across subproducts. However, in differentiated goods (SITC 71–89), U.S. patterns of comparative advantage and disadvantage vary diversely across subproducts. The United States tends to have stable comparative advantage in producer goods subcategories,[25] fairly stable comparative disadvantage in consumer goods subcategories,[26] and reversal of comparative advantage between 1980 and 1995 in the one subproduct on the margin of producer and consumer goods, computers and office machines (SITC 75).

More exactly, table 7.3 reveals remarkable uniformity of comparative advantage across various types of chemical products (SITC 5), and of disadvantage across various types of manufactured materials (SITC 6).

21. The nature of the index is that if competitive advantage rises in some categories compared to others, *comparative* advantage must rise in the first and fall in the second.

22. In table 7.4, although nine of the top eleven NAFTA RRCAs decline by 1995, so do all eleven of the middling RRCAs. In table 7.6, although all twelve of the top NAFTA RRCAs decline by 1995, so do nine of the twelve middling RRCAs.

23. In table 7.3, "all categories" in the definition of the RCA index refers to all manufactured exports; whereas in table 7.1 it refers to all merchandise exports.

24. The correlation coefficients recording this intertemporal stability are about the same or higher at the two-digit level as at the one-digit level. See Hoekman and Djankov (1997, 475) for a similar finding that the intertemporal stability was similar at their four-digit level of disaggregation to that at a two-digit level.

25. Producer goods are taken to include all subcategories of SITC 7 except computers, telecommunications, and road vehicles (SITC 75, 76, 78), plus instruments (SITC 87).

26. Consumer goods are taken to include telecommunications equipment (a large part of SITC 76, though SITC 76 also includes equipment that is a producer good) and autos (the bulk of SITC 78, which also includes trucks, buses, and motorcycles), plus all of SITC 8, except instruments (SITC 87).

Table 7.3 U.S. Export RCAs, SITC Two-Digit Level, Manufacturing

	SITC	1995	1980
Organic chemicals	51	135.7	133.0
Inorganic chemicals	52	120.3	114.2
Dyeing, tanning, and coloring materials	53	131.2	117.5
Medicinal and pharmaceutical products	54	120.4	159.1
Essential oils and perfume materials, toilet-cleansing materials	55	138.2	134.9
Fertilizers, manufactured	56	154.4	124.2
Artificial resins, plastic materials, cellulose esters/ethers	58	153.0	161.5
Chemical materials and products n.e.s.	59	153.4	162.6
Leather, leather manufactures n.e.s., and dressed fur/skins	61	86.8	108.4
Rubber manufactures n.e.s.	62	92.5	62.7
Cork and wood manufactures (excluding furniture)	63	73.0	50.9
Paper, paperboard, articles of paper, paper-pulp/board	64	92.3	78.8
Textile yarn, fabrics, made-up articles, related products	65	98.4	116.1
Nonmetallic mineral manufactures n.e.s.	66	74.8	62.9
Iron and steel	67	68.7	48.3
Nonferrous metals	68	86.8	90.2
Manufactures of metal n.e.s.	69	94.5	92.8
Power-generating machinery and equipment	71	111.8	126.3
Machinery specialized for particular industries	72	123.6	133.0
Metalworking machinery	73	102.3	91.3
General industrial machinery, equipment, and parts	74	113.4	137.2
Office machines and automatic data-processing equipment	75	95.2	143.2
Telecommunications and sound-recording apparatus	76	78.8	63.9
Electrical machinery, apparatus, and appliances n.e.s.	77	105.1	104.1
Road vehicles (including air-cushion vehicles)	78	70.9	59.5
Other transport equipment	79	145.6	142.1
Sanitary, plumbing, heating, and lighting fixtures	81	64.9	82.8
Furniture and parts thereof	82	67.2	58.8
Travel goods, handbags, and similar containers	83	15.9	13.3
Articles of apparel and clothing accessories	84	31.0	25.4
Footwear	85	8.5	13.5
Professional, scientific, and controlling instruments	87	145.8	148.0
Photographic apparatus, optical goods, watches	88	70.6	84.9
Miscellaneous manufactured articles n.e.s.	89	92.4	96.5
Weighted correlation[a]			
SITC 51–59		0.77	
SITC 61–69		0.96	
SITC 71–79		0.91	
SITC 81–89		0.99	
Correlation[b]			
SITC 51–59		0.35	
SITC 61–69		0.80	
SITC 71–79		0.85	
SITC 81–89		0.97	

Note: n.e.s. = not elsewhere specified.

[a]Cross-sectoral correlation coefficient, weighted by export share, between 1995 and 1980.

[b]Unweighted.

Finished manufactures (SITC 8) shows more diversity, as expected of differentiated subproducts, but it is explicable diversity. The United States has strong comparative advantage in instruments (SITC 87), the one producer good among finished manufactures. It has comparative disadvantage in all the consumer goods, with the disadvantage being sharpest in luggage, apparel, and footwear (SITC 83–85), and less sharp in everything else. Machinery and equipment (SITC 7) seems to show even more diversity, but it, too, is explicable, and falls into the same pattern as finished manufactures. The United States has strong comparative advantage in capital equipment—industrial machinery and transport equipment not including road vehicles (SITC 71–74, 77, 79). It has comparative disadvantage in the largely consumer goods categories of household electronics (SITC 76) and road vehicles (SITC 78, largely autos).

These subproduct patterns are very stable between 1980 and 1995 with just a few important exceptions. The most noteworthy is the reversal of U.S. comparative advantage in computers and office machines (SITC 75). U.S. comparative advantage also falls modestly for medicinal and pharmaceutical products (SITC 54) but rises modestly for fertilizers (SITC 56). U.S. comparative disadvantage becomes less marked in iron and steel (SITC 67).

An apparent change between 1980 and 1995 is a moderate evening-out of U.S. comparative advantage across the 34 two-digit manufacturing subsectors. Believers in increasing sectoral niche specialization might expect the opposite.[27] Sectoral niche specialization shows up only a little better at the three-digit level for machinery and equipment (below in table 7.5). Increased subproduct specialization is far less pronounced there, however, than increased *regional* specialization, seen in increased cross-regional dispersion of the RRCA indexes between 1980 and 1995.

When these worldwide patterns are broken down across trading partners in table 7.4, there are noteworthy subpatterns. First, the comparative success of U.S. exporters does differ dramatically from market to market, in ways that do not match simple explanations such as proximity or lingual ties. European economic centrality and preferential trade policies do, however, seem to make typical U.S. RCA indexes lower there than elsewhere. Second, patterns of U.S. comparative advantage sometimes change rapidly over time, especially in China, and especially for consumer goods. Third, the United States has stable global comparative advantage in most varieties of differentiated producer goods, but in Japan it has stable *dis*advantage (as if U.S. exports of differentiated producer goods faced discriminatory market barriers,[28] which is often alleged). Finally, in more standardized producer goods, though U.S. patterns of comparative advantage and disadvantage

27. Proudman and Redding (1997, 23) find a very similar decline in their measure of RCA dispersion for British and German exports from 1970 to 1993.

28. Especially relative to exports back to Japan from Asian affiliates of Japanese companies.

Table 7.4 U.S. Export RCAs by Region, SITC Two-Digit Level, Manufacturing

Category	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
								A. 1995					
Organic chemicals	51	89.9	129.4	153.1	125.3	210.2	219.8	176.7	112.2	0.35	0.31	0.93	0.61
Inorganic chemicals	52	90.9	83.0	122.2	220.8	223.5	241.9	48.1	72.3	0.51	0.60	0.87	0.94
Dyeing, tanning, and coloring materials	53	81.8	163.0	155.4	101.4	189.8	203.7	102.4	121.8	0.34	0.33	0.98	0.97
Medicinal and pharmaceutical products	54	87.7	160.6	171.7	186.6	191.7	235.0	34.9	98.1	0.38	0.62	0.98	0.97
Essential oils and perfume materials, toilet-cleansing materials	55	79.7	150.4	146.3	229.7	183.1	212.3	95.3	126.0	0.37	0.37	0.94	0.61
Fertilizers, manufactured	56	136.3	40.5	177.0	267.5	241.0	229.3	289.1	144.3	0.62	0.64	0.47	0.90
Artificial resins, plastic materials, cellulose esters/ethers	58	134.0	135.7	163.2	121.6	201.3	232.9	272.0	139.4	0.22	0.29	0.44	0.31
Chemical materials and products n.e.s.	59	118.4	173.0	163.7	155.4	213.4	175.4	182.3	98.0	0.23	0.25	0.72	0.46
Leather, leather manufactures n.e.s., and dressed fur/skins	61	46.8	124.0	8.3	237.0	159.1	128.9	80.0	17.7	0.62	1.16	0.98	0.83
Rubber manufactures n.e.s.	62	76.4	123.1	107.5	55.5	44.3	49.7	12.9	98.3	0.35	0.72	0.58	0.05

Cork and wood manufactures (excluding furniture)	63	123.6	49.1	37.8	270.8	79.3	12.2	40.3	112.1	0.74	0.94	0.64	0.56
Paper, paperboard, articles of paper, paper-pulp/board	64	76.6	64.7	138.4	203.2	183.2	220.0	205.3	145.8	0.52	0.47	0.91	0.81
Textile yarn, fabrics, made-up articles, related products	65	76.4	142.6	107.4	98.4	63.7	51.6	22.2	86.6	0.39	0.57	0.95	0.54
Nonmetallic mineral manufactures n.e.s.	66	49.0	109.5	69.6	101.6	121.1	99.5	54.8	29.2	0.50	0.49	0.96	0.73
Iron and steel	67	31.8	97.1	44.5	33.7	108.5	158.4	107.8	35.2	0.52	0.65	0.90	0.76
Nonferrous metals	68	92.3	64.7	31.6	200.8	212.7	195.2	170.5	26.1	0.62	0.85	0.76	0.25
Manufactures of metal n.e.s.	69	71.4	135.8	137.9	58.9	40.3	127.2	31.9	88.7	0.44	0.56	0.96	0.73
Power-generating machinery and equipment	71	94.0	125.6	123.9	60.5	177.1	212.9	214.1	127.4	0.31	0.43	0.85	0.74
Machinery specialized for particular industries	72	73.8	146.1	167.8	58.3	199.5	236.0	261.5	122.5	0.47	0.54	0.93	0.80
Metalworking machinery	73	75.7	154.3	128.6	42.2	158.3	215.5	237.7	118.0	0.51	0.57	0.85	0.84
General industrial machinery, equipment, and parts	74	74.7	135.5	143.6	39.2	155.9	191.8	196.9	132.9	0.39	0.54	0.97	0.80
Office machines and automatic data-processing equipment	75	145.3	122.7	172.6	67.9	46.0	61.1	90.4	129.3	0.46	0.47	0.83	0.10

(*continued*)

Table 7.4 (continued)

Category	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
Telecommunications and sound-recording apparatus	76	142.1	79.9	154.5	52.9	67.0	44.8	84.6	100.2	0.41	0.44	0.59	0.44
Electrical machinery, apparatus, and appliances n.e.s.	77	110.3	130.0	164.7	76.7	92.4	127.4	66.4	113.9	0.21	0.30	0.92	0.57
Road vehicles (including air-cushion vehicles)	78	55.7	84.1	147.6	31.5	100.3	169.8	75.7	136.5	0.38	0.56	0.85	0.93
Other transport equipment	79	113.5	90.6	145.0	198.5	221.2	180.7	280.2	120.8	0.36	0.38	0.84	0.39
Sanitary, plumbing, heating, and lighting fixtures	81	68.9	102.1	22.6	44.8	112.6	180.9	15.1	142.6	0.64	0.89	0.76	0.28
Furniture and parts thereof	82	45.1	88.9	23.8	11.5	91.0	168.7	5.6	106.3	0.52	1.20	0.89	0.96
Travel goods, handbags, and similar containers	83	14.3	61.1	3.6	1.1	84.3	266.2	0.2	111.6	1.57	2.50	0.52	0.81
Articles of apparel and clothing accessories	84	44.7	45.3	3.4	1.1	85.1	256.7	1.0	13.9	1.04	2.07	0.26	0.87
Footwear	85	16.2	6.9	1.8	1.0	79.0	273.0	0.4	73.2	1.64	2.32	0.96	0.94
Professional, scientific, and controlling instruments	87	131.5	172.0	169.2	201.0	154.1	137.1	187.4	117.7	0.14	0.18	0.86	0.59

Photographic apparatus, optical goods, and watches	88	84.1	158.3	44.0	46.4	138.1	38.9	16.5	133.9	0.55	0.79	0.96	0.43
Miscellaneous manufactured articles n.e.s.	89	96.0	131.5	47.5	82.7	136.4	134.0	15.2	104.7	0.42	0.75	0.89	0.95
Weighted dispersion[e]		0.32	0.26	0.32	0.62	0.61	0.52	0.78	0.34				
Dispersion[f]		0.54	0.35	0.80	0.70	1.26	1.58	1.81	0.61				
B. 1980													
Organic chemicals	51	92.5	134.3	151.7	162.3	218.9	268.1	87.4	147.7	0.33	0.38		
Inorganic chemicals	52	84.5	78.1	158.2	209.4	227.4	266.0	53.7	123.1	0.46	0.58		
Dyeing, tanning, and coloring materials	53	67.4	169.4	153.7	107.2	211.5	265.2	75.3	125.6	0.48	0.48		
Medicinal and pharmaceutical products	54	131.2	172.4	160.5	202.5	211.2	259.7	46.2	150.6	0.21	0.53		
Essential oils and perfume materials, toilet-cleansing materials	55	92.3	168.9	135.9	191.9	203.5	202.6	4.4	146.9	0.34	1.30		
Fertilizers, manufactured	56	144.1	30.5	177.4	244.3	232.9	270.2	128.3	99.8	0.56	0.71		
Artificial resins, plastic materials, cellulose esters/ethers	58	118.6	179.8	177.3	154.6	214.2	265.5	128.3	154.6	0.26	0.26		
Chemical materials and products	59	121.4	171.6	160.2	208.4	222.5	267.3	77.9	103.7	0.34	0.42		

(*continued*)

Table 7.4 (continued)

Category	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
Leather, leather manufactures n.e.s., and dressed fur/skins	61	88.7	127.0	6.7	174.2	165.0	139.3	126.2	101.0	0.40	1.07		
Rubber manufactures n.e.s.	62	32.1	104.1	170.2	10.0	19.4	196.3	124.6	112.0	0.75	1.10		
Cork and wood manufactures (excluding furniture)	63	113.9	50.1	93.6	76.2	3.9	3.5	30.0	120.4	0.63	1.45		
Paper, paperboard, articles of paper, paper-pulp/board	64	123.2	34.1	164.3	212.9	181.2	269.8	126.7	154.6	0.74	0.62		
Textile yarn, fabrics, made-up articles, related products	65	104.4	170.3	125.5	60.2	53.7	115.0	63.4	139.9	0.35	0.43		
Nonmetallic mineral manufactures	66	40.7	132.3	123.9	58.9	126.6	126.1	9.5	22.2	0.69	0.98		
Iron and steel	67	30.8	100.9	91.1	4.4	54.6	262.1	128.2	33.5	0.72	1.24		
Nonferrous metals	68	111.8	51.1	60.6	153.9	131.4	31.3	47.5	56.4	0.43	0.56		
Manufactures of metal n.e.s.	69	83.8	137.7	136.3	33.7	42.4	245.8	82.2	113.0	0.45	0.65		
Power-generating machinery and equipment	71	87.2	146.2	155.7	96.6	194.8	268.9	127.1	150.4	0.33	0.36		

Machinery specialized for particular industries	72	78.0	152.8	176.2	87.9	212.0	266.9	127.9	150.0	0.37	0.42
Metalworking machinery	73	58.1	159.9	156.7	32.4	129.5	269.7	104.0	144.5	0.57	0.66
General industrial machinery, equipment, and parts	74	94.8	162.0	171.4	79.6	184.3	267.6	121.7	147.8	0.32	0.39
Office machines and automatic data-processing equipment	75	138.7	140.7	166.5	110.6	110.2	264.7	128.2	146.3	0.11	0.28
Telecommunications and sound-recording apparatus	76	117.2	131.2	161.2	12.1	33.8	178.9	122.9	140.9	0.71	0.95
Electrical machinery, apparatus, and appliances n.e.s.	77	108.2	165.0	156.3	59.0	69.0	83.8	114.8	142.9	0.36	0.38
Road vehicles (including air-cushion vehicles)	78	23.6	103.9	160.1	3.9	80.5	268.4	128.1	149.4	0.66	1.37
Other transport equipment	79	117.1	130.7	159.7	174.1	176.2	268.6	128.3	120.8	0.25	0.28
Sanitary, plumbing, heating, and lighting fixtures	81	67.2	156.2	47.9	212.0	139.9	127.1	34.8	21.2	0.60	0.82
Furniture and parts thereof	82	43.5	119.2	10.6	9.5	99.5	88.2	3.2	113.2	0.59	1.40
Travel goods, handbags, and similar containers	83	12.7	33.1	3.5	38.7	151.6	62.7	0.4	116.1	1.44	2.01

(*continued*)

Table 7.4 (continued)

Category	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
Articles of apparel and clothing accessories	84	76.6	112.3	1.2	2.1	135.2	71.8	0.0	49.5	0.81	2.94		
Footwear	85	22.6	11.1	0.5	1.7	65.4	120.5	0.0	132.9	0.90	2.18		
Professional, scientific, and controlling instruments	87	120.9	170.2	178.5	260.5	166.0	155.8	127.1	141.6	0.19	0.24		
Photographic apparatus, optical goods, watches	88	101.6	174.8	46.0	229.3	150.1	38.0	105.4	144.5	0.50	0.63		
Miscellaneous manufactured articles n.e.s.	89	99.5	147.8	20.3	98.9	155.6	81.5	8.3	118.2	0.43	1.05		
Weighted dispersion[e]		0.36	0.31	0.22	0.82	0.69	0.44	0.38	0.38				
Dispersion[f]		0.59	0.47	0.75	1.06	1.61	1.45	1.85	0.53				
Weighted correlation[g]		0.89	0.93	0.76	0.82	0.79	0.43	0.51	0.87				
Correlation[h]		0.85	0.88	0.92	0.73	0.92	0.83	0.79	0.56				

Note: n.e.s. = not elsewhere specified.

[a]RCA dispersion across regions by sector, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[b]RCA dispersion across regions by sector, unweighted, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[c]Cross-regional correlation coefficient by sector, weighted by export share, between 1995 and 1980.

[d]Cross-regional correlation coefficient by sector, unweighted, between 1995 and 1980.

[e]RCA dispersion across sectors by region, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[f]RCA dispersion across sectors by region, unweighted, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[g]Cross-sectoral correlation coefficient, weighted by export share, between 1995 and 1980.

[h]Cross-sectoral correlation coefficient, unweighted, between 1995 and 1980.

are stable over time, they are more mixed across trading partners, with comparative advantage in some markets and disadvantage in others, depending on product group.

In standardized manufactures (SITC 5 and 6), U.S. patterns of comparative advantage are surprisingly different, both qualitatively and quantitatively, across trading partners. In chemical subproducts (SITC 51–59), U.S. comparative advantage is strong across the board in both 1980 and 1995, except in Europe. It is exceptionally strong in Asia (except in China),[29] often ranging above 200. U.S. comparative advantage in paper and wood products (SITC 63 and 64) and in nonferrous metals (SITC 68) is also exceptionally strong in Asia—in 1995 especially—and usually nonexistent (U.S. disadvantage) elsewhere. In iron and steel (SITC 67), U.S. export performance in both 1980 and 1995 ranges from strong comparative advantage (in OthAs4) to strong comparative disadvantage (in Europe and Japan).

In differentiated manufactures (SITC 7 and 8), there are several varieties of pattern. The first two varieties characterize producer goods and seem very stable over time; the second two characterize consumer goods and are chaotic.

Variety 1: Stable Patterns across Time, Common across Trading Partners. Instruments (SITC 87) shows strong patterns of U.S. comparative advantage for every set of trading partners in both 1980 and 1995.

Variety 2: Stable Patterns across Time, Diverse across Trading Partners. Producer goods other than instruments show stable comparative advantage over time, but diversity across trading partners. Nonelectrical industrial machinery (SITC 71–74) shows strong patterns of U.S. comparative advantage in both 1980 and 1995 for every set of trading partners except Europe and Japan.[30] Electrical machinery (SITC 77) shows reasonably strong U.S. comparative advantage in both 1980 and 1995 everywhere except Asia. In Asia, the main exception to temporal stability is China, where U.S. comparative advantage in electrical machinery in 1980 becomes strong *dis*advantage by 1995.[31]

Variety 3: Changing Patterns across Time, Diverse across Trading Partners. Computers and office equipment (SITC 75) shows strong patterns of U.S. comparative advantage for every set of trading partners in 1980, but the

29. In China, U.S. chemicals comparative advantage is quite different across subproducts and quite volatile over time.

30. This pattern is consistent with both Japan's and Europe's importing preferentially from other countries in our data set. For Japan, such preferential spheres of influence seem likely to include most other Asian exporters; for Europe, such preferential patterns might be seen with exports from former colonies.

31. This pattern might occur, for example, if U.S. foreign investors in China displaced their previous exports to China faster than rival exporters did.

comparative advantage remains in 1995 only for non-Asian regions; in Asia, U.S. advantage has turned to marked disadvantage.

Variety 4: Chaotic Patterns across Time and Trading Partners. Consumer goods categories (SITC 76, 78, 81–84) all reveal quite erratic patterns, with the exception of footwear and photographic apparatus (SITC 85, 88).[32]

7.7 Less Aggregated (Three-Digit SITC) Patterns for Machinery and Equipment

To see whether patterns of comparative advantage become even more interesting at the three-digit level, we selected machinery and equipment (SITC 7) for deeper analysis. That sector is both large and tempting as a venue for national industrial policies. The very disaggregated region-by-region export data are, however, unfortunately suspect in the early years for China and emerging Asia, and also for office equipment (SITC 75) and road vehicles (SITC 78).

Table 7.5 refines the picture of U.S. worldwide comparative advantage in machinery and equipment.[33] The United States has strong and consistent comparative disadvantage in the three consumer goods categories (SITC 761–762, radios and televisions, and 775, other household equipment). Among producer goods, the United States has strong, stable comparative advantage in some categories, but not in others. RCAs are high and stable for power-generating equipment (except standard internal combustion engines), pumps, heating and cooling equipment, agricultural and specialized machinery, and aircraft; but RCAs are lower and less stable for machine tools, electrical equipment, and producer goods for more mature, standardized industries (textiles, paper, printing, railways, and shipping).[34]

Across trading partners, the patterns in table 7.6 for machinery and equipment exports recall those of table 7.4 for all manufactures.

Producer goods subproducts mimic variety 2 (mentioned previously) because they are stable over time[35] (with some exceptions), but are very

32. Footwear (SITC 85) shows enormous U.S. comparative disadvantage, except in Asian near-Tigers (OthAs4) and Tigers. U.S. comparative advantage in photographic apparatus, optical goods, and watches (SITC 88) varies dramatically across trading partners, but is reasonably stable except in Japan, where it declines precipitously from strong advantage to strong disadvantage.

33. In table 7.5, "all categories" in the definition of the RCA index refers to all selected three-digit categories of machinery and equipment, whereas in table 7.3 it refers to all manufactured exports, and in table 7.1 to all merchandise exports.

34. Moenius and Riker (1998) find that sectoral patterns of U.S. trade in machinery and equipment (SITC 7) are far more volatile over time than in other sectors. Intervening years between 1980 and 1995 may indeed reveal patterns of similar volatility, especially because those years marked a period of exceptionally strong real exchange values for the dollar and exceptionally weak Latin American markets relative to those elsewhere in the world.

35. The correlations between 1980 RRCAs and 1995 RRCAs drop considerably from their two-digit counterparts.

Table 7.5 **U.S. Export RCAs, SITC Three-Digit Level, Machinery and Equipment**

	SITC	1995	1980
Steam and other vapor-generating boilers and parts	711	169.4	141.7
Steam and other vapor power units, steam engines	712	185.0	152.0
Internal-combustion piston engines and parts	713	94.0	119.7
Engines and motors, nonelectric	714	131.9	126.9
Rotating electric plant and parts	716	105.2	138.3
Other power-generating machinery and parts	718	94.6	107.4
Agricultural machinery and parts	721	152.7	123.5
Tractors fitted or not with power take-offs, etc.	722	95.3	129.8
Civil engineering and contractor's plant and parts	723	142.3	157.3
Textile and leather machinery and parts	724	69.3	89.6
Paper and pulp-mill machinery, machinery for manufacture of paper	725	117.3	99.3
Printing and bookbinding machinery and parts	726	91.5	118.6
Food-processing machines and parts	727	120.2	141.7
Machinery and equipment specialized for particular industries	728	130.8	130.1
Machinery and tools for working metal and metal carbides, and parts	736	103.3	90.6
Metal-working machinery and parts	737	80.5	125.1
Heating and cooling equipment and parts	741	143.1	156.8
Pumps for liquids, liquid elevators, and parts	742	126.1	136.8
Pumps and compressors, fans and blowers, centrifuges	743	114.6	147.3
Mechanical handling equipment and parts	744	120.9	146.7
Other nonelectrical machinery, tools, apparatus, and parts	745	120.8	134.6
Ball, roller, or needle-roller bearings	749	84.4	107.2
Television receivers	761	33.0	84.4
Radio broadcast receivers	762	22.7	14.8
Telecommunications equipment and parts	764	94.0	69.7
Electric-power machinery and parts thereof	771	81.4	95.1
Electrical appliances such as switches, relays, fuses, plugs, etc.	772	104.8	121.3
Equipment for distributing electricity	773	99.6	129.6
Electric apparatus for medical purposes (e.g., radiology)	774	114.1	87.0
Household-type electrical and nonelectrical equipment	775	70.3	72.3
Thermionic, cold, and photo-cathode valves, tubes, parts	776	114.3	88.7
Electrical machinery and apparatus, n.e.s.	778	93.5	120.3
Railway vehicles and associated equipment	791	93.8	88.3
Aircraft and associated equipment and parts	792	156.2	150.8
Ships, boats, and floating structures	793	64.5	69.9
Weighted correlation[a]		0.86	
Correlation[b]		0.81	

Note: n.e.s. = not elsewhere specified.

[a]Cross-sectoral correlation coefficient, weighted by export share, between 1995 and 1980.

[b]Cross-sectoral correlation coefficient, unweighted, between 1995 and 1980.

Table 7.6 U.S. Export RCAs by Region, SITC Three-Digit Level, Machinery and Equipment

	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
A. 1995													
Steam and other vapor-generating boilers and parts	711	125.3	65.5	180.0	254.7	240.4	249.9	288.0	151.8	0.51	0.49	0.25	0.10
Steam and other vapor power units, steam engines	712	108.8	125.4	176.8	221.8	223.4	250.4	289.2	145.5	0.29	0.35	0.79	−0.09
Internal-combustion piston engines and parts	713	69.7	134.7	99.8	10.9	192.1	246.2	181.4	146.1	0.49	0.99	0.92	0.84
Engines and motors, nonelectric	714	104.9	107.7	140.6	237.3	185.9	214.8	234.6	110.5	0.34	0.36	0.97	0.30
Rotating electric plant and parts	716	84.5	109.0	141.5	45.9	121.3	170.8	144.0	131.6	0.29	0.41	0.78	0.75
Other power-generating machinery and parts	718	48.7	146.7	142.3	26.3	198.0	248.5	254.5	126.8	0.60	0.80	0.99	0.93
Agricultural machinery and parts	721	132.9	140.9	164.0	179.0	198.9	247.3	251.6	126.0	0.16	0.27	0.60	0.10
Tractors fitted or not with power take-offs, etc.	722	73.3	109.2	161.6	10.7	208.2	250.6	202.7	151.5	0.51	1.02	0.78	0.91
Civil engineering and contractor's plant and parts	723	81.5	173.6	167.2	18.6	178.0	249.7	282.4	146.5	0.44	0.87	0.89	0.29

Textile and leather machinery and parts	724	32.6	193.0	141.1	16.1	85.8	235.5	153.7	134.8	0.87	0.94	0.99	0.89
Paper and pulp-mill machinery, machinery for manufacture of paper	725	52.3	155.1	170.6	91.3	199.1	248.1	241.8	144.7	0.54	0.53	0.98	0.62
Printing and bookbinding machinery and parts	726	54.9	137.0	175.7	39.8	220.4	241.8	280.4	60.9	0.67	0.76	0.87	0.42
Food-processing machines and parts	727	56.4	156.2	171.9	142.8	202.6	239.8	282.8	129.8	0.57	0.49	0.92	0.25
Machinery and equipment specialized for particular industries	728	81.7	141.4	172.6	82.3	210.8	228.4	272.7	117.2	0.44	0.46	0.82	0.21
Machinery and tools for working metal and metal carbides, and parts	736	77.5	159.4	128.7	42.9	158.4	214.2	235.2	116.6	0.51	0.56	0.86	0.70
Metal-working machinery and parts	737	37.9	98.1	122.7	9.3	151.6	249.8	284.5	148.6	0.72	1.12	0.59	0.61
Heating and cooling equipment and parts	741	93.0	152.5	163.6	75.2	196.1	175.8	277.1	134.1	0.33	0.41	0.87	−0.06
Pumps for liquids, liquid elevators, and parts	742	84.6	170.0	111.3	48.2	193.1	246.6	229.3	141.3	0.43	0.55	0.92	0.89

(*continued*)

Table 7.6 (continued)

	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
Pumps and compressors, fans and blowers, centrifuges	743	60.8	163.6	85.8	31.1	162.5	155.5	205.4	147.1	0.47	0.64	0.82	0.25
Mechanical handling equipment and parts	744	81.6	128.6	168.9	28.9	163.0	245.3	181.2	142.5	0.40	0.67	0.98	0.63
Other nonelectrical machinery, tools, apparatus, and parts	745	85.6	156.8	170.8	66.0	115.5	231.2	248.6	137.8	0.37	0.46	0.96	0.18
Ball, roller, or needle-roller bearings	749	52.8	113.8	135.4	22.5	109.8	162.0	79.5	104.1	0.45	0.64	0.98	0.93
Television receivers	761	89.1	26.3	180.1	10.5	82.7	4.4	7.1	134.4	0.90	1.44	−0.47	0.15
Radio broadcast receivers	762	61.3	78.2	32.0	10.8	5.2	0.7	0.1	17.3	0.89	2.33	0.93	−0.01
Telecommunications equipment and parts	764	143.8	99.5	178.1	58.6	80.0	65.7	127.1	105.7	0.36	0.39	0.79	0.53
Electric-power machinery and parts thereof	771	81.8	105.3	159.5	52.5	46.1	65.6	32.6	119.1	0.38	0.53	0.69	0.60
Electrical appliances such as switches, relays, fuses, plugs, etc.	772	101.9	133.6	153.4	38.8	94.0	83.9	94.8	83.1	0.31	0.41	0.89	0.60

Equipment for distributing electricity	773	135.7	97.7	146.4	75.8	91.3	67.1	111.5	137.4	0.18	0.29	−0.72	−0.18
Electrical apparatus for medical purposes (e.g., radiology)	774	76.2	167.9	177.8	142.4	234.0	246.7	286.3	112.7	0.47	0.44	0.90	0.56
Household-type electrical and nonelectrical equipment	775	72.0	118.8	171.7	116.0	20.0	31.3	4.4	142.2	0.64	1.26	0.83	0.24
Thermionic, cold, and photo-cathode valves, tubes, and parts	776	126.2	163.8	176.0	90.8	103.4	137.0	176.0	123.2	0.22	0.24	0.77	0.34
Electrical machinery and apparatus n.e.s.	778	107.6	112.9	164.4	48.9	75.2	123.0	64.1	112.5	0.30	0.39	0.65	0.86
Railway vehicles and associated equipment	791	46.2	91.9	123.4	32.4	227.8	249.8	252.3	127.1	0.36	0.77	0.47	0.88
Aircraft and associated equipment and parts	792	119.8	97.2	143.3	227.4	233.1	179.8	281.4	119.9	0.36	0.38	0.87	0.01
Ships, boats, and floating structures	793	51.0	53.5	166.5	50.3	21.2	216.2	209.8	129.5	0.61	0.84	0.25	0.47
Weighted dispersion[c]		0.28	0.25	0.19	0.68	0.46	0.39	0.48	0.17				
Dispersion[b]		0.37	0.39	0.32	0.97	0.83	1.23	1.58	0.38				

(*continued*)

Table 7.6 (continued)

	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
								B. 1980					
Steam and other vapor-generating boilers and parts	711	63.2	146.8	175.5	130.7	226.8	270.2	64.2	156.7	0.41	0.53		
Steam and other vapor power units, steam engines	712	107.4	145.4	178.7	62.8	232.9	270.2	64.2	156.7	0.41	0.54		
Internal-combustion piston engines and parts	713	69.5	155.6	131.8	27.8	215.4	269.8	64.2	153.1	0.43	0.75		
Engines and motors, nonelectric	714	95.3	112.4	174.2	242.0	188.3	267.2	64.2	146.8	0.37	0.48		
Rotating electric plant and parts	716	106.5	171.8	176.7	40.3	159.1	269.5	64.2	151.9	0.34	0.62		
Other power-generating machinery and parts	718	54.6	181.5	172.0	65.7	202.5	270.2	n.a.	114.1	0.55	0.60		
Agricultural machinery and parts	721	111.8	119.4	176.8	152.6	206.1	270.2	64.2	139.8	0.15	0.43		
Tractors fitted or not with power take-offs, etc.	722	41.8	170.3	176.7	21.6	231.7	262.3	128.3	156.9	0.49	0.88		
Civil engineering and contractor's plant and parts	723	112.0	162.1	177.6	101.3	227.8	268.0	64.2	153.6	0.28	0.46		
Textile and leather machinery and parts	724	50.8	168.4	163.5	29.7	105.4	260.9	64.2	142.8	0.64	0.73		

Paper and pulp-mill machinery, machinery for manufacture of paper	725	55.4	123.1	174.1	86.7	229.8	270.2	64.2	155.9	0.50	0.58
Printing and bookbinding machinery and parts	726	90.4	125.8	179.0	72.7	226.2	267.9	64.2	154.3	0.34	0.52
Food-processing machines and parts	727	86.2	175.5	177.2	174.4	204.9	266.4	64.2	145.2	0.36	0.47
Machinery and equipment specialized for particular industries	728	76.8	161.9	175.6	144.4	218.2	266.8	64.2	135.4	0.43	0.49
Machinery and tools for working metal and metal carbides, and parts	736	59.0	162.1	155.4	32.0	128.2	269.6	64.2	144.5	0.58	0.69
Metal-working machinery and parts	737	91.2	139.8	179.1	51.0	226.1	270.2	64.2	144.8	0.29	0.59
Heating and cooling equipment and parts	741	113.1	174.5	174.2	132.9	229.1	268.9	64.2	152.5	0.27	0.44
Pumps for liquids, liquid elevators, and parts	742	81.6	171.1	167.4	92.3	203.1	269.8	n.a.	139.2	0.39	0.42
Pumps and compressors, fans and blowers, centrifuges	743	99.6	184.2	174.7	100.3	167.8	269.2	64.2	147.3	0.32	0.45

(*continued*)

Table 7.6 (continued)

	SITC	EU15	NAFTA	Latin6	Japan	Tiger	OthAs4	China	Others	Weighted Dispersion[a]	Dispersion[b]	Weighted Correlation[c]	Correlation[d]
Mechanical handling equipment and parts	744	110.5	151.6	177.4	68.5	191.8	265.3	64.2	155.2	0.26	0.50		
Other nonelectrical machinery, tools, apparatus, and parts	745	98.0	156.8	173.0	104.6	200.3	268.6	64.2	146.3	0.29	0.45		
Ball, roller, or needle-roller bearings	749	69.6	150.1	159.5	40.2	125.6	264.3	64.2	134.0	0.45	0.61		
Television receivers	761	34.1	177.3	179.1	2.2	27.8	270.2	64.2	157.0	0.64	1.58		
Radio broadcast receivers	762	51.0	154.2	54.2	0.0	1.0	77.9	64.2	66.7	0.88	2.95		
Telecommunications equipment and parts	764	119.7	119.1	177.7	17.2	43.9	189.2	64.2	142.7	0.63	0.82		
Electric-power machinery and parts thereof	771	70.2	129.7	166.5	39.9	79.3	230.8	64.2	143.6	0.45	0.58		
Electrical appliances such as switches, relays, fuses, plugs, etc.	772	106.3	167.7	163.7	75.5	133.5	69.9	64.2	145.4	0.29	0.39		
Equipment for distributing electricity	773	114.3	144.1	122.4	59.8	163.4	269.6	64.2	149.0	0.25	0.49		
Electrical apparatus for medical purposes (e.g., radiology)	774	38.6	135.1	179.0	193.8	225.6	264.4	64.2	82.4	0.74	0.68		

Household-type electrical and nonelectrical equipment	775	58.9	176.5	168.1	18.0	20.2	268.0	64.2	154.1	0.80	1.02
Thermionic, cold, and photo-cathode valves, tubes, parts	776	115.1	156.4	130.5	62.4	82.6	71.1	64.2	150.5	0.33	0.38
Electrical machinery and apparatus n.e.s.	778	104.0	180.1	148.1	51.1	103.3	239.6	64.2	144.6	.39	.52
Railway vehicles and associated equipment	791	16.8	108.1	83.9	9.8	230.4	270.2	64.2	96.4	0.50	1.16
Aircraft and associated equipment and parts	792	120.6	136.2	170.5	230.8	204.6	268.6	64.2	123.4	0.32	0.46
Ships, boats, and floating structures	793	93.8	130.4	132.5	6.4	47.1	268.1	64.2	88.7	0.54	1.11
Weighted dispersion[e]		0.25	0.14	0.13	0.86	0.56	0.44	0.08	0.10		
Dispersion[f]		0.44	0.15	0.24	1.62	1.05	0.37	0.12	0.20		
Weighted correlation[g]		0.76	0.29	0.50	0.94	0.86	0.55	−0.29	0.28		
Correlation[h]		0.48	0.15	0.74	0.56	0.92	0.49	0.06	0.60		

Note: n.e.s. = not elsewhere specified. n.a. = not available.

[a]RCA dispersion across regions by sector, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[b]RCA dispersion across regions by sector, unweighted, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[c]Cross-regional correlation coefficient by sector, weighted by export share, between 1995 and 1980.

[d]Cross-regional correlation coefficient by sector, unweighted, between 1995 and 1980.

[e]RCA dispersion across sectors by region, weighted by export share, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[f]RCA dispersion across sectors by region, unweighted, 1995 and 1980. Dispersion = standard deviation of natural logs of indexes/100.

[g]Cross-sectoral correlation coefficient, weighted by export share, between 1995 and 1980.

[h]Cross-sectoral correlation coefficient, unweighted, between 1995 and 1980.

diverse across regional markets. That cross-regional diversity seems to be increasing. The dispersion of U.S. comparative advantage across trading partners increases between 1980 and 1995 for twenty out of thirty-two producer goods categories.[36]

The three consumer goods subproducts mimic variety 4 in that they are chaotic over time and regional market. In fact, the dispersions of U.S. comparative advantage across trading partners for radio and television exports are larger than those for any of the thirty-two producer goods, and the cross-regional dispersion for household equipment is sixth highest among the thirty-five categories.

There is some, though very limited, evidence of sectoral niche specialization. The cross-product dispersion indexes rise between 1980 and 1995 in five of the eight regional markets for U.S. exports, but several (especially China's) are suspect due to the poor quality of the 1980 data. And though U.S. comparative disadvantage becomes sharper for machinery and equipment in the Asian Tigers between 1980 and 1995 (part of a niche specialization story), U.S. comparative advantage does not. Nor is there any evidence of increasing sectoral niche specialization in U.S. exports of machinery and equipment to Europe or Japan.

7.8 Addendum: Using Import Data Alone

Our RCA indexes in this paper are based on U.S. export data alone. Comparative advantage is measured by U.S. versus rival export performance in world and regional markets. Comparative advantage is signaled by indexes that are greater than 100.

However, comparative advantage might also be signaled by RCA indexes based on U.S. import data alone. In contrast to export-based measures, these would measure the relative competitiveness of foreign exporters in U.S. markets. By way of an analogy to this construction, the import-based measure would be the share of industry i in total U.S. imports divided by the share of industry i in the rest of the world's total imports. U.S. comparative advantage would be signaled by RCA indexes that were less than 100. If the rest of the world in these measures were to include only a subset of peer importer countries, then we would have the import-based counterpart to the focus of this paper, our RRCAs (regional RCA indexes). For example, relative to its NAFTA partners, the United States would be said to have comparative advantage in sector i if its import shares of i were lower than those of Canada and Mexico (relative to its import shares of everything else).

It is not clear that the export-based and import-based measures would

36. In table 7.4, only 18 of the 34 two-digit submanufactures showed increasing cross-regional dispersion between 1980 and 1995.

(or should) parallel the underlying reality of U.S. comparative advantage. The most important reason is that the markets in which U.S. comparative advantage is being measured differ—non-U.S. markets in one case, U.S. markets in the other. Therefore, export-based U.S. RCA measures would be expected to differ from import-based U.S. RCA measures, for precisely the same reasons that RRCA measures differ across the various trading-partner markets. Furthermore, with a trading partner with which two-way trade is high, both the export-derived RCA and the import-derived RCA might be above 100, signaling simultaneous comparative advantage and disadvantage. The problem is actually in the concept, not in the measure; the apparently anomalous measures are accurately reflecting the intrinsic ambiguity of any concept of comparative advantage in which two-way trade is high.

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Comment Kei-Mu Yi

Since Bela Balassa first developed a convenient way of measuring comparative advantage almost thirty-five years ago, there have been advances in

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raw data collection, in matching/linking trade, production, and endowment data, in computation technology, and in the theory of international trade with many goods and factors. We now have the tools and technology to calculate comparative advantage in a variety of economic contexts. Nevertheless, it is still the case that these calculations are usually limited to a few countries, a few sectors, and a few years. Hence, despite the well-known theoretical limitations of Balassa's revealed comparative advantage (RCA) measure, its simplicity and broad applicability—because it requires data on trade flows only—makes it useful in building a set of stylized facts. These facts have the potential to inform our theoretical and theory-based empirical research.

In this paper, David Richardson and Chi Zhang extend the dimensionality of RCAs by constructing indexes with respect to particular geographic regions. The regional revealed comparative advantage (RRCA) index for the United States with respect to Japan, for example, is the U.S. share of world exports of industry *i*'s goods to Japan relative to the U.S. share of world exports of all goods to Japan. Richardson and Zhang calculate RCAs and RRCAs for U.S. exports at the one-digit, two-digit, and three-digit levels for 1980 and 1995. The RRCAs are computed across eight geographic regions.

Relation to Robert E. Lipsey's Research

As Richardson and Zhang note, Bela Balassa "was a master of measurement and analysis," or, in other words, very much in the mold of Robert Lipsey. Lipsey, of course, has made important contributions in the measurement of international prices and quantities throughout the last forty years. From his 1963 book *Price and Quantity Trends in the Foreign Trade of the United States*—which pushed back the frontier of measurement of import and export prices and quantities in several directions, including constructing a complete and accurate time series for 1879–1923, as well as providing more detailed disaggregation—to his more recent work documenting the extent of internationalized production in the world economy, all of his research has been the definitive work in the field.

This paper's broad connection to Lipsey's work is clear: The paper deals with the measurement of exports; it also deals with assessing comparative advantage, which ideally requires accurate measurement of (autarky) relative prices. More specifically, Lipsey himself has calculated RCAs. For example, in Kravis and Lipsey (1992), RCAs are calculated for U.S. multinational exports over time and disaggregated into high technology, medium technology, and low technology. In this work, Kravis and Lipsey find that U.S. multinational RCAs are much higher than overall U.S. RCAs in the high technology and medium technology sectors.

Theoretical Background of RCAs

Revealed comparative advantage for the U.S. in sector i is measured as

$$\frac{X_{\text{U.S.}i}/X_{\text{U.S.}}}{X_{\text{W}i}/X_{\text{W}}},$$

where $X_{j,i}$ denotes exports by country j (U.S. or World) in sector i and X_j denotes total exports by country j. RRCAs are RCAs where exports are defined as exports to a region. Hence, the RRCA for Latin America is U.S. exports of sector i's goods to Latin America (relative to total U.S. exports to Latin America), relative to world (excluding Latin America) exports of sector i's goods to Latin America (relative to total world exports to Latin America).

When does RCA reveal comparative advantage and when does it not? This question has been addressed rigorously elsewhere; I will mention a few cases in which RCA does and does not reveal comparative advantage. Under the classical 2 × 2 × 2 Heckscher-Ohlin model with free trade and identical preferences, RCA does indeed reveal comparative advantage. This is true in the classical Ricardian model with two goods and identical preferences, as well. However, in more general settings, RCA does not reveal comparative advantage. For example, the generalized Heckscher-Ohlin framework with more goods than factors implies

$$p_{a,\text{U.S.}}M \geq 0,$$

$$p_{a,\text{r.o.w.}}(-M) \geq 0,$$

$$(p_{a,\text{U.S.}} - p_{a,\text{r.o.w.}})M \geq 0,$$

where $p_{a,j}$ refers to autarky prices in country j (U.S. or rest-of-world [r.o.w.]), and M denotes the U.S. vector of net imports. On average, the United States will export goods that have lower relative autarky prices, but there is no prediction for particular goods. In other words, it is possible that it will export some goods that have higher autarky prices than that of the rest of the world.

RCAs also do not reveal comparative advantage when tariffs, transportation costs, other nontariff trade barriers and other distortions, or home bias in preferences affect the pattern of exports. In addition, vertical specialization, in which countries import inputs and use them to make export goods, may lead to misleading inferences. For example, Mexico and Spain are major motor-vehicle producers and exporters, which would yield a large RCA or RRCA number for motor vehicles; however, both countries tend to specialize only in motor vehicle assembly.

It is perhaps more appropriate to think of RCA as telling us about competitiveness rather than about comparative advantage. Indeed, Kravis and Lipsey (1992) often refer to their RCA numbers as measures of competitiveness.

Results

The results are presented in six tables, starting with the one-digit SITC trade data, and continuing to the three-digit SITC data, although the latter is only for SITC 7 (machinery and equipment). In all cases, the United States is the reference country. One property of RCAs (and RRCAs) to remember is that at least one sector must have an RCA (or RRCA) < 1 and at least one sector must have an RCA (or RRCA) > 1. In addition, the RCAs can be thought of as weighted averages of the RRCAs, in which the weights are complicated functions of the industry-level and aggregate export shares to the region and to the world.

The major results are summarized as follows:

1. There is very little variation in RCAs or RRCAs over time, at all levels of disaggregation. This means that changes over time in U.S. export patterns tend to be mirrored by changes in world export patterns.
2. There is wide variation in RRCAs across regions, at all levels of disaggregation. This means, for example, that a good that the U.S. exports (relatively) intensively is exported particularly intensively to particular regions, and is not exported intensively to other regions.
3. The machinery and equipment industry (SITC 7) tends to exhibit wider variation in RCAs than do other sectors as the data become more disaggregated—but a similar pattern does not hold for the RRCAs. This means that machinery and equipment contain many different niche goods in which different countries specialize, but that geography exerts an independent effect on export patterns regardless of whether the goods are machinery-and-equipment goods or other goods.

Result 1 is understandable in a context where the major changes in the world tend to be uniform across countries, such as GATT-induced tariff reductions. To the extent that changes tend to be country specific, such as the structural transformation occurring in China between 1980 and 1995, one would expect larger variation over time, and indeed this is present in these tables.

The most interesting aspect of the paper is the breakout into geographic destination. U.S. (relative to world) exports to a country or region exhibit a great deal of variation across one-digit, two-digit, and three-digit SITC sectoral breakouts. This suggests the importance of industry-level, bilateral-partner-specific factors such as transportation costs, regional trade agreements, common resources, and so forth. Were it not for these factors, the RRCAs would equal the RCAs across all geographic destinations. It would be interesting to try to study more formally the linkages between these factors and the RRCAs.

One particular pattern seems curious. Tables 7.4 and 7.6 indicate that the RRCAs involving NAFTA declined for many industries between 1980 and 1995. This is a period during which *maquiladora* trade soared and the United States–Canada Free Trade Agreement was implemented. For example, *maquiladora* exports as a share of Mexico's total exports increased from about 15 percent to more than 30 percent. These exports have tended to concentrate in textiles and apparel, in transportation equipment, and in electronics. In all three industries, most of the gross production is derived from imported inputs; that is, only about 20 percent of the value of gross production represents value added. Most of the imported inputs are from the United States; hence, high *maquiladora* exports in (for example) electronics also mean high U.S. exports of electronic components. Yet in all three industries, the RRCAs declined. This implies that world exports to Mexico in these industries increased by more than U.S. exports to Mexico in these industries. It would be good to try to reconcile the results in this paper with the facts of rapid U.S. export growth to Mexico and Canada.

As just mentioned, it would be useful to tie the RRCA measures formally to possible explanatory factors, such as industry- and bilateral-partner-specific transportation costs, industry-specific regional trade agreements, and so on. Further, just as trade theories and models have been developed to rationalize the gravity equation (indeed, there is now a surplus of such theories), it would be nice to do the same for the RCAs and RRCAs. While it may be true that RCAs do not truly reveal comparative advantage, it is still the case that they may be useful in helping to establish the important forces behind observed trade patterns. Finally, I would suggest including oil-producing countries in the sample, to help remove some of the apparent anomalies in the oil related data.

References

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