

Dissecting Trade: Firms, Industries, and Export Destinations

Author(s): Jonathan Eaton, Samuel Kortum and Francis Kramarz

Source: *The American Economic Review*, Vol. 94, No. 2, Papers and Proceedings of the One Hundred Sixteenth Annual Meeting of the American Economic Association San Diego, CA, January 3-5, 2004 (May, 2004), pp. 150-154

Published by: American Economic Association

Stable URL: <https://www.jstor.org/stable/3592873>

Accessed: 24-03-2019 16:29 UTC

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



JSTOR

American Economic Association is collaborating with JSTOR to digitize, preserve and extend access to *The American Economic Review*

Dissecting Trade: Firms, Industries, and Export Destinations

By JONATHAN EATON, SAMUEL KORTUM, AND FRANCIS KRAMARZ*

We examine the entry behavior of producers in different industries in different export markets using a comprehensive data set of French firms. These data reveal enormous heterogeneity, primarily within industries, in the nature of market penetration. Nonetheless, some striking regularities appear both across and within industries.

The French data add a new dimension to an emerging empirical literature examining international trade at the level of individual producers. James Tybout (2003) provides a survey. This work has shown that: (i) exporters are in the minority; (ii) they tend to be more productive and larger; and yet (iii) they usually export only a small fraction of their output.

The findings that most firms do not export while those that do sell most of what they make at home suggest substantial barriers to exporting. Theories of producer export behavior have suggested either standard “iceberg” costs (e.g., Andrew Bernard et al., 2003), or fixed costs (e.g., Mark Roberts and Tybout, 1997; Marc Melitz, 2003), as explanations.

Up to now our knowledge of the export behavior of individual producers has been limited to knowing whether or not they export and how much they sell abroad if they do. Without data on where producers sell it is hard to untangle the nature of trade costs or whether they apply

simply to exporting at all or to entering individual foreign markets.

I. The French Data

The French data, in indicating where French firms export, are particularly enlightening on these issues. They suggest a world in which national markets are highly fragmented, and in which both fixed and unit costs of export play a role in separating them. Rather than pursuing a particular explanation of firm export penetration, our purpose here is to establish some key features of the data that any successful model of trade and market structure must confront.

Pierre Biscourp and Kramarz (2002) describe how the French firm-level data are constructed by merging customs and tax-administration data sets. French customs records exports of French firms to each of over 200 destinations. We use 1986 data. Table 1 presents our industry classification and compares features of the French firm data with U.S. plant-level data taken from Bernard and J. Bradford Jensen (1995). Since the U.S. data exclude the smallest plants, while the French data are virtually exhaustive, there are more French producers, especially in light industries such as food and tobacco products. But there are strong underlying similarities between the two countries, not only in overall export participation, but also in the pattern across industries.

II. Dissection 1: Markets per Firm

Having seen the similarity between the French and U.S. data in terms of overall export activity, we now look at the dimension unique to the French data: where individual firms sell. Table 2 presents, for each of our 16 industries, the fraction of exporting firms shipping to exactly one destination, to 10 or more, and to 50 or more. In each case, we report the fraction of total exports that such firms represent. To summarize, across industries, the modal exporter ships to only one foreign destination (most often Belgium), whereas exports by the small fraction

* Eaton: Department of Economics, New York University, 269 Mercer Street, New York, NY 10003, and NBER (e-mail: jonathan.eaton@nyu.edu); Kortum: Department of Economics, University of Minnesota, 1035 Heller Hall, 271 19th Avenue South, Minneapolis, MN 55455, Federal Reserve Bank of Minneapolis, and NBER (e-mail: kortum@econ.umn.edu); Kramarz: CREST-INSEE, 15 Bd. Gabriel Peri, Malakoff 92245, France CEPR, and IZA (e-mail: kramarz@ensae.fr). Eaton and Kortum gratefully acknowledge the support of the National Science Foundation. Any opinions expressed are those of the authors and not those of the Federal Reserve System, INSEE, the NBER, or the NSF. The data underlying the aggregate numbers we present here are confidential, but their access is not restricted to the authors. For further information contact CREST at the address above. We thank David Hummels for comments.

TABLE 1—PRODUCER EXPORT PARTICIPATION,
FRANCE VS. UNITED STATES

SIC	Industry	Number of producers			
		France	USA		
20, 21	Food and tobacco products	59,637	11,887		
22, 23	Textiles and apparel	24,952	17,456		
24, 25	Lumber and furniture	29,196	22,518		
26	Paper and allied products	1,757	4,512		
27	Printing and publishing	18,879	27,842		
28	Chemicals, etc.	3,901	7,312		
30	Rubber and plastics	4,722	8,758		
31	Leather and leather products	4,491	1,052		
32	Stone, clay, glass, and concrete	9,952	10,292		
33	Primary metal industries	1,425	4,626		
34	Fabricated metal products	25,923	21,940		
35	Machinery and computer equipment	17,164	27,003		
36	Electronic and electrical equipment	9,382	9,525		
37	Transportation equipment	3,786	5,439		
38	Instruments, etc.	7,567	4,232		
39	Miscellaneous manufacturing	11,566	7,254		
	Manufacturing (ex. petroleum refining)	234,300	191,648		
SIC	Industry	Percentage that export		Percentage exported	
		France	USA	France	USA
20, 21		5.5	13.1	11.9	5.8
22, 23		24.1	6.2	22.0	4.6
24, 25		12.1	6.7	9.9	8.8
26		45.3	18.0	18.4	8.7
27		15.1	2.9	4.3	3.2
28		55.4	30.3	27.4	12.0
30		44.3	22.2	24.3	6.5
31		26.3	17.0	19.3	11.6
32		16.3	9.0	16.7	7.0
33		52.8	22.1	27.7	4.0
34		16.8	15.2	13.1	7.5
35		26.8	19.6	27.7	13.9
36		30.2	34.6	21.6	11.5
37		32.9	23.5	28.7	12.9
38		13.3	43.1	32.7	15.5
39		21.0	13.0	22.4	7.3
Manuf. ^a		17.4	14.6	21.6	10.3

Notes: U.S. figures are for 1987, derived from Bernard and Jensen (1995). French figures are for 1986, based on customs and Bénéfices Réel Normal (BRN)-Système Unifié de Statistiques d'Entreprises (SUSE) data sources. Percentage exported is exports of the industry as a percentage of exporting producers' sales.

^a Manufacturing (ex. petroleum refining).

TABLE 2—PENETRATION OF EXPORT MARKETS
BY FRENCH FIRMS

SIC	Percentage of firms exporting to:		
	Exactly 1 market	Ten or more markets	Fifty or more markets
20, 21	36.2 (1.8)	18.4 (78.5)	1.6 (35.9)
22, 23	26.8 (1.4)	24.9 (83.8)	0.4 (19.9)
24, 25	50.6 (5.4)	4.8 (45.4)	0.0 (0.0)
26	25.4 (0.2)	24.6 (89.9)	1.0 (30.2)
27	46.8 (2.8)	9.1 (61.1)	0.6 (23.4)
28	19.6 (0.1)	38.4 (96.9)	6.2 (69.1)
30	30.9 (1.1)	18.1 (91.4)	0.9 (54.9)
31	29.5 (1.2)	21.3 (83.5)	0.8 (30.8)
32	47.4 (2.2)	12.6 (89.3)	1.3 (57.1)
33	23.0 (0.1)	25.1 (81.1)	2.4 (40.3)
34	41.9 (3.0)	13.1 (71.7)	0.5 (19.3)
35	30.6 (0.5)	26.1 (93.5)	2.5 (58.8)
36	29.7 (0.3)	23.3 (94.1)	2.8 (58.9)
37	28.9 (0.1)	24.2 (96.0)	2.3 (65.1)
38	27.3 (1.1)	30.0 (90.9)	2.7 (42.5)
39	34.8 (1.9)	17.5 (82.5)	0.8 (24.2)
Manuf. ^a	34.5 (0.7)	19.7 (89.6)	1.5 (51.6)

Notes: French figures are for 1986, based on Customs and BRN-SUSE data sources. Numbers in parentheses report the percentages of exports represented by each class of firm. See Table 1 (top panel) for explanations of SIC codes.

^a Manufacturing (ex. petroleum refining).

of firms that ship widely constitute a substantial share of total exports.

Looking at all of manufacturing, Figure 1 plots the frequency with which firms serve different numbers of markets, including France itself (so that nonexporters appear as having one market). The frequency with which more markets are served declines smoothly and monotonically to the point where at most a single firm serves a very large number. Overall, the elasticity of the number of firms with respect to the number of markets is roughly -2.5 .

The qualitative pattern is very much replicated industry-by-industry, although there are distinct differences in the extent to which the frequency declines with number of markets. Figure 2 reports patterns for four industries that reflect the gamut: food and tobacco, lumber and furniture, chemicals, and electronic and electrical equipment. (To make the plots more comparable across industries, frequency here is in terms of the fraction of firms in the industry rather than firm count, with the fractions

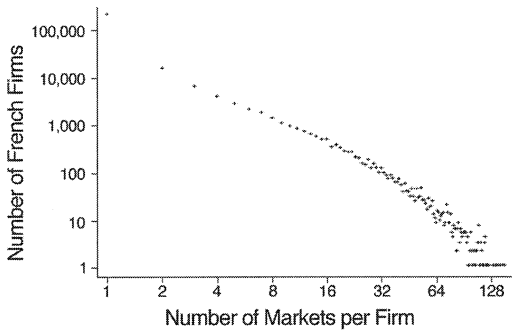


FIGURE 1. ENTRY OF FRENCH FIRMS

grouped by intervals of 10 markets for market numbers exceeding 40.) Looking across all 16 industries, the decline is most precipitous in light industries such as lumber and furniture, paper, and textiles and apparel and least so in heavy industries such as chemicals and in high-tech industries such as machinery and computer equipment.

III. Dissection 2: Firms per Market

Having looked at the number of destinations across firms we now examine the number of firms across destinations. In order to match the French firm data to a measure of a destination's market size we aggregate to 113 countries, including France. Our measure of market n 's size is its absorption, X_n , defined as gross production plus imports minus exports (in billions of U.S. dollars).¹

A standard approach to modeling bilateral trade volumes is the gravity equation, which relates exports from i to n , X_{ni} , to the market sizes of n and i and measures of the geographic barriers between them, such as distance d_{ni} , for example,

¹ Total exports and imports are from Robert Feenstra (2000). Gross production is from United Nations Industrial Development Organization (2001), available at the industry level for 86 countries. For the remainder we use value added in manufacturing from the World Bank (2000), translating it to gross production as described in a supplement available on the American Economic Review web site (<http://www.aeaweb.org/aer/contents/>), which also reports the destinations, along with each destination's total manufacturing absorption, French market share, number of French exporters, and average sales per French firm.

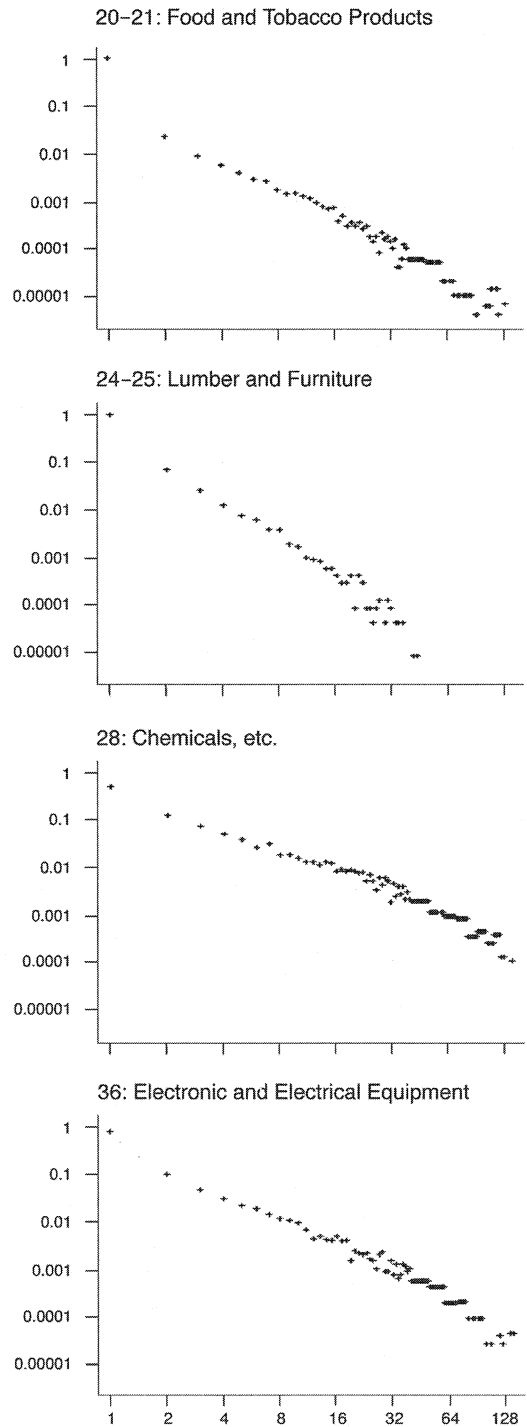


FIGURE 2. ENTRY OF FRENCH FIRMS IN FOUR INDUSTRIES (FRACTION IN INDUSTRY VS. NUMBER OF MARKETS)

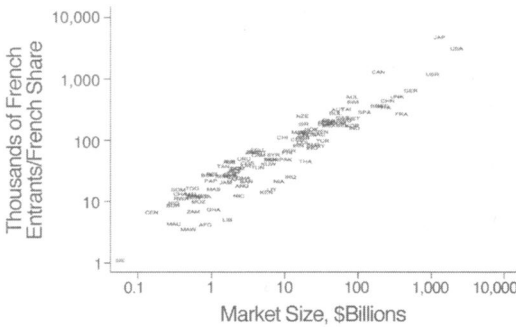


FIGURE 3. ENTRY AND MARKET SIZE

$$X_{ni} = \kappa \frac{X_i X_n}{d_{ni}}$$

(where κ is a constant reflecting units of measurement). In our situation the source is always France (so $i = F$), while we can summarize the role of geographic barriers with France’s market share, λ_{nF} , giving us the following identity:

$$X_{nF} \equiv \lambda_{nF} X_n.$$

With our firm data we obtain an additional identity relating X_{nF} to firm behavior:

$$X_{nF} \equiv N_{nF} \bar{x}_{nF}$$

where N_{nF} is the number of French firms selling in destination n and \bar{x}_{nF} is the average sales per firm there.²

Figure 3 depicts a striking relationship among the three elements of these two decompositions. On the horizontal axis is the market size measure X_n . On the vertical axis is the number of French exporters divided by French market share (N_{nF}/λ_{nF}).³ When normalized by French market share, the number of French firms selling increases systematically with market size, but with an elasticity less than 1.

Another way to present this relationship is in terms of a regression of $\ln N_{nF}$ on $\ln \lambda_{nF}$ and \ln

X_n , yielding the following coefficients (with robust standard errors):

$$\ln N_{nF} = 9.088 + 0.875 \ln \lambda_{nF} + 0.617 \ln X_n$$

(0.150) (0.030) (0.021)

The R^2 is 0.903.⁴ The implication is that, given market size, a higher French market share in a destination typically reflects 88 percent more firms selling there and 12 percent more sales per firm. Given market share, sales to a larger market reflect 62 percent more firms and 38 percent more sales per firm.

To what extent does this pattern of entry differ for individual industries? We pursued this question in a number of directions, all of which gave the same answer: not much. For example, we decomposed France’s exports to destination n in industry s , X_{nF}^s , into (i) French market share, λ_{nF} , (ii) absorption, X_n (both at the level of total manufacturing), and (iii) the “industry bias” of French exports to market n , $B_{nF}^s = X_{nF}^s/X_{nF}$, as well as into the number of French firms in industry s selling in market n , N_{nF}^s , and their average sales there, \bar{x}_{nF}^s , yielding

$$\lambda_{nF} X_n B_{nF}^s \equiv X_{nF}^s \equiv N_{nF}^s \bar{x}_{nF}^s.$$

Extending our procedure above, we regressed $\ln N_{nF}^s$ on $\ln \lambda_{nF}$, $\ln X_n$, and $\ln B_{nF}^s$ for each industry. While the differences in coefficients are statistically significant, the magnitudes of the differences are small with no clear economic significance. Hence, we report a pooled regression (with robust standard errors in parenthesis, allowing for clustering by industry).⁵

$$\ln N_{nF}^s = 7.442 + 0.826 \ln \lambda_{nF}$$

(0.258) (0.023)

$$+ 0.585 \ln X_n + 0.418 \ln B_{nF}^s$$

(0.019) (0.051)

The R^2 is 0.837. Adding industry indicators has

² For a foreign destination n , X_{nF} is the sum across firms of exports there. When n is France, it is the sum across firms of domestic sales. All measures are translated into billions of U.S. dollars.

³ If French firms sell on average the same amount as other firms to destination n , then N_{nF}/λ_{nF} indicates the total number of firms selling there.

⁴ Of course, because of the identity connecting the variables, a regression of $\ln \bar{x}_{nF}$ on $\ln \lambda_{nF}$ and $\ln X_n$ yields coefficients of exactly 1 minus the ones reported above.

⁵ With 16 sectors and 113 destinations we have 1,808 observations. For 38, both X_{nF}^s and N_{nF}^s are zero. We dropped these observations.

virtually no effect on these coefficients and raises the R^2 to only 0.894. More importantly, to show that industry is not the essential element explaining entry, the R^2 of the regression with only industry indicators is 0.150, whereas a regression that only includes country indicators has an R^2 of 0.744. Our account of entry, which includes only three variables, is therefore both powerful and parsimonious.

IV. Conclusion

We have reviewed initial evidence on the nature of market penetration by individual firms in different industries across national markets. At the level of overall manufacturing several features stand out: (i) There is enormous heterogeneity across firms in the extent of their export participation, with most selling only at home. (ii) The number of firms selling to multiple markets falls off with the number of destinations with an elasticity of -2.5 . (iii) Variation in French exports across destinations represents differences in the number of French firms selling there much more than the amount that each one sells. (iv) Decomposing French exports to each destination into the size of the market and French share, variation in market share translates nearly completely into firm entry, while about 60 percent of the variation in market size is reflected in firm entry.

Qualitatively, these features are very much replicated within two-digit industries, suggesting that differences across industries have surprisingly little to do with them. Across industries, larger markets are served by more firms. Presumably consumers benefit from more variety or more competition. A policy implication is that a potentially important welfare gain from market integration is the entry of firms.

Eaton et al. (2003) develop a Ricardian model with imperfect competition, transport costs, and destination-specific fixed costs of market entry to explain these qualitative features of the data. In that paper, we pursue a structural estimation of the model at the level of overall manufacturing, finding that it can pick up aggregate patterns quite well. Our examination of the industry-level data suggests that the

qualitative implications of the model survive looking within industries, in particular, the enormous heterogeneity across individual firms and the fragmentation of the world market.

REFERENCES

- Bernard, Andrew B.; Eaton, Jonathan; Jensen, J. Bradford and Kortum, Samuel.** "Plants and Productivity in International Trade." *American Economic Review*, September 2003, 93(4), pp. 1268–90.
- Bernard, Andrew B. and Jensen, J. Bradford.** "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976–1987." *Brookings Papers on Economic Activity*, Microeconomics 1995, pp. 67–119.
- Biscourp, Pierre and Kramarz, Francis.** "French Firms and International Trade: A Descriptive Analysis of the Period 1986–1992." Working paper, Centre de Recherche en Économique et Statistique, Malakoff, France, 2002.
- Eaton, Jonathan; Kortum, Samuel and Kramarz, Francis.** "An Anatomy of International Trade: Evidence from French Firms." Unpublished manuscript, New York University, 2003.
- Feenstra, Robert C.** "World Trade Flows, 1980–1997." Unpublished manuscript, University of California–Davis, 2000.
- Melitz, Marc.** "The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity." *Econometrica*, November 2003, 71(6), pp. 1695–1725.
- Roberts, Mark J. and Tybout, James R.** "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs." *American Economic Review*, September 1997, 87(4), pp. 545–64.
- Tybout, James R.** "Plant and Firm Level Evidence on 'New' Trade Theories," in E. Kwan Choi and James Harrigan, eds., *Handbook of international trade*. Oxford, U.K.: Blackwell, 2003, pp. 338–415.
- United Nations Industrial Development Organization.** *Industrial statistics database*. Vienna, Austria: UNIDO, 2001.
- World Bank.** *World development indicators*. [CD-ROM]. Washington, DC: World Bank, 2000.