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State Export Behavior and Barriers

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Abstract

The pattern of U.S. state exports to foreign destination—which states export which goods to which destinations—has not been studied in detail despite the high profile of exports in the public consciousness. Currently there is not a clear description of facts characterizing exports for all states, destinations, and manufacturing subsectors. I combine research methods from both firm- and country-level empirical international trade on a cross section of state export data to list seventeen stylized facts that any state trade theory should account for.

JEL classification: F12, F13, R12, R38.

Keywords: empirical international trade, exports, states, geography, gravity

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1 Introduction

International trade has a large presence in the American consciousness. To the extent that trade effects individual communities, it is important to study trade on the most local of levels. On the other hand, the locality of study needs to be both large enough so the data are meaningful and self-governed enough so, in principle, policy may be used to alter the effects of trade. It is for these reasons U.S. states are an interesting geographic and political entity to study with respect to their exports to foreign destinations.

Since U.S. states are—at least in data—an intermediate level of aggregation between a firm and a country, using methods from the firm- and country-level empirical international trade literature brings a dual perspective on state exports. First, firm-level methods emphasize the difference between exporting and nonexporting firms, typically without knowing anything about the importers or the destination of exports. Second, country-level methods use information about both exporters and importers to estimate trade flows and barriers between established partners. I apply both techniques to the state export data, yielding a list of seventeen stylized facts that any theory of state trade must account for. Furthermore, studying state export data reveals interesting consequences of trade and trade barriers missed by firm- and country-level analysis.

Consistent with the two empirical branches of the trade literature just mentioned, this paper's contributions are descriptive. After discussing the data in section 2, section 3 documents the facts. States export a positive, but small fraction of their total sales (13.86%), and to a fraction of the possible destinations (40.23%). State exports are on average 13.20% of total shipments, the elasticity of the number of exporters to destinations is increasingly negative, and the geographic concentration of exporting is more than twice that of manufacturing employment. Some states such as Florida and New York are relatively good at exporting: they export far more than their domestic sales or distance to destinations predict. Furthermore, states that export to more destinations and to more exotic destinations sell more both domestically and abroad. The change in country exports from exporting to the next destination is 65% due to the intensive margin (extent state exporters adjusting shipments) and 35% to the extensive margin (the number of exporting states). Also, regardless of destination, exporting is a highly concentrated activity geographically. But nearly all states specialize in exporting to some destination. Finally, domestic sales are both positively correlated with the number and the exoticness of destinations (0.65 and 0.89 respectively).

Section 4 applies state level data to a gravity equation to estimate barriers to trade faced by states and estimate the importance of geography in the pattern of state exports. Because states are subsumed by federal policies, and have access to the same destinations, this exercise yields more refined barriers to trade than are achieved with a gravity equation using country data. I find state location near the border of the United States matters substantially for the pattern of state exports, but otherwise location within the country does not.

Though there is work on the effects of state exports on a particular state, region, or bilateral relationship (for example Dep 2005; Kehoe and Ruhl 2004), there is no systematic description of the characteristics of exporting states. The pattern of exports—what is exported and to whom—is not well described. Work by Coughlin and Wall (2003) and Coughlin and Pollard (2001) have some useful results on state exports, but nonetheless more is needed. Combining the firm- and country-level techniques of the literature on U.S. states fills in this gap in the knowledge as well as deepening our understanding of exporting in general.

2 Data

I use the Origin of Movement (OM) state export data compiled by the U.S. Bureau of the Census and available from the World Institute for Strategic Economic Research. These data are free-alongside-ship (f.a.s.) export sales from 54 U.S. states (including Washington D.C., Puerto Rico, Virgin Islands, and unknown) to 242 foreign destinations by 32 3-digit North American Industry Classification System (NAICS) subsectors. The data are measured at the port of exit and include the value of inland freight and insurance. These data are the same as the official export statistics of the United States because, by law, every shipment more than $2500 must be counted. Therefore these data are more complete than survey based export data typical in firm-level studies.

Cassey (2009) gives a complete description of the OM data as well as performing diagnostic tests for data quality. One potential problem is that since the state export data are measured at the port of exit, the origin of movement could be the state where shipments produced in other states are consolidated. Cassey (2009) argues this problem is not too widespread to prevent the use of the OM data in the current context of documenting state export patterns. Nonetheless I only use data from manufacturing for the 50 "true" states.

There are 21 manufacturing subsectors categorized in the NAICS. For each subsector, data on the total value of shipments (TVS) is from *Exports From Manufacturing Establishments: 2003* (Census 2007). These data are measured free-on-board (f.o.b.) at the producing plant. Therefore, I have to convert the f.a.s. values of the export data to f.o.b. values for comparison. The details of this conversion are in appendix A.

The TVS data are edited by the Census Bureau to remove data that may lead to the identification of individual firms, low quality estimates, and observations for subsectors with fewer than 950 employees. These edits suppress 23% of the data. For these observations, I use data on gross state products from the Bureau of Economic Analysis (BEA).The BEA, however, combines six of the smaller NAICS into three groups. Therefore to match the TVS data to the OM data, I combine six subsectors into three, forming 18 manufacturing subsectors for each of the 50 states.

The minimal unit of observation in the OM data is the pairing of a U.S. state and a single 3-digit NAICS manufacturing subsector. State-NAICS may seem an odd object to study because it is not a natural decision making entity as is a plant or a country. However state-NAICS pairs do represent a natural intermediate level of aggregation between plant-industry pairs and national industrial groups. Furthermore, state-NAICS observations allows me to control for the industrial mix of a state and to focus on their geographic locations. Individual state-NAICS may be grouped by either state or subsector to study aggregates, but as the research focus is on states, I only report state groups.

Specific state-NAICS pairs are named by their 2-letter abbreviation followed by the 3-digit NAICS code. Thus Minnesota furniture and fixtures is MN-337. When one of the three combined subsectors is named, the first of the two subsectors is used. Thus Utah apparel and accessories and leather and allied products is UT-315. Table 1 on page 5 lists state codes. Table 4 in appendix A lists the subsectors.

There are $50 \times 18 = 900$ state-NAICS observations in each year. I report results using 2003 data, but results for other recent years do not differ substantially. There are 242 destinations in the

OM data but 2003 GDP data from the International Monetary Fund (IMF) is available for only 179. Thus there are $900 \times 179 = 161,100$ observations.

Using latitudes and longitudes of capital cities, I calculate the great circle distance from the United States to each of these destinations, as well as the distance from each state to each destination. The location of the United States and each U.S. state is given by its population weighted centroid: the coordinates that would balance the state if every person in the state weighed the same. A list of destinations and descriptions of the IMF and distance data is in appendix A.

3 Characteristics of State Exports and their Destinations

The style of the empirical trade literature exemplified by Bernard and Jensen (1995) is to focus on unilateral characteristics. This section follows that style and documents stylized facts about features of the exporter and the importer.

3.1 Exports and Shipments

Exports are a small fraction of U.S. sales (12% in 2003). The same is true for states as well.

Fact 1. *Exports are a positive but small fraction of total sales.*

To derive fact 1, I calculate the export-to-TVS ratio of each state. The ratio is the sum of exports to all destinations multiplied by a factor of 0.857 then divided by TVS. The conversion factor accounts for the difference in exports measured f.a.s. and shipments measured f.o.b.

Columns 3–5 of table 1 present the total shipments, manufacturing exports to 179 destinations, and the percent of exports (converted to f.o.b.) to TVS. Every state exports manufacturing. Most export between 8%–15% of TVS with an average of 11.81%. The maximums are 31.44%, 24.75%, and 24.23% for Washington, Florida, and Arizona respectively. The minimums are 4.37%, 5.00%, and 5.03% for Montana, Arkansas, and South Dakota. The standard deviation is 6.17. (Figure 9 in appendix B is a histogram of this data.) The average state-NAICS exports 13.37% of its shipments with a std. dev. of 20.72. For comparison, Bernard and Jensen (1995) report 14.6% of plants export, but 71% of exporters ship less than 10% of sales abroad. The average plant export share is 10%. Thus the state export ratio is the same as the firm export ratio.

Table 1. U.S. States

State	Code	TVS[a]	OM[b]	Ratio[c]	Plants[d]	Exporters[e]	Ratio	S(s,all)	X(s)	LQ(s,all)
		(Millions $2003)		(%)	(All Establishments)		(%)	(hundreths)		
Alaska	AK	4378.7	619.6	12.13	19176	717	3.74	0.10	0.11	0.93
Alabama	AL	71027.4	7519.9	9.07	99838	2916	2.92	1.23	1.77	0.69
Arkansas	AR	48102.9	2804.6	5.00	64285	1769	2.75	0.46	1.20	0.38
Arizona	AZ	44353.9	12542.3	24.23	121533	5057	4.16	2.05	1.10	1.85
California	CA	385882.6	84142.2	18.68	827472	57133	6.90	13.73	9.61	1.43
Colorado	CO	34113.2	5919.4	14.87	143949	4175	2.90	0.97	0.85	1.14
Connecticut	CT	41730.6	7735.8	15.89	91611	5140	5.61	1.26	1.04	1.21
Delaware	DE	15245.7	1741.3	9.79	24803	890	3.59	0.28	0.38	0.75
Florida	FL	79264.4	22894.0	24.75	460746	31700	6.88	3.74	1.97	1.89
Georgia	GA	126316.6	14830.1	10.06	209137	9706	4.64	2.44	3.15	0.77
Hawaii	HI	3876.9	285.3	6.31	31061	668	2.15	0.05	0.10	0.48
Iowa	IA	70521.7	4884.4	5.93	81078	2419	2.98	0.80	1.77	0.45
Idaho	ID	15812.1	1938.6	10.51	39839	1163	2.92	0.32	0.40	0.80
Illinois	IL	191218.4	25225.8	11.31	311714	17962	5.76	4.12	4.76	0.86
Indiana	IN	168878.0	16112.6	8.18	147547	6288	4.26	2.63	4.21	0.63
Kansas	KS	50674.6	4145.0	7.01	74972	2265	3.02	0.68	1.26	0.54
Kentucky	KY	89889.7	110035.8	9.57	90651	3267	3.60	1.64	2.24	0.73
Louisiana	LA	94906.8	8695.2	7.85	102245	3142	3.07	1.42	2.36	0.60
Massachusetts	MA	78507.1	17721.7	19.35	178675	10245	5.73	2.89	1.96	1.48
Maryland	MD	35851.8	4559.2	10.90	133304	4569	3.43	0.74	0.89	0.83
Maine	ME	13950.7	1719.0	10.56	40701	1653	4.06	0.28	0.35	0.81
Michigan	MI	224770.2	31516.0	12.02	237122	12419	5.24	5.13	5.60	0.92
Minnesota	MN	82351.1	10444.5	10.87	145861	6456	4.43	1.70	2.05	0.83
Missouri	MO	96189.6	6971.9	6.21	150415	4617	3.07	1.14	2.40	0.48
Mississippi	MS	39847.9	2343.6	5.04	59827	1673	2.80	0.38	0.99	0.39
Montana	MT	5351.6	272.7	4.37	33831	845	2.50	0.04	0.13	0.33
North Carolina	NC	158279.5	15298.4	8.28	208387	8242	3.96	2.49	3.94	0.63
North Dakota	ND	6452.9	625.8	8.31	20459	972	4.75	0.10	0.16	0.63
Nebraska	NE	33030.6	2248.8	5.83	50394	1508	2.99	0.37	0.82	0.45
New Hampshire	NH	15799.8	1760.8	9.55	38294	2280	5.95	0.29	0.39	0.73
New Jersey	NJ	96521.4	15243.8	13.53	237842	15947	6.70	2.49	2.40	1.04
New Mexico	NM	10758.9	2236.8	17.82	43568	1036	2.38	0.36	0.27	1.36
Nevada	NV	9050.4	1932.6	18.30	53335	1813	3.40	0.32	0.23	1.40
New York	NY	141353.8	34345.5	20.82	502948	31048	6.17	5.61	3.52	1.59
Ohio	OH	244906.8	28626.5	10.02	270255	13057	4.83	4.67	6.10	0.77
Oklahoma	OK	41627.0	2534.2	5.22	86014	2408	2.80	0.41	1.04	0.40
Oregon	OR	44558.2	8772.1	16.87	103064	4914	4.77	1.43	1.11	1.29
Pennsylvania	PA	181580.0	15379.8	7.26	298081	12725	4.27	2.51	4.52	0.55
Rhode Island	RI	11047.6	1016.8	7.89	29333	1492	5.09	0.17	0.28	0.60
South Carolina	SC	85733.0	11530.8	11.53	99128	4448	4.49	1.88	2.14	0.88
South Dakota	SD	10358.4	607.6	5.03	24468	778	3.18	0.10	0.26	0.38
Tennessee	TN	115239.3	11009.5	8.19	130057	5282	4.06	1.80	2.87	0.63
Texas	TX	340288.4	93472.9	23.54	483945	26518	5.48	15.25	8.48	1.80
Utah	UT	25928.3	3958.2	13.08	60324	2211	3.67	0.65	0.65	1.00
Virginia	VA	82747.3	9098.1	9.42	183468	5746	3.13	1.49	2.06	0.72
Vermont	VT	9455.6	2540.8	23.03	21831	1161	5.32	0.41	0.24	1.76
Washington	WA	80040.9	29362.2	31.44	167272	9579	5.73	4.78	1.99	2.40
Wisconsin	WI	132326.5	10772.7	6.98	142220	6670	4.69	1.76	3.30	0.53
West Virginia	WV	19937.2	2096.7	9.01	40376	830	2.06	0.34	0.49	0.69
Wyoming	WY	4749.1	505.5	9.12	18917	311	1.64	0.08	0.12	0.70
mean		80295.7	12251.9	11.81	144707	7197	4.09	2.00	1.99	0.90
maximum		385882.6	93472.9	31.44	827472	57133	6.90	15.25	9.61	2.40
minimum		3876.9	272.7	4.37	18917	311	1.64	0.04	0.10	0.33

Source: Author's calculations unless otherwise stated.

[a]Manufacturing only. Measured at plant (f.o.b). *Source:* Annual Survey of Manufactures, Census (2003).

[b]Manufacturing only. Measured at port (f.a.s.) to 179 destinations. *Source:* WISER (2003).

[c]$Ratio = \frac{0.857*OM}{TVS}$.

[d]Includes manufacturers, wholesaler, and others. *Source:* County Business Patterns, Cenus (2003).

[e]Includes manufacturers, wholesaler, and others. *Source:* A Profile of U.S Exporting Companies, 2003–2004, Census (2006).

Columns 6–8 are the count of total establishments, the count of exporting establishments, and the ratio of exporting establishments to nonexporting establishments by state. Notice the ratio of exporting establishments (column 8) does not vary much.

Fact 2. *The percentage of establishments exporting is roughly constant across states.*

California has the largest ratio of exporting establishments to total establishments at 6.90%. Florida follows California with 6.88%. Wyoming and West Virginia have the lowest percent of establishments exporting in 2003 at 1.64% and 2.06% respectively. The average state has 4.09% of its establishments exporting. The standard deviation is 1.33, indicating roughly the same fraction of establishments export in every state. Note the establishment counts include all exporters regardless of whether they are agriculture, mining, manufacturing, or wholesale.

Fact 2 coupled with fact 1 suggests exporting establishments in high export-to-sales states export more than similar establishments in low export-to-sales states. That is, Californian plants export a greater percentage of TVS than exporting Montana plants. Another possibility is that states with a greater ratio of wholesalers to all establishments have a greater exports-to-sales ratio. This would occur if producing plants in one state sell to a wholesaler in another state without knowing these shipments will eventually become exports. The wholesalers' exports count as export shipments in the second state but count as domestic shipments in the first state. But Bernard and Jensen (1995) document a fact similar to fact 2 using counts of manufacturing plants only, suggesting that the possibility of fact 2 being caused by wholesaling is not likely.

3.2 Exports and Destinations

The unique feature of the OM state export data is that destination information is known, something that is not common in firm-level data sets. In this subsection, I use that information.

U.S. manufacturing exports to all 242 destinations are \$614.43 billion, but are \$612.60 billion to the 179 destinations for which GDP is available. Thus the 179 countries in the sample receive 99.7% of U.S. manufacturing exports. Of the 161,100 possible bilateral export matches (for 179 destinations), only 64,806 (40.25%) are nonzero in 2003.

Fact 3. *Exports are to a fraction of destinations.*

The states exporting to the most destinations are California (178 destinations; all except Libya), New York (177; no Libya or Vanuatu) and Florida (177; no Libya or East Timor). Four states are tied with 173 destinations. Alaska exports to the fewest destinations (69), followed by Wyoming (71) and Hawaii (74). The average state exports to 144.1 destinations. (In appendix B, figure 10 upper image is a histogram of the exact number of destinations each state exports to.) The distribution has a long left tail indicating most states export to quite a few destinations. The largest destination importing from only 49 states is Russia. Destinations import from an average of 40.25 states, and nine subsectors from each state. Every destination imports from at least three different states (Libya imports from MD-323, MS-311.5, and WI-334 only).

For state-NAICS, CA-334 exports to the most destinations, 175 (it does not export to Comoros, Cape Verde, Libya, and East Timor). It is followed by NY-334, FL-334, and TX-334 who export to 173, 171,and 164 destinations respectively. NY-333 is the state–NAICS exporting to the most destinations in a subsector other than 334. It exports to 163 destinations. WY-337 exports to only two destinations (Canada and Ethiopia). The other state-NAICS exporting to only two destinations are WY-327 (Canada and China), ND-331 (Canada and France), and NM-324 (Mexico and Venezuela). Thus, the state data show that propensity to export varies by subsector. The average number of destinations is 72. (See figure 10 lower image for a histogram of the exact number of destinations each state-NAICS exports to. Notice how the distribution for states has a long left tail, but for state-NAICS the distribution has both left and right tails.)

Canada is the most populous destination in terms of the number of state-NAICS pairs who export there, followed by Mexico. Of all 900 state-NAICS, only four do not export to Canada: HI-324, HI-331, NM-324, RI-324 (32 state-NAICS do not export to Mexico). These state-NAICS are among the smallest in terms of TVS. Other notable destinations: Germany imports from 834 state-NAICS and China imports from 816. Five hundred ninety state-NAICS export to Russia, 551 to Egypt, but only 259 to Yemen. Libya is the least populous (or most exotic) destination, receiving shipments from only 3 state-NAICS. The average destination imports from 362 state-NAICS.

As the number of destinations grows, fewer and fewer state-NAICS export to at least that many destinations.

Fact 4. *Elasticity of exporters to destinations is negative and increasing (in absolute value).*

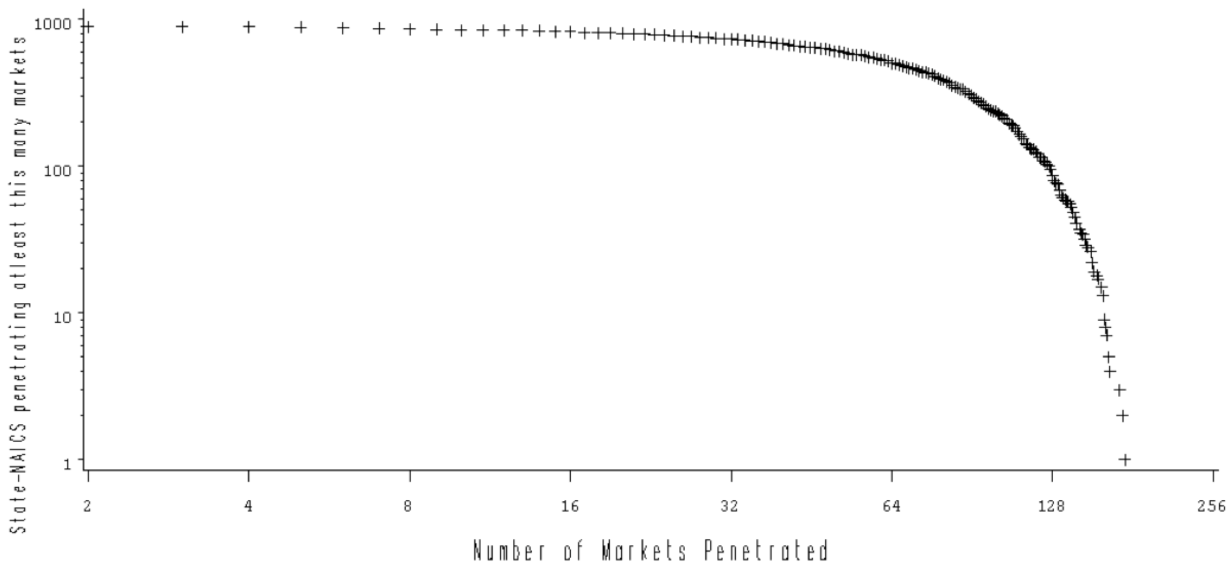

Figure 1. Destinations per State-NAICS. Data include 179 destinations and 900 state-NAICS. The left most data point represents that at least 900 state-NAICS export to two or more destinations. The second to the left indicates 896 state-NAICS export to three or more destinations.

Figure 1 shows fact 4. The number of destinations is on the abcissa. The ordinate is the number of state-NAICS exporting to at least that many destinations. Hence the left most points show 900 state-NAICS export to at least two destinations but only 896 export to at least three destinations. The scale is in logarithms, thus the slope is the elasticity of the number of state-NAICS with respect to the number of destinations. Clearly this elasticity is not constant, ranging from near zero on the left to very (negatively) steep on the right. A regression of the non-logged data estimates each new destinations is serviced by six fewer state-NAICS.[1] Interestingly state-NAICS differ from firms in this respect. Eaton, Kortum and Kramarz (2010) find a constant elasticity of -2.5 for French firms. (See figure 8 in appendix B for a different way of viewing fact 4.)

3.3 Export Specialization and Concentration

States such as California, Massachusetts, and New York are good at exporting: they have high exports-to-shipments ratio, a high share of exporting establishments to total establishments, and they export to many destinations. But these states are also good at manufacturing. Thus it is not

[1] $LHS = \beta_0 + \beta_1 \text{Markets Penetrated} + \varepsilon$. $\beta_0 = 899.74$ (35.47). $\beta_1 = -6.10$ (0.01). $R^2 = 0.98$. $N = 162$ which is the number of different markets penetrated (no state-NAICS export to exactly zero or one destination so the number of observations is strictly less than 179). Standard errors, in parentheses, are robust.

clear if these states are good at exporting beyond their other characteristics. To see which states concentrate in exports, I apply localization tools, appropriately modified for use with exports.

I define an *exporting state* to be a state where its share of exports (compared to the U.S. total) is large compared to its share of manufacturing shipments. I measure relative specialization with a location quotient (LQ).

To construct this LQ, begin with

$$S_i(s,c) := \frac{X_i(s,c)}{X_i(us,c)} \tag{1}$$

where $X_i(s,c)$ is the exports from state s to destination c in subsector i. $X_i(us,c)$ is the exports from all 50 states to destination c in subsector i. Note $X_i(us,c)$ is not U.S. exports since Washington, DC and outlying areas are not counted. $S_i(s,c)$ is a state's share of exports in subsector i to destination c. All manufacturing is represented by dropping the i subscript.

Next, let $TVS_i(s)$ denote the total value of manufacturing shipments in subsector i from state s measured at the plant of production. The fact that TVS is measured at the plant and exports are measured at the port will not affect the findings because ratios cancel units. The state share of TVS in subsector i is

$$Z_i(s) := \frac{TVS_i(s)}{TVS_i(us)}. \tag{2}$$

Now for the LQ. If in subsector i, state s has the same share of exports to destination c that it does for TVS, then

$$LQ_i(s,c) := \frac{S_i(s,c)}{Z_i(s)} \tag{3}$$

is equal to one. The more the LQ exceeds one, the greater the state share of exports is over its TVS share, indicating state s is relatively specialized in exporting subsector i to destination c. If exporters were concentrated in the same pattern as production then the LQ would be one for all observations.

Fact 5. *Relatively specialized exporters exist.*

I calculate the $LQ_i(s,c)$ for each state-NAICS to each of 179 destinations. Of 161,000 possible $LQ_i(s,c)$ observations, 11,050 are not calculable because $X_i(us,c) = 0$ and 358 are not calculable because $TVS_i(s) = 0$. The distribution of the $LQ_i(s,c)$ statistic has a large mass point at zero and a long right tail. The average $LQ_i(s,c) = 1.18$. Seventy-five percent of $LQ_i(s,c)$ are less than 0.35 (50% are zero). The standard deviation is 12.98. The maximum $LQ_i(s,c)$ is 2719.7 (AK-322 to Azerbaijan) followed by 1738.7 (HI-333 to Kiribati). In all, 14% of observations show $LQ_i(s,c) > 1$.

To find which state-NAICS are relatively good exporters to all destinations, I calculate $LQ_i(s, all)$ for each state. There are 898 state-NAICS with a calculable $LQ(s, all)$ ($TVS_i(s) = 0$ for MD-324 and VT-324). Here, the right tail is more compact than before and there is not a mass point at zero since all state-NAICS export to at least two destinations. Values range from 0.004 (WY-323) to 23.9 (AK-331) with a mean of 0.97. Thirty-two percent of observations are greater than one.

To present the data more manageably, I sum all 18 manufacturing subsectors into total manufacturing and sum exports to all 179 into total state exports. An $LQ(s, all) > 1$ indicates a state that relatively specializes in exporting manufactures. Table 1 reports the results in columns 9–11. Fifteen states are relatively good at exporting. Washington is best at 2.40, followed by California and Arizona. Montana, Arkansas, and South Dakota have the lowest LQs. The average is 0.90.

Using *counts* of exporting establishments to total establishments, I construct an equivalent statistic to the $LQ(s, all)$. There are nine states that are relatively good at exporting using both criteria: CA, CT, FL, MA, NJ, NY, TX, VT, and WA.[2]

Table 1 gives some indication of which states specialize in general exporting. However, table 1 does not indicate which states are the most specialized with respect to destinations. My method for calculating such a statistic is that, for each destination, I find the state-NAICS with the greatest $LQ_i(s,c)$. Then for each state, I count the occurrences in which that state has the maximum $LQ_i(s,c)$ among all observations. Because of zero imports to places like Libya, there are only 3001 $LQ_i(s,c)$ observations for each state (out of a possible $18 \times 179 = 3222$).

Figure 2 shows the results. The top half of the figure only shows total manufacturing; the bottom half counts each NAICS as a separate observation. Dark grey represents the counts for the maximum LQ. Light grey is top 3 counts.

[2] I calculate $LQ(s, all)$ using another state export data set (AR-1) without destination information as a check on the problems of consolidation of the OM data. Comparing LQs with OM and AR-1 data support the findings of Cassey (2009): overall the OM data do represent the origin of production of exports, but there is evidence Florida is overestimated and South Dakota is underestimated. The correlation is 0.73. A t-test rejects matching means ($t = -2.33$) though it cannot reject in 1997 (t=-1.36).

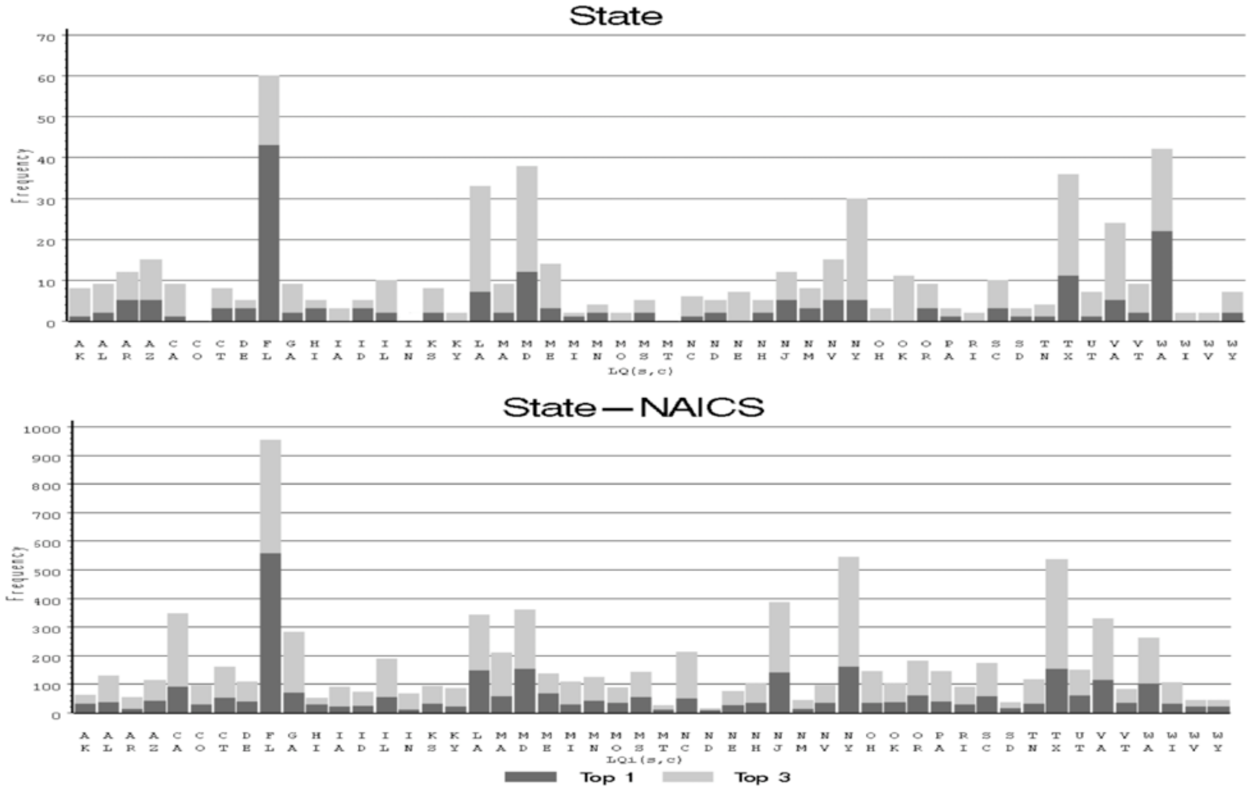

Figure 2. Counts of largest location quotients by state and state-NAICS.

States that are relatively specialized in exporting manufactures to the most destinations are Florida (with 43 top-one occurances and 60 top-three), Lousiana (7, 33), Maryland (12, 38), New York (5, 30), Texas (11, 36), Virginia (5, 24), and Washington (22, 42). Connecticut, Indiana, and Montana do not specialize in exporting manufacturing to any destination. Colorado is interesting in that it is the only state with $LQ(s, all) > 1$ yet without any destination for which it is the most specialized. The average state is the most specialized exporter to 3.58 destinations and within the top-three to 10.74 destinations. By far, the most specialized is Nevada exporting to Bhutan ($LQ(s, c) = 230.7$) followed by Wyoming-Vanuatu (92.9) and Delaware-Nepal (75.0). One feature of figure 2 is every state has the maximal $LQ_i(s, c)$ for at least one state-NAICS. Thus even though CT, IN, and MT export less manufacturing to each destination than expected based on total shipments, they have at least one subsector exporting more to one destination than expected. The state with the lowest occurrence of state-NAICS specialization is North Dakota with nine.

Fact 6. *Nearly all states are relatively specialized in exporting something somewhere.*

Another noticeable feature in figure 2 is the general pattern for total manufacturing (top half) holds when broken up into subsectors (bottom half). The extent to which this is true indicates that state exports are not dominated by a single subsector.

Fact 7. *Industrial mix is not primary for export specialization.*

When looking at the bottom half of figure 2, the most specialized exporters are similar to before: Florida, New York, and Texas, and to a lesser extent, California, Louisiana, Maryland, New Jersey, and Virginia. Washington is no longer such as specialized exporter. This is likely due to the Washington's large exports in the transportation equipment subsector (336).

Notice states specializing in exporting are all border states and have direct sea access through deep water ports. This suggests distance plays some role in determining those states that are relatively good at exporting. One drawback of the LQ analysis is that distance is not considered. When distance is considered, however, the results change little.

Fact 8. *Relative distance does not change export specialization.*

To see if distance does matter for export specialization, the same exercise as in figure 2 is repeated in figure 3 except (1) is muliplied by the ratio of the state geographic distance to c, $d(s,c)$, to the U.S. distance to c, $d(us,c)$. Distance is the great circle route distance from the the population centroid. See appendix A for details.

Figure 3 gives a visual comparison of all manufactures and when each subsector is separated out. As the results with the distance modified $\hat{LQ}_i(s,c)$ are essentially identical to those of the standard $LQ_i(s,c)$, it seems distance does not strongly affect state export specialization. But the fact that distance does not change export specialization in terms of the count of maximum $LQ_i(s,c)$ does not mean that distance does not matter for the pattern of state exports. I explore this in section 4.

Location quotients are useful for finding states that are relatively specialized in exporting, but they are not useful for describing the geographic concentration of exporting. A locational Gini coefficient is useful:

$$Gini := 1 - \sum_{s=1}^{50} Z(s)\big(S(s,all) + 2\sum_{j=s+1}^{50} S(j,all)\big). \tag{4}$$

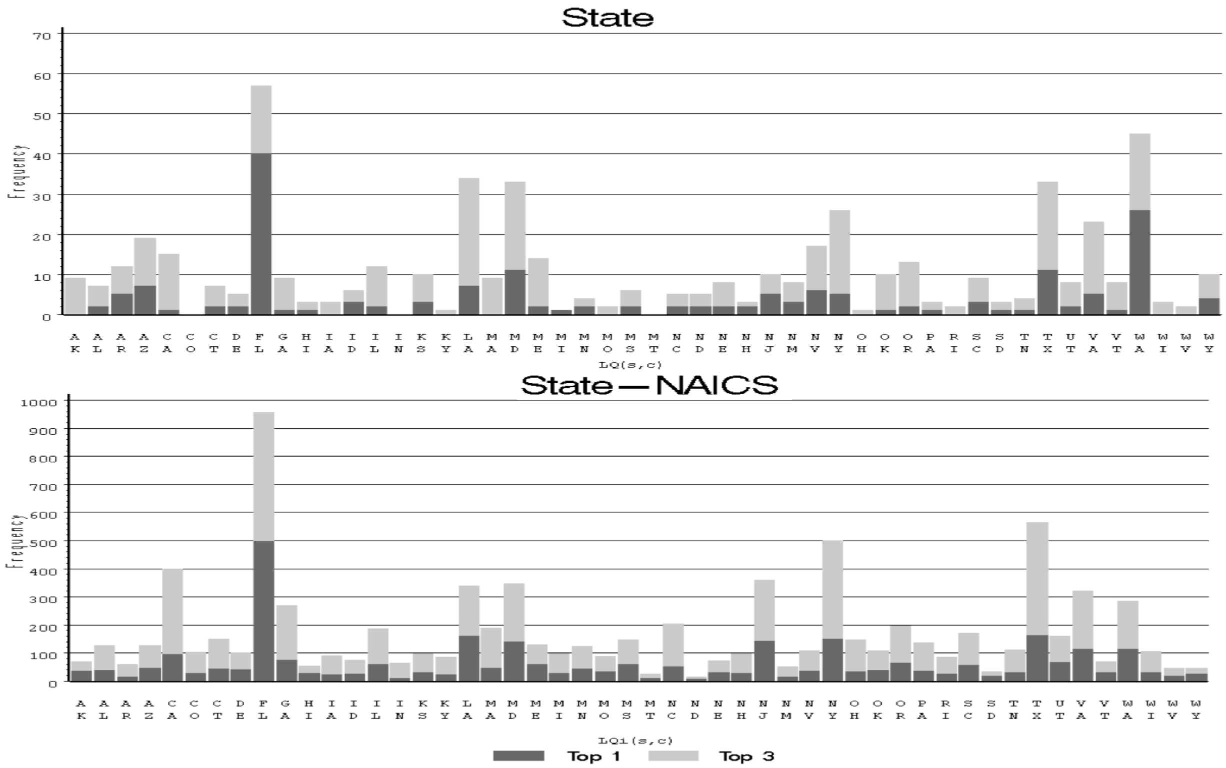

Figure 3. Counts of Largest Distance Location Quotients by state and State-NAICS. $\hat{LQ}_i(s,c) := \frac{S_i(s,c)\times \frac{d(s,c)}{d(us,c)}}{Z_i(s)}$

The Gini describes the degree of equality of export specialization, taking values between zero and one. Though in principle a locational Gini may be constructed for each destination, the small number of exporters to many of the destinations distorts the Gini since it does not distinguish concentration due to randomness from small numbers and other forms of export concentration.

For 2003, the export locational Gini is 0.26, about the same as the gini for agricultural employment. Compare this to the manufacturing employment Gini of 0.10 (Holmes and Stevens 2004). Thus manufacturing exporting is a far more concentrated activity than manufacturing employment.

Fact 9. *Exporting is a geographically concentrated activity.*

Figure 4 provides some indication of the concentration of exporting to specific destinations. States that are closest to Canada are the states that are relatively specialized in exporting to Canada. A similar pattern holds for China. As the destination becomes more exotic, less states export there, and randomness breaks down the geographic concentration.

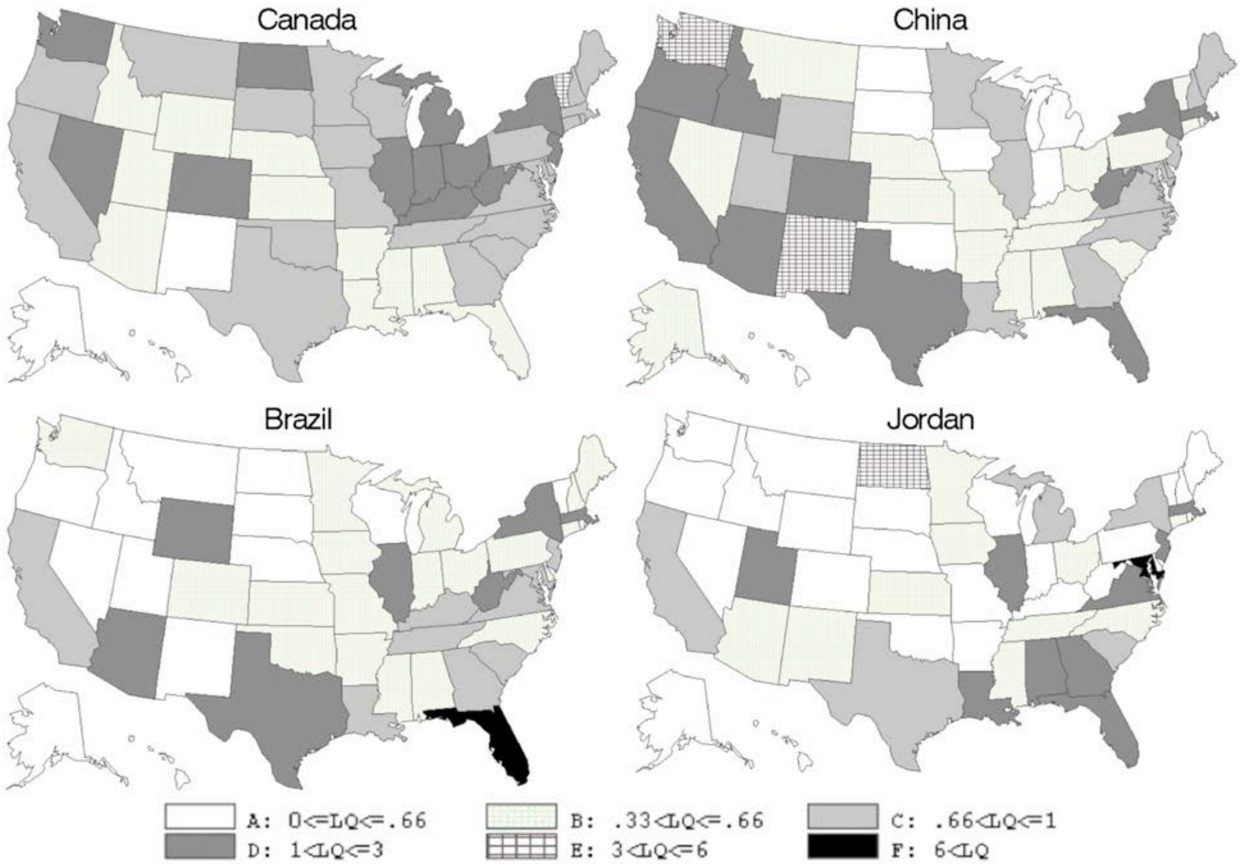

Figure 4. $LQ(s, c)$ to four destinations. Notice how export specialization greatly depends on the relative location of the destinations to each of the U.S. states, in particular, border vs. interior states.

Despite Cassey's (2009) findings, one may be concerned that the export status of Florida, Texas, and New York is due to consolidation at ports of exit rather than actual export specialization. In a separate online appendix, `www.ses.wsu.edu/People/faculty/Cassey/Webpage`, most of the exercises reported here are also performed on destination-less export data from *Exports from Manufacturing Establishments: 2003*. Though there are some interesting differences, none of the major facts described here fundamentally change.

3.4 Destination Characteristics and State-NAICS Exports

A key feature of the OM data is, unlike more disaggregated export data, the destination of exports is known. This information allows for characterizing destinations by size and popularity—I call the absence of popularity *exoticness*—and analyzing how these characteristics affect state-NAICS exports.

Fact 3 is that state-NAICS do not export to all possible destinations. Thus there are either characteristics of destinations that appeal to exporters or there is randomness. Some of these characteristics such as size and tariffs will depend solely on the destination. But these characteristics will be the same for all states. Other characteristics such as distance will be bilateral.

I focus on the unilateral characteristics of destinations first, following the theory in Eaton et al. (2010). Suppose state-NAICS differ from each other in productivity. Then, I expect state-NAICS with high domestic sales to export to more destinations and to more exotic (less popular) destinations than state-NAICS with low domestic sales. Secondly, I expect state-NAICS that sell the most domestically to also sell the most in each of the foreign destinations they export to. These expectations hold in the data.

Fact 10. *Domestic sales are positively correlated with both number and exoticness of destinations.*

The top half of figure 5 shows the relationship between the mean state-NAICS's domestic sales and the number of destinations. The bottom half of figure 5 shows mean domestic sales and the popularity of the destination. Popularity is a rank of the destinations by the number of state-NAICS exporting there. The most state-NAICS (896) export to Canada, thus it is number one. Only three state-NAICS export to Libya making it the 179th most popular. Domestic sales are the difference from TVS and OM exports,

$$DS_i(s) = TVS_i(s) - 0.857 * \sum_{c=1}^{179} X_i(s,c). \tag{5}$$

where 0.857 is applied to the OM data due to the difference in shipments measured f.o.b. and f.a.s.[3]

In the top half of figure 5, mean domestic sales is the average of domestic sales for state-NAICS exporting to the exact number of destinations regardless of which destinations those are. The correlation between the number of destinations and mean domestic sales is 0.65. A regression on

[3]Because of inconsistencies in the data, $DS_i(s) < 0$ for seven state-NAICS: OR-315.5, MI-315.5, MD-324, VT-324, AK-331, NV-331, and DE-331. Of these, OR-315.5, MI-315.5, and NV-331 use reported values for both TVS and exports whereas TVS is estimated for the rest. Recall the TVS estimates for MD-324 and VT-324 are zero. These seven observations are dropped.

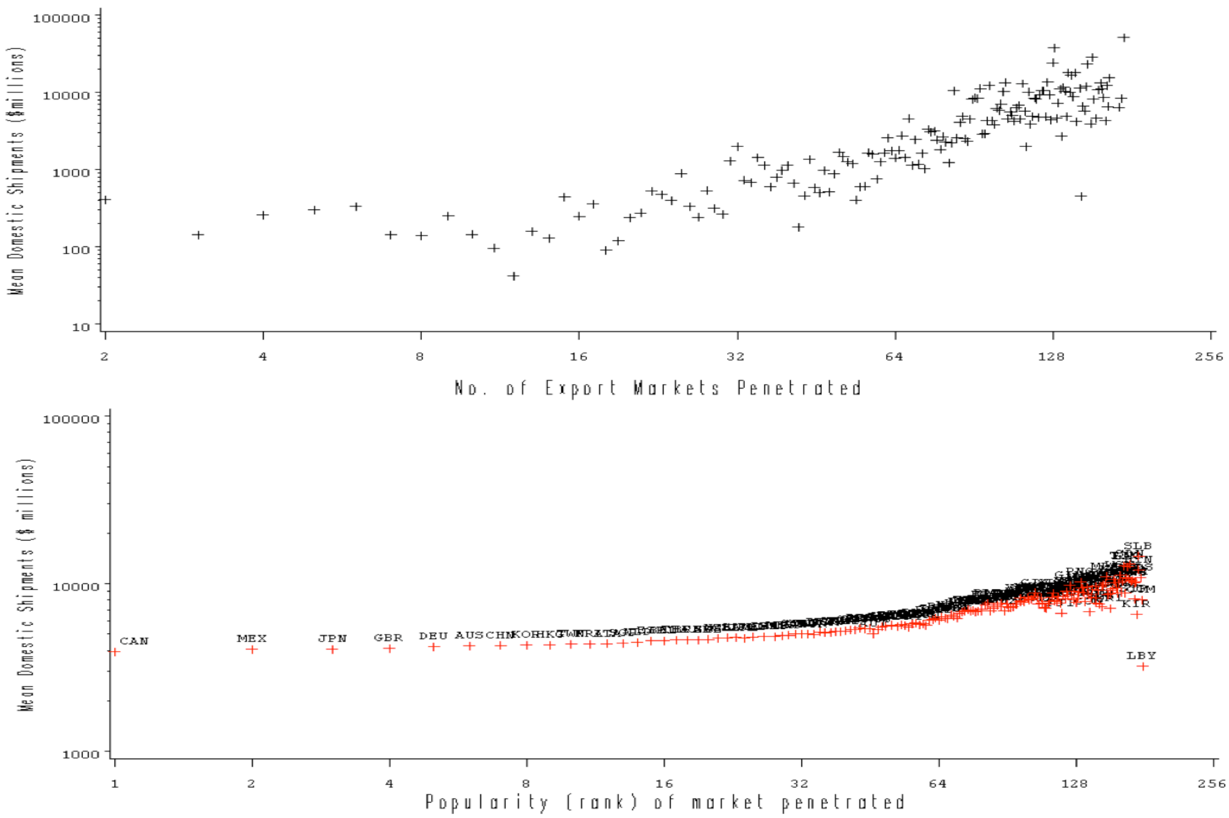

Figure 5. Domestic sales vs. number and popularity of destination. There are 893 state-NAICS with positive domestic sales and 179 destinations.

the logged variables yields

$$\log \bar{X}(s,us) = \underset{(0.51)}{1.92^*} + \underset{(0.12)}{1.40^*} \log \text{Destinations(s)} + \varepsilon(s) \tag{6}$$

with $R^2 = 0.73$. The $^-$ indicates mean values and * indicates significance at the 5% level. All standard errors are robust. Thus state-NAICS exporting to twice as many destinations sell 140% more in the United States.

In the bottom half of figure 5, mean domestic sales is the average of sales in the United States for all state-NAICS that export to that specific destination. The correlation is 0.88. A regression on the logged variables yields

$$\log \bar{X}(s,us) = \underset{(0.09)}{7.73^*} + \underset{(0.02)}{0.26^*} \log \text{Popularity(s)} + \varepsilon(s) \tag{7}$$

with $R^2 = 0.71$. Therefore state-NAICS exporting to twice as exotic a destination sell 26% more domestically on average than those who do not export there. However, the data suggest this elasticity is not constant; it increases as popularity decreases.

Next consider a state-NAICS that exports to some number of destinations. Its mean exports is the sum of the exports to those destinations divided by the number of destinations.

Fact 11. *Mean exports increase with number of destinations.*

Figure 6 shows state-NAICS with the most destinations have the largest exports per destination. Each + in figure 6 is this average. The • is the average of the mean exports of all state-NAICS exporting to that many destinations.

As figure 6 shows, not only do state-NAICS exporting to many destinations sell the most exports, they also sell the most to each destination. The correlation between the number of destinations and the mean exports to those destinations is 0.44. At first this is puzzling because Eaton et al. (2010) predict the least attractive destinations will be those least exported to. But the evidence from figure 6 is that those state-NAICS exporting to the most destinations get so much more sales from the popular destinations that their small sales to exotic destination does not bring mean sales down to those of firms with small sales to only the popular destinations. Do not confuse marginal exports with mean exports.

Since unilateral appeal differs across destinations but is common to all state-NAICS, that destination appeal is captured by the share of U.S. exports consumed by the destination. Let $\lambda(c)$ be the manufacturing U.S. market share of destination c; $\lambda(c) := X(us, c)/GDP(c)$. U.S. exports to c are the product of the number of exporting state-NAICS, $N(us, c)$, to the average exports of the state-NAICS, $\bar{X}(us, c)$ to destination c. Hence

$$X(us, c) = \lambda(c)GDP(c) = \bar{X}(us, c)N(us, c). \tag{8}$$

Fact 12. *Corrected for U.S. market share, the number of state-NAICS exporting to a destination increases in the destination's size with elasticity less than one.*

Fact 13. *The intensive margin of state exports increases more to a change in either the U.S. market share or the size of the destinations than extensive margin exports.*

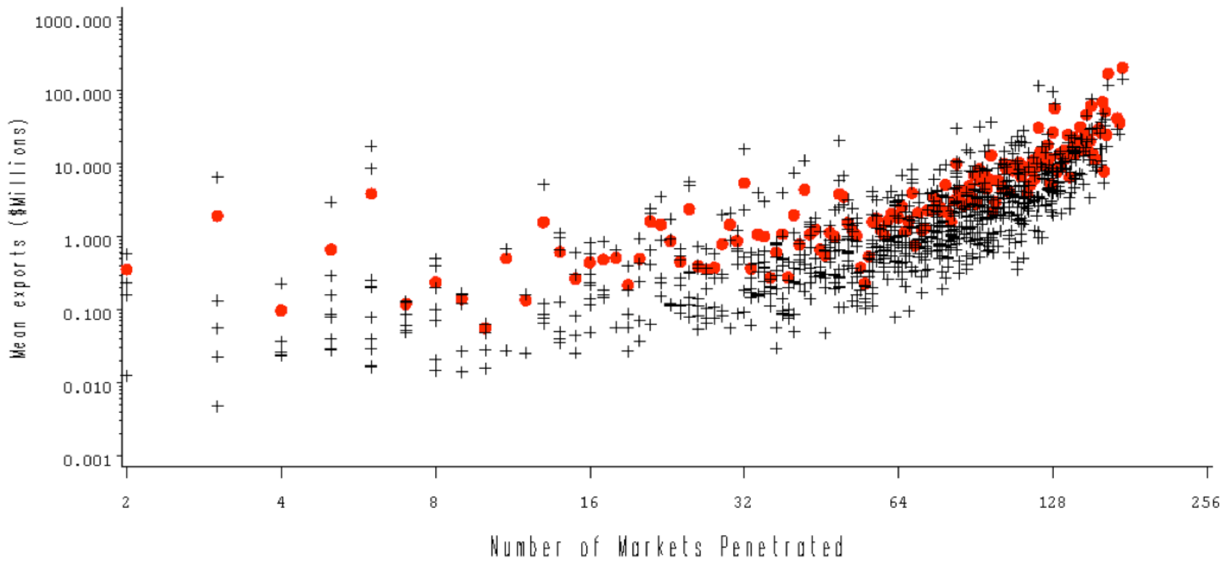

Figure 6. Exports per destination vs. number of destinations. There are 179 destinations. Eight-hundred ninety-three state-NAICS export to 162 different destination counts. + is a state-NAICS exporting to exactly that many destinations. • is the average of the state-NAICS exporting to exactly that many destinations.

Figure 7 shows the positive relationship between destinations 2003 $GDP(c)$ and $N(us,c)/\lambda(c)$. The scale is in logarithms, so the slope, 0.35 (robust standard error 0.03) is the elasticity. Alternatively, I regress the number of exporting state-NAICS on the U.S. export share and size of destination c.

$$\log N(us,c) = \underset{(0.01)}{4.47}^* + \underset{(0.01)}{0.24}^* \log \lambda(c) + \underset{(0.00)}{0.25}^* \log GDP(c) + \varepsilon(c). \quad (9)$$

Thus given a destination's GDP, a doubling in U.S. market share is due to a 24% increase in the number of exporters and 76% to more sales from existing exporters. Likewise given market share, a destination twice as large accommodates 25% more exporters and 75% more sales from existing exporters. This differs from firm-level studies such as Eaton, Kortum and Kramarz (2004) who report coefficients of 0.875 on share and 0.617 on destination GDP. Therefore, the evidence indicates that the majority of aggregation is occurring below the state-NAICS-level.

If export appeal differs across destinations but is common across states, and there is no randomness in determining destinations, then there is a strict hierarchy of destinations (Eaton et al. 2010). Every state-NAICS should export to Canada as Canada is the most popular and thus the most appealing destination. The data show this is not true. There are four state-NAICS that export somewhere, but not to Canada. There is one, RI-324, that does not export to Canada though it is

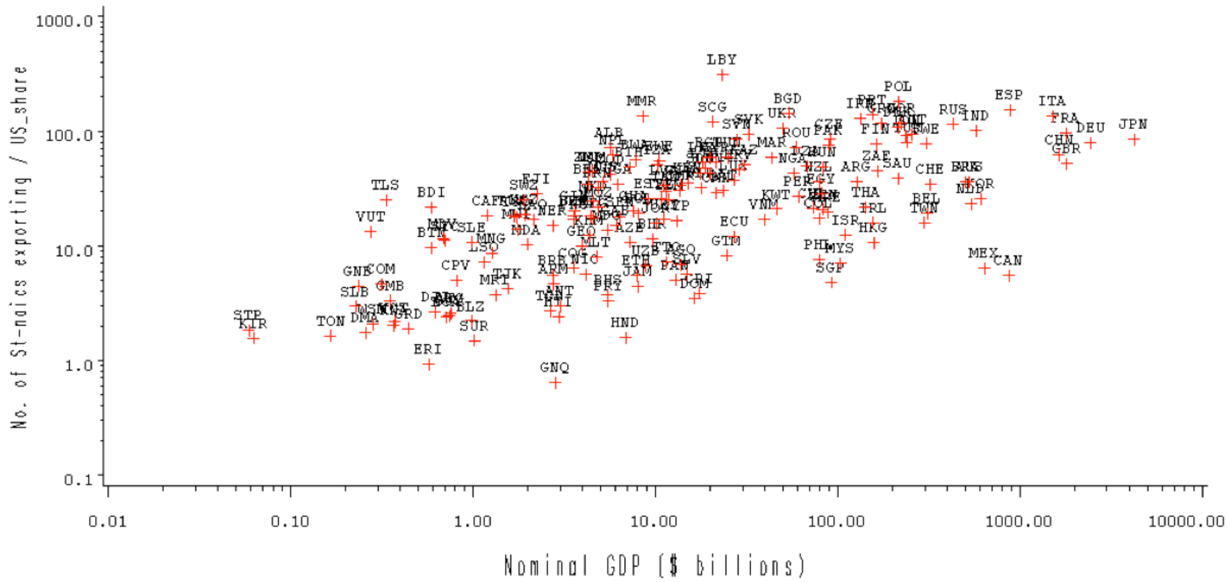

Figure 7. Entry vs. market size.

the closest destination. Instead, it exports to Japan, Belgium, Mexico, Ireland, and South Africa.

Fact 14. *A strict hierarchy of destinations does not exist, but there is evidence of a hierarchy in probability.*

Consider the five most popular destinations overall in terms of the number of state-NAICS exporting there: Canada, Mexico, Japan, Great Britain, and Germany. Out of 900 state-NAICS, only three follow this hierarchy, 0.33%. They are IL-327, MI-334, and NC-332. This may not seem like much, but if destinations are assigned randomly to each of the 900 state-NAICS, then the chance that one of them has a matching hierarchy is $\frac{900}{174!/179!} = 5 \times 10^{-6}\%$. Therefore the data show state-NAICS match the hierarchy several orders of magnitude more than expected if destinations have no appeal.

4 State Exports and Relative Distance

Facts like exporting is a geographically concentrated activity within the United States suggest the appeal of a destination for exports is based on bilateral factors, in addition to unilateral features. The most obvious bilateral characteristic is physical distance. I use a gravity equation (Tinbergen 1962) to estimate the importance of physical distance in accounting for state exports.

4.1 The Gravity Equation

The gravity equation is a standard tool in applied international trade for estimating the importance of economic size and barriers to trade. The standard gravity equation is

$$X(s,c) = \beta_0 \times TVS(s)^{\beta_1} \times GDP(c)^{\beta_2} \times d(s,c)^{\beta_3} \times \varepsilon(s,c) \tag{10}$$

where $X(s,c)$ is the value of manufacturing exports from state s to destination c, $TVS(s)$ is the total value of manufacturing shipments for state s, $GDP(c)$ is the gross domestic product in country c, and $d(s,c)$ is the economic barriers to trade, or the effective distance between the two. I assume the bilateral error term, $\varepsilon(s,c)$, is independent of the other regressors so $\mathbb{E}\big(\varepsilon(s,c)|TVS(s), GDP(c), d(s,c)\big) = 1$. The estimated parameters are the βs.

In (10), economic distance includes all of the bilateral characteristics such as physical distance, cultural distance, and tariffs. Many of these bilateral characteristics are identical across state-destination pairs. For example, all U.S. state exports are subject to the same tariff rates. All states more-or-less are identical in terms of language and colonial ties. Thus for the state export data, much of the variation in economic distance is due to physical distance. Therefore compared to international studies, the state export data permit a better estimate of the importance of distance for trade flows.

Typically, the multiplicative form of (10) is log-linearized so the ordinary least squares (OLS) estimator may be used. However, estimating (10) by log-linearization may yield misleading results for two reasons.

The first reason, pointed out by Anderson and van Wincoop (2003), is due to the lack of "multilateral resistance" terms in (10). These terms account for price indices in exporting and importing countries, or in a looser sense, the remoteness of the country with respect to other trading partners. One correction for this is the inclusion of exporter and importer fixed effects (Feenstra 2004, p.161).[4] The exporter and importer specific fixed effects account for all observed and

[4] Anderson and van Wincoop do not use fixed effects except in a sensitivity section. Instead they solve for the resistance terms using market clearing conditions (unlikely to hold in data especially for manufacturing subsectors) and estimate with NLS. This procedure is more efficient but much more cumbersome, if not impossible given the market clearing requirement.

unobserved unilateral features such as TVS and GDP. Instead of using export shares as regressand as in Anderson and van Wincoop, I follow Helpman, Melitz, and Rubinstein (2008) and use export flows.

The second problem with estimating a log-linearized version of (10) is that roughly 20% of the left hand side is zero in the data. A zero occurs in the state export data whenever there is not a single shipment of more than $2500. None of the zeros are because of nondisclosure or edited data. Nonetheless, zeros are non-randomly assigned throughout the sample. They are more likely in small nonmanufacturing states and small remote countries. By using total manufacturing exports instead of industry exports for data, I alleviate the problem of zeros somewhat. When using subsector data, the fraction of zero observations is 60%. Santos Silva and Tenreyro (2006) recommend using a poisson pseudo-maximum likelihood estimator (PPML).[5] This estimator is appealing for three reasons: it handles the Anderson and van Wincoop fixed effects, it preserves zero observations, and it corrects a heteroskedasticity bias. Furthermore, Santos Silva and Tenreyro find their estimator to to be more efficient than a nonlinear least squares estimator.

One of the nice features of using the state export data is that the source of all of the data, regardless of destination country, is the same: United States Customs and compiled by the Census Bureau. Nonetheless, it is still true that small states and countries may have worse quality data because random mistakes in counting are less likely to be corrected when numbers are small.

4.2 State Location within the United States

Given the problems described in section 4.1, the regression I take to the data with the PPML estimator is

$$X(s,c) = \exp\Big(\log\beta_0 + \beta_1 \log d(s,c) + \sum_{s=2}^{50}\gamma(s)S(s) + \sum_{c=2}^{179}\delta(c)C(c)\Big) \times \varepsilon(s,c), \tag{11}$$

where $S(s)$ and$C(c)$ are the exporter and importer fixed effects.

Table 2 shows the estimates for $d(s,c)$. Besides the coefficients on distance, table 2 also lists the top and bottom five states and destinations in terms of estimated coefficients on their fixed

[5] The first order conditions are $\sum_j \big(\mathbf{y_j} - \exp(\mathbf{x_j}\boldsymbol{\beta})\big)\mathbf{x_j} = 0$.

Table 2. Distance coefficient estimates

Variable		Est.	se
$\log d(s,c)$		$-1.13*$	(0.16)
Cons.		$6.99*$	(1.45)
Top states	California	$5.21*$	(0.14)
	Texas	$5.09*$	(0.19)
	Washington	$4.11*$	(0.18)
	Michigan	$3.77*$	(0.26)
	Florida	$3.72*$	(0.16)
Low states	MT	-0.60	(0.47)
	Hawaii	-0.38	(0.37)
	Wyoming	0.00	–
	South Dakota	0.12	(0.28)
	North Dakota	0.14	(0.41)
Top countries	JPN	$6.59*$	(0.30)
	Singapore	$6.03*$	(0.28)
	China	$5.99*$	(0.28)
	South Korea	$5.84*$	(0.28)
	Great Britain	$5.84*$	(0.31)
Low countries	East Timor	$-6.59*$	(0.72)
	Libya	$-5.64*$	(0.99)
	Kiribati	$-4.35*$	(0.77)
	Burundi	$-4.30*$	(0.48)
	São Tomé & Príncipe	$-4.24*$	(0.53)

Notes: Uses PPML with state and destination fixed effects. Robust standard errors in parenthesis. $N = 8950$ and $AIC = 280289$ is the Akaike information criterion.

* indicates significance at the 95% level.

effects. The state coefficients may be thought of as a state's willingness or ability to export. The country coefficients may be thought of as export appeal or the degree of openness to U.S. exports. The coefficients are in comparison to Wyoming and Zimbabwe.

The resulting distance estimate is greater in absolute value than that reported by Santos Silva and Tenreyro, but is roughly consistent with estimates using OLS applied to country data. The coefficients on the state fixed effects show that Florida, New York, and Texas are good at exporting and Montana and South Dakota are not good at exporting, regardless of destination. The coefficients on countries are highest for those in Asia, with Great Britain fifth. The largest trading partners of the United States, Canada and Mexico, are not in the top five.

The estimates in table 2 show the importance of distance on the pattern of state exports and reenforce the facts about states that are good at exporting and the appeal of destinations. A 1% change in distance corresponds to a $1.13 million change in bilateral exports.

Fact 15. *Distance is an important feature in state export volumes.*

Table 2 is not capable of accounting for *how much* a state's location within the United States affects the destinations it exports to and the volume it exports there. To see the importance of state location *within the United States*, it would be useful to repeat the estimation of (11) replacing $d(s,c)$ with $d(s,us)+d(us,c)$. This would effectively force all states to ship their exports to the center of the United States (Phelps, Missouri), then abroad. Unfortunately, the exporter fixed effect accounts for state distance to the center of the United States and the importer fixed effect account for distance from the United States to the destination. Thus to get estimates to compare with $d(s,c)$, the regressions must be re-run without the fixed effects.

Though losing the fixed effects causes a missing variable bias, the problem is moot because all that is needed is the relative explanatory power of the state-destination distance over the US-destination and state-US distances. I report the adjusted R^2 using OLS on a log-linearized (10) and compare. I use OLS here because I am not interested in the estimates, but only a comparison of goodness-of-fit statistics. Nonetheless, table 3 reports the estimates as well as the goodness-of-fits.

The first column of table 3, uses the state-country distance $d(s,c)$. The second column replaces this with distance from the United States to the country, $d(us,c)$. The adjusted R^2 from the state-destination distance model is 0.687 and it is 0.680 from the US-destination distance model. Thus there is a 0.7% increase in explanatory power, indicating that that state location within the United States is not important for the pattern of exports.

Fact 16. *Location within the United States does not matter for the pattern of state exports.*

The third column in table 3 shows the estimates for $d(s,us)+d(us,c)$. Table 3 reports a positive sign on the state-United States distance. Though the estimate is biased from missing variables and heteroskedasticity before taking logs, the positive sign does indicate the following fact.

Fact 17. *Border states export more than interior states, controlling for size.*

Therefore the results indicate that though state location within the United States is not important for state exports, location on the border is important.

Table 3. Importance of location within the U.S.

Variable	Est.	se	Est.	se	Est.	se
$\log d(s,c)$	$-1.30*$	(0.04)	–	–	–	–
$\log d(us,c)$	–	–	$-1.18*$	(0.04)	$-1.19*$	(0.04)
$\log d(s,us)$	–	–	–	–	$0.38*$	(0.03)
$\log TVS(s)$	$1.18*$	(0.02)	$1.12*$	(0.02)	$1.28*$	(0.02)
$\log GDP(c)$	$1.08*$	(0.01)	$1.08*$	(0.04)	$1.08*$	(0.01)
Cons.	$-11.99*$	(0.39)	$-13.23*$	(0.40)	$-16.58*$	(0.47)
AIC	28455		28618		28483	
$\hat{R}^2$	0.687		0.680		0.686	

Notes: Uses OLS without fixed effects. Robust standard errors in parenthesis. $N = 7205$. AIC is the Aikaike information criterion. $\hat{R}^2$ is the adjusted R^2.

* indicates significance at the 95% level.

The models from left to right:

$$\log X(s,c) = Cons. + \beta_1 \log TVS(s) + \beta_2 \log GDP(c) + \beta_3 \log d(s,c) + \varepsilon(s,c)$$

$$\log X(s,c) = Cons. + \beta_1 \log TVS(s) + \beta_2 \log GDP(c) + \beta_3 \log d(us,c) + \varepsilon(s,c)$$

$$\log X(s,c) = Cons. + \beta_1 \log TVS(s) + \beta_2 \log GDP(c) + \beta_3 \log d(us,c) + \beta_4 d(s,us) + \varepsilon(s,c).$$

5 Bits & Pieces Put Together to Present a Semblance of a Whole[6]

The OM data are unique export data due to their relative disaggregation while providing destination information. This additional information allows for identification of geographic traits of exporting states and state-NAICS as well as characteristics of destinations that cannot be achieved with other export data. Sections 3 considers the data using empirical methods commonly found in firm-level analysis whereas section 4 uses methods commonly found in county-level studies. Combining the results gives a connected framework for the pattern of state exports.

The results are a list of seventeen stylized facts on the behavior and pattern of state exports. State-NAICS export a small fraction of their sales (11.81%) and to a fraction of possible destinations (40.25%). Each additional destination has 6.22 fewer state-NAICS exporting to it regardless of its characteristics or popularity. Some states such as New York are relatively good at exporting compared to their total shipments, industrial mix, and distance to destinations, both in terms of location quotients and in terms of counts of maximum location quotients by destination. Some states such as Montana are not. However every state specializes in exporting some manufacturing good to some destination. Exporting is an extremely concentrated activity compared to manufac-

[6]Sculpture by Lawrence Weiner, Walker Art Center, Minneapolis Minnesota (1991).

turing employment. Domestic sales are positively correlated with the number of destinations (0.65) and the exoticness of destinations (0.88). The same is true for mean exports and the number of destinations (0.44). Exporting state-NAICS adjust to destination characteristics primarily on the intensive margin and there is evidence of a hierarchy of destinations in probability.

However, the facts suggest distance within the United States matters insofar as location to the ocean is concerned. For example, though Washington is much further away from France than either New York or South Dakota, Washington is a better exporter to France than South Dakota because of its location on the water. I show that border states are relatively specialized exporters who export more to each foreign destinations, as well as exporting to more foreign destinations, than their size and locations predict. Furthermore, I show evidence of the geographic concentration of exports, that distance significantly matters for the volume of state exports, and export volumes increase as states locate away from the interior. But distance to the center of the United States does not dramatically increase the explanatory power of the model.

This paper documents stylized facts about the pattern of U.S. state exports to foreign countries. I do not offer any explanations for these facts here, though any theory of state exports should account for them. Given some state facts do not match the firm export theory in Eaton et al. (2010), a modified or more nuanced theory of trade is needed.

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Appendices

In addition to the appendices below, there is an online appendix with some data (OM is proprietary), SAS code, and nonessential tables. This appendix is available at http://www.ses.wsu.edu/People/faculty/Cassey/Webpage/.

A Data

A brief description of the origin of movement (OM) state export data is in section 2. Cassey (2009) gives a detailed description including diagnostic assessments of quality. Information about WISER is available from `http://www.wisertrade.org/home/index.jsp`.

Export data on agriculture and mining are not reliable in indicating the production state. Though these sectors are important for many interior states, their omission does not change the reported implications because LQs account for the industrial mix of a state. One may argue that there are spillover effects to exporting so eliminating agriculture and mining affects manufacturing exports. This is mistaken for several reasons. For one, agriculture and mining are dropped due to consolidation at ports of exit. Consolidation occurs when a freight forwarder (rather than the original producer) is the exporter of record. Hence no business ties are established between the production state and the destination. Also if any spillovers effects are present, then the data would include it without the omitted sectors.

Exporting establishment count data are from *A Profile of U.S. Exporting Companies, 2003-2004* (Census 2006) and, along with the same publication dating back to 1996, are available for download from `http://www.census.gov/foreign-trade/aip/index.html\#announcements`. Exporter profiles are compiled by the Census using survey data as well as export documents and administrative records of various government agencies. Data are from table 6 which gives the total value of all exports including agriculture and mining to all 242 destinations. Thus the OM sales differ from the values in the paper. The number of exporters are the number of establishments that export in all NAICS including agriculture, mining, and wholesalers. *A Profile of U.S. Exporting Companies, 2003-2004* does not list the total number of establishments, however. These data are obtainable from *County Business Patterns* `http://www.census.gov/epcd/cbp/view/cbpview.html`. They are compiled by the Census from the *Business Registrar*, the Annual Company Organization Survey, and the Economic Census. The number of establishments is broken down by NAICS, but I use the state totals for all NAICS because that is what is given in*A Profile of U.S. Exporting Companies*.

Data on nominal GDP (in $US Billions) are from "World Economic Outlook Database" of the International Monetary Fund, `http://www.imf.org/external/pubs/ft/weo/2006/01/data/index.htm`. The database is updated semi-annually. The data used here are from the April 2006 update. The database contains 2003 data for 180 countries including the United States. There are fewer countries in earlier years.

Data on the total value of manufactured shipments (TVS) for each state-NAICS pair are from *Exports From Manufacturing Establishments: 2003* (Census 2007). The same data are also available from the Annual Survey of Manufactures, Geographic Areas Statistics, `http://www.census.gov/econ/overview/ma0300.html`. There are numerical discrepancies between the two publications.

TVS is measured by survey at the plant of production. Some observations are not disclosed because of privacy concerns. The edited data are about 1% of the TVS of the U.S. but about 16.5% of state-NAICS observations. I estimate nondisclosed observations in a two step procedure in which the value added share (gross state product by manufacturing subsector calculated from income by the BEA, `http://www.bea.gov/bea/regional/gsp/`) of each state is applied to each missing observation and multiplied by the state TVS (reported for all states). This results in a 0.5%

(low billions) discrepancy between U.S. TVS (less D.C.) and the constructed TVS. The second step allocates this by finding the state discrepancy and splitting that across the missing observations. There is a missing observation in the BEA value added data for OR-315 and NV-331. The second step takes care of these observations. Another problem is that for some states, the sum of the estimates is greater than the reported state totals. This is due to differences between GSP shares and TVS shares. When this occurs, some shipments are deducted from each of the estimated observations so the sum across NAICS matches the reported state total. The TVS estimates are negative for MD-324 and VT-324. . I make these estimates zero.

Domestic sales are the difference between TVS and the OM data where the OM data is multiplied by 0.857 regardless of state or subsector. This factor is an eyeball approximation. Constructing a more careful conversion rate involves creating at least as many errors as this eyeball. The complications arise from using conversion rates for 6-digit IO codes that are published in *Benchmark Input-Output Accounts of the United States 1997* (Lawson, Bersani, Fahim-Nader, and Jieman 2002). The benchmark accounts find the conversion rate as the ratio between producer prices and consumer prices. I did not use these conversions for three reasons. First, the IO codes do not match well with 3-digit NAICS codes. Second, the edition of the conversion rates, is 7 years older than the TVS and OM data. Third, conversion rates do not apply to states, thus inland freight costs are not appropriately adjusted.

In seven cases in 2003 domestic sales are less than zero. Of those seven, three use actual data and four use my estimates. I eliminate these seven observations in exercises where domestic sales are needed, but use them in the remaining exercises.

Great circle distance data are calculated by the author using the coordinates of capital and major cities from CEPII (Centre d' Etudes Prospectives et d' Information Internationales), `www.cepii.fr/anglaisgraph/bdd/distances.htm` and the CIA World Factbook, `www.cia.gov/library/publications/the-world-factbook/`. States and United States population centroids represent the coordinate that would balance the area if everyone in that area is the same physical weight. These data for U.S. states are from the American Congress on Surveying and Mapping, `www.acsm.net/statecenters`, which uses 2000 Census data for the distribution of people in each state. The population centroid of the United States is available from `www.noaanews.noaa.gov/stories/s636.htm`.

Table 4. NAICS (1997-present) and SIC (1987-2000) subsectors in the OM series

NAICS	SIC	AR-1	Description
111	01	—	Agricultural products
112	02	—	Livestock and livestock products
113	08	—	Forestry products, NESOI[a]
114	09	—	Fish, fresh, chilled or frozen and other marine products
211	13	—	Oil and gas
212	10,12,14	—	Minerals and ores
311	20	Y	Food and kindred products
312	20,21	Y	Beverages and tobacco products
313	22	Y	Textiles and fabric
314	22,23	Y	Textile mill products
315	22,23	Y	Apparel and accessories
316	31	Y	Leather and allied products
321	24	Y	Wood products
322	26	Y	Paper
323	27	Y	Printing, publishing, and similar products
324	29	Y	Petroleum and coal products
325	28	Y	Chemical
326	30	Y	Plastics and rubber products
327	32	Y	Nonmettalic mineral products
331	33	Y	Primary metal manufacturing
332	34,35	Y	Fabricated metal products, NESOI[a]
333	35	Y	Machinery, except electrical
334	35,36,38	Y	Computer and electronic products
335	36	Y	Electrical equipment, applicances, and components
336	37	Y	Transportation equipment
337	25	Y	Furniture and fixtures
339	38,39	Y	Miscellaneous manufactured commodities
511	27	—	Prepackaged software[b]
910	91	—	Waste and scrap[c]
920	92	—	Used or second-hand merchandise[c]
980	93	—	Goods returned to Canada[c]
990	95,99	—	Special classication provisions, NESOI[a,c]

Source: Descriptions are from WISER who adjusts descriptions to reflect export goods as in schedule B, not all commodities in the category.

Notes: Y under the AR-1 column denotes the subsector is available in AR-1, subject to disclosure concerns; Since concordance between 2002 NAICS and 1987 SIC at this level of aggregation is not exact, descriptions for NAICS and SIC may differ slightly.

[a]NESOI is a standard acronym for "not elewhere specified or included."

[b]511 is Publishing Industries which is mostly non-tradeables. However, 511 does contain one tradeable good, prepackaged software.

[c]These represent schedule B codes that do not have NAICS or SIC classifications. The Foreign Trade Division of the Census has created "trade-related" NAICS and SIC to handle such goods. These codes do not appear in a regular list of NAICS or SIC published by the Census.

Table 5. Foreign Destinations

Destination	Code	GDP (Billions)	Distance (Miles)
Afghanistan	AFG	4.585	7303
Albania	ALB	5.652	5484
Algeria	DZA	68.013	4958
Angola	AGO	13.825	7414
Antigua	ATG	0.754	2306
Argentina	ARG	127.643	5439
Armenia	ARM	2.768	6389
Australia	AUS	527.042	9112
Austria	AUT	256.662	5049
Azerbaijan	AZE	7.276	6525
Bahamas, The	BHS	5.502	1217
Bahrain	BHR	9.697	7397
Bangladesh	BGD	54.167	8195
Barbados	BRB	2.745	2608
Belarus	BLR	17.823	5157
Belgium	BEL	310.521	4502
Belize	BLZ	0.981	1427
Benin	BEN	3.565	6195
Bhutan	BTN	0.595	7931
Bolivia	BOL	8.100	4287
Bosnia-Hercegovina	BIH	7.228	5316
Botswana	BWA	7.765	8721
Brazil	BRA	505.535	4666
Brunei	BRN	4.863	9028
Bulgaria	BGR	19.974	5554
Burkina Faso	BFA	4.300	5709
Burundi	BDI	0.595	8043
Cambodia	KHM	4.349	8866
Cameroon	CMR	13.630	6780
Canada	CAN	870.477	986
Cape Verde	CPV	0.814	4416
Central African Republic	CAF	1.198	7133
Chad	TCD	2.671	6595
Chile	CHL	73.374	5105
China	CHN	1640.966	6785
Colombia	COL	79.459	2517
Comoros	COM	0.316	9140
Congo (Brazzaville)	COD	5.681	7336
Congo (Kinshasa; Zaire)	COG	3.571	7329
Costa Rica	CRI	17.491	1975
Côte d'Ivoire	CIV	13.764	5743
Croatia	HRV	28.812	5138
Cyprus	CYP	13.191	6301
Czech Republic	CZE	90.602	4900
Denmark	DNK	214.269	4616
Djibouti	DJI	0.622	7957
Dominica	DMA	0.258	2417
Dominican Republic	DOM	16.459	1878
Ecuador	ECU	27.201	2755
Egypt	EGY	81.384	6487
El Salvador	SLV	14.941	1669
Equatorial Guinea	GNQ	2.825	6638
Eritrea	ERI	0.575	7576
Estonia	EST	9.185	4819

Destination	Code	GDP (Billions)	Distance (Miles)
Ethiopia	ETH	7.942	7905
Fiji	FJI	2.239	6966
Finland	FIN	162.621	4793
France	FRA	1794.389	4491
Gabon	GAB	6.080	6816
Gambia, The	GMB	0.353	4849
Georgia	GEO	3.984	6309
Germany	DEU	2446.432	4766
Ghana	GHA	7.624	6071
Greece	GRC	174.320	5793
Grenada	GRD	0.444	2565
Guatemala	GTM	24.738	1596
Guinea	GIN	3.630	5061
Guinea-Bissau	GNB	0.236	4968
Guyana	GUY	0.746	3002
Haiti	HTI	2.957	1770
Honduras	HND	6.866	1656
Hong Kong	HKG	158.473	7966
Hungary	HUN	83.100	5177
Iceland	ISL	10.802	3317
India	IND	575.330	7802
Indonesia	IDN	237.468	9967
Iran Islamic Republic	IRN	133.750	6850
Ireland	IRL	157.295	4022
Israel	ISR	110.457	6516
Italy	ITA	1511.141	5168
Jamaica	JAM	8.008	1638
Japan	JPN	4237.073	6391
Jordan	JOR	10.160	6567
Kazakhstan	KAZ	30.860	6215
Kenya	KEN	15.036	8329
Kiribati	KIR	0.063	6437
Korea (South)	KOR	608.146	6684
Kuwait	KWT	46.202	7129
Kyrgyzstan	KGZ	1.921	6805
Laos	LAO	2.138	8479
Latvia	LVA	11.186	4914
Lebanon	LBN	19.895	6448
Lesotho	LSO	1.153	8955
Libya	LBY	23.396	5587
Lithuania	LTU	18.687	5053
Luxembourg	LUX	27.090	4614
Macedonia	MKD	4.583	5516
Madagascar	MDG	5.464	9672
Malawi	MWI	1.765	8743
Malaysia	MYS	103.952	9488
Maldives	MDV	0.691	9396
Mali	MLI	4.418	5354
Malta	MLT	4.759	5511
Mauritania	MRT	1.330	4701
Mauritius	MUS	5.179	10240
Mexico	MEX	639.109	1339
Moldova	MDA	1.981	5535
Mongolia	MNG	1.274	6414

Table 5 continued

Destination	Code	GDP (Billions)	Distance (Miles)
Morocco	MAR	43.813	4591
Mozambique	MOZ	4.880	9125
Myanmar	MMR	8.559	8639
Namibia	NAM	4.473	8164
Nepal	NPL	5.873	7917
Netherlands, The	NLD	538.669	4470
Netherlands Antilles	ANT	3.002	2264
New Zealand	NZL	79.265	8116
Nicaragua	NIC	4.147	1802
Niger	NER	2.736	5860
Nigeria	NGA	57.564	6317
Norway	NOR	222.892	4403
Oman	OMN	21.698	7788
Pakistan	PAK	89.776	7414
Panama	PAN	12.933	2130
Papua New Guinea	PNG	3.584	8311
Paraguay	PRY	5.524	4882
Peru	PER	60.787	3572
Philippines	PHL	79.202	8245
Poland	POL	216.539	5031
Portugal	PRT	155.515	4322
Qatar	QAT	23.604	7482
Romania	ROU	59.506	5571
Russia	RUS	431.429	5333
Rwanda	RWA	1.684	8017
Samoa (Western)	WSM	0.284	7148
São Tomé & Príncipe	STP	0.059	6677
Saudi Arabia	SAU	214.859	7361
Senegal	SEN	6.422	4758
Serbia & Montenegro	SCG	20.699	3634
Seychelles	SYC	0.703	9363
Sierra Leone	SLE	0.990	5236
Singapore	SGP	92.727	9566
Slovak Republic	SVK	32.665	5080
Slovenia	SVN	28.069	5071
Solomon Islands	SLB	0.228	7614

Destination	Code	GDP (Billions)	Distance (Miles)
South Africa	ZAF	166.170	8879
Spain	ESP	882.667	4519
Sri Lanka	LKA	18.246	9311
St. Kitts & Nevis	KNA	0.369	2257
St. Lucia	LCA	0.716	2499
St. Vincent	VCT	0.372	2529
Sudan	SDN	17.680	7287
Suriname	SUR	1.020	3179
Swaziland	SWZ	1.907	9058
Sweden	SWE	304.854	4640
Switzerland	CHE	322.915	4761
Syrian Arab Republic	SYR	21.416	6497
Taiwan Province	TWN	299.606	7592
Tajikistan	TJK	1.555	7023
Tanzania	TZA	10.284	8503
Thailand	THA	142.920	8797
Timor, East	TLS	0.336	3849
Togo	TGO	1.731	6132
Tonga	TON	0.166	6761
Trinidad & Tobago	TTO	11.540	2650
Tunisia	TUN	25.000	5282
Turkey	TUR	240.596	6032
Turkmenistan	TKM	11.424	6878
Uganda	UGA	6.243	8039
Ukraine	UKR	50.133	5416
United Arab Emirates	ARE	88.536	7617
United Kingdom	GBR	1807.485	4326
Uruguay	URY	11.211	5514
Uzbekistan	UZB	8.885	6853
Vanuatu	VUT	0.276	7493
Venezuela	VEN	83.436	2427
Vietnam	VNM	39.542	8223
Yemen Republic	YEM	11.870	7793
Zambia	ZMB	4.318	8504
Zimbabwe	ZWE	10.515	8748

Sources: GDP from IMF World Outlook Database; Distance based on author's calculations using coordinates from CEPII with supplements from the CIA's World Factbook, and population centroids from the American Congress on Mapping and Surveying.

Notes: GDP in billions of 2003 $U.S.; Distance is great circle miles from U.S. population centroid to either the capital city or the main city (13 cases); OM destinations for which there is no IMF GDP data: Aruba, Andorra, French Southern and Antartic Lands, Bermuda, Cuba, Cocos Islands, Cook Islands, Christmas Island, Cayman Islands, Falkland Islands, Faroe Island, Federated State of Micronesia, Gaza Stip, Gibraltar, Guadeloupe, Greenland, French Guiana, Guam, Heard and McDonald Islands, Indian Ocean Territory (British), Iraq, Iraq-Saudi Arabia Neutral Zone, Liberia, Liechtenstein, Macao, Monaco, Marshall Island, Northern Mariana Islands, Martinique, Mayotte, Nauru, New Caledonia, Niue, Norfolk Island, North Korea, Palau, Pitcairn Island, French Polynesia, Reunion, St. Helena, St. Pierre and Miquelon, San Marino, Somalia, Svalbard Jan & Jan Mayern Islands, Turks and Caico Islands, Tokelau Islands, Tuvalua Islands, Unknown, U.S. Outlying Areas, Vatican City, Virgin Islands (British), Virgin Islands (U.S.), Wallis and Futuna, West Bank, and Western Sahara. Some of the 242 destinations in the OM data are archaic such as USSR, East and West Germany, and Czechoslovakia.

B Supplemental Figures

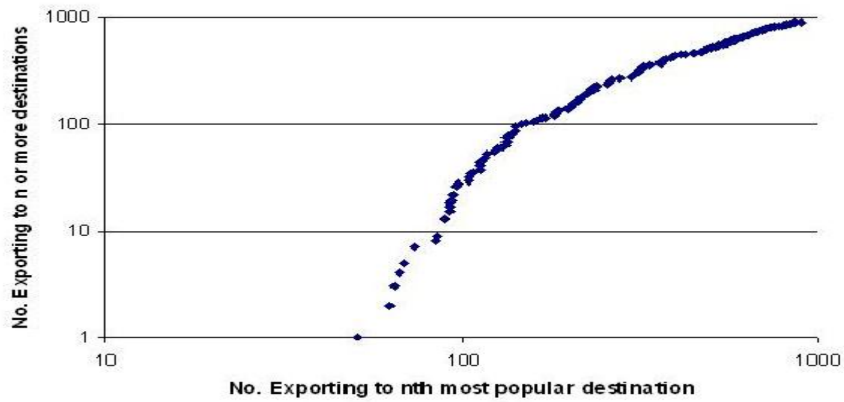


Figure 8. Hierarchy of destinations. The right most point is Canada because it is the 1st most popular destinations and the most state-NAICS export there. As you read to the left and down, destinations become less popular. The scale is in logs so the slope is the elasticity which is clearly not constant and decreasing. The log scale forces the elimination of some observations. Libya is the 179th most popular destinations with 3 state-NAICS exporting there, but 0 state-NAICS export to 179 destinations.

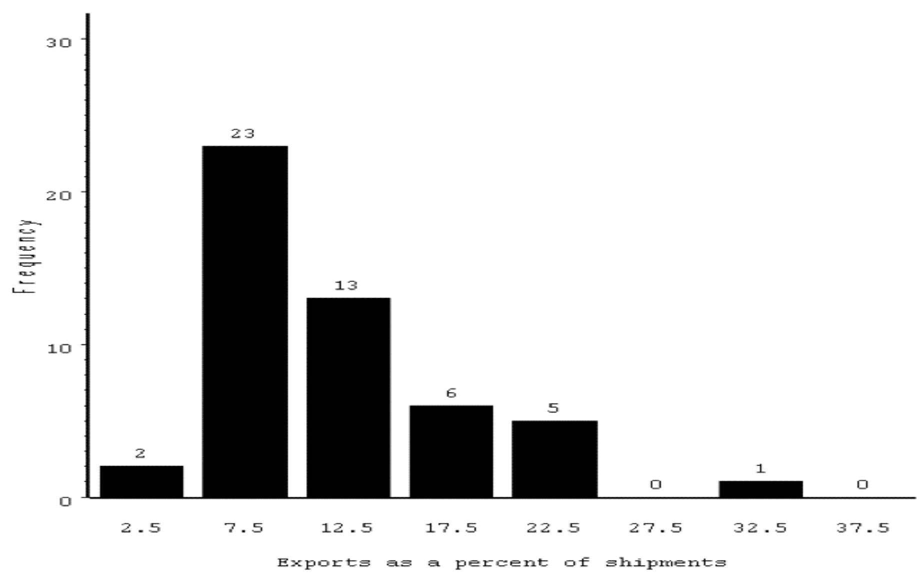
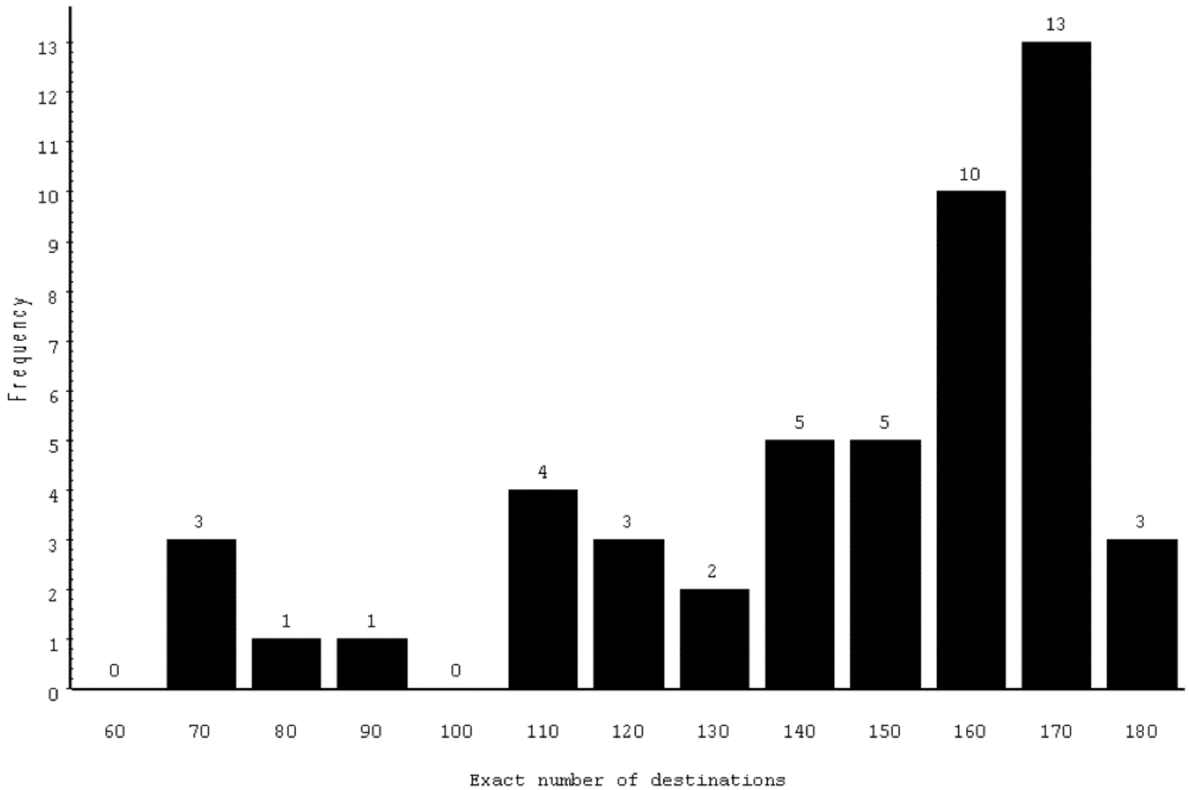


Figure 9. Histogram of exports as percentage of shipments. F.a.s. valued exports are converted to f.o.b. using a conversion rate of 0.857.



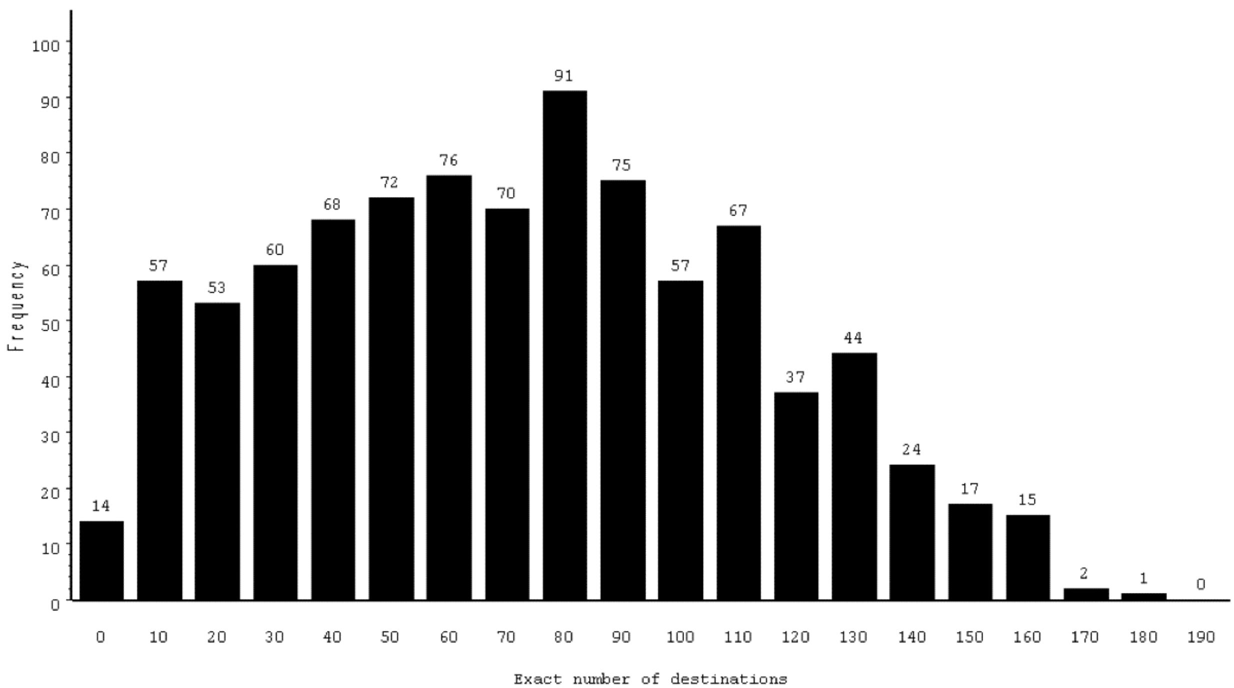


Figure 10. Histogram of states and state-Naics exporting to exactly this many destinations. The upper image is for states; the lower for state-NAICS.

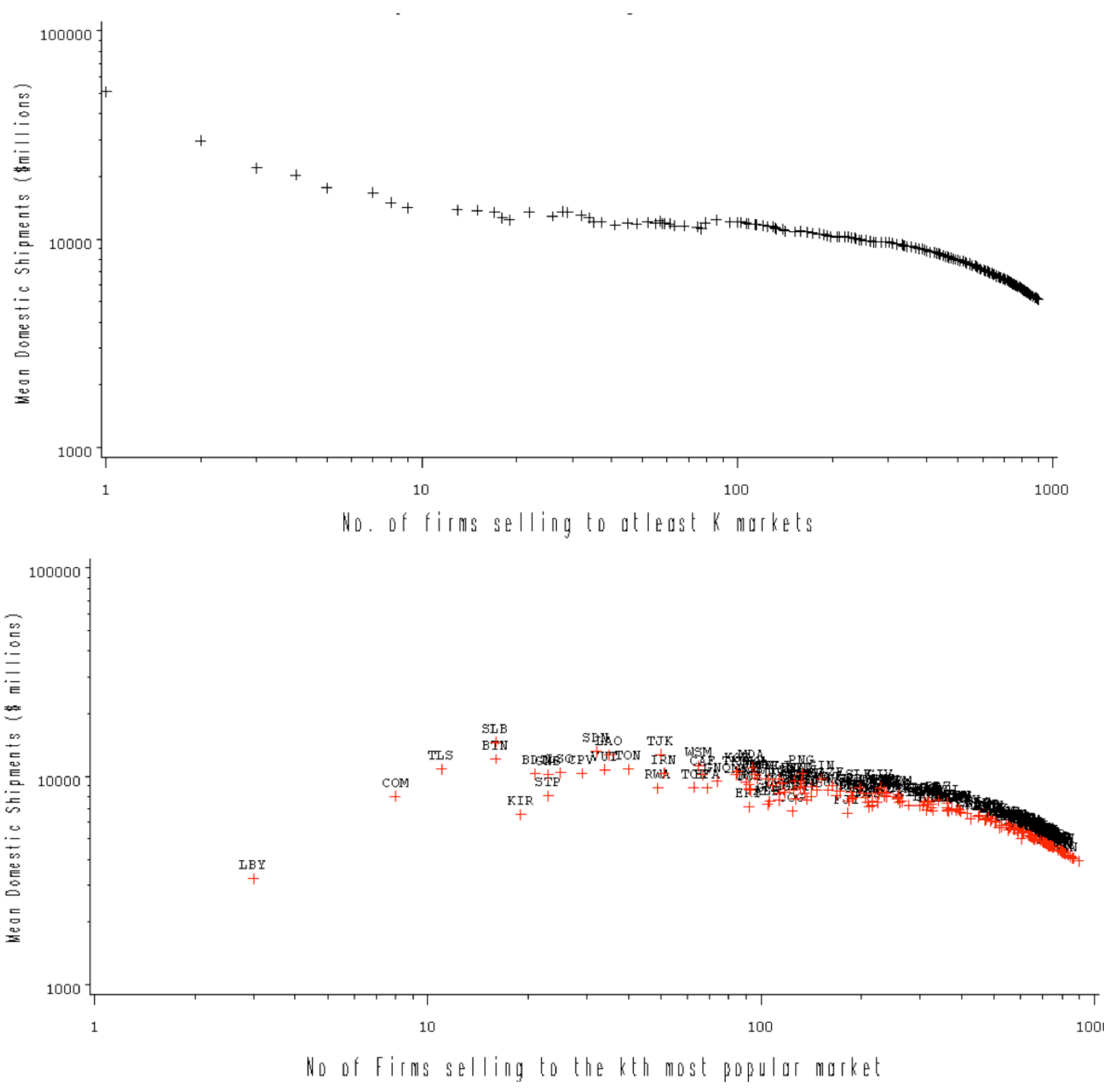


Figure 11. Domestic Sales vs. No. of Exporting State-NAICS. There are 898 state-NAICS and 179 destinations in 162 Bins