LEVERHULME LECTURE 1

Firms, Technology, and the Global Economy: A Tour of the Data

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New data and new theories have made producer level participation in international trade an extremely active research area.

What is the current state of our knowledge?

- Empirical investigators are assembling a wide array of data on producer level behavior in international trade from sundry sources.

- These investigations have yielded regularities that have forced trade economists to amplify and revise theories of international trade.

- We are making progress toward developing a structural framework that can accommodate these basic facts.

How should we proceed?

A desire is that theory and measurement progress in concert.

Two failures:

1. Keynesian macroeconomic forecasting models: data without theory.

2. Factor Endowments: Elegant theory that sits awkwardly with the facts

More successful:

Growth economics.

Some specific modeling challenges:

- How to connect producer level facts with what we observe at the aggregate level.

- How to integrate producer level observations into a model of international trade.

- What more can we learn from producer level observations?

These lectures

- Today: Review evidence on producer level facts
- Tomorrow: Firms, Exports, and Innovation: A Dynamic Framework
- Thursday: The Export Behavior of French Firms: Interpreting Four Portraits

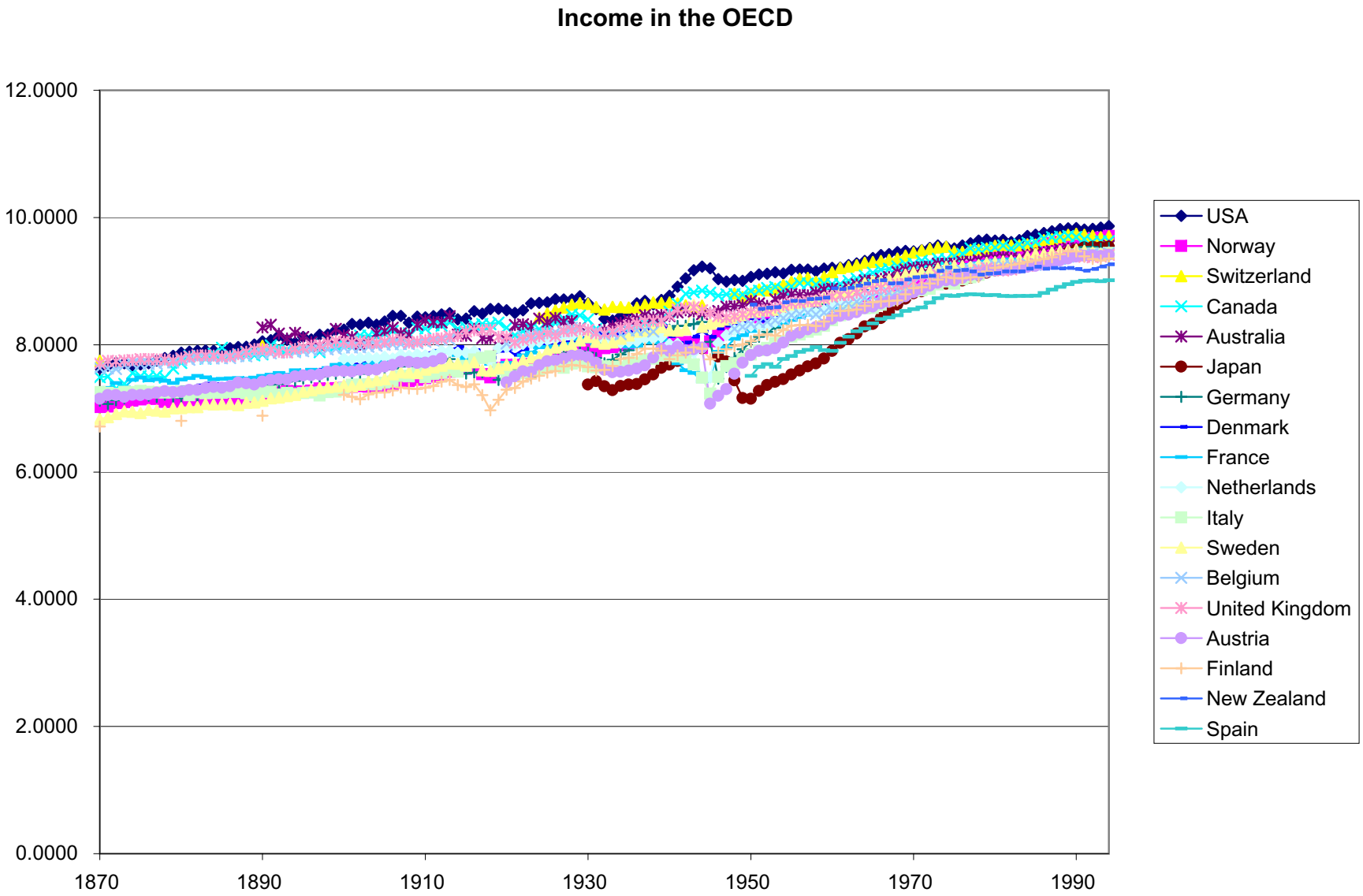
Evidence according to different Units of Observation

- Production plants or establishments
- Firms
- Products
- Evidence suggests that they are not telling very different stories
- Multiproduct firms: Klette and Kortum (2004).
- Here we treat a firm as the owner of a technology for producing a product.

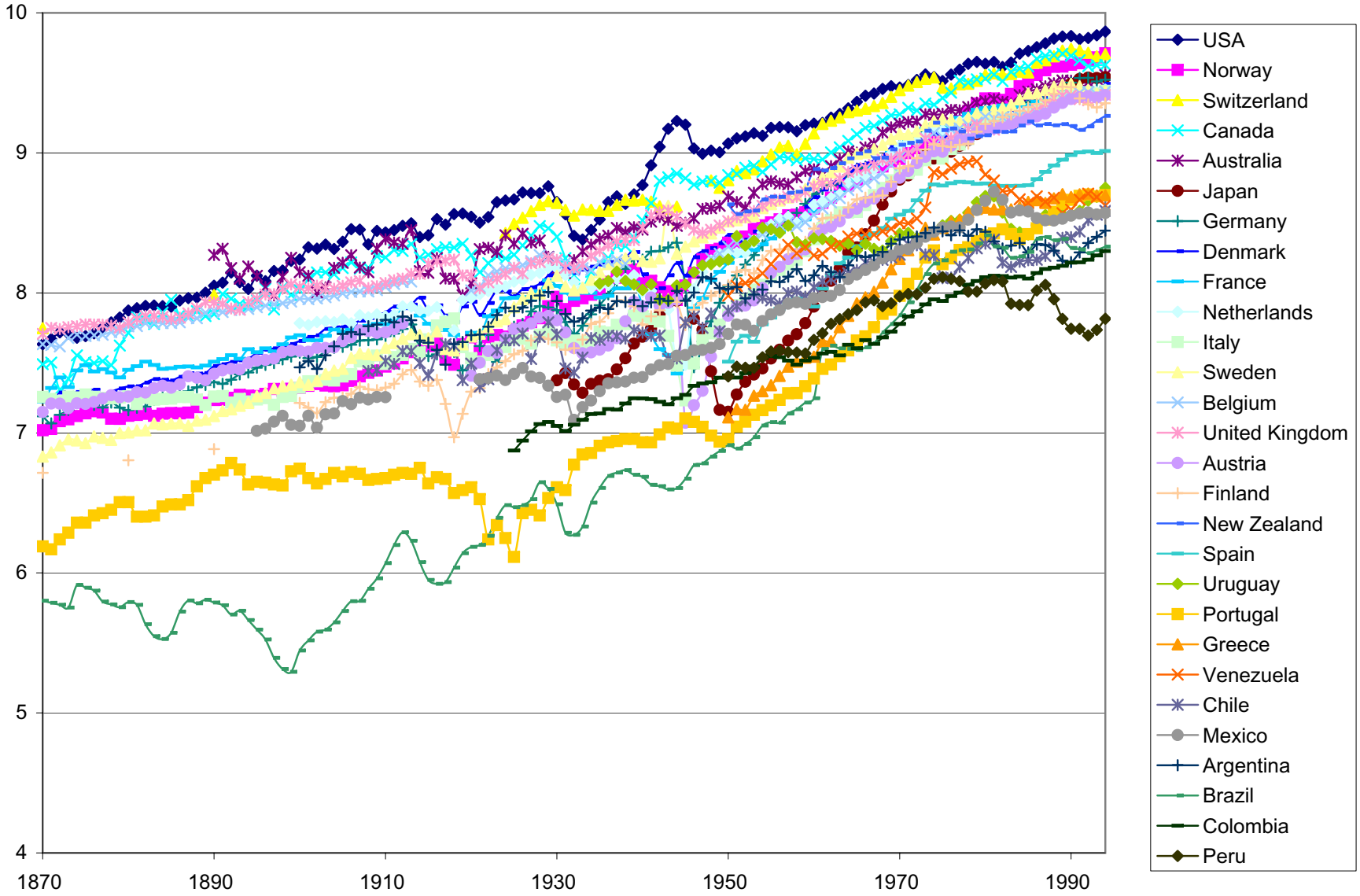
Some Basic Facts about the Global Economy that Producer Level Evidence can help us Understand

Fact 1:

Growth is a global, not a national, phenomenon, but barriers to technology flows remain


Income in the OECD
12.0000
10.0000
8.0000
6.0000
4.0000
2.0000
0.0000
1870
1890
1910
1930
1950
1970
1990
USA
Norway
Switzerland
Canada
Australia
Japan
Germany
Denmark
France
Netherlands
Italy
Sweden
Belgium
United Kingdom
Austria
Finland
New Zealand
Spain

Income in the OECD and LA



Fact 2:

World Growth is driven by innovation in a small number of countries

TABLE 1

Business Sector Research Scientists
(per 1000 Industrial Workers)

COUNTRY	Scientists	Income	Population
Finland	12.2	69	5176
United States	10.2	100	275423
Japan	9.8	73	126919
Sweden	7.7	69	8871
Luxembourg	6.8	138	441
Russia	6.6	28	145555
Belgium	6.2	70	10254
Norway	6.0	90	4491
Canada	5.9	81	30750
Germany	5.5	67	82168
Singapore	5.3	80	4018
France	5.1	66	60431
Denmark	4.5	80	5338
Ireland	4.4	76	3787
Korea	4.2	42	47275
United Kingdom	4.2	68	59756
Taiwan	4.2	55	21777
Austria	3.9	70	8110
Netherlands	3.6	72	15920
Australia	2.4	76	19157
Slovenia	2.0	48	1988
Spain	1.8	53	39927
New Zealand	1.7	56	3831
Italy	1.6	64	57728
Slovak Republic	1.6	35	5401
Czech Republic	1.4	42	10272
Hungary	1.4	31	10024
Romania	1.4	14	22435
Poland	0.8	27	38646
Portugal	0.7	48	10005
China	0.7	11	1258821
Greece	0.5	44	10558
Turkey	0.2	21	66835
Mexico	0.1	27	97221

Data are for 2000 or the previous available year
Income is relative to the United States (100)
Population is in 1000's
Sources: OECD (2004) and Heston, Summers, and Aten (2002).

Fact 3:

Distance matters for trade, and, to a lesser extent, technology diffusion

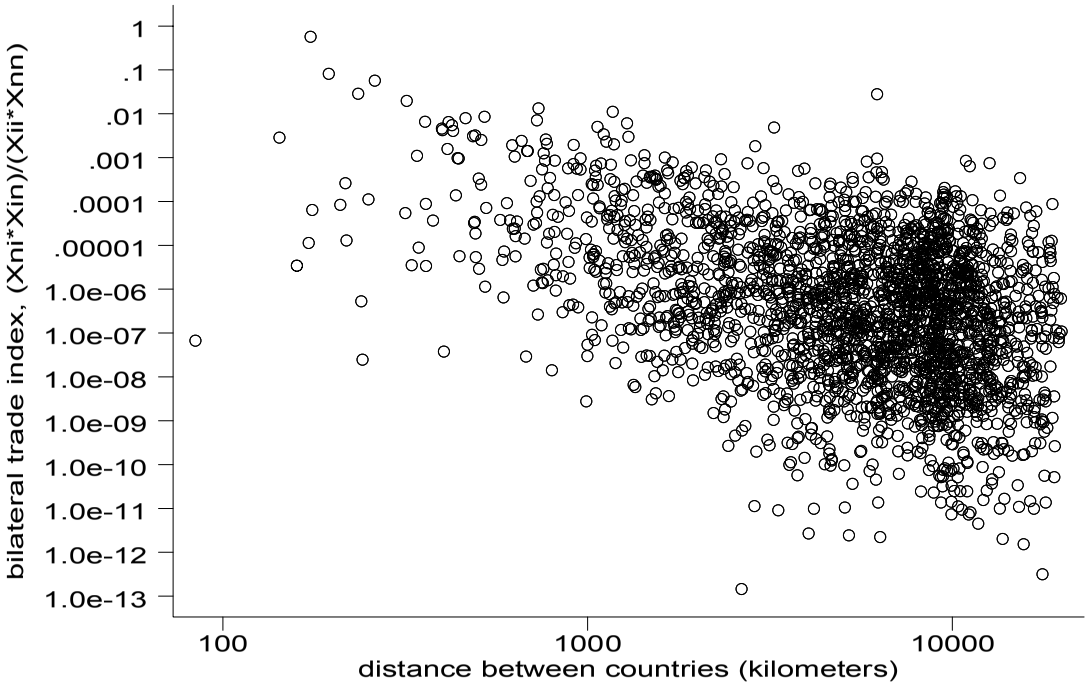


Figure 4: Bilateral Trade and Distance

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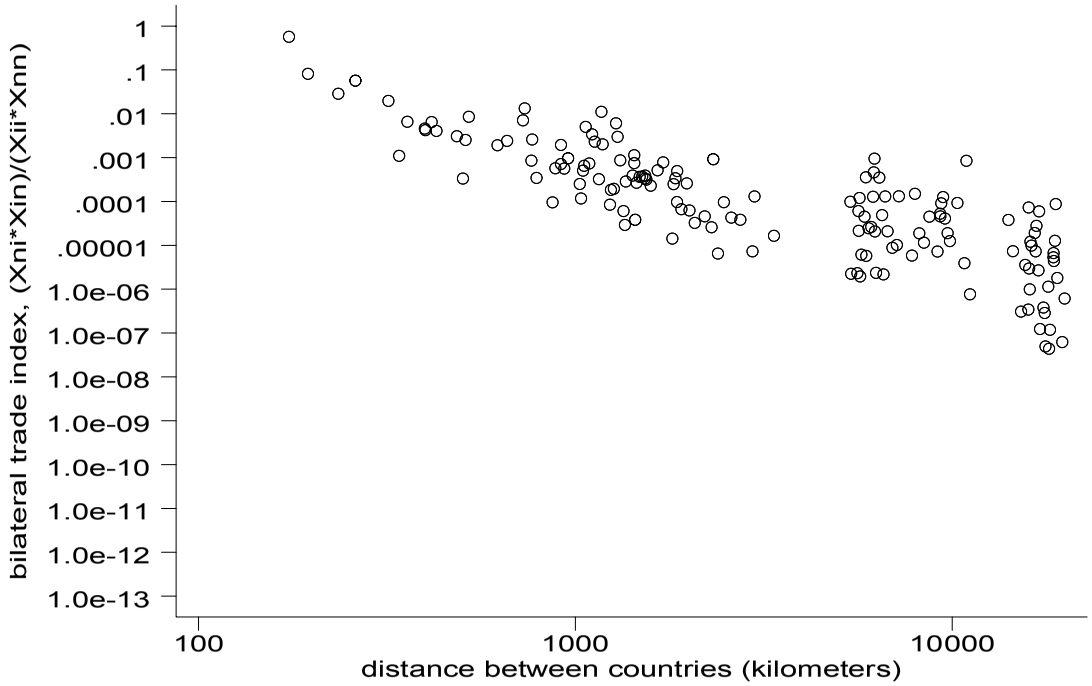

Figure 5: Bilateral Trade and Distance, 19 OECD Countries

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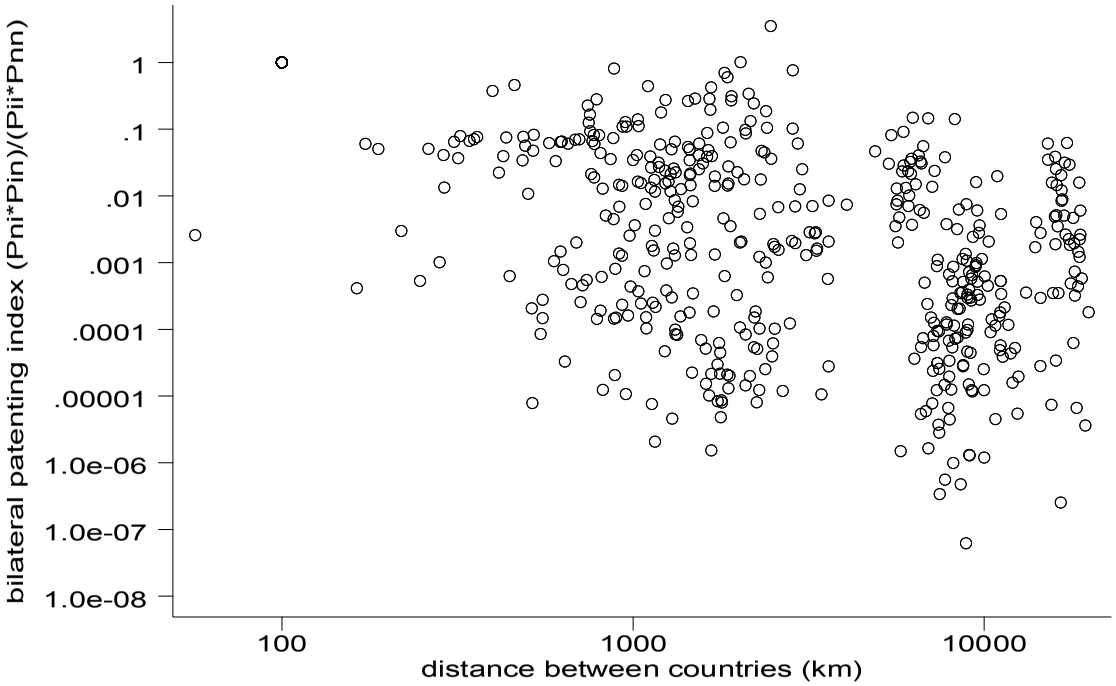

Figure 11: Bilateral Patenting and Distance

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Some Basic Facts about Individual Producers that help us to think about these features of the Global Economy

Fact 1:

Most producers don't export, and those that do export very little and not very widely.

TABLE 1: Producer Export Participation, France vs. USA

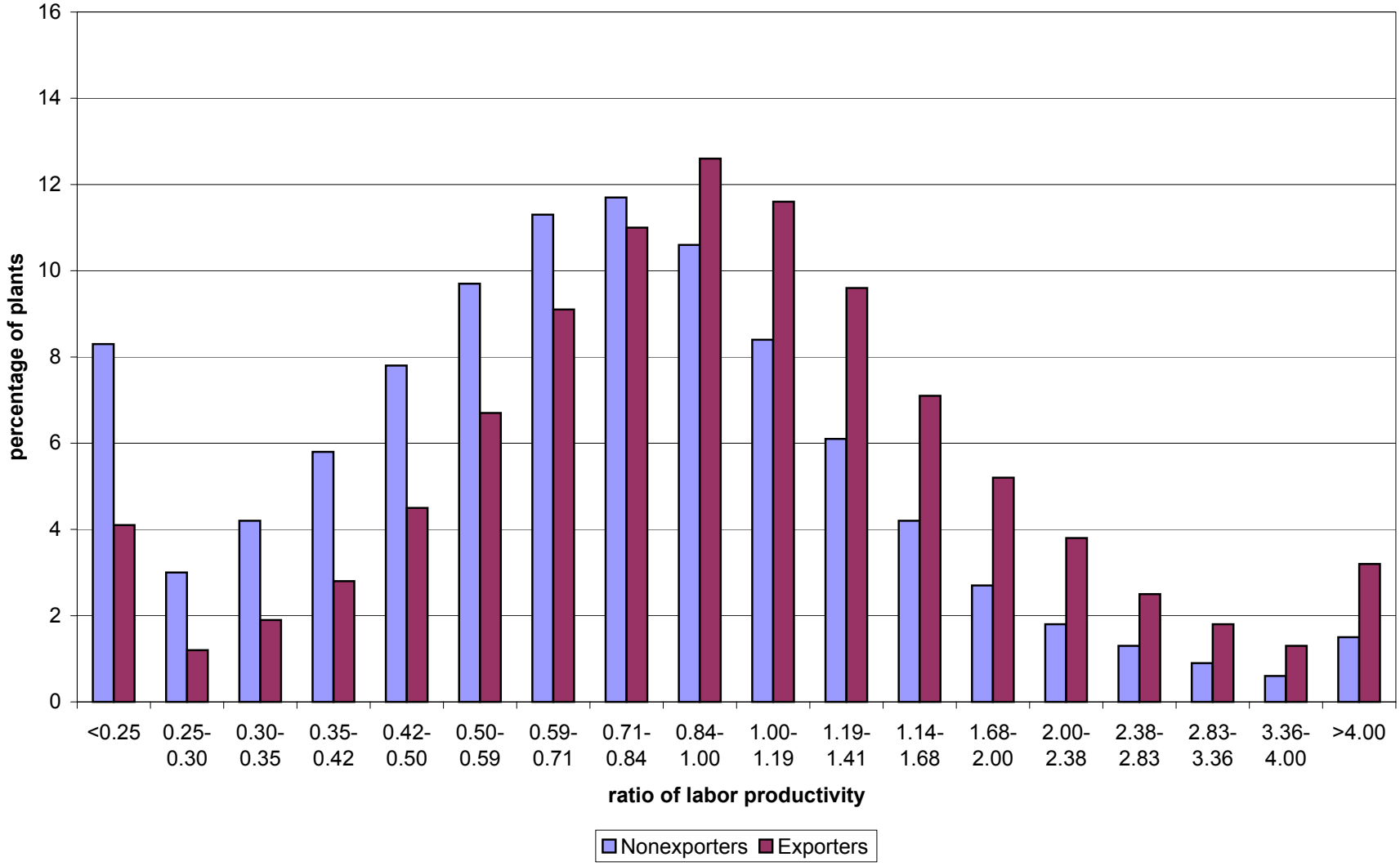
SIC	Industry	Number of Producers		Percentage that Export		Percentage Exported	
		France	USA	France	USA	France	USA
20, 21	Food and Tobacco Products	59637	11887	5.5	13.1	11.9	5.8
22, 23	Textiles and Apparel	24952	17456	24.1	6.2	22.0	4.6
24, 25	Lumber and Furniture	29196	22518	12.1	6.7	9.9	8.8
26	Paper and Allied Products	1757	4512	45.3	18.0	18.4	8.7
27	Printing and Publishing	18879	27842	15.1	2.9	4.3	3.2
28	Chemicals, etc.	3901	7312	55.4	30.3	27.4	12.0
30	Rubber and Plastics	4722	8758	44.3	22.2	24.3	6.5
31	Leather and Leather Products	4491	1052	26.3	17.0	19.3	11.6
32	Stone, Clay, Glass, and Concrete	9952	10292	16.3	9.0	16.7	7.0
33	Primary Metal Industries	1425	4626	52.8	22.1	27.7	4.0
34	Fabricated Metal Products	25923	21940	16.8	15.2	13.1	7.5
35	Machinery and Computer Eqpt	17164	27003	26.8	19.6	27.7	13.9
36	Electronic and Electrical Eqpt	9382	9525	30.2	34.6	21.6	11.5
37	Transportation Equipment	3786	5439	32.9	23.5	28.7	12.9
38	Instruments, etc.	7567	4232	13.3	43.1	32.7	15.5
39	Miscellaneous Manufacturing	11566	7254	21.0	13.0	22.4	7.3
	Manufacturing (ex. Petroleum Ref.)	234300	191648	17.4	14.6	21.6	10.3

Notes: US figures are for 1987, derived from Bernard and Jensen (1995). French figures are for 1986, based on Customs and BRN-SUSE data sources. Percentage exported is exports of the industry as a percentage of exporting producers' sales.

Fact 2:

Exporters are larger at home, and more productive.

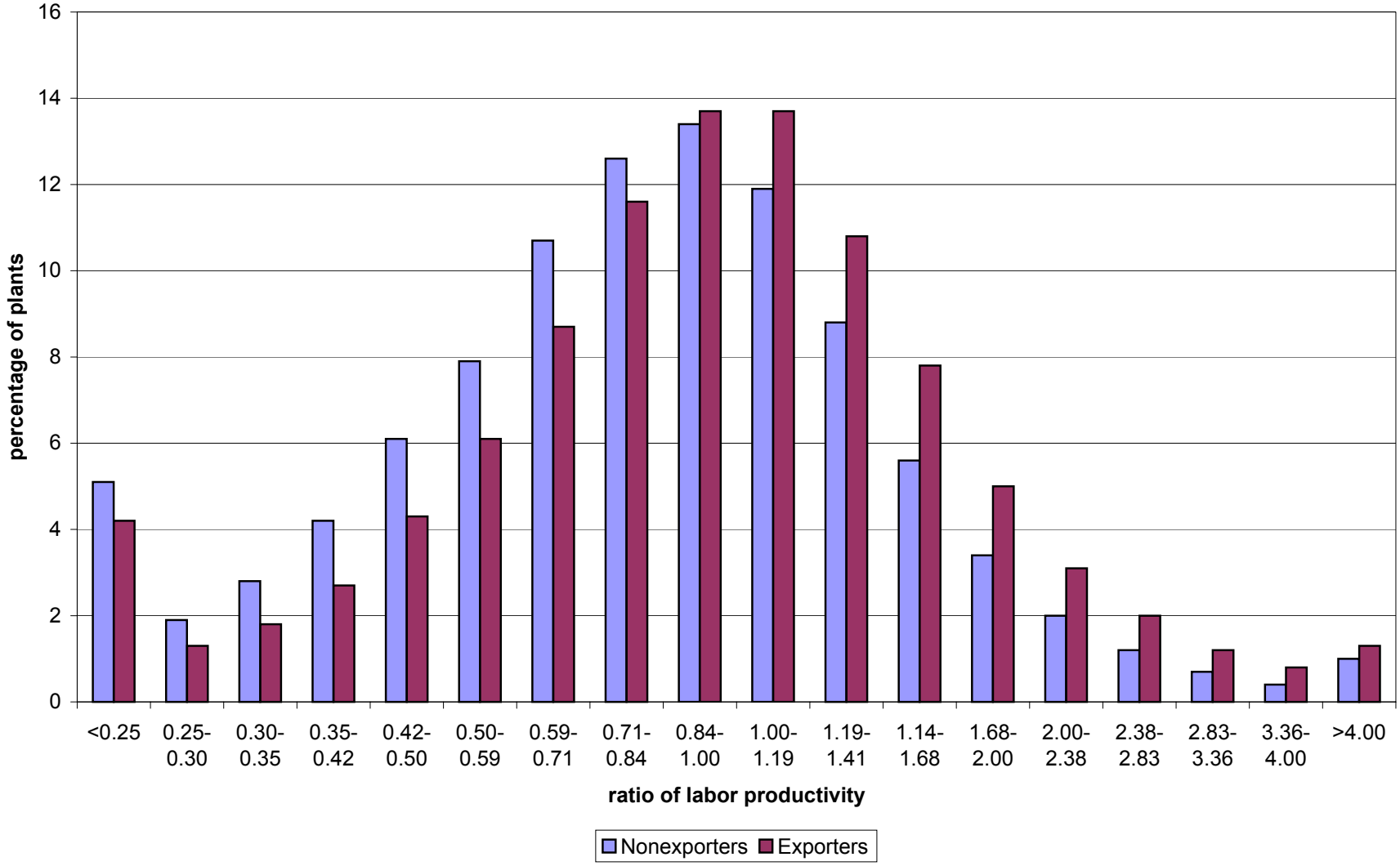
Figure 2a: Ratio of Plant Labor Productivity to Overall Mean



Fact 3:

Industry is not very informative about export participation or research specialization. The action is inside industry.

Figure 2b: Ratio of Plant Labor Productivity to 4-digit Industry Mean



BUSINESS SECTOR R&D 1985 (BY INDUSTRY)

	UK	W. GER.	JAPAN	FRANCE	SWEDEN
31 Food, Beverages & Tobacco	2.6%	1.1%	2.7%	1.4%	2.2%
32 Textiles, Apparel & Leather	0.5%	0.5%	1.2%	0.6%	0.3%
355+356 Rubber & Plastic Products	0.8%	1.7%	2.7%	2.6%	0.9%
351+352 Chemicals	20.2%	22.6%	17.6%	18.2%	17.5%
353+354 Petroleum Refineries & Product	1.2%	0.7%	1.3%	3.1%	0.2%
37+381 Sub-total metals group	2.0%	5.0%	8.3%	3.2%	5.6%
382 Non-Electronic Machinery	12.8%	14.8%	7.2%	9.5%	16.7%
383 Sub-total electrical-electronical	32.7%	27.8%	36.4%	27.0%	21.1%
384 Transport Equipment	25.5%	24.0%	17.6%	32.5%	29.1%
34 Paper, Paper Prod. & Printing	0.4%	0.4%	1.0%	0.4%	5.3%
36 Non-Metallic Mineral Products	0.9%	1.2%	3.3%	1.2%	0.7%
39 Other Manufacturing, nec	0.3%	0.2%	0.9%	0.1%	0.5%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%
TOTAL (1995 US$ million)	11261.7	22175.0	35176.2	11525.5	2653.3

SOURCE: OECD

Firms and Individual Destinations: Portraits from France (for interpretation Thursday)

The Data

- Tax data on nearly all French firms, indicating employment, domestic sales, etc.

- Merged with Customs declarations on firm exports and imports.

- Exports by firm for each foreign market (200+ destinations reduced to 113 countries).

- So far, 1986 cross-section in manufacturing (230,000 + firms).

- Firm export data line up well with aggregate data, with about 20% missing quite uniformly

- Exporter/nonexporter differences similar to U.S. plants.

Portrait 1

Most exporters don't sell very widely.

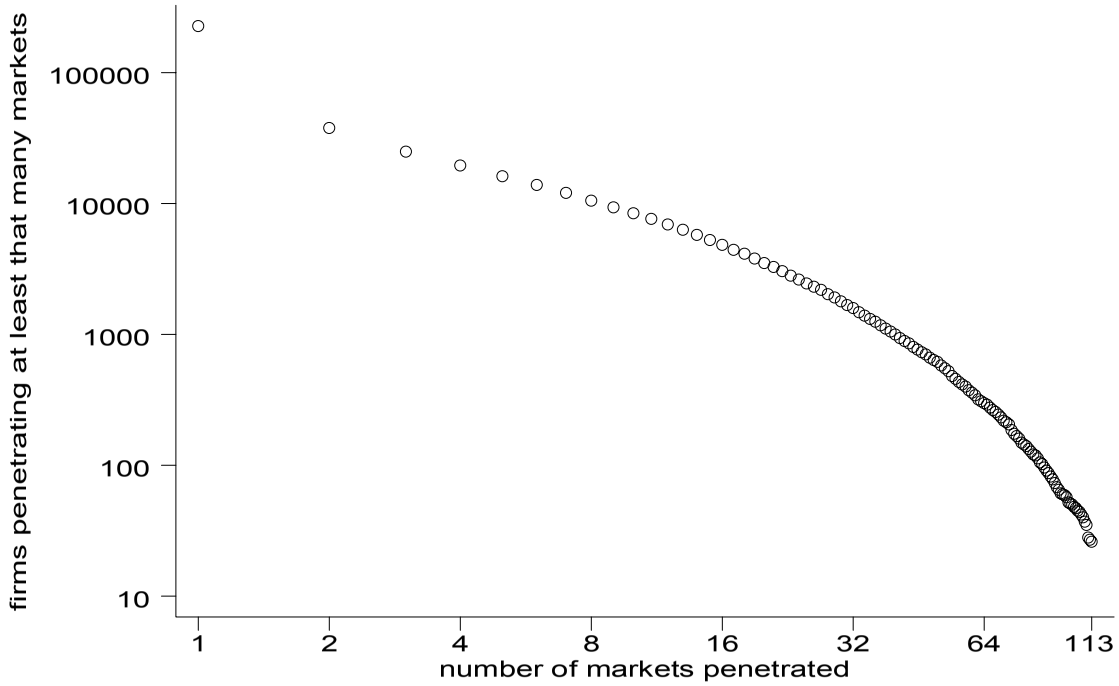


Figure 1: Frequency of Selling in Multiple Markets

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Portrait 2

Exporters who sell widely are systematically larger in France.

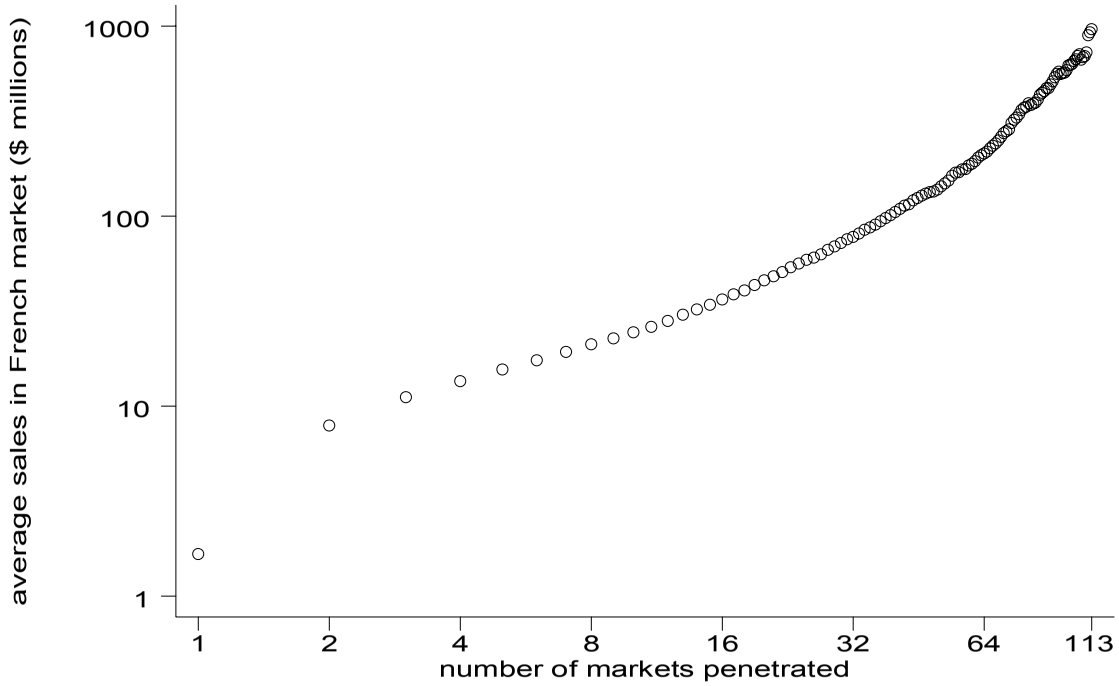

Figure 2: Firm Size and Market Penetration

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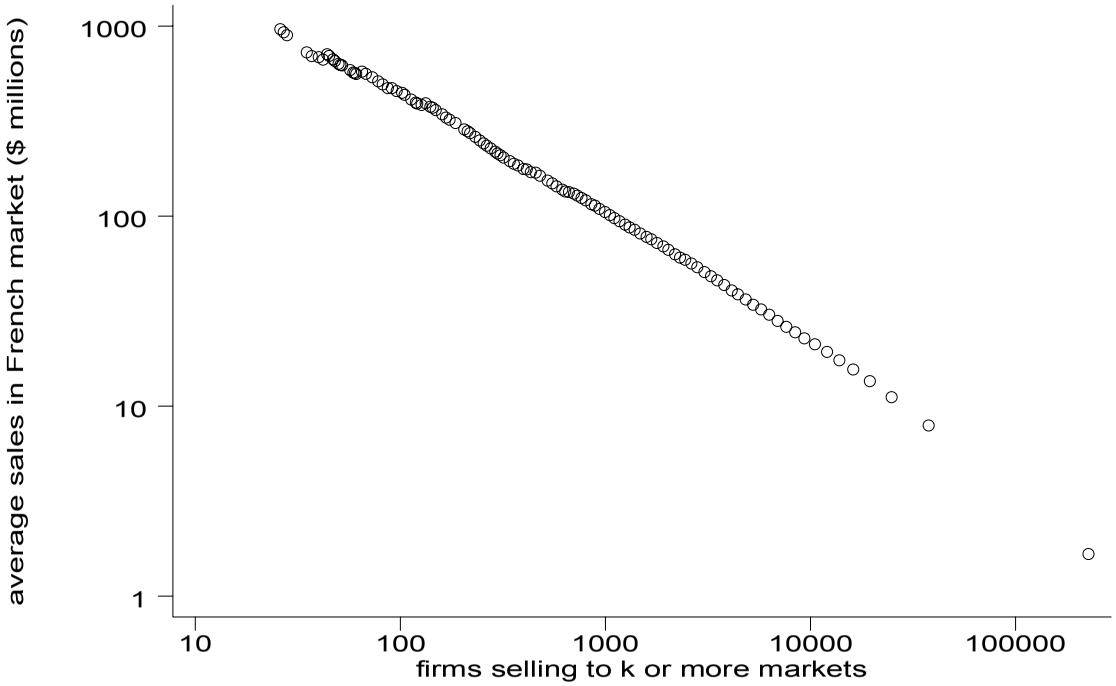

Figure 8: Firm Size and Frequency of Multiple Markets

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Portrait 3

The size distribution of sales is very similar across markets (with France itself not very different).

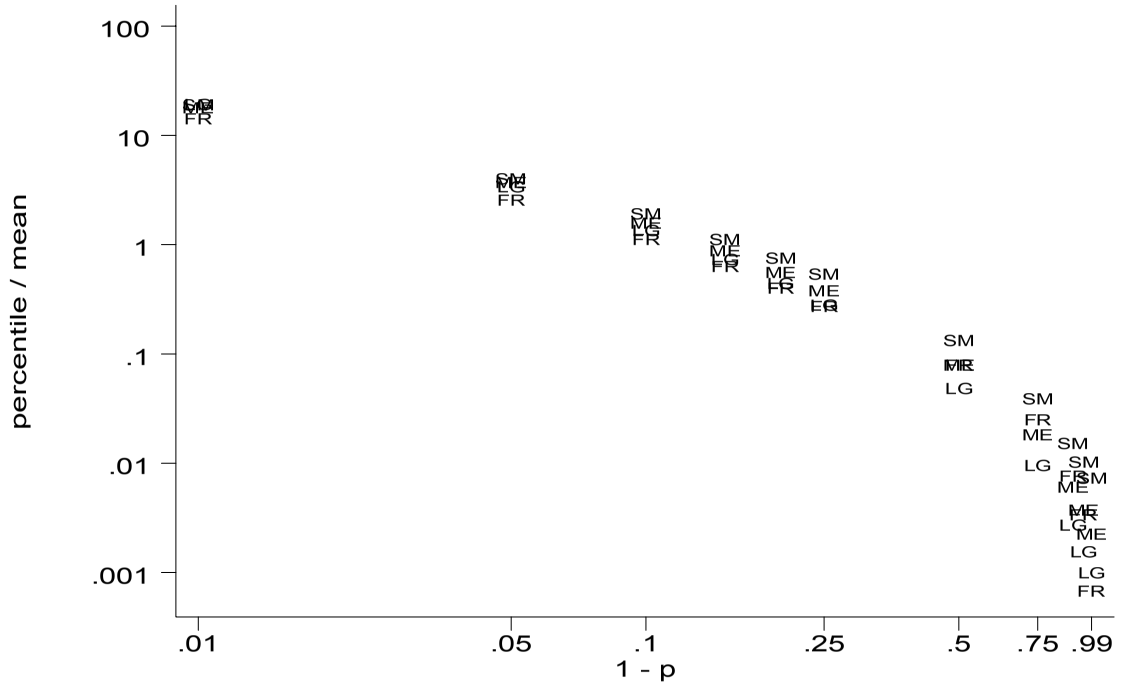

Figure 6: Distribution of Sales, by Market Size

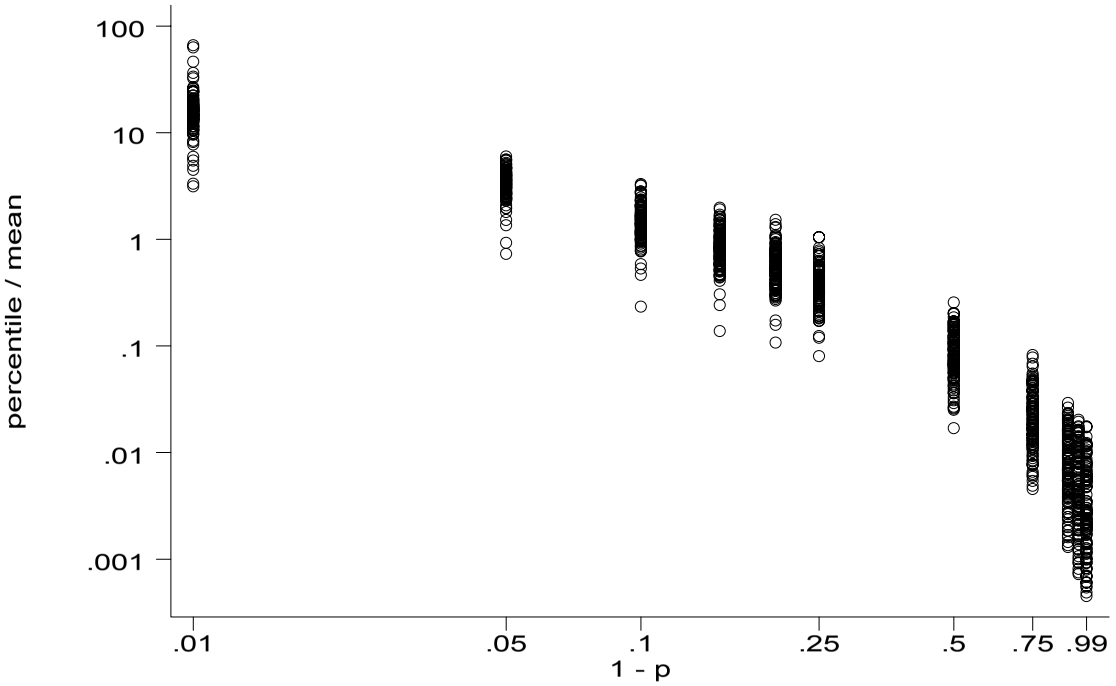

Figure 6a: Distribution of Sales (all markets)

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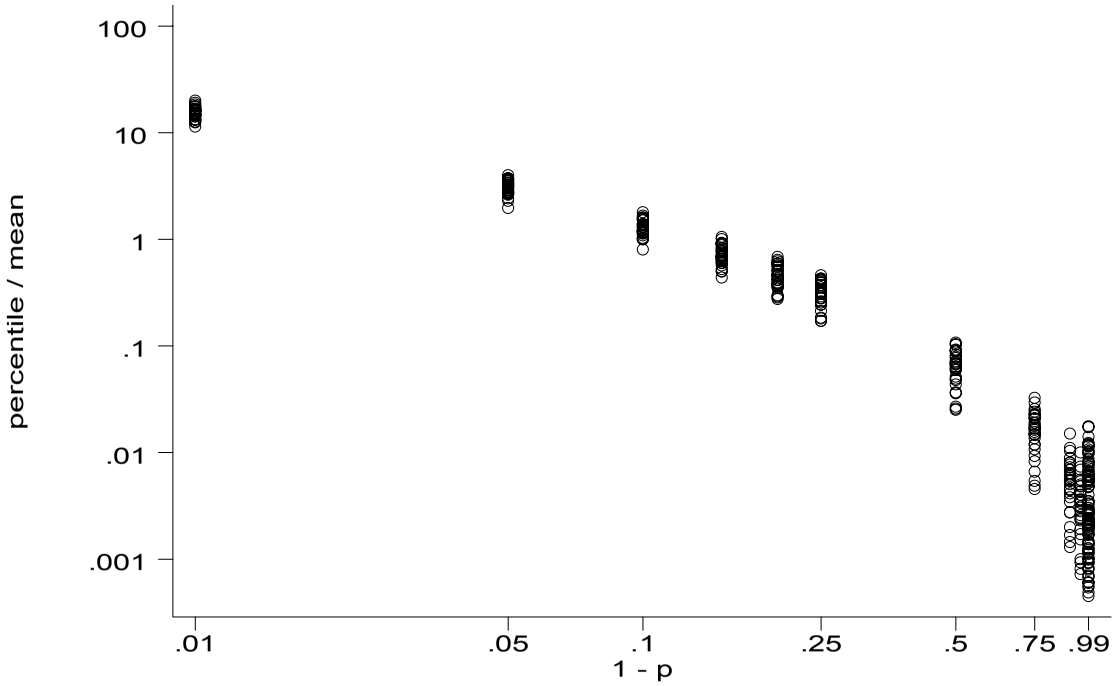

Figure 6b: Distribution of Sales (top 25% mkts.)

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Portrait 4

The margin of entry: It's mostly the number, not the amount.

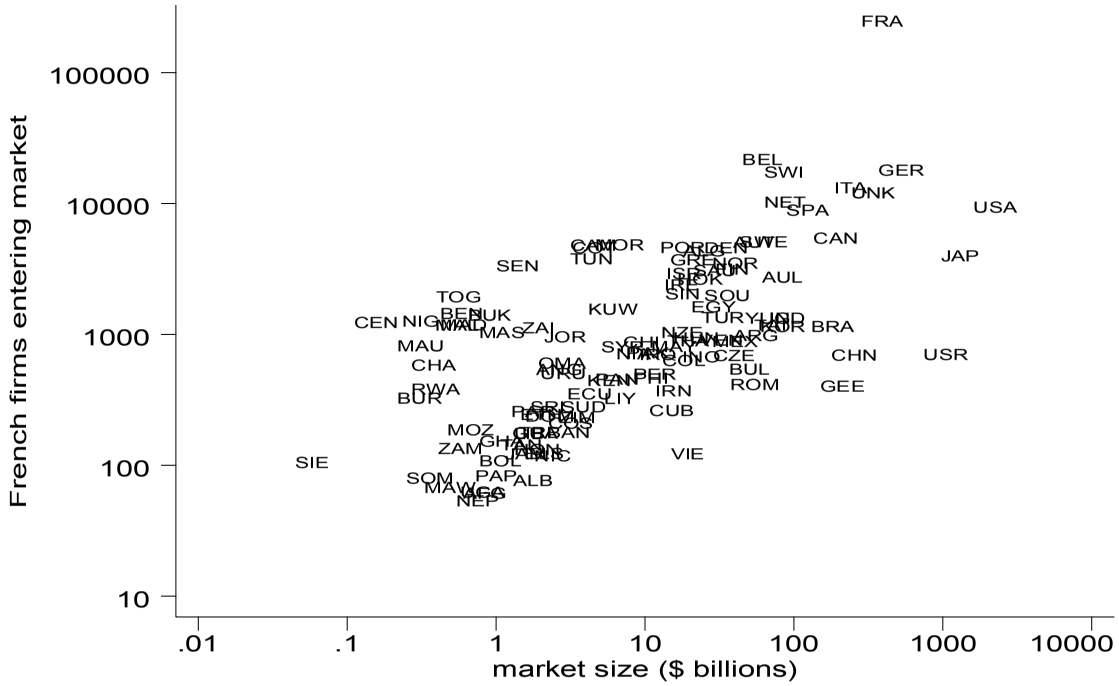

Figure 3: French Firm Entry and Market Size

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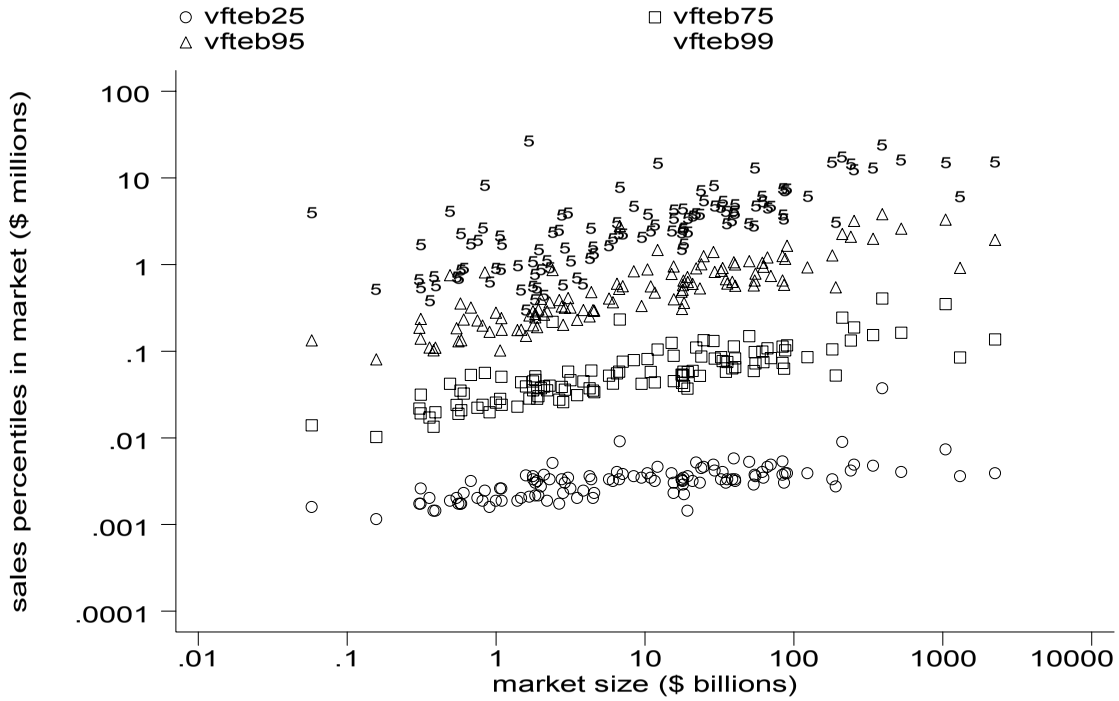

Figure 4: Distribution of Sales by Market

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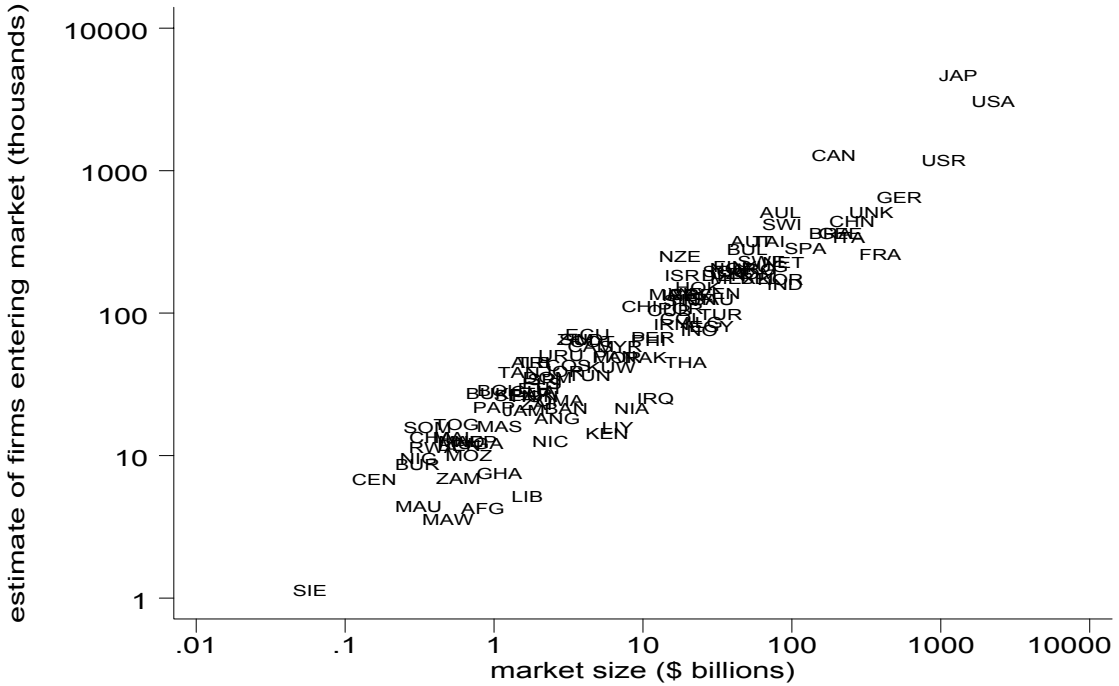

Figure 5: Entry and Market Size

The Margin of Entry in a Regression

- Double identity:

$$\overline{x}_{nF} J_{nF} \equiv X_{nF} \equiv \pi_{nF} X_n$$

- Systematic relationship among # of French exporters, market size X_n, and French market share in n, π_{nF}:

$$\ln J_{nF} = \beta_X \ln X_n + \beta_S \ln \pi_{nF}$$

with $\beta_S = .87$, $\beta_X = .62$ $R^2 = .90$.

Portraits 1a and 4a

Industry doesn't matter very much

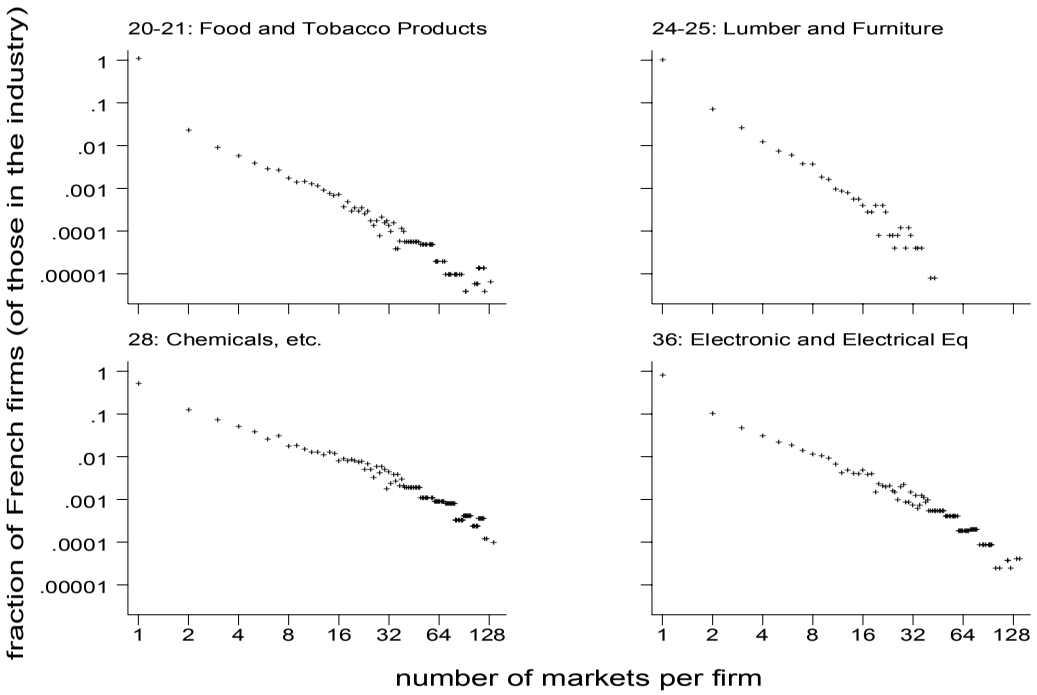

Figure 1B: Entry of French Firms in Four Industries

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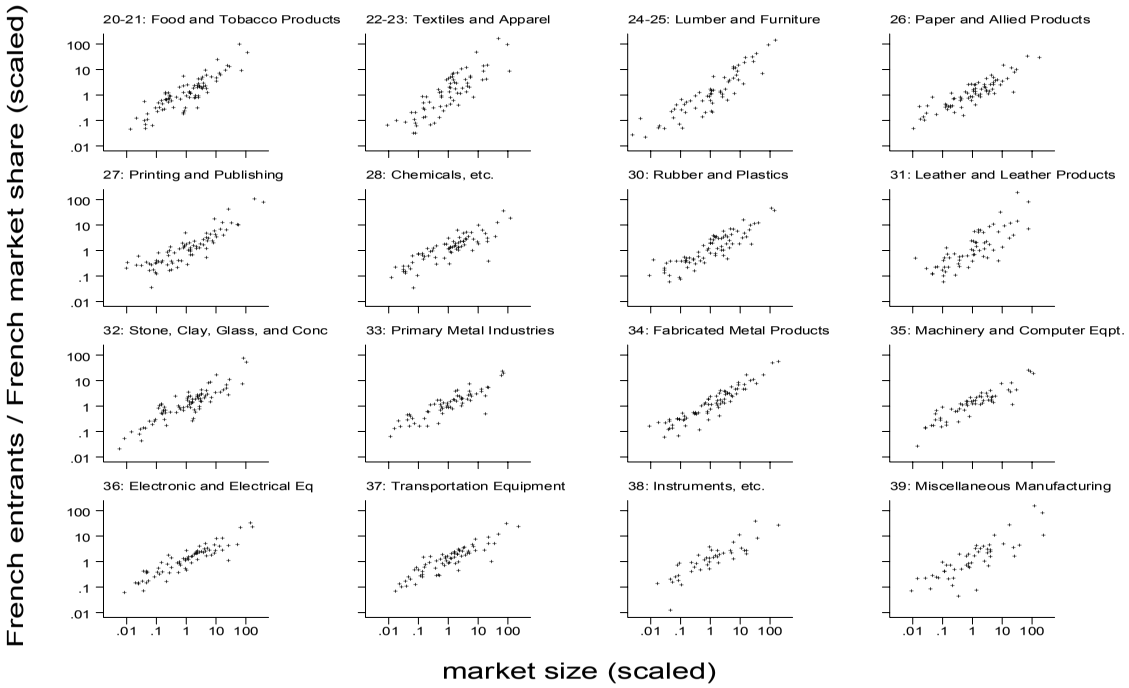

Figure A2: Entry and Market Size, All Industries

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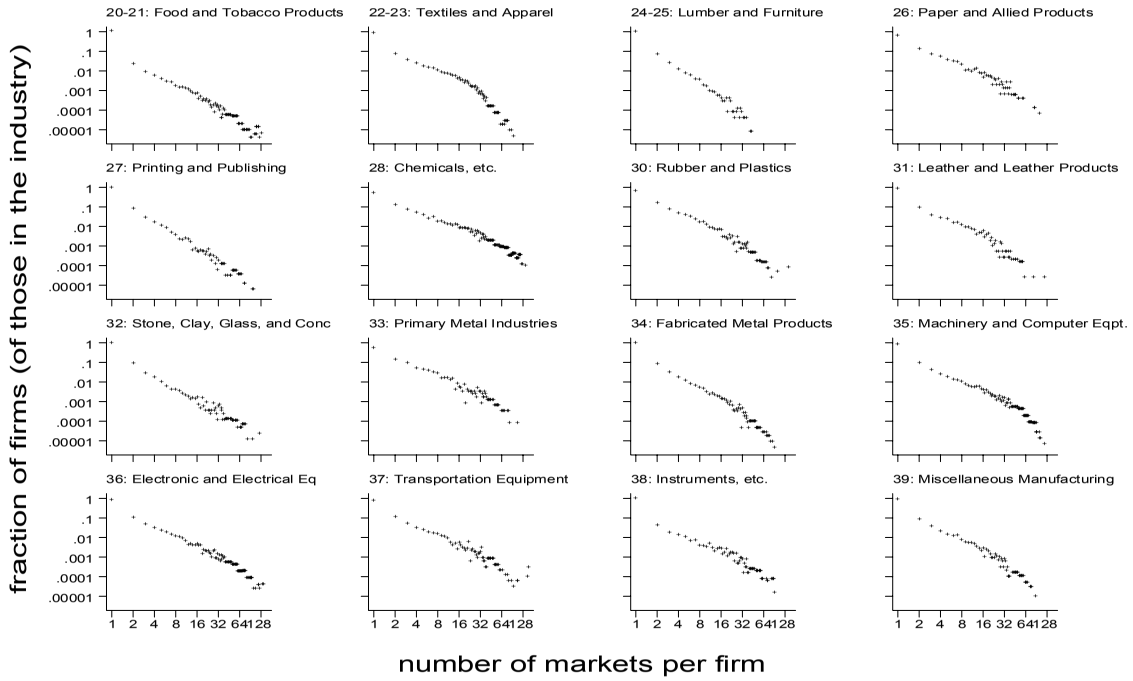

Figure A1: Entry of French Firms, All Industries

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Challenges:

1. Developing an analytic framework can make the connections among these disparate observations.

2. Inferring parameter values from the data.

3. Understanding the nature of geographic barriers.

Tomorrow: A framework for trying to put these various facts together.

Thursday: Interpreting the Portraits from France in a theoretical framework.